New Interactions: The relationship between journalists and audience mediated by Google Glass

Abstract

From the first studies of wearables inside MIT´s Media Lab decades ago to the smartwatches and smartglasses nowadays sold as consumer devices, wearables provide clues to better understand new paths to record and distribute information. Google Glass was one of the first immersive products, allowing users to capture and stream information to the web; creating screen-based micro-interactions displayed in front of the user's eye or sent to their smartphone.

The first person perspective is not new, but network-enabled Glass creates a novel state of streamed information and images, potentially making the Journalist an avatar of the audience. Possibilities also lay in the development of Glass-specific ambient or calm communications - providing users with seamless information updates. Our study explores how Glass, attached to the head of the Journalist-broadcaster, creates alternative behaviors in those captured due to its almost-invisible camera.

These and other aspects of Glass will be explored during this paper, recalling experiences made in across multiple test beds in the United Kingdom, Porto Alegre, Brazil and Sahara Desert. The lessons acquired from these experiences allow us to understand not only new ways to inform, but new relationships between journalists, newsrooms and the public.

Introduction: Google Glass, MoJo and connected wearables

Wearable media devices are slowly moving into the public consciousness, and with web connectivity, they offer new digital opportunities and digital interactions for audiences and content producers to explore. Merging mobile connectivity with wearable media capture and publication, Google Glass heralded a potentially mass-market and wearable multimedia device.

Prototyped in 2011 and launched as the 'Explorer' in 2013, Glass combined a wearable with high definition video capture, mobile connectivity and harnessed, within the consumer electronics market, the relatively unique ability of overlaying images and live information into a user's field of vision. As such, Google sought to develop a unique and mass-market 'wearable' offering audio and touch-controlled interactions, bring functionalities extensively trialed in military and research environments.

From a journalistic perspective, Glass presented intriguing new opportunities for reporters, news editors and newsroom operations. Although self-consciously at an early stage of development, and tentatively seeking to engage with a broad range of users, when viewed as a new evolutionary strain of mobile media devices (otherwise known as 'mobile journalism' or 'MoJo') correspondents could, potentially, utilise Glass in similar way to a smartphone or tablet. Since the early 2000s, these tools have gathered a more central role in the production and distribution of digital content (Westlund, 2013; Mills et al, 2012), but, equally, there are challenges around the efficacy and functionality of capturing and producing content on a mobile (Jokela et al, 2009) such as inferior media capture when compared to 'professional-level' alternatives. Google Glass, then, would have specific content production challenges and potential reputation and privacy concerns to overcome when placed in a mojo context. Its functionalities include an integrated HD image capture, microphone, data connectivity via accompanying smart-device, voice recognition and a heads-up display that allowed information to presented in front of a correspondent's field of vision. As such, Glass offers news operations a hands-free tool that takes the advantages of mobile devices, but with a unique wearable computing variant. It offers hands-free and voice-activated interaction, alongside the ability to capture line-of sight video and live streaming, and creates powerful locative data and context that provides an additional layer of story metadata (Pavlik, 2016).

Although the Explorer trial has now completed, Google continues to develop the product under the Aura banner. Equally, other tech players are developing alternative products that come under the wearable banner, offering virtual reality, heads-up displays or other immersive headsets. Examples include Microsoft Hololens, which at the time of writing is available under a developer license, and the Oculus Rift, a crowdfunded VR product that generated almost $2.5m on Kickstarter (Oculus Rift, 2012), that harnesses virtual reality overlays, and is particularly focused at the gaming community. Nevertheless, wearable devices that create immersive experiences and interactions are a rich and innovative area for journalism, and this paper seeks to understand both practical opportunities created by Glass as an immersive wearable journalism content capture device and also explore the structural challenges newsrooms face when adopting new technologies independent of their standard workflows and content production practices. Finally, it raises interesting research

questions for how wearables present journalists, audiences and newsrooms with new methods of digital connection, media capture and communication.

The study

Spanning endurance sporting activities in the Sahara Desert, court reporting in Manchester, UK, consumer stories from Belfast, Northern Ireland, pop acts in Liverpool and news production in Porto Alegre, Brazil, this paper explores how print and online newsrooms, alongside small production companies and business-to-business operations, utilise Glass in range of scenarios. The paper offers an understanding of the diffusion of new technologies, their use and storytelling opportunities from an editorial and newsroom organisational perspective. As such, the paper builds on device-specific case studies to offer insights into of the efficacy of technological innovation and diffusion at a newsroom level. This analysis is set against an ecosystem of cross media ownership, usable production technologies and the need for efficient and cost-effective cross-platform output (Singer, 2004; Dupagne & Garrison, 2006; Quandt and Singer, 2009). It is accompanied by the development of multi-media reporters, whose 'multi-medianess' spans technological, structural and cultural factors (Deuze, 2004), and is constantly evolving (McAdams, 2014). As such, rapidly adopted digital technologies are an increasingly normalised newsroom feature.

A note on innovation and the creation of change agents

The media is increasingly interested in how to 'innovate' organizational and technical capabilities alongside the products they offer. In tandem, scholars are exploring innovation diffusion within media organisations and the markets in which they operate, but enquiry is at a formative stage (Dal Zotto and Kranenburg, 2008). Nevertheless, scholars such as Baumann (Baumann, 2013) highlight the media's strategic requirement to reach a point of "continuous innovation" and "adequate organisational design". Rogers' seminal work on the diffusion of innovation (Rogers, 2010) articulates a range of factors behind the adoption of new processes or technologies that could offer a suitable frame of enquiry, and a central actor in this dynamic is that of change agent and change agency. In response to some of the issues outlined above, we use Rogers' concept of change agency to illuminate the adoption of Google Glass we witnessed and to understand the technology as a catalyst for organisational realignment and the embedding of a culture of innovation within a media organization more widely.

Rogers suggests that 'change agents' fulfil seven roles, primarily through making 'interventions' to prompt behavioural change. The individual stages are to:
1) develop a need for change,
2) establish an information exchange relationship,
3) diagnose problems,
4) create an intent for change in the client,
5) translate intent into action,
6) stabilise adoption and prevent discontinuance and
7) achieve a terminal relationship (i.e. instil an adoption culture within an organisation that would make the change agent redundant).

Our case studies, therefore, identify change agents through their experiences of adopting and diffusing Glass on both an organisational and individual level, and considers its efficacy.

Google Glass: industry adoption

The media industry is not the only sector that sought to utilise the wearable, voice-command media capture and web-connectivity of Glass. Medical researchers and practitioners have explored uses for both medical professionals in surgical environments (Muensterer et al, 2014; Glauser, 2013), and to explore how patients with conditions such as Parkinson's could take advantage of the Glass-enabled human-computer interactions (McNaney et al; 2014). The reported benefits include hands-free internet access, image quality, instant communications (i.e. video calling and accessing online reference material) and recording communications, such as the capture of medical consent.

The position of the camera, specifically head-worn and providing line of sight footage, and the ability for instantaneous, or near instantaneous, data-sharing and conference calling offered some tangible benefits and advantages over existing technological approaches. Users were also positive about how people responded to the Glass within specific medical environments. Muensterer et al (2014) outlines future benefits around bespoke applications designed specifically for the medical professional not currently available on Google Glass app store Glassware.

In addition to these positives, there were a number of negative outcomes identified by the studies. These include latency and data lags, a lack of an expansive app availability, limited battery life, concerns over privacy and how the data was transferred, accuracy and reliability of voice commands, effectiveness of the mastoid bone conductor and reliance on an additional device for data transfer and web access. Many of these findings are relevant to a journalistic use, and were identified in our own studies.

Evolving mobile journalism

'Mobile journalism' has taken a number of guises since the beginning of the 20th century, and spans professional use and the rise of user generated content, facilitated through the ubiquitous data connectivity that pervades much of the developed and developing nations. Since Reuters' early experiments with mobile journalism toolkits (Nokia Research Center, 2007), through rapid expansion of technological capacities, mobile reporting is a normalised method of editorial operations in many newsrooms across the world (Westlund, 2013; Mills et al, 2012). Our approach to Google Glass is placed within this oeuvre; sitting within the development strand of mobile journalism but moving into another space: wearable computing.

The wearability of video capture and web-connectivity offers unique properties for journalists, and other users, to explore from two distinct perspectives: as a novel publication platform that allows users to have pop-up information presented within their field of vision, and as a content capture device. It also enables, as many mobile

and wearables do, a strong locative element of opportunities for storytelling, and connecting audience to an 'authentic' experience, as outlined by Goggin et al (2015), This study concentrates on content capture approaches, rather than as a content distribution tool, but begins to question how individuals, particularly within professional practice, are becoming ever more intertwined with the media they generate, and are forming ever-closer symbiotic relationships between a reporter, the media and the audience - a relationship moving towards Deuze's (2012) articulation of 'living in media', and resultant complexities for each protagonist who experiences this interrelationship.

This raises interesting connections with wearables, and their potential to mirror mobiles as a ubiquitous computing device. Mobile devices provide constant and intimate digital connectivity and leverage a vast range of utility applications and communication options. Mobiles, therefore, offer a constant and pervasive use dynamic. The logical evolution of mobile technology would "have the device on you instead of with you" as we see computers attached to the body. This dynamic offers a further development of a human computer interaction paradigm – the always-present wearable device can collect constant sensor data that spans external information and the body's own information, such as steps or heartbeat. Nevertheless, there are negative renderings of this ubiquity. Potential overuse (Turkle, 2010) is a threat to socialization so the disruption of traditional ways of conversation.

Wearables as ubiquitous computing devices also raise a number of challenges for both journalistic users and the public more generally. For the public, concerns have around issues of privacy have been raised in response to issues of surveillance. Particularly when pre-conceived social/private boarders are transgressed (Langheinrich, 2002). The range of biometric sensors currently available via smart devices also present a different challenge, with some highlighting anxiety users have when faced with the potential for their biometric data to be captured and released into the public domain, particularly when contextual information offers some degree of personal identification (Raij et al, 2011). Journalistic activity involving wearables could, therefore, transgress privacy in novel ways. It also raises the question that a journalist's own biometric data could be collected via a wearable device.

Wearables are also still at an early point of development, and the ranges of form and functionalities can be expected to evolve rapidly in coming years. Perhaps because of this emergent status, the devices have taken familiar physical forms. This can be seen in both Google Glass and Apple Watch. In both cases there is an adaptation of the original object to offer a new appropriation or cultural adaptation. In terms of user uptake, watches potentially would have a lower resistance to market entry as they always had some kind of extra information beyond telling time. Glasses are generally perceived as an optical amplification or correction tool, which may present reduced market demand for a wearable in the same guise. In both cases, however, the wearables represent new information flow for various uses. Specifically, in the field of journalism, it seems there are several routes that can be explored to both capture information and to provide journalists with information relevant to the context in which they find themselves.

Current practice: Glass as platform and capture device

The Guardian, Elle, the Wall Street Journal and other news publishers developed news consumption apps for the Glass platform either on launch or during the live phase of the Explorer project. This paper, though, explores Glass as a journalistic tool, rather than as a product simply for media display consumption. Pavlik (2016) suggests the impact of wearables such as Glass could manifest themselves in four ways: "1) [changing] methods of producing video content; 2) the ways stories are told; 3) the level of engagement with the public or viewer and 4) the structure management, and funding of broadcasting as well as corresponding legal and ethical considerations".

Practitioners such as Tim Pool, who began his journalistic work as a citizen at the Occupy Wall Street protests in 2011 armed with a mobile phone, provide an effective example against which this study can be framed. Pool explored Glass's live connectivity and storytelling opportunities around first-person perspectives and has 'live streamed' using Google Glass in a number of locations while working for Vice Magazine. His reports include pro-democracy demonstrations in Istanbul (Vice Livestream, 2013) and civic demonstrations in Ferguson in the US.

By 'streaming' content from these sites, Pool's audience could consume content directly from the demonstrations, and interact with Pool in a live environment via the Ustream or Livestream third-party apps. Scholarly work into Glass as a journalistic tool is limited, but Lenzner (2014) frames Pool's work through documentary practice, and analyses how Pool creates a multifaceted framework through which we can assess the potential of Glass as a digital media capture and broadcast device. Discussing Pool's adoption of the device and how it places itself, and is placed by others, as a 'citizen' alternative to mainstream output, Lenzner describes Glass as an 'assembledge' technology, effectively allowing his audience to act as editor. Lenzner highlights a number of instances where Pool's audience interacts with him over digital channels to influence his behaviour and resulting media capture, and how Pool sees his audience as more than simply passive receivers - a model that he links to a more formal broadcast media, but to enable them to consume, adapt, cut and share the content.

Glass's heads-up display allows Pool to broadcast to and communicate with the audience, who witness the events taking place in his field of vision. This digital interconnectedness combined with a hands-free exchange, potentially creates new opportunities for journalists to capture and interact with (and be directed by) their audience, the subjects and their newsroom.

Case studies and data collection

Between November 2014 and November 2015, a range of studies were undertaken in England, Northern Ireland, Morocco and Brazil to examine questions relating to Glass. These involved understanding its uptake within newsroom environment, its affordances and efficacy as a media capture device, role as a wearable device and how newsrooms managed the process of its adoption. An additional underpinning question was around how diverse and continentally disconnected news operations may operate when held in comparison to one-another. Participants were able to withdraw from the trial at any point, provided permission to

be interviewed, and were briefed on the safe use of Glass within the public domain from a research, but were encouraged to see their use of Glass not as a research project but as a commercial activity that was embedded in the real world of content creation and journalistic activity. The trials met with a wide range of potential responses, moving from regular uptake and locating Glass within standard workflows of print and digital newsrooms, to not being taken out of the box. Below is an overview of each of the trails and the main insights garnered. Semi-structured face-to-face interviews were conducted during the outset, while others were conducter after the process as "debriefing sessions" with the reporters and editors who used it. These face-to-face interviews were either conducted in person or over video calls, and the approach was replicated across multiple sites.

UK: Trinity Mirror, Fieldcraft Studios and News:rewired

The largest of the studies, Trinity Mirror Regionals' innovations editors were invited to trial Glass in a number of regional newspaper newsrooms across England between October 2014 and October 2015. Primarily focused in the northwest region, the device was also deployed in Belfast, Northern Ireland, and Reading in the south of England. As with all the UK trials, participants were given little external training or guidance on how to use Glass, and were instead were presented with the technology as though it were a piece of directly-purchased consumer electronics. The innovation editors (Alison Gow and Paul Gallagher) established a structure whereby the Glass would be factored into to story development meetings, and provided to reporters based at the Manchester Evening News and the Liverpool Echo. The devices were managed centrally, and issued to reporters on a case-by-case and story-by-story basis. Content generated by the trial spanned crime and investigative reporting to 'lite' lifestyle pieces. A selection of these can be found on a curated Wakelet page (Trinity Mirror Wakelet, 2015).

Trial: Content and behaviour

First person footage - The Manchester Evening News (MEN) and Liverpool Echo newsrooms sought to explore Glass's video capture, and equipped reporters with a brief to capture first-person footage. This can be seen in stories such as '*Watch: Look inside Manchester City's new £25k-a-game VIP Platinum Experience box - using Google Glass*', which saw an MEN reporter provide a guided tour around an executive area of a local football stadium and interview a number of former players, and '*Scandal of Greater Manchester's Hidden Homeless forced to seek shelter in caves*' which featured footage taken directly by the correspondent as she walked through the area. Both stories offer strong narratives of discovery and uncovering, and the correspondents involved in the pieces highlighted the 'authenticity' that the eye-level video capture provided them. This was deemed to be a real advantage editorially and practically for the reporters, allowing them to act as an 'eyewitness' to news events, or set-pieces they set up themselves.

From the subject's perspective - What began to emerge from both the content generated, and from the interview material gathered during and after the trial, was the participant newsrooms' desire to include the subject in the content gathering process

- i.e. to specifically involve those at the centre of the story in gathering editorial by handing over the Glass to them. This stands apart from the literature on journalists such as Tim Pool who maximises his own presence within a story in order to relay it, as the teams in Manchester and Liverpool sought to invert the traditional responsibility for capturing media from the 'professional' to the newsworthy entity themselves. This practice can be seen in a number of stories generated by both Manchester and Liverpool. Examples include *McBusted,* and *Iceskater* and *Basketball*. Many of these items were entertainment or 'lite' items that were looking, to some extent, to create a 'novelty' value in conjunction with the softer editorial line. However, a number of stories, which did not come to fruition, sought to add a harder journalistic edge and place participants at the centre of the story. Attempts were made to co-opt local councillors to record official proceedings and provide the MEN's audience with a livestream or edited footage from within the democratic process. Although planned, these stories didn't emerge due to a combination of technical failure, mainly through battery life limitations, and council members' availability. However, more success was had in the Belfast phase of the trial. At the launch of the 'Belfast Live' site, the editorial team provided Health Minister Jim Wells with Glass for him to demonstrate and outline a new accident awareness scheme in Northern Ireland.

A third incarnation of the desire to capture an 'insider's view' on events was also demonstrated by the newspapers themselves. Glass was used in Manchester Live, an initiative from the Manchester Evening News to open up their internal operations to their audience.
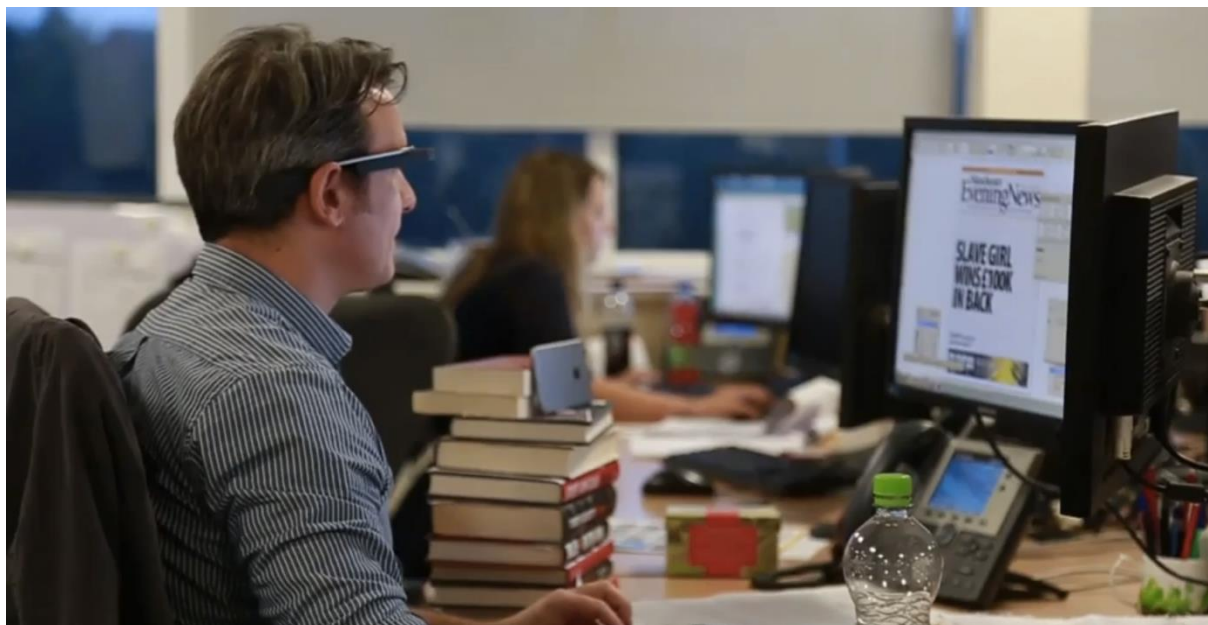
Figure 1: the MEN's chief subeditor recording the creation of the following day's front page

This desire mirrors the Guardian's Open News day (The Guardian, Open Weekend, 2012) that trialed a similar exercise to foster and develop transparency and audience engagement. The editorial team at the MEN quickly connected the ability to livestream to allowing readers to see a number of processes, such as editorial conference and afternoon 'huddles' used to manage the news agenda and publication output for the day. The live linkup failed due to technical issues, and Google's decision to pull the livestream function from Google Hangouts, where the journalists would have

been able to publish live to the web. Instead, the MEN produced a short video showing a first-person perspective from the position of the chief sub who demonstrated how the front page of the newspaper was created and distributed it on their website (Manchester Evening News, Manchester Live, 2014).

There were multiple attempts to use Glass was to allow the journalists to reveal the inner workings of the newsroom. In Belfast, Trinity Mirror's innovation team covered the opening of a new editorial operation using Glass (Belfast Live, 2013). Again, although the livestreaming was not used, the desire to provide a behind the scenes, and first-person, perspective is present.

Uptake of Glass throughout the trial: As might be expected from any adoption trial, there was a period where Trinity Mirror staff had initial concerns about the technology, and became accustomed to its operations. Interviews revealed that reporters who used Glass saw potential editorial advantages. Although all outlined limitations, which are outlined below. A number of positive insights emerged as Glass entered their editorial workflow. Hands-free content capture capabilities were useful when contrasted with hand-held mobiles and members of the editorial team found that they adapted to Glass, and the user-interface, relatively easily. However, they failed to experiment with additional third-party applications beyond native video and still image functions. Trinity Mirror reporters described the fit of Glass as organic, and the design also created their own editorial opportunities. For example, a general news reporter highlighted how the novel technology could be used as an ice-breaker and enable reporters to initiate conversation with potential interviewees.

Audience recognition: Legal and ethical concerns: Unlike the positive vox pop icebreaker, the lack of recognition for some interviewees created ethical and legal issues for the editorial team. Following the conviction of a member of public for criminal damage whilst on a flight landing at Manchester International Airport, the MEN's crime reporter interviewed the perpetrator while wearing Glass on the outlying area of the court. Although the interview was conducted amicably, and in good faith, it became evident to the editorial team on reviewing the footage that the interviewee had not been aware that he was being recorded. As such, a decision was made not to publish the footage. This in turn raises questions about recognition, and a potential lack of understanding about Glass is, and what it is capable of - i.e. video footage - from the perspective of those being reported on in the communities that the Manchester Evening News, and Trinity Mirror Regionals more widely, serves. Ethical and legal issues raised by this case focused on whether the subject had an implicit awareness of being recorded, and how this awareness, or more importantly lack of, would influence the decision on whether or not to publish.

This case raises an important distinction between cultural understanding of being captured, and a potential naiveté when new and alternative content capture devices, including wearables, are used by journalists. For instance, the process of being recorded would have been implicitly understood had a camera crew or mobile device been used to capture the footage. The semi-hidden wearable camera subverted this assumption. Additional questions materialise when livestreaming is also added into the mix - i.e. if those being captured do not understand they are being broadcast, they will be unable to provide informed consent at the moment of publication. Although the interview in question was conducted in public space, and with the cooperation of the

interviewee, the addition of video footage and the uncertainties around camera recognition added another layer of complexity for the news operation. Taken from a traditional print background, although one well-versed in multimedia journalism, it was felt by the senior editorial team that this instance raised the need for additional guidelines, and that training should be offered to reporters equipped with wearable video devices.

Livestreaming opportunities were then scrutinised from a legal perspective, as it was recognized that the newsroom quality mechanisms expected a delay between production and publication. This challenge was highlighted during a police raid story, where the MEN's crime reporter was shadowing a police raid as part of a PR initiative. The reporter had intended to livestream, but had concerns around the robustness of the technology and what legal issues might arise if he were to broadcast live from a suspect's home – specifically about the lack of control over what he would put into the public domain. Additional concerns around prejudicing any criminal trial would also have been taken into consideration.

Glass and change management: As the trial progressed, the role of Glass as a catalyst for and, in parallel, a symptom of change became evident. This can be seen both in terms of technology adoption patterns within a journalistic and content creation context, but also in the underlying motivations of how the technology was rolled out. Across a range of interviews, editorial management, who in offering a tool that was radically 'other' than what a traditional and digital newsroom would expect to use, particularly newsrooms with a strong print and written-word heritage, suggested that using Glass was a visibly progressive action, demonstrating that newsrooms were exploring new digital opportunities and practices that were both current, and other than traditional approaches. Trinity Mirror, during the lifespan of the trial, was in the process of restructuring their regional newsrooms around a 'digital first' approach. From the perspective of the managers, and the journalists who used it, Glass provided a physical incarnation of a 'different' and 'innovative' way of producing journalism; a literal embodiment of the 'art of the possible'. The adoption and uptake stood alongside the desire to introduce new practice options, and echoed and reinforced a culture of change that was being disseminated throughout the regional newspaper network at the time of the study. Our interviews revealed that editorial managers positioned Glass not just as an innovative tool, but as a tool for innovation.

Change agent and adoption: Change management evidenced throughout this trial also went beyond the role of Glass as a surrogate 'change agent', but was manifested in the staff used to manage the distribution and use of the technology. Trinity Mirror Regionals created the role of Innovation editor across Manchester and Liverpool in the preceding months before the trial, and this editor was responsible for introducing new methods and working practices into the newsroom. The study engaged with this 'change agent' in two distinct ways: to gauge the efficacy of the Glass device and its suitability for a journalistic setting, and in understanding how a technology 'champion' could facilitate use and adoption. Speaking about the role of the innovation editor in the 'successful' adoption of the technology, Alison Gow, who oversaw both the trial and the innovation editor position, suggested:

> "*Someone in [the innovation editor's] position offers the chance to introduce more playfulness and openness into the news desks. There needs to be an*

openness and a desire to try and do new things that present new editorial opportunities, like Google Glass. Some of the centres (i.e. newsrooms in the study) would have adopted Glass, but it would not have been adopted as effectively had Paul not been available to offer support and encouragement."

The theme of openness and adoption was repeated a number of times in relation to the role of innovation editor, a role that specifically targets new methods and tools. Paul Gallagher mentioned 'space' and 'time' repeatedly when asked about his position in facilitating the trial and disseminating the technology through Manchester and Liverpool. An interesting counterpoint to this positive rendering is when the Glass were transferred to a second newsroom in Reading. Loaned to the newsroom for over a month, Gow and Gallagher suggested that Glass may have been used to a greater extent had there been someone on the ground with both the knowledge of the device and the capacity to explore and discover editorial opportunities it may have provided. This description mirrors the change agency that was present within the other trials that could feature an innovation editor on site and as technology advocate.

However, the 'innovation editor' as change agent within the construct of innovation dissemination was still influenced by the constraints of newsroom environment, where time is perceived to be a limited resource. Although Glass was used, many of the functions enabled by accompanying smartphone were not explored, and newsroom pressures and standard working practices were mentioned as being responsible.

Technical responses: Throughout the trial, a number of technical advantages and limitations were found by the Trinity Mirror reporters. Positives were the ability to complete other tasks while capturing video, the quality of the footage, the (unrealised) potential of livestreaming, and the opportunity to capture video from users' perspectives. There were limitations from the team, and these included limited battery life, audio quality and reliable voice commands. Some of the reporters felt that these limitations would impact on them using Glass in the field, but not to the extent that they would not consider Glass as a legitimate journalistic tool.

Fieldcraft Studios - April 2015

The Fieldcraft Google Glass trial took place between April 5th and April 11th 2015 at the seven-day, 156-mile Marathon des Sable (MdS) in Morocco's Sahara Desert. Fieldcraft were commissioned to look after media for explorer Sir Ranulph Fiennes' attempt to run the MdS for charity Marie Curie. The initial plan for the deployment of Glass would be to have Sir Ranulph Fiennes wear the device during the endurance race, allowing him to capture media and utilise the digital connectivity to potentially communicate with both his support team and the public on social media thank to a remote satellite connection that provided web connectivity.

The technology would also be placed within a multimedia production workflow that saw Fieldcraft produce national TV 'live' broadcasts, still photography, film and a running diary published in the Telegraph. They were also responsible for social media coverage through Marie Curie and their own accounts, although some support for this activity was provided from London. Unlike Trinity Mirror, Fieldcraft's use of the trial

sought to understand how Glass functioned in a time-pressured, multifaceted and multimedia production workflow in extreme conditions.

Figure 2 Sir Ranulph Fiennes competing in the Marathon des Sable. Photo credit:© Liz Scarff/Fieldcraft Studios

User experience It became evident early in the trial that the initial plan to create Sir Ranulph Fiennes as the main media user was not a sustainable model. This was due to a number of factors: the perceived difficulty with operating the technology both using the touch interactions and audio controls, the weight of the accompanying mobile device required to operate the connected functionalities. and battery life. As such, an alternative plan was to equip the production crew with the Glass, but this was quickly abandoned when it became obvious that other media capture tools, such as a DSLR camera and video camera, were more reliable and effective. When combined with time and power restrictions (the generator was turned off at a specific time in the evening), Glass was seen as a device that didn't enough sufficient value within the operating context.

Technical limitations: The limitations as described by the participants spanned battery life, the requirement for an additional smartphone or similar device (and the accompanying weight restrictions within and extreme sporting environment), user accessibility and user-interface access. Concerns were also raised about battery temperature during the trial, although Google suggested that Glass could operate in the Sahara's extreme temperatures.

Innovation and adoption: Unlike the multi-staffed newspaper with standardised working practices, procedures and editorial workflows, Fieldcraft Studios described themselves as an agile organisation capable of easily trialing new media technologies. With a small team of two on the production, they suggest that their operating infrastructure allows for the adoption of new media devices, tools and processes. Nevertheless, high-intensity production prompted an immediate use decision that prevented extended trailing once Glass was deemed to be unsuitable. Fieldcraft's quick diagnosis of Glass, in terms of both its media capture capabilities and usability

within the various pressures facing the production team, prompted them to drop Glass from their workflow entirely.

News:rewired trial - February 2015

The final trail from a UK perspective focused on a one-day event, specifically a journalism conference run by industry website journalism.co.uk. Held in London, UK, on February 3rd, 2015, the news:rewired conference sees the website team live blog the event. Google Glass was to feature in the editorial production to deliver livestreaming, still images, social media updates and video. It would accompany additional reporting, and primarily be used by Journalism.co.uk's then technology editor Abigail Edge. In some ways the operating conditions mirrored that at of the Sir Ranulph Fiennes project in that the live conditions provided the editorial team with specific technical requirements that Glass could either meet or not.

User experience: A key motivating factor for the editorial team to adopt Glass was to utilise the wearable as a wearable, i.e. take advantage of the hands free recording and livestreaming. The planned editorial approach was to create multimedia content of the conference and directly publish some of the key panels and other elements, while allowing the technology editor to publish posts via other connected devices, such as her laptop. Ultimately, after trialing Glass in advance of the conference, the editorial team decided to drop the device before the conference began, despite the initial promise and potential they identified in the wearable. This decision was motivated by a number of factors which included usability and aesthetic/reputational issues.

Technical limitations: The user found the interface counter-intuitive in terms of scrolling and navigation, and the third party apps - such as Twitter - unresponsive or poorly integrated with the voice to text commands. The larger barrier to use was the removal of livestreaming from Google hangouts, which would have been relied upon as a live output. Third-party live-streaming options weren't considered.

Innovation and adoption: Glass was not used as part of the trial, partly due to the reasons outlined above, but also because of a reputational factor. Although the wearable device had initially been used in by a number of industries, such as the health sector listed above, uptake in the UK didn't demonstrate an overly eager consumer market for this wearable and others (Blair, 2014), and Google responded with withdrawing the explorer edition just a few weeks before the conference. This, in itself, produced a challenge. How would delegates and attending industry commentators react to the technology editor wearing and using a device that was defunct? As such, reputational issues were at stake due to the potential recognition of the wearable as a failed piece of tech.

Brazil: Zero Hora

In October, 2014, one editor from Zero Hora newspaper used Google Glass for two weeks. The newspaper from Porto Alegre, Brazil, is one of the most important in

Brazil and owned by RBS, a media group who owns TV and radio stations, along with Internet initiatives. During this period, she managed the Lifestyle section and spent her time working inside the newsroom. The trial itself could be divided in three stages: an initial workshop, deployment and a period of debriefing.

Pre-trial preparations - Before the trial commenced, the Ubilab research team contacted the newsroom and discussed who could use it. Rather than just pick someone willing to change their working routines, editors and researchers decided that to maximise the wearable, the person should be familiar to hardware usage notions and used to experimenting new tools. With these criteria in mind, one editor was chosen due to her skills.

The editor was invited for some training before taking Glass home. Along with commands and usage notions, she was asked to try Glass at home before using it professionally. During the initial days, a lot of accidental images were taken, forcing the journalist to stop her routine to delete some files. One major element of feedback was that people stared at her as though she had adopted a different identity, and was not the editor they knew. Along with this, during the first day she avoided walking fast inside newsroom to avoid any fall that could damage it – and her too.

So, if at home there was a sense of "they turned her into a cyborg", inside the newsroom it evolved to "is she recording me?". This raises issues about how journalists react not only using Glass, but to being recorded and tracked by it. When others stared at her, an "ice breaker" was to introduce the device to the newsroom as a whole was to lend the Glass for others to try and understand it. If a lack of understanding occurred inside newsrooms, it may happen within the general audience.

From time to time, Zero Hora invites readers to meet the crew in coffee shops and parks, and these events would be ideals to invite someone to test the new tool without stop any story in progress that uses it. More than this, readers could ask audience to record something around to later discuss it with others, creating a positive buzz effect in social networks. In addition, editorial crew would gain additional understanding and potentially use it more. This could embed the idea of the wearable into the corporate and general cultures.

Traditional mechanisms vs Glass - During this time, the editor did not leave the newsroom, and used Glass during internal processes. Some quick interviews were recorded, and the journalist explained that Glass was recording. Others acted as a back-up with traditional cameras. Traditional mechanisms were preferred because the staff were familiar to the routines. Moments like this indicates that the reporters should not only be able to experiment, but open-minded to fail - or at least use back-up technologies, practice that some professionals forget.

Skills and knowledge - After the period, the editor remembered the experience in a session with the professors from the laboratory, reporting the information previously discussed in this paper. One of the key issues was the learning curve, for her and the others. Different than a new Content Management System (CMS, like Wordpress) or software, it requires new gestures and usages that takes too much time

to learn and then implement. If a wearable may be a new tool for a new storytelling, it may take time and failure to change it.

Discussion and future work

The study of the 'adoption' of a single piece of technology amid a range of different contexts and constraints sought to explore a number of adoption and diffusion questions. These span the device's basic functionality, its relevance to specific editorial tasks, the suitability of Glass as a wearable and connected device within a wider social and community context in terms of how it would be recognised, interpreted and responded to by audiences and editorial subjects. The following discussion discerns issues that relate to the basic technical functionalities and opportunities, the editorial opportunities and challenges, and how the experience of uptake within multiple news operations reflects on the role of change agents and change agency.

Suggestions are made for how future iterations of Glass, and connected wearables more generally, might be used in future as are specific challenges.

Functionalities and editorial uses

As with the health industry's early experiences with Glass, the trials revealed a number of basic user experience findings. These included the potential and effectiveness of the video capture for professional practice, and the ability to publish to an audience. There is also the potential, thanks to web connectivity, for the audience to communicate back to those wearing Glass. Our editorial trails demonstrated similar opportunities, particularly in relation to Trinity Mirror, but with distinct limitations. Our initial research was intrigued by the opportunities for newsrooms and audiences to connect with journalists in the field, watching first-person perspective material, and responding to it. Taking Tim Pool as an example of this form interactivity in an embryonic form, our interest was around if journalists and media professionals would position themselves, or at least begin to position themselves, as a journalistic 'avatar' specifically when they're covering 'live' events or are actively engaged in newsgathering.

This activity and approach didn't emerge throughout any of the trials. Zero Hora was focused on internal usage and was not public-facing, News:rewired and Fieldcraft did not utilise Glass for a number of operational and reputational reasons. As a consequence, the opportunities to explore this direct audience-journalist connection did not materialise.

Trinity Mirror's use did provide the opportunity to create this dynamic, but livestreaming limitations at the first attempt, the MEN Live day, meant that the editorial team shifted focus during other stories to content creation and filming from the first person perspective. The web-enabled functionality also relies on a standalone smart device, and the newsrooms, with the rush to roll out the Glass, did not explore the peripherals and the enhanced functionality they offer. During the feedback interviews, it became apparent that some of the reasons for this lack of exploration were time constraints in handing over the device to journalists, and for the innovation editor to fully explore some of the working opportunities of Glass and smart devices. The interviews also

revealed a 'fit for purpose' dynamic: Glass was found to serve a useful editorial and change management role as Trinity Mirror restructured to focus on digital output - the video footage was enough to satisfy these goals. The co-opting of the subjects of stories to wear the wearable device was an innovative use beyond that expected, and demonstrates that the editorial teams were looking for creative examples that Glass could facilitate.

Expectations, deployments and diffusion

Out of the four trails, only one publisher could have been said to adopt Glass fully and in external environments. Two (Fieldcraft and News:rewired) rejected Glass for a variety of usability and reputational reasons, while Zero Hora had limited uptake within the internal environments of the newsroom in Porto Alegre. Although Trinity Mirror titles created a range of content, the initial 'promise' of Glass didn't materialise across all four scenarios. Each of the trialists identified a number of potential advantages, but uptake was limited due to multiple factors, all of which combined to limit a full exploration of what Glass could, potentially, achieve within editorial contexts. The "success" or "failure" of the deployment, perhaps expectedly, seems to depend on an interconnected web of factors that included the ability of the tool to deliver required outputs (i.e. video content for display on a website), but also the attitude of the editorial staff championing the trial, the willingness of users to use within the confines of their specific role and the environment in which the individual user and their device were placed. Indeed, the success for Trinity Mirror within the confines of this study are potentially not measured by the quality of editorial content, heightened production values or the exploring of new journalism tools, but a nuanced combination of all these factors that are also subject to external forces not discussed here, such as business concerns and changing 'political' demands of newsroom operations over a 12-month trial amid challenging market conditions.

It seems that the existence and reach of a change agent here is intriguing, and maps across a number of the seven roles that Rogers outlines and are discussed above. Institutionally, a 'need for change' had been recognized, and the innovation editors proactively implemented the diffusion of digital tools (translating institutional intent into action), provided information exchange about the tools and assisted in stabilising adoption to prevent discontinued use. These represent numbers one, two, five and six of Rogers' change agent factors. On a practical level, then, individual championing and supporting the technology, i.e. the change agent, created a conduit through which others could access the device, and feel supported in its use. What emerged during the Trinity Mirror trial is that the editorial opportunities and shifting culture created an adoption environment where Glass would be used, but under certain limitations, and where time constraints and editorial production values had to fit within the wider operational requirements. This stood apart from news:rewired and Fieldcraft where, although practitioners in new technology adoption, the device didn't meet the nuanced editorial, business and reputational requirements that it met. As such, alternative technologies were favoured. In these cases, although the function of change agency may have been present in the operational fibre of the organisation, the technology and alternative workflows it presented were rejected as an improvement to the individual and organisation's workflow. As such, although Rogers' 'need for change', 'diagnosis of a problem', 'intent to change' and a translation of 'intent in to action' were all

identifiable, a 'stabilised adoption and continuing relationship with a *specific* piece of technology was not, and diffusion failed. In these instances, the current incarnation of Glass as a wearable technology was not 'fit for purpose(s)' when judged within scenarios it was placed within.

Glass ethnographies

Figure 3: Zero Hora newsroom, Porto Alegre

The picture above, taken by Glass in the Zero Hora newsroom, is one sample of a normal routine day in the Porto Alegre hub. Many shots like this was taken during the trial, and they represent an internal picture of the newsmaking process. This image could point to an important way to use wearables like Google Glass within journalistic and other industry contexts. These devices could act like a tool to research the ambient using ethnographic methodologies. We can identify on the pictures journalists' moods and change on density in certain parts of the room. This is different than take photos with a regular camera or smartphone, because it occurs more covertly.

In the same way, the method could be used to understand environments that are subject of a specific story. There is more than one way to capture images in regular time intervals that could be useful for this objective. Our observations also let us to understand that despite the fact that the device have a unique heads-up display, the camera was the main focus in the two-week period of Zero Hora, and in the other trails.

Here lies an important issue of Journalism today, and one that was identified in all the trails mentioned above, which was a lack of time for experimentation and failure. Such experimentation is expensive (in terms of money, time or human resources) and although they could present new ideas to a traditional job, are traded or unexplored for the usage of ready-made solutions. As such, editorial 'issues' are partially solved, and new knowledge or practices are not generated. This is perhaps more of an issue for larger news gatherers, but could also be identified in some of the smaller trials as part of this study.

Potential futures: wearables and beyond

Although not confirmed at the time of writing, it is expected that Google will produce another version of Glass, but one specifically geared towards industry use. However, our study is eager to move beyond Glass and consider how some of our findings could be applied to wearables more generally, although the authors acknowledge that these technologies are, despite some successful commercialisation, are at an embryonic stage of development and are liable for substantial development in the coming years. Nevertheless, Newsrooms may want to consider a number of factors if deploying wearable devices, particularly:

Fit for purpose: A key decision behind appropriating new wearable content generation device, is for newsrooms to consider their relevancy to the editorial task in hand. The allure of Glass as a new and, at least initially, 'innovative' wearable and connected device was soon found wanting when journalists and media professionals sought to extract content from the process. Half the trialists opted for alternative technologies to perform the required role.

New storytelling paradigms: Placing Glass in the hands of the subject of the story points towards media capture wearables creating a new paradigm for storytelling using miniaturized cameras to offer alternative angles and footage. This approach, which has been a staple of media output for a number of years, particularly in broadcast and investigative reporting, is relatively novel for journalism practitioners who are perhaps lodged in non-video mediums. Wearable content capture devices could allow reporters to create first person perspectives more easily and less intrusively. Equally, there's also the scope to explore internal ethnographic data generation, as mentioned above. A final area for exploration is how wearables could generate their data for use in storytelling contexts. The rise of geolocation, biometric and pollution sensors, for example, could allow reporters to create a range of personally sourced data sets.

Journalistic avatars: The potential for wearable devices to both collect media, and convey it allows for journalists to explore live communications and commentary during the newsgathering process. Glass offers a specific rendering of this, the heads-up display that could allow audience members and editorial offices to interface directly with the reporter. The authors feel this is a potentially rich field of study, and one that spans the continued emergence of connected communications devices, augmented reality and virtual devices as they being to emerge into the marketplace. It could also present opportunities for live collaborations between all actors in this scenario, and create a digital ecosystem of journalistic interactions.

Training and support: An identified usage barrier throughout the trial was on the ground training and support. Trinity Mirror's 'innovations editor' created an individual newsroom environment where journalists could access help and support, and is one method of product diffusion that could be trailed by other newsrooms. There was an understanding in all the study locations that time and recourse was needed to fully extract value from the device. The embedding of local support systems could equally be of benefit for editorial operations considering using wearable devices.

Change agency, champions and adoption: As with training and support, it seemed that throughout the trials, an appointed champion was instrumental in the adoption and diffusion of technology. Even organisations who were self-consciously 'agile' in terms of technology choices, failed to adopt without an on-the-ground advocate, although this lack of adoption was also due to a nuanced assessment of benefits of Glass, rather than a simple rejection. It could also point to a technology failure in that the devices did not offer a native intuitiveness that would help drive adoption. Nevertheless, following this initial and limited research, the authors feel that a local champion who could articulate genuine benefits of new approaches and practices and offer localized support is a powerful instrument for exploring new editorial tools and practices.

Legal, ethical and privacy concerns: Embedding multimedia capture devices that weren't initially recognizable by members of the public, or, conversely, attracted targeted attention, raise a number of issues that newsrooms, particularly those with a print and non-video heritage, may want to consider if adopting video capture-enabled wearables. These include embedding legal knowledge around image capture, and permission issues, and how livestreamed material in challenging live conditions may result in unexpected, unwanted or legally sensitive material appearing directly into the public concern.

Future work

The authors feel that there are a number of areas where future studies would provide valuable research data. From a media management perspective, there are opportunities to understand how disruptive technologies, such as wearables or augmented reality devices, can be embedded within newsrooms, and how the organisational management of newsrooms could evolve to allow for a greater experimentation, particularly within digital contexts and transitions from old media into new. The authors would advocate further ethnographic studies in the areas of new and potentially disruptive wearable devices within a range of newsrooms and media organisations to explore these issues. We also suggest these enquiries expand into the public domain to better understand how the audience respond to both wearable-generated content, and the process of being captured by wearable technologies.

More generally, we feel that the creation of a 'culture of a adoption' within editorial operations would benefit journalism audiences and produce new business and commercial opportunities. Along this, studies in this field utlilising disruptive technologies as a catalysing agent would be of direct benefit to the industry, helping to understand the impact of these new tools.

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