Digital work practices: Matching learning strategies to future employment

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Abstract

The impact of technology needs to drive thinking in education forward and lead to new ways of understanding student work readiness and the teaching practices that best enable it. This article focuses on the first-stage planning of a multidisciplinary, multi-institutional research project on digital work practices and graduate work readiness, using journalism as a case in point. The project seeks to implement a scaffolding method for domain-specific learning experiences. The method utilises the concept of affordances to develop task-based learning activities that model industry-relevant digital labour, establishing functional and perceptual capabilities and then structuring opportunities for cross-contextual application and innovation. The concept of affordances has been discussed widely in communication and education studies, and is not without critics. However, as this article argues, affordances can be useful. They remind educators of the interactive relationship between technologies and their users, and the need for scaffolded learning opportunities for students as they develop employability capabilities.

Keywords: digital affordance model; digital work practices; employability; journalism education; pedagogy futures

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Introduction

Changes in technology have been changing organisations and work practices radically for some time. Future needs of organisations include a flexible, creative and mobile workforce, in which collaboration and the use of technology are central to practice (e.g. Hajkowicz et al., 2016). Furthermore, the 'collective skills and strengths of a multidisciplinary agile team … [outweigh] the heroics or talents of any one individual' (Bhens, Lau & Sarrazin, 2016, p. 2). Although teamwork, digital literacies and digital learning are in the spotlight in higher education, it is concerning that 'recent studies have found that university students often are ineffective in their use of the Internet and other digital research tools' (Selwyn et al., 2016, p. 5). In addressing the challenge of matching higher education learning strategies to future employment involving digital work practices, a research project is underway as a collaboration of three Australian

universities. The project focuses on preparing graduates for digital work and how to embed this in the curriculum in the fields of communications, creative arts, business and management, engineering and potentially others. At the heart of this project, a digital affordance model is being developed to support scaffolded learning. The model incorporates the progressive development of digital capabilities that are common across disciplines (such as collaboration), as well as those that are specific to different disciplines. This article focuses on journalism as a case in point, in terms of meeting new needs for graduate employability in the context of the evolving industry.

Like the industry it seeks to service, critique and assist, journalism education is in a highly disrupted state. Although consensus as to what the ideal university-based journalism program should consist of is difficult to achieve, there appears to be broad agreement among industry practitioners and educators that universities do have a role to play in preparing journalists in terms of educational background and capabilities (Tanner et al., 2014). However, to borrow a phrase from practice, the 'hows, whys, wheres and whats' of that role are unclear and at times contested. Given the immense changes flushing through the industry, it is not surprising that the practices and ambitions of journalism education – and the industry it serves – are hotly contested. As US scholar Seth C. Lewis (Carlson & Lewis, 2015) suggests, these ongoing debates point to a future in which the boundaries of journalism and its study are formed 'in a more interdisciplinary fashion', where ideas are cross-checked against different though often allied perspectives to reveal new insights and make sense of journalism as an occupation defined by its often shifting boundaries:

> We might, as it were, need to cross boundaries a bit more readily … to make the study of journalistic boundaries a more meaningful, diverse, and conceptually vibrant enterprise. of journalism that fully acknowledges the social and the material from multiple perspectives, allowing the range of human actors and nonhuman technological objects, and the interstitial spaces and relationships between them, to come into full view. (2015, p. 298)

Thus our broader research fittingly concerns the potential of a concept such as digital affordances to deliver fresh pedagogical pathways. In doing so, we acknowledge both the macro changes to practice and perspectives wrought by digital technologies across disciplines and the micro or specific concerns of journalism and the well-documented tensions between industry and the academy. Trevor Cullen and colleagues' (2014) specific study of news editors in Western Australia, for instance, fleshes out two common elements of that latter debate: that many industry practitioners have a 'limited knowledge' of the tertiary programs on offer and that there is disagreement within industry as to whether 'university-based degrees should be generalist in nature, or journalistic; theory-oriented or practical in nature?' (2014, p. 12). Rapid technological change in journalism has added a sense of urgency, if not desperation, to this apparent schism between what the industry needs and what is taught. As Cullen (2015, p. 299) notes in his work on developing a capstone unit for tertiary journalism programs:

> Journalism and the media industry have undergone major structural changes due to the introduction *of new digital technologies*. This rapid,

> fast-paced change is notable in many industries but is acute in the media sector and therefore demands a particularly responsive and adaptable curriculum for journalism education. (emphasis added)

Cullen's work makes a specific contribution to a lengthy, ongoing and increasingly complex debate that extends to questioning whether the professional identity and framing of professional capabilities in journalism are appropriate to the new capabilities required in the digital workplace or the new ways that journalists conceive themselves and their responsibilities. An industry-wide study into the transformation of Australian journalism (Hanusch, 2015) concludes that accelerating technological innovation, business model challenges and the shift to audience participation created a sense of constant change for practitioners – and the need for further and ongoing examination by journalism educators and scholars of the way journalists experience change in their industries. Hanusch (2015, p. 51) suggests tracking several key questions, including the following:

> Do increased audience engagement and feedback lead journalists to reformulate news values? Will they become more likely to cater only to what their audiences want to know, rather than what they feel they ought to know? To what extent may the organisational context play a part in any changes in journalistic culture?

More recent work by the same author, working with Edson C. Tandoc Jr (Hanusch & Tandoc, 2017, p. 13), indicates that journalists are in fact increasingly influenced by feedback from reader comments, web analytics and social media to the extent that giving audiences 'what they want' is becoming more important than the traditional watchdog functions of the press. Such trends clearly have implications for the academy and the teaching of both practical and reflective skills and broader capabilities, not to mention the more profound and often repeated question posed by scholar Jay Rosen (1999) at the beginning of the digital revolution: What are journalists for? We submit that these issues are not at odds with the immediate day-to-day concern of how to best arm graduates with both old and new weaponry – or, as recent industry inquisitors Stencel and Perry (2016) put it, both foundational and transformational powers.

The question at the heart of this article relates to just how prepared journalism graduates are to practise twenty-first century journalism, given the influence of these new technologies? Within the Australian academy, this question is made harder to interrogate and resolve given the wide range of journalism offerings and the 'considerable differences in structure even between dedicated Bachelor of Journalism degrees, or similarly named programs' (Tanner et al., 2014, p. 5).

This article suggests a way forward. First, we explain the theoretical foundation of an affordance model for scaffolding the development of digital capabilities. Second, we discuss journalism capabilities and outcomes in terms of industry and higher education. Third, we propose a digital capabilities descriptor for journalism, by organising knowledge and skills into outcome-specific domains to underpin an affordance scaffold for teaching journalism students. We aim to demonstrate how the digital capabilities descriptor and the affordance model can be combined to advance a pedagogical

discussion. We will demonstrate how the separation of functional, perceptual and contextual capabilities makes it easier to define categories of requirements. Organising capabilities in terms of interaction complexity also serves as a scaffolding framework for teaching them.

Affordance theory

Affordance theory defines a technology in terms of the uses, interactions and possibilities that it affords to its users. In Gibson's (1979, p. 129) original formulation, affordance theory attempted to define an epistemology of external objects: 'An affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy.'

More recently, affordance theory has been adapted for use in design work, with more of an emphasis placed on the power of perception: 'The term affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used' (Norman 1988, p. 9). Increasingly, the language of affordances has sought to emphasise the enabling potential of interaction. A technology is only realised through interaction with a skilled user – one who is able to exert 'control' over the features of the technology in a way that makes a full range of potential outcomes possible. For Hutchby (2001, p. 444), affordances are 'functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object'.

As Joinson and Piwek (2013, p. 8) also suggest, the utility of affordances is that 'they imply a direct, in some cases designed, link between the properties of an object, material or tool, and the uses to which it is put'. Evans and colleagues (2017, p. 35) propose a simple set of criteria for affordances 'to facilitate a more consistent approach to its conceptualization and application'. According to their approach, to be called an affordance, a *proposed affordance* must not be a feature of the technology … but must be variable or 'have range' – that is, an affordance must permit differential action depending on the perception and intention of the user. Or, as Treem and Leonardi (2012) state, 'materiality exists independent of people, but affordances do not. Because people come to materiality with diverse goals, they perceive a technology as affording distinct possibilities for action.'

Given these criteria, it becomes possible to identify and to categorise affordances. Evans and colleagues (2017) explain how *anonymity* can be an affordance, being neither a feature nor an outcome of a specific technology but rather a variable characteristic of the way certain users interact with certain technologies to maintain their anonymity. Similarly, *persistence* and *visibility* may also be affordances of social media technologies, but *collaboration* is not because collaboration is the outcome of interaction between user(s) and technology. Treem and Leonardi (2012, p. 143) extend the list of affordances for social media use within organisations, arguing that *editability* and *association* are particularly influential for altering 'socialization, information sharing, and power processes in organizations'.

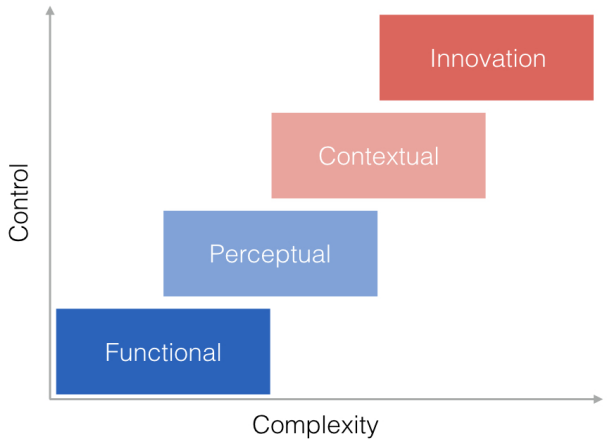
An affordance must describe in some way the process of interaction between object and user. Therefore, it makes sense to attempt some sort of categorisation of these interactions. Hartson (2003), for instance, differentiates *functional* and *perceived* affordances. Best (2009, p. 1020) determines that 'a technology's functional affordances allow us to accomplish a task, and its perceived affordances allow us to understand and manipulate the technology itself'. Furthermore, she extends the categorisation to include *maintenance* and *contextual* affordances, which are respectively the need to keep the technology going and the abilities granted by the context of use. The logic behind such distinctions would appear to be that there is a spectrum of relational interaction, with some affordances being *more* intrinsic to the technology and others being more situated with the perceptive capacities of users. The categorisations echo Norman's (1988) distinction between real and perceived affordances, and are thus susceptible to the same epistemological criticism. Affordances are troublesome because they are attempting to do two different things at once (Oliver, 2005).

This, though, is also exactly why the concept is so useful pedagogically. Affordances force focus on to the relational interaction between object and user. They emphasise that there are different 'ends' to an interactive spectrum and that these ends perhaps may even be of a different *type* (that is, the spectrum is multidimensional). At one end of the spectrum is the object situated in its physical and social environment, presenting itself to potential users in ways that may or may not be easily perceived; at the other end, users must navigate an environment full of objects, and each user has the potential to perceive differently – because of training, experience, conditioning and so on.

If affordances are assembled during the interaction between a technology and its user, then the affordance scaffold seeks to translate the spectrum of possible interactions into an ordered model for learning and teaching. In order to categorise affordances in terms of complexity (for pedagogy), it relies upon the following classification (Best, 2009):

- *Functional affordances* enable the operation of a technology – a user is able to make the technology do what it is supposed to do to accomplish its professed aim. Functional affordances describe interactions that involve naming, knowing and operating the features of a technology. They produce functional control. Functional affordances can be thought of as the 'what and how' of using the technology.
- *Perceptual affordances* permit the user to identify and develop the functionality of a technology; perception is key to feeling in control. Perceptual affordances are interactions that require the in-context recognition and application of functional control. Perceptual affordances can be thought of as the 'when and why' of using the technology.
- *Contextual affordances* enable the user to adapt the technology to a variety of uses and purposes. Contextual affordances require the cross-contextual interpretation of perceptual control. Contextual affordances can be thought of as 'adapting and extending' the use/application of the technology.

The affordance scaffold posits that functional affordances are easier for a user to master than perceptual affordances, which in turn are easier to master than contextual affordances. Furthermore, the mastery of these three types of affordance places a user in full *control* of a technology. Control enables the user to innovate with that technology – that is, to imagine new uses of known features in new contexts.



Source: adapted from Best (2009); Evans et al. (2017); Gibson (1979); Hartson (2003); Hutchby (2001); Joinson & Piwek (2013); Norman (1988, 1999).

Figure 1: *An affordance scaffold concept for teaching to develop digital capabilities*

Building upon this affordance concept, we next discuss contemporary industry outcomes and higher education in journalism so that we can identify important digital capability *domains* for graduate journalists. For the purposes of this article, a domain is a discrete (but not fixed) set of capabilities that a journalist requires for interacting with technology to effect a defined outcome. Within each domain, we argue that educators need to develop task-based learning activities that model industry-relevant digital labour, establishing functional and perceptual capabilities and then structuring opportunities for cross-contextual application and innovation.

Industry outcomes

The massive cultural, societal and technological shifts of the so-called Fourth Industrial Revolution (Schwab, 2016) are expected to have a fundamental impact on many occupations – both white and blue collar. Repetitive jobs, including some currently done by journalists, are likely to disappear; some have already vanished (Mullin, 2016). Many of the new jobs of the future will be ideally suited to people who possess a high level of communication and interpersonal skills, yet these are not always evident in graduates (Norton & Cakitaki, 2016), and journalism graduates may not be immune to this concern. To encapsulate what the industry wants is quite simple: it wants it all! Media employers seek graduates who have both what can be called foundational knowledge and skills – the basics used to research, gather and publish news – and

transformational knowledge and skills (Stencel & Perry, 2016). This latter challenge is especially fluid, as is neatly summed up in the introduction to the Poynter Institute report, *Core Skills for the Future of Journalism* (Finberg & Klinger, 2014, p. 1):

> Creating a successful journalist is not like passing a recipe down through generations. There is no single fixed formula of core skills that journalists need to be successful. It is a list that is forever changing and evolving, just like journalism itself.

Building on the Poynter work two years earlier, Stencel and Perry (2016) do produce a list – via a survey of 31 media employers (asking 39 individuals across 'old' and 'new' media) in the United States, a follow-up questionnaire on hiring priorities, and a review of job postings and interviews with two dozen media executives. In their key findings, they define *foundational* knowledge and skills as those 'that newsrooms have long relied on to cover and uncover news and present … on established media platforms, such as print, broadcast and 'web classic' (the laptop/desktop web experience)' and *transformational* knowledge and skills as 'the abilities that media organizations need to address and adapt to acute, broad and ongoing changes in the news audience, as well as technology for both collecting and distributing news' (2016, p. 1). The surveyed media executives were asked to prioritise the knowledge and skills that they considered both important to transformation and that they would be seeking to hire over the coming year. The top five were: coding/development; audience development/user data and metrics; visual storytelling; digital design; and social media distribution. Asked to nominate their top three, the media executives picked coding; audience development/data; and visual storytelling.

There are a number of caveats to add to this work: first, as previously stated, most of those surveyed want both sets of knowledge and skills and expect new hires to be blessed with the full range of foundational skills – namely excellent writing, reporting, researching and editing; second, the questions asked were focusing on a wishlist skillset in new hires. The results can best be described as a list of good intentions. As the authors note, several skills often associated in the past with the ongoing transition from legacy to digital media were no longer in short supply in their newsrooms. Thus only a quarter of the newsrooms surveyed nominated blogging, verification/fact-checking, copy/self-editing and competencies with content management systems. This survey should be seen as a snapshot in time – of the capabilities in short supply in mid-2015, the time period when Stencel and Perry (2016) conducted their interviews with 39 news leaders from 31 different media companies in the United States. But nonetheless it is a survey with value and insight for students, educators, researchers and industry practitioners at all levels. It is a clarion call for change. As Stencel and Perry (2016, p. 1) state in the outset of their report:

> The news industry is in the market for heroes – great journalists who also have the specialized skills it takes to tell the stories and build the products that audiences want, need and expect.

Journalism in higher education

The Australian Office for Learning and Teaching report by Tanner and colleagues (2014, p. 6) into graduate qualities and journalism curriculum renewal argues for a 'relational approach' to mapping the relationships between knowledge and skills and their application; between discipline communities, professional bodies and the industry; and between macro program/course structure and micro subject/unit design. The report adopts five categories of generic graduate attribute developed by the Simon Barrie-led GAP Project for the Office for Learning and Teaching (see Barrie, 2006): information literacy; research and inquiry; ethical professional understanding; communication; and personal and intellectual autonomy. Citing the GAP taxonomy for information literacy, Tanner and colleagues (2014, p. 116) note that 'for journalists, technological literacy is a key driver of each of the other capabilities'. Indeed, in this GAP cluster, 'technologies' and 'technological innovation' are mentioned in each of the five categories. As Tanner and colleagues (2014, p. 116) point out:

> As the pace of technological change continues to impact on the media industry this first cluster of capabilities (technological literacy) will become increasingly important in the development of journalism education.

As Cullen (2015) notes, the Tanner-led Office for Learning and Teaching report laid the groundwork for a debate among journalism educators on how to 'improve learning outcomes in journalism programs in Australia against agreed national standards, especially the requirement to map and evidence the relationships between generic attributes and disciplinary capabilities' (2015, p. 300). But that debate 'faded' due partly to the lack of agreement on definitions and a 'sense that there are limited practical outcomes' (2015, p. 300). If Cullen is correct, there is an opportunity to look at certain aspects of journalism pedagogy through a new lens.

Inspired by media academic Jay Rosen's (1999) provocation – What is journalism for? – recent survey work indicates that, despite the tensions identified in the studies cited above, there is a broad agreement between journalism academics and journalists that the role of journalism is to inform, educate, hold the powerful to account, record history, amuse and perhaps entertain (Wake & Farrer 2016, pp. 167-168). Where any differences existed between the two groups, they existed at the margin, with academics placing a 'slightly greater emphasis' on holding the powerful to account, monitoring government and using a 'professional ideology and ethics as the basis of the journalist's craft' (p. 168). As the authors note, the high degree of equanimity is unsurprising given that the 'journalism academic cohort is at least 94 percent made up of ex-journalists' (p. 172). This closeness of origin and thinking between academics and journalists could be seen as a 'cause of celebration' in the industry, but Wake and Farrer suggest that sharing a background is not necessarily a positive for an academy charged with helping industry cope with 'massive technological and economic change':

> 'To meet these challenges, the academy, made up in large part as it is by ex-journalists, needs to take that background and reframe it, combining it with theory, reflection and forward thinking to ensure a relevant future.' (Wake & Farrer 2016, p. 172)

Additionally, there is clearly a difference between articulating the purpose of journalism and naming the specific capabilities required to fulfil that purpose. This is especially the case given the multiple challenges inherent in reframing journalism education in light of a rapidly changing media landscape. Ensuring the ongoing existence of core capabilities and their coexistence with new ones can become a source of definitional disagreement between the academy and industry – and within both groups individually.

The Poynter report in 2014 found broad agreement between US journalism educators and professionals on the top 10 attributes (Finberg & Klinger 2014, p. 8). These included accuracy; curiosity; grammar; being able to select information on reliability; being able to handle stress; being acquainted with ethics; knowing about current events; having good news judgement; being able to master interview techniques; and being able to network and develop sources. But the two groups diverged on capabilities considered essential for 'multimedia story-telling on new platforms' and 'new methods for gathering and delivering news and information' (2014, p. 2). Surprisingly, the educators surveyed had a better appreciation of the need for these new capabilities than those who responded in the industry.

Differences were also found between professionals and educators across a range of knowledge, skill and attribute areas, including those considered important to questions of media innovation. Media professionals were, for instance, less inclined to consider knowing about the business of media (38 per cent versus 61 per cent) and the media landscape (57 per cent versus 78 per cent) (Finberg & Klinger, 2014, p. 9). Such results may be a product of the difference between being within the daily battle of keeping journalism relevant and/or economically viable against those who can afford to observe it from the side. Or, as Jeff Jarvis, the director of the Tow-Knight Center for Entrepreneurial Journalism, told Finberg and Klinger (2014, p. 10), professionals will not worry 'about the business of journalism as long as those who do worry about it continue to give them paychecks'. A further explanation unearthed in the Poynter work by Finberg and Klinger goes closer to the concerns of this article: the question of what is actually meant when describing digital capabilities. As their report notes (2014, p. 17), 'When we talk about digital journalism, coding and programming, it can sometimes be confusing as to what we're really talking about.'

This brings into play the contested nature of what is meant by innovation. Just as the provocation 'What is journalism for?' needs to be asked and re-asked, so too should a more contemporary query: 'What do we mean by innovation in journalism? And to what end do we innovate?' A recent critique of US journalism think tanks and foundations (Creech & Nadler, 2017) questions the normative idea that news organisations need to anticipate market-driven and technological changes if they are to preserve journalism's public value. In opposition to Clay Christensen's theory of disruptive innovation (Christensen, Skok & Allworth, 2012), the authors call for a shift away from a 'fixation with anticipating technological change and emerging business models, turning instead to persistent, historically rooted concerns about journalism's sustained democratic value' (Creech & Nadler, 2017, p. 11). They don't argue against innovation per se or experimentation in technology and news forms; rather, they pose another key question: 'What kind of news system does a robust democracy need?' (2017, p. 12). They rise, in short, in favour of value-driven inquiry and innovation in the face of 'intractable market-failure' and suggest

the 'potential need for public funding' (2017, p. 12). These concerns, while worthy of debate, serve here only to highlight the need to consider innovation in the practice and teaching of journalism in a broad and often multi-layered context.

Graduate capabilities (knowledge, skills and attributes) such as leadership, professional competence, indigenous proficiency, critical thinking, problem solving and communication, including teamwork, are common to many Australian universities. Such capabilities can be aligned with descriptors used by the Australian Qualifications Framework (AQF), which mandates the knowledge, skills and application of the knowledge and skills students need to have acquired on graduation from different levels of qualification, such as a Bachelor's or Master's degree. Australian universities may map their own graduate attributes with the knowledge, skills and application of knowledge and skills in each program at the relevant AQF level. Some educators have become familiar with graduate capability mapping exercises, which also need to take account of new and emerging knowledge and skills requirements in a rapidly evolving world such as journalism. Trevor Cullen's work, for example, addressed the development of 'capstone' units for journalism to provide a baseline of journalism graduate capabilities to be acquired and 'evidenced' across universities in Australia – but not a prescribed curriculum for all (see Cullen, 2015, 2016).

Table 1: *journalism aims, attributes, knowledge and skills*

1. Journalism aims: aspirational, outcome focus	Inform Educate Hold the powerful to account Record history Amuse Entertain
2. Requirements of journalists: attributes	Ethical professional understanding Personal and intellectual autonomy Leadership, adaptability and agility Curiosity and creativity Professional competence Indigenous proficiency Ability to handle stress
3. Requirements of journalists: knowledge, skills, and application of knowledge and skills	Information and technology literacy Communication and collaboration Ability to network and develop sources Research and inquiry Critical thinking and problem solving Good news judgment Ability to select information on reliability Knowing about current affairs Mastery of interview techniques Accuracy Grammar proficiency

Source: Adapted from Cullen (2015); Cullen et al. (2014); Davies & Cullen (2016); Finberg & Klinger (2014); Hunter & Nel (2011); Mullin (2016); Schwab (2016); Stencel & Perry (2016); Tanner et al. (2014); Wake & Farrer (2016).

Table 1 summarises various aims, attributes, knowledge and skills for journalism, as mentioned in a range of literature. Tier 1 lists aspirational, outcome functions of journalism broadly (the knowledge and skills or tasks that answer the question 'What is journalism for?'). Tier 2 includes attributes needed for journalists to inform, educate and so on. Tier 3 lists the specific knowledge and skills needed by the individual journalist, including application of knowledge and skills.

Digital capabilities descriptor

Worryingly, from our perspective, the Table 1 lists hardly address the changing technological environment in which journalism is practised, although information and technology literacy were mentioned in the literature from which the lists were drawn. Where, for instance, are the specific knowledge and skills necessary to conduct 'multimedia storytelling on new platforms'? And what are the 'new methods for gathering and delivering news and information' highlighted by Finberg and Klinger (2014, p. 2)? This suggests that we need to reflect more carefully on strategies for teaching and developing specific digital capabilities in journalism students.

As part of a learning and teaching research project aimed at developing digital pedagogy for communications, creative arts, business and management, engineering and potentially other disciplines, we have sought to advance this discussion of digital capability requirements for journalism graduates in the emerging media industries. The project is developing detailed descriptions of capability domains through an iterative process, which involves a comprehensive review of the literature on existing and future industry requirements; analysis of current teaching and work practices; roundtable discussions between academics and industry; and detailed analysis of job advertisement data, including the media and communication areas.

The descriptor below is an outcome from the first stage of the process and will likely be developed further. However, we believe it is sufficient to illustrate the affordance approach discussed earlier for teaching and developing digital capabilities. Our digital capabilities descriptor for journalism (Table 2) is informed particularly by Stencel and Perry's (2016) survey and research into specific aspects of curriculum reform, most notably by Davies and Cullen (2016) and to a modest extent by Hunter and Nel (2011). We note that attempting specificity in many areas of digital development presents problems to researchers and educators alike. There is, for instance, a wide range of opinion on what is meant by a term such as 'data journalism' (DJ), as pointed out by Davies and Cullen (2016), and a dearth of academic work to 'document and develop quantitative literacy or numeracy in communications education' (2016, p. 8):

> The emergence of different subspecies of DJ in newsrooms has been noted, with some focused on the presentation of numeric information via infographics and some more focused on the challenge of extracting meaning from large and often unwieldy data sources. (2016, p. 3)

This dynamic further clouds attempts to be precise when discussing many of the new skillsets required by journalism graduates. As illustrated in the survey of US media

executives (Stencel & Perry, 2016), skills in coding are often mentioned within the same frame – and job advertisements – as data journalism or audience development. Stencel and Perry make a start at defining the mix of technical and editorial expertise in demand by separating the industry's need for coders into two camps: *newsroom friendly coders* and *code-friendly journalists*.

Our digital capabilities descriptor for journalism integrates and builds upon the discussion of journalism-specific knowledge and skills and the affordance concept discussed earlier: it categorises capabilities first in terms of (generalised) outcomes and then in terms of the functional, perceptual and contextual knowledge and skills required to enable those outcomes. It organises these capabilities into four proposed sample *domains* (coding; data; external communication; internal communication). It thus makes it clearer to educators what capabilities we believe are necessary to scaffold digital interaction to enable specific journalistic outcomes.

Coding domain

We define coding as the knowledge required to write and to organise instructions to direct a computer to achieve specific tasks using machine-readable languages. We do not propose that journalism graduates need to be able to code. While it is obviously advantageous for them to have this ability, we do not see technical scripting and 'debugging' skills as essential within this domain because such activities are easily and increasingly outsourced. Furthermore, automation – especially for the generation of boilerplate code – is increasingly common; and coding is taught in schools so there is diminishing value in attempting to teach graduate-age journalists foundational coding. Rather, we propose that journalists need to be fluent in the principles, language and potential of code, so they can direct coding projects, interact with specialist and generalist coders and use the potential of scripted computing power for research and storytelling.

Data domain

We differentiate between the coding domain, which we treat as technical, computer-control knowledge and skills, and the data domain, which we treat as the knowledge and skills required to identify, process and interpret qualitative and quantitative data (representing, in sum or in part, news value). At present, the coding and data domains often seem to be confused, which we would argue makes pedagogical scaffolding difficult. Data capabilities are far broader than technical coding ones: they require statistical knowledge, familiarity with empirics and the use of software programs to organise and process datasets.

External communication domain

We differentiate between external and internal communication capabilities because we argue that these two domains reflect quite different journalistic responsibilities and require quite different knowledge and skillsets. External communication tends to require visibility, transparency, network building and audience engagement. In other

words, external communication refers to the relationship between a journalist and their publication-audience and their personal public (Schmidt, 2014).

Internal communication domain

Internal communication capabilities are required to source, research and prepare a story for publication – the required knowledge, skills and attributes are diametrically opposed to those necessary for external communication. The emphasis is frequently on privacy, security, anonymity and small-team coordination with fellow specialists and different specialists (i.e. including cross-functional teams). Consequently, it makes sense to treat these capabilities as a separate domain. We now provide examples of functional, perceptual and contextual capabilities within each of these four domains.

Table 2: *A digital capabilities descriptor for journalism*

1. Coding domain		
Functional capabilities *Language of code:* Name and define programming concepts; name the principles and limitations of automated processing and define them appropriately. *Relationship between code and journalism:* Name and define programming concepts; articulate ways in which code can be used to support journalism.	***Perceptual capabilities*** *Language of code:* Use concepts appropriately in communications with programmers. *Relationship between code and journalism:* Employ code directly, or employ programmers, in the most effective way to perform journalism and to tell stories.	***Contextual capabilities*** *Language of code:* Use concepts to direct programmers strategically to achieve journalistic outcomes. *Relationship between code and journalism:* Explain the influence of code (and automation) on the production and consumption of news; translate into journalism.
2. Data domain		
Functional capabilities *Statistics:* Name basic statistical concepts and perform basic statistical calculations. *Data processing:* Operate data processing software packages; control user interface.	***Perceptual capabilities*** *Statistics:* Interpret statistical findings to identify news value; use statistical findings in support of stories. *Data processing:* Produce analysis and visualisations to support a story.	***Contextual capabilities*** *Statistics:* Select appropriate statistical tools to investigate data sources, to identify news value and to illustrate news value in innovative ways. *Data processing:* Select software appropriate to data and to news value; support new forms of storytelling, in collaboration with design, business/IT, advertising/PR, marketing/sales.
3. External communication domain		
Functional capabilities *Social media software:* Operate a range of social media software	***Perceptual capabilities*** *Social media software:* Direct social media applications to	***Contextual capabilities*** *Social media software:* Differentiate strategically

packages relevant to audiences; establish connections; publish content; engage interactively. *Networked audiences:* Name and define concepts and actions related to networks and engagement.	fulfil journalistic requirements: build personal following; disseminate stories to audience; develop content and storytelling techniques appropriate to medium. *Networked audiences:* Interpret audience and traffic data; social metrics and engagement measures; differentiate between good and bad strategies.	between platforms: select platforms appropriate to both stories and audiences; tell stories in ways that maximise the potential of different platforms – media and audiences. *Networked audiences:* Make strategic decisions based on network knowledge and news value in collaboration with advertising/marketing/PR, design, business/IT, to increase audience engagement with stories.
4. Internal communication domain		
Functional capabilities *Collaboration:* Name and define internal communication and project management principles. *Security:* Name and define security concepts and tools: anonymity, encryption, virtual private networks (VPNs)	***Perceptual capabilities*** *Collaboration:* Apply those principles to support journalistic practices. *Security:* Employ tools appropriately during journalism to ensure privacy and security for all participants: journalists, stringers and sources.	***Contextual capabilities*** *Collaboration:* Adapt established principles to emergent contexts to increase productivity and minimise risk; work with different specialists *Security:* Respond to emergent security threats by employing available tools appropriately; develop new approaches to enhance security for vulnerable stakeholders.

Sources: Building upon Best (2009); Cullen (2015); Cullen et al. (2014); Davies & Cullen (2016); Evans et al. (2017); Finberg & Klinger (2014); Gibson (1979); Hartson (2003); Hunter & Nel (2011); Hutchby (2001); Joinson & Piwek (2013); Mullin (2016); Norman (1988, 1999); Schmidt (2014); Schmidt & Rosenberg (2014); Schwab (2016); Stencel & Perry (2016); Tanner et al. (2014); Wake & Farrer (2016).

The domains that we define in the descriptor table do not represent a conclusion or the culmination of the planning process; rather, they define an initial step in a pedagogical process that must 'operationalise' the domains for learning and teaching purposes. Next, the domains must be 'populated' – that is, filled out with specific descriptions of the technologies, practices and processes (capabilities) that represent professional mastery within a given domain. Following this description phase, specific capabilities must be interpreted in terms of the functional, perceptual and contextual affordances that realise desired outcomes. Finally, those affordances can be used to scaffold a learning and teaching strategy.

The ATN project aims to theorise and deliver each of these steps, using an iterative method of development, implementation and testing. A full description of this work is well beyond the scope of this introductory article, which instead seeks to describe the affordance model and to articulate the drafting process for the domain descriptors. Rather than being an exclusive categorisation of journalism capabilities – a formal description of the 'profession' – the descriptors serve as a draft for discussion and

development. Our focus here is on the development and articulation of a process that begins with an interactive theory of technology and then applies that theory to the pedagogical scaffolding of capability development within specific professional contexts.

We acknowledge that there are broader concerns abroad in the intersections of journalism, journalism studies, media studies and education: that, for instance, the algorithms driving many of the affordances we discuss are in and of themselves an area of emerging and productive study. As the scholar Philip Napoli, among others, have theorised, media technologies should be thought of as an institution, able 'through the characteristics of their design, to both constrain and facilitate communicative practices and preferences and thus essentially provide base structures and parameters that regulate the production, distribution, and consumption of content' (Napoli, 2014, p. 343). Understanding the power and influence of algorithms on contemporary journalism – and thus on educational efforts to prepare graduates for careers within it – is indeed a vital area of research. This project will need to be mindful, if not active, of this area as it explores, to borrow a phrase from Rosen, what journalism education is actually for.

Conclusion

In this article, we have explained the concept of an affordance model for scaffolding the development of digital capabilities, with a discussion of journalism capabilities and outcomes in terms of industry and higher education. We proposed a digital capabilities descriptor for journalism by organising knowledge and skills into outcome-specific domains to underpin an affordance scaffold for teaching journalism students. Within each domain, digital capabilities must involve the variable interaction between journalist and technology to effect some sort of productive or transformative outcome. In the process, we demonstrated how the separation of functional, perceptual and contextual capabilities can serve two purposes: making it easier to define and categorise an account of digital capability requirement; and organising capabilities in terms of interaction complexity to develop a scaffolding framework for teaching and developing them.

At Google, 'innovation entails both the production and implementation of novel and useful ideas … for something to be innovative it needs to offer new functionality, but it also has to be surprising' (Schmidt & Rosenberg, 2014, p. 206). Achieving innovation can involve cross-functional teams, such as those that exist within Google, and the digital capabilities descriptor we have developed for journalism takes account of that idea. The cross-functional team – perhaps including journalists with programmers, engineers, marketing/sales and design – may include what Schmidt and Rosenberg describe as 'smart creatives' who are capable of innovating and consequently are highly sought after. We believe it is vital that journalism students experience collaborating with different specialists but also develop their own knowledge and skills in a range of technology applications. A useful framework can be developed, planned for and implemented, in a thoughtful and meaningful way, within university journalism programs. We can apply the affordance concept to specify digital

capabilities that are functional (what, how to), perceptual (when and why) and contextual, with potential for innovation (apply, adapt, extend, create something new).

The domains we have proposed in our journalism digital capabilities descriptor (coding, data, internal communication and external communication) are not an exhaustive list, nor are the areas of focus identified within them (statistics, networked audiences, collaboration, etc.). The descriptor we put forward is intended as a springboard for further research involving industry practitioners and the academic community, to test and refine the domains and the specific capabilities nominated. Mapping capability development to the curriculum, devising an assessment strategy and verifying the achievement of associated learning outcomes is a longer-term endeavour, which we believe is essential to advance contemporary pedagogy.

Equipping journalism students with coding and data journalism capabilities to create outcomes is already a work in progress (e.g. Davies & Cullen 2016). The digital scaffolding model we are developing offers a method of contextualising and mapping the capabilities required to assist students to interrogate and interact with technologies in potentially new ways. It is vital that we continue to explore the interactive relationship between technologies and their users to inform curriculum design and development. While the environment, and the strategic and creative knowledge and skills required, are undoubtedly dynamic, the core values and aims of journalism remain. Adopting an affordance approach looks promising for the design of scaffolded learning opportunities to support students as they develop the digital employability capabilities needed now and in future.

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