

UK News Coverage of Extended Reality Technologies:

Analysing extended reality news discourse and its relation to product marketing

by

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Abstract

Informed by framing theory from a social constructivist perspective, this thesis presents a study of extended reality (XR) news discourse and its relationship with product marketing. The study analyses how XR is represented in the news and the extent to which this news acts as a promotional tool for XR products, potentially supporting their diffusion. These aims are addressed using a multimodal, mixed methods research design utilising quantitative content analysis and qualitative framing analysis. This is based on a sample of 977 news articles from three UK national news websites (*The Sun*, *The Guardian* and *MailOnline*) during the period that the latest generation of XR products were announced and released (2012-2017). These articles are compared to the marketing of five XR products (Oculus Rift, Samsung Gear VR, Google Glass, Microsoft HoloLens and Magic Leap).

The study reveals that the news outlets favour positive representations of XR and that several of the same frames appear in both the news and marketing samples. It also uncovers that the creators of XR hardware and software have been the dominant news sources, contributing to the positive framing of the technologies. With insights from diffusion of innovations theory and technological acceptance models, it finds that the frames used in the news discourse highlight aspects of the technologies that could increase the likelihood of their adoption. These findings indicate that this news prioritises the interests of XR companies over those of the general public, compromising traditional journalistic principles. This research contributes to the existing literature on news coverage of emerging technologies, as well as studies examining the interplay between news and promotional content. The thesis also makes a theoretical and methodological contribution by developing a set of frames and frame categories that can be applied to future studies of other emerging technologies.

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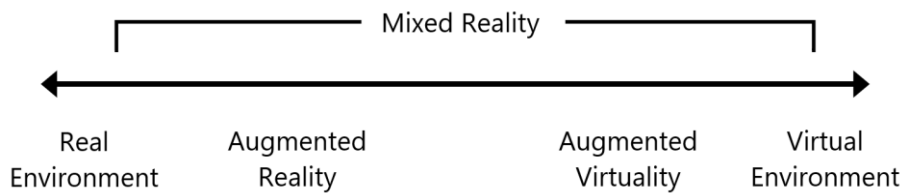
Chapter 1: Introduction

This thesis analyses the news coverage of extended reality technologies and how it relates to the marketing of these products. It utilises framing theory from a social constructivist perspective as its main theoretical approach, which informs a mixed methods research design combining content analysis and framing analysis. The study investigates three main areas: (1) how the news frames extended reality; (2) the extent to which these frames align with those in extended reality promotional materials; and (3) whether the way the news frames extended reality could promote its diffusion. As the introduction to this thesis, the current chapter first defines extended reality and provides some background information about this group of emerging technologies. Following this, the chapter turns to providing justification for the current research, both in terms of the medium under study (news) and the topic that is focused on (extended reality). Based on this discussion, the next section presents the outline of the research, including the inspiration, aims and specific research questions. The chapter ends by detailing the structure for the rest of the thesis.

1.1 Defining Extended Reality Technologies

As the topic of this research, it is useful to begin by defining extended reality and providing some background information about it. Extended reality (XR) is an umbrella term for virtual reality (VR), augmented reality (AR) and mixed reality (MR). While these technologies differ in the way they treat the physical environment, they are similar in that they each modify (or *extend*) reality in some form. In 1994, Milgram and Kishino proposed the concept of a “virtuality continuum” to classify different types of VR (see Figure 1.1). The authors define the VR environment as “one in which the participant-observer is totally immersed in, and able to interact with, a completely synthetic world” (1994: 2). They see AR and MR as subsets of VR. Milgram and Kishino define AR as “any case in which an otherwise real environment is ‘augmented’ by means of virtual (computer graphic) objects” (1994: 4). Furthermore, as shown in Figure 1.1, MR is the combination of the real and virtual environments.

Figure 1.1: The Virtuality Continuum, Recreated From Milgram and Kishino (1994: 3)



These definitions have mostly remained consistent in recent years. Indeed, Brigham states that VR “obscures the user’s physical surroundings and replaces them with a computer-generated scene or one that was previously captured” (2017: 173). On the other hand, AR “allows a person to see the real, physical world, but it is overlaid with a layer of digital content in real time” (Brigham, 2017: 172). Similarly, MR “allows a person to see the real, physical world and objects but also see believable, and even responsive, virtual objects” (Brigham, 2017: 174). There is clear overlap between AR and MR and these terms are sometimes used interchangeably (Carter and Egliston, 2020). However, the main difference between the two is that the digital objects seen with MR are able to *interact* with the physical environment, whereas the digital elements displayed using AR are simply superimposed on top of the physical environment (Brigham, 2017; Greengard, 2019). In other words, MR is somewhat more advanced than AR in the way that it treats the physical environment.

Virtual, augmented and mixed reality can currently be experienced in two main ways: through the use of a smartphone or wearing a head-mounted display (HMD). In the years covered by this study (2012-2017), MR was only accessible through the use of an HMD. Such devices include Microsoft HoloLens and Magic Leap. On the other hand, AR can be experienced either by using an HMD (such as Google Glass) or through smartphone applications that utilise the device’s camera (Greengard, 2019). Additionally, the VR devices focused on in this study always involve the use of an HMD. However, there are some variations in how this can work. Users may wear a dedicated headset that has all the technology needed for the experience in the device itself, or they may use a cheaper headset that utilises a smartphone as the screen (Evans, 2019). During the sample period of this study, dedicated headsets required to be connected to an external power source to function. These devices include the Facebook-owned Oculus Rift, Sony’s PlayStation VR and the HTC Vive. However, since 2018, standalone headsets have been

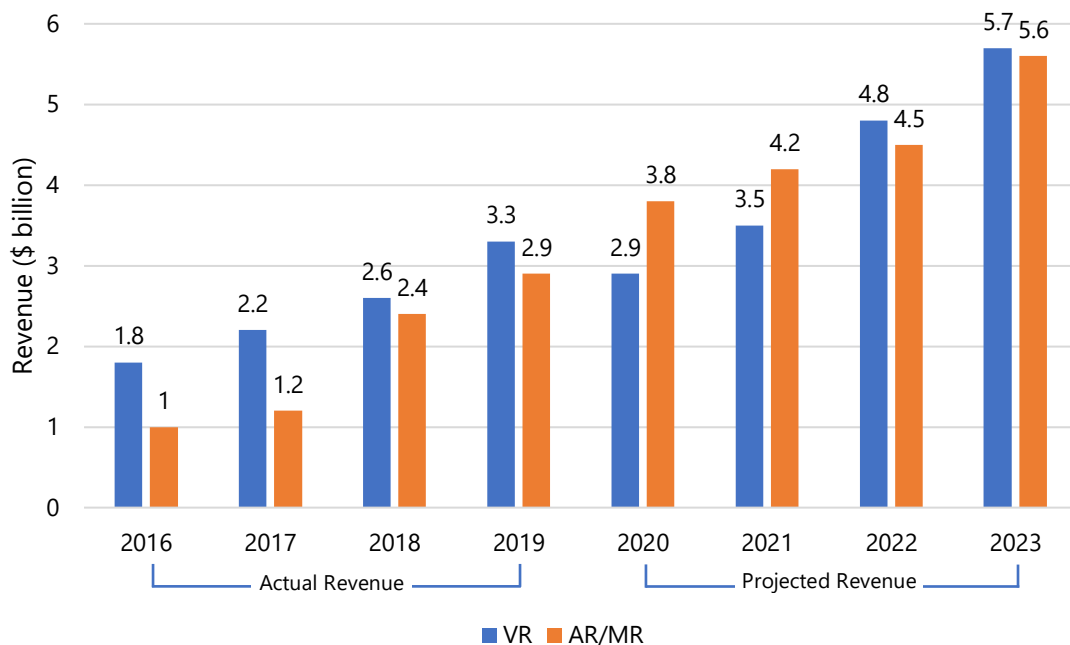
released that are comparable in quality to the previous dedicated headsets but with the benefit of functioning without being connected to an external power source. The first such device was Oculus Go, released in May 2018 (Evans, 2019). This demonstrates that XR can take several forms and is still evolving after its initial inception.

Regarding software, the applications of XR are extremely wide-ranging. Although there are overlaps between VR and AR/MR, the main uses of each vary. During the sample period of this study, videogames have been the main commercial application of VR (Steinicke, 2016). Indeed, according to SuperData (2017), an estimated 65 percent of VR revenue was produced by videogames in 2017. On the other hand, AR/MR does not yet have a main application (Craig, 2013). However, both VR and AR/MR are used in a very wide variety of areas, from entertainment (including videogames and film) to product design and development, training, education, health care, marketing, retail, tourism, defence and more (Ariel, 2017; Blascovich and Bailenson, 2011; Fuchs et al., 2017; Parisi, 2016). Therefore, it is clear that XR is much more than a technology purely for leisure and entertainment.

The first attempt at consumer VR was made in the 1990s. However, the technology was not sufficiently advanced to provide a high-quality experience at a reasonable price, meaning it did not achieve commercial success (Dixon, 2016; Parisi, 2016). From 2014, a new generation of XR products began to be released to the public, including the Google Glass AR headset and the Facebook-owned Oculus Rift VR device mentioned above (Ariel, 2017; Steinicke, 2016). Early estimates predicted that the VR industry would generate approximately \$40 billion of revenue worldwide by 2020 (SuperData, 2016). While the industry has not yet been as financially successful as predicted, worldwide XR revenue has increased every year since 2016 and is predicted to continue to do so (see Figure 1.2). According to SuperData, in the year when the first dedicated VR headsets were released to consumers (2016), the industry made approximately \$2.8 billion. This has grown every year thereafter and SuperData has predicted this will continue to rise. Though AR/MR revenue was lower than VR in the period this study focuses on, by 2018 AR/MR were producing almost as much revenue as VR and SuperData predicts that this will remain the case until at least 2023. This provides useful context for a study of XR news coverage because it highlights that VR was more established during the sample period of the current study than AR/MR.

Moreover, the steady rise in XR revenue, combined with the several large companies involved, suggests that the industry will continue to grow rather than mirroring the commercial failure of the 1990s.

Figure 1.2: Actual and Projected XR Revenue Worldwide 2016-2023 (\$ Billion), Adapted From SuperData (2018; 2020a)



1.2 Why News Discourse Matters

Now that the topic of this study has been defined, it is important to provide justification for this research. As mentioned at the beginning of the chapter, this thesis utilises framing theory from a social constructivist perspective. Both of these concepts highlight the power that language (including news discourse) can have in constructing reality. For instance, regarding framing, Pan and Kosicki state that:

Choices of words and their organization into news stories are not trivial matters. They hold great power in setting the context for debate, defining issues under consideration, summoning a variety of mental representations, and providing the basic tools to discuss the issues at hand (1993: 70).

That is to say, what language is used, and how it is used, works towards framing – and thus constructing – reality in certain ways. This aligns with social constructivism which sees reality as created through interaction with others in a social system, rather than

existing in an objective form (Slater, 2017). Indeed, Hallahan argues that “[f]raming is a critical activity in the construction of social reality because it helps shape the perspectives through which people see the world” (1999: 207). Along the same lines as Pan and Kosicki, Richardson also stresses the power of news discourse in contributing to the construction of reality:

Journalism has social effects: through its power to shape issue agendas and public discourse, it can reinforce beliefs; it can shape people’s opinions not only of the world but also of their place and role in the world; or, if not shape your opinions on a particular matter, it can at the very least influence what you have opinions on; in sum, it can help shape social reality by shaping our views of social reality. For these reasons, and many more, the language of the news media needs to be taken very seriously (2007: 13).

Therefore, analysing the framing of XR can reveal how the technology has been socially constructed.

Regarding emerging technology specifically, McKernan argues that “nascent technologies provide opportunities for different discursive outlets to construct or reiterate powerful cultural codes and worldviews” (2013: 309). Certainly, when it comes to new technologies, the news media are particularly powerful in shaping public attitudes and opinions, since most individuals have little or no knowledge about these innovations (Chuan, Tsai and Cho, 2019; Cogan, 2005; Dimopoulos and Koulaidis, 2002; Hetland, 2012; Kelly, 2009; Royal, 2006; Scheufele and Lewenstein, 2005). This is especially the case since the mass media are the public’s main source of information about emerging technologies (Cacciatore et al., 2012; Sun et al., 2020; Whitton and Maclure, 2015; Williams, 2003). Indeed, Scheufele and Lewenstein (2005) found that respondents who were frequent readers of nanotechnology news (which is mostly positive) were more likely to believe the benefits of the technology outweighed the risks than those who were not frequent readers of this news. Moreover, Buenaflor and Kim argue that “perception of a new technology significantly affects acceptance” (2013: 107). Therefore, as the news media are a major force affecting public perception of emerging technologies, how they represent these products could ultimately impact their adoption.

In other areas, previous research has uncovered a blurring of the boundary between news and promotional content (Chyi and Lee, 2018; Erjavec, 2004; Harro-Loit

and Saks, 2006; Lewis, Williams and Franklin, 2008; Pander Maat, 2007; Sissons, 2012). Such practices “compromis[e] the independence of the press” (Lewis, Williams and Franklin, 2008: 2). As will be explored in Chapter 3, research on this topic has, so far, only focused on two areas: the use of native advertising and the reliance on press releases. Comparing the frames present in the wider marketing materials (i.e. websites, social media posts and video advertisements) to the news discourse would provide further insight into the interplay between news and promotional messages. While “product promotion aims at manufacturing a favorable view toward a product” (Chyi and Lee, 2018: 588), the purpose of news content should be to inform and educate the general public (Kovach and Rosenstiel, 2014). Thus, if similar frames appear in the news and marketing of XR products, this would indicate not only a blurring between news and advertising, but that the news has acted as a promotional tool for these technologies. This emphasises the importance of analysing the relationship between news and marketing discourse.

1.3 Why Extended Reality Matters

Of course, there are many different emerging technologies, including the more science-focused nanotechnology, biotechnology and genetically modified products, as well as more technology-based innovations such as smart energy meters, artificial intelligence and autonomous vehicles. However, XR technologies stand out for a number of reasons, making it particularly worthwhile to examine how they have been framed in the news. First, XR has been described not just as a new technology, but as a new *medium* (Evans, 2019; Li et al., 2020; Papagiannis, 2014), bringing with it new concepts and experiences. Thus, as XR is notably different from previous technologies, analysing its news framing would make a valuable contribution to the literature.

Second, XR alters how individuals perceive reality either by immersing the user into a completely virtual environment or by overlaying digital objects on the physical environment. Because of this, representations of XR can impact the public’s view towards not only the virtual but also the real (Chan, 2014). This makes its news representations even more important since their effect can extend beyond the technology itself to the wider world. Third, regarding VR specifically, Madary and Metzinger argue the following:

VR technology will eventually change not only our general image of humanity but also our understanding of deeply entrenched notions, such as 'conscious experience,' 'selfhood,' 'authenticity,' or 'realness.' In addition, it will transform the structure of our life-world, bringing about entirely novel forms of everyday social interactions and changing the very relationship we have to our own minds (2016: 1-2).

If XR can have such profound effects, how the news frames this technology is vital because it could impact how many people adopt the technology and thus become susceptible to these effects.

Fourth, as mentioned above, several major companies are involved in the XR industry, with Facebook, Google, Microsoft, Samsung, HTC and more each having their own XR products. Therefore, by analysing XR news and marketing, the current study is able to provide a critical analysis of how these elite organisations may impact the news. Lastly, and on a more pragmatic level, this research began in 2017; one year after the so-called "year of virtual reality" (Fuchs et al., 2017; Steinicke, 2016). This means the thesis can make a timely contribution to the literature by focusing on a technology that has just started to gain commercial traction.

Despite the value of such research, the only published academic study in English that has examined news coverage of XR focused on one AR smartphone application (Grandinetti and Ecenbarger, 2018). Additionally, research that has looked at the relationship between news and promotional content has so far focused only on native advertising and press releases. Therefore, this thesis fills two important gaps in the literature. Firstly, it does so by analysing the news framing of XR – a topic previously neglected. Secondly, it looks at the interplay between news and promotional discourse more broadly than existing research by examining a range of marketing materials beyond press releases or native advertising. That is to say, in addition to press releases, this study also analyses video advertisements, social media posts and company websites. This provides further insight into the relationship between news and promotional content.

1.4 Research Outline

Having justified the focus of this thesis, the research itself will now be outlined, beginning with some details regarding the inspiration for this project. On 6 March 2015, the online

edition of *T3* magazine posted an article with the headline “Better than life: 2015’s hottest VR, console and PC gaming tech” (*T3 Online*, 2015). The article introduced some upcoming VR products, including HTC Vive, PlayStation VR (then named Project Morpheus) and motion capture peripherals that could be used with VR headsets. It was troubling to me that this article was encouraging escapism into immersive virtual worlds by insinuating the experience would be better than real life. Jaron Lanier, who is credited with coining the term “virtual reality” (Rheingold, 1991), envisioned that the technology would improve upon the real world, rather than offer a compelling alternative. He explains: “When my friends and I built the first virtual reality machines, the whole point was to make this world more creative, expressive, empathic, and interesting. It was not to escape it” (Lanier, 2011: 33). The “better than life” phrase used in the *T3* article contested Lanier’s original vision, instead risking disillusionment with the real world. Therefore, this article was the initial inspiration for researching news coverage of VR to uncover whether this was a one-off case or if such sentiments were more widespread.

First, this enquiry took the form of my third-year undergraduate dissertation project. This subsequently became a pilot investigation for my Masters by Research study which, to the best of my knowledge, provided the first detailed look at how VR devices were presented in the news. While these news articles rarely referred to VR as superior to real life, this research revealed that news coverage of VR was largely very positive and some articles even prompted readers to purchase these products alongside links to relevant retailers. These findings raised questions about the extent to which the news acts as a promotional tool for new technologies (such as VR) rather than maintaining a clear boundary between news and advertising content. This led to the PhD research presented in this thesis.

Although the current study was inspired by these earlier findings, it differs from my previous work in several ways. The research presented here examines news coverage of virtual, augmented and mixed reality, rather than focusing on particular VR devices as my Masters study did. Moreover, whereas my previous research analysed news articles published in seven four-week blocks between 2014 and 2016, this PhD study takes articles published between 2012 and 2017 as its sample. These two points mean that this thesis is much broader in its scope because it looks at XR (rather than only VR) over a longer period of time. Additionally, the current research extends this enquiry beyond only

news to analyse how XR is marketed. This allows the relationship between news and promotional discourse to be analysed. Lastly, informed by framing theory, this study identifies specific frames applied to XR in the news and marketing. Based on these frames, it provides a set of frame categories that can be used in future research on news coverage of XR or, indeed, other emerging technologies.

Informed by this previous enquiry, the current study has two main aims: (1) to analyse the way XR has been presented in the news; and (2) to investigate the extent to which the news has acted as a promotional tool for XR. To address these points, this thesis is primarily underpinned by framing theory. Framing can be understood as presenting an issue or topic in a way that emphasises certain aspects, while obscuring others, in the interests of promoting a particular interpretation of that issue or topic (Allan, Anderson and Petersen, 2010; de Vreese, 2010; Entman, 1993; Gitlin, 1980; Hallahan, 1999; Scheufele and Scheufele, 2010). Regarding the specific aims, the former is addressed by analysing a sample of news articles about XR. The latter aim is achieved in two ways. Firstly, the marketing materials of XR products are compared to the news articles. Secondly, the study analyses whether the way the news presents XR is positively or negatively related to the perceived characteristics of technological innovations that make them more likely to be adopted (Buenaflor and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007; Rogers, 2003).

Based on these aims, the study is guided by three research questions as follows:

RQ1: What are the key patterns of XR news coverage and how does this contribute to the framing of the technology?

RQ2: What are the key frames through which the news represents XR and how do these compare to the frames present in XR marketing materials?

RQ3: To what extent does news coverage of XR promote the diffusion of the technology and what does this say about journalistic principles in a commercial context?

These research questions are addressed using a mixed methods approach that combines quantitative content analysis and qualitative framing analysis. Online news articles about XR from *The Sun*, *The Guardian* and *MailOnline* are examined. Additionally, the marketing materials of five XR products are analysed: Oculus Rift, Samsung Gear VR, Google Glass, Microsoft HoloLens and Magic Leap. This is based on a sample period covering the

announcement and subsequent releases of several XR products: 1 January 2012 to 31 December 2017. Using a rigorous research design informed by framing theory, this study reveals how XR is framed in these three news outlets as well as the extent to which this news coverage shares promotional frames with XR marketing.

1.5 Final Remarks and Thesis Structure

In sum, studying news discourse is important because it has power in constructing reality (Pan and Kosicki, 1993; Richardson, 2007). It has particular power when it comes to emerging technologies such as XR since the general public have little or no prior knowledge of them (Chuan, Tsai and Cho, 2019; Cogan, 2005; Dimopoulos and Koulaidis, 2002; Hetland, 2012; Kelly, 2009; Royal, 2006; Scheufele and Lewenstein, 2005) and the news is usually their main source of information about such topics (Cacciatore et al., 2012; Sun et al., 2020; Whitton and Maclure, 2015; Williams, 2003). Furthermore, because perceptions are key to the success of a new technology (Buenaflor and Kim, 2013), how the news constructs XR could ultimately impact its adoption. Additionally, if promotional content seeps into the news, this can undermine journalistic independence (Lewis, Williams and Franklin, 2008). Thus, by examining both news and marketing of XR, this study is able to critically analyse the extent to which the news acts as a promotional tool for XR.

Moreover, while there are many emerging technologies, XR makes a particularly important case for several reasons: it is classified as a new medium rather than simply a new technology (Evans, 2019; Li et al., 2020; Papagiannis, 2014); it can impact an individual's distinction between the real and virtual (Chan, 2014); it has wide-reaching implications (Madary and Metzinger, 2016); several large organisations are involved in XR; and the technology has only recently started to gain commercial traction (Steinicke, 2016), meaning it allows a timely examination of news about emerging technologies to be carried out. This thesis makes an original contribution to knowledge by: (1) examining the news coverage of an emerging technology that has received very limited scholarly attention; (2) extending the enquiry regarding the blurring of news and promotional discourse beyond press releases and native advertising to marketing materials more broadly; and (3) producing a set of frames and frame categories that can be applied to future research on emerging technologies.

While this introductory chapter has justified and provided context for the research, the remainder of this thesis is structured as follows. Chapters 2 and 3 review the literature relevant to the current research. Chapter 2 provides a brief history of XR, introduces the concepts of immersion and presence and discusses the benefits and concerns surrounding XR. It then explores diffusion of innovations theory (Rogers, 2003), as well as models of technological acceptance. This is followed by an examination of previous research on media representations of XR and news coverage of emerging technologies and videogames. Chapter 3 explores framing theory in terms of the frame-building process. It considers the various factors that can impact framing, based on Shoemaker and Reese's (2014) hierarchy of influences model, including the commercial context news is produced within, newspaper type (i.e. tabloid or quality), media ownership, journalistic principles, news values, news aggregators, sourcing practices and frame advocates. The chapter then introduces the concepts of marketization (Fairclough, 1993) and native advertising before proceeding to review previous research that has analysed the relationship between news and promotional content. Chapter 3 ends by clarifying how the current thesis fills gaps in the existing literature.

Following the review of relevant literature, Chapter 4 presents the methodology of the study. It discusses the study's main theoretical approach (framing theory), paying particular attention to framing devices. The chapter then defines the mixed methods nature of the research and the specific methods used (content analysis and framing analysis). This is followed by an explanation and justification of the sampling strategies appropriated to address the research questions. The last section of this chapter clarifies the procedures carried out for data collection and analysis.

Next, Chapters 5-9 present the findings of the study. Chapter 5 primarily deals with quantitative data uncovered through the application of a coding sheet. It examines the patterns in the news coverage and how this affects the framing of XR (RQ1). The remaining data analysis chapters consider both quantitative and qualitative data together to address research questions two and three. Chapters 6-8 each examine specific frames that were found to be present in both the news and marketing samples, organised into three categories as follows. Chapter 6 examines frames that conceptualise XR (Immersive and Transcendent). Additionally, Chapter 7 focuses on frames relating to the newness of XR (Different and Unique; Revolutionary and Transformative; and

Advanced and High-Quality). Chapter 8 discusses the frames relating to the user experience of XR (Social; Easy to Use; and Comfortable). The final data analysis chapter (Chapter 9) is slightly different in its structure. It first examines the specific evaluative frames that were applied to XR in the news articles (Important; Successful; Affordable; and Much-Anticipated). This is followed by a section that examines the overall tone of the articles (regardless of specific frames).

Ultimately, this thesis argues that XR news prioritises the interests of the companies that create this technology over the general public, neglecting journalistic principles. Chapter 10 concludes the thesis by elucidating this argument based on the research findings. It first summarises the results based on each research question. Next, the largest section of this chapter discusses the four key findings of the study: the preference of the news to apply favourable frames to XR; the similarities between the news and marketing discourses; the power of frame advocates in the frame-building process; and the tendency for the news to promote the diffusion of XR. This is followed by a section that reflects upon the journey this research has taken (from the "Better than life" article discussed in Section 1.4 to the current PhD study) and considers why XR news may be this way, whilst further emphasising the central argument of the thesis. The chapter then acknowledges the limitations of the study before highlighting the main contributions of the thesis. This final chapter ends with suggestions for future research.

Chapter 2: Extended Reality and the Emergence of Technological Innovations

As the first of two literature review chapters, this section of the thesis discusses the theoretical and empirical background to the study related to technological innovations. Firstly, it provides some important context for the study by discussing the history of XR, the concept of immersion and the concerns and benefits surrounding XR. Additionally, to theoretically ground the third research question of this study, the chapter proceeds to examine diffusion theory and related models of technological acceptance. Next, the chapter reviews previous related studies that have been carried out in order to properly situate the thesis within the broader literature. The chapter ends with a discussion of the moral panic concept and how this links to technology news.

2.1 A Brief History of Extended Reality

Chapter 1 introduced XR technologies as virtual, augmented and mixed reality. While virtual and augmented reality have existed for decades, mixed reality is a relatively new concept that developed from AR and VR (Brigham, 2017). Therefore, this section will provide a brief history of the development of VR and AR in particular.

Although it is only in recent years that XR for general consumers appears to be taking off, VR has appeared in many forms since the 1960s (Steinicke, 2016). Even before this, VR simulators in the military and training situations have been used since the 1930s (Chan, 2014). In 1968, what is believed to be the first VR HMD was created by Ivan Sutherland, named the Ultimate Display but also known as the Sword of Damocles (Rheingold, 1991; Steinicke, 2016). However, such devices were not intended for commercial or mainstream use. In 1986, Jaron Lanier coined the term "virtual reality" (Rheingold, 1991). It was only after this, in the 1990s, when the first attempts at commercial VR were made. This will be referred to in this thesis as the first wave of XR. Large companies developed and released VR headsets for consumer use, including Nintendo's Virtual Boy and Sony's Glasstron (Ariel, 2017), amongst others. However, these products were not commercially successful (Dixon, 2016), some argue because the technology was not advanced enough to create a high-quality experience at a reasonable

consumer price (Parisi, 2016). Indeed, Rheingold (1991) states that, as of 1990, a high-quality VR set-up for one person would cost a minimum of \$115,400. Attempting to create these consumer devices at affordable prices meant that the products “fell short of providing a truly immersive experience due to sub-optimal ergonomics, low-quality image and resolution, and physical side effects” (Ariel, 2017: 36). Therefore, the first wave of XR faded away without success.

As opposed to VR, AR development started slightly later and originated in the workplace environment (Ariel, 2017). In the early 1990s, one of the first AR HMDs was prototyped by Boeing scientists Thomas Caudell and David Mizell to aid the building of aeroplanes (Caudell and Mizell, 1992). Another AR HMD named EyeTap was created in 1999 (Mann, Fung and Moncrieff, 1999), though was never released for consumer use. Also in 1999, HITLab scientists Hirokazu Kato, Mark Billinghurst, Rob Blanding and Richard May developed ARToolKit – an open source software library that enabled easy development of AR applications (Kato and Billinghurst, 1999). This led to some of the first AR applications being developed for consumer use, including an outdoor mobile game named ARQuake released in 2000 (Thomas et al., 2000) and MagicBook, which overlaid digital imagery onto books, released in 2001 (Billinghurst, Kato and Poupyrev, 2001). In 2008, the first AR application for a smartphone was released – a travel guide launched with the G1 Android phone (Ariel, 2017). Other applications followed, such as Wikitude and Layar. Therefore, it appears AR has had a more stable presence over the years than VR.

Still, it was only with the announcement of the AR headset Google Glass in 2012 that “the industry became aware of the mass diffusion potential of Augmented Reality” (Ariel, 2017: 42). Relatedly, it is only recently that the components needed to create a high-quality VR experience have become sufficiently advanced at an affordable price to make consumer VR viable (Parisi, 2016). The announcement and introduction of these products is what this thesis terms the second wave of XR. The Oculus Rift VR headset is considered by many to be the product that spurred this new XR trend (Brigham, 2017; Evans, 2019; Parisi, 2016; Steinicke, 2016). Originally developed by Palmer Luckey of Oculus VR, Oculus Rift gained attention when the company crowd-funded \$2.4 million on Kickstarter to create the product, surpassing its initial funding goal of \$250,000 in less than 24 hours (Oculus, 2012a; Oculus, 2012b; Steinicke, 2016). It garnered even more

attention in 2014 when the independent company was acquired by Facebook for a value of \$2.3 billion (Steinicke, 2016), leading to renewed interest in VR (Brigham, 2017).

However, in the AR realm, Google Glass “failed to generate long-term, widespread and meaningful adoption” (Ariel, 2017: 44), leading to it being discontinued in its consumer form in 2015. Instead, according to Ariel, the smartphone AR game Pokémon Go “marked the beginning of the Augmented Reality Mania” (2017: 51). The free game was released in July 2016 and “became the most popular game in the history of smartphone games” (Zsila et al., 2018: 56). According to Newzoo, “the game has accrued more than 550 million installs and \$470 million in revenues in its first 80 days since launch” (2016: n.p.). As of September 2016, there were still “approximately 700,000 new downloads every single day” (Newzoo, 2016: n.p.). Furthermore, even in 2019, 81 percent of revenue generated by AR mobile games came from Pokémon Go (SuperData, 2020b). Therefore, Pokémon Go has played a significant role in the commercial AR industry so far, at least in the smartphone AR market. In all, it appears that Oculus Rift and Pokémon Go have been major driving forces in the current generation of XR.

2.2 Immersion and Presence

Immersion and presence are the two key concepts surrounding XR technology, particularly for VR (Brigham, 2017; Evans, 2019). However, these are not new concepts. Broadly, “[a] stirring narrative in any medium” can create a sense of immersion, defined as “[t]he experience of being transported to an elaborately simulated place” (Murray, 1997: 98). That is to say, individuals could feel immersed in a novel, film or videogame. The concept of presence tends to go hand-in-hand with immersion (Ryan, 2015) and the terms are often used interchangeably (McMahan, 2003). Certainly, Lombard and Ditton’s definition of presence has some similarity with Murray’s conceptualisation of immersion, with presence described as “the perceptual illusion of nonmediation” (Lombard and Ditton, 1997: n.p.). The illusion of nonmediation “occurs when a person fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the medium were not there” (Lombard and Ditton, 1997: n.p.). In other words, the user feels as if they are actually present in a simulated environment and instinctively attempts to interact with it as such. It is clear that immersion and presence are strongly linked; based on these definitions, both immersion

and presence refer to the illusion of *being* in a simulated world. However, presence expands upon this by referring to the response of an individual. As Lombard and Ditton note above, someone feeling a sense of presence would respond to the simulation as if they were really there. That is to say, with regard to differentiating the two terms, interaction is the key to presence.

Furthermore, immersion and presence have also been appropriated slightly differently in VR technology in comparison to AR/MR technology. In relation to VR, immersion can be understood as “the illusion of being inside a computer-generated scene” (Rheingold, 1991: 112). Put another way, the user feels immersed in a fully digital environment which is different to the physical space they are in. On the other hand, presence in AR (and by extension, MR) “arises from a high level of technologically-facilitated immersion and environmental consistency, and which in turn may give rise to realistic behaviour and response” (Steptoe, Julier and Steed, 2014: 214). With AR and MR, then, immersion is created when the user is convinced that the digital elements are actually present within the physical environment, leading them to interact with the virtual objects as such.

While these concepts have been used in relation to other media before XR, XR immersion and presence are different in the sense that they are technologically induced rather than being a mental product of the imagination (Ryan, 2015). That is, with the use of a headset, this technology provides a sense of immersion and presence by replacing the user’s view of the real world with a virtual environment (in VR) or superimposing digital objects onto the real world (in AR/MR). This differs from the sense of immersion that is imagined when reading a novel or watching a film. However, the simple use of an HMD does not guarantee the user will feel immersed or present in the virtual environment. The sense or level of immersion/presence depends upon a number of features, including the quality of the hardware (Steinicke, 2016) and the ability of the user to interact with the virtual environment (Rheingold, 1991). Moreover, Evans argues that immersion is “a tightly crafted emergent property of the visuals, sounds, narratives and haptics (or touch) of the VR experience and the mood or orientation of the user towards the VR experience itself” (2019: 50). Therefore, while immersion and presence are key concepts in this area, it is important to remember that these are not inherent characteristics of any XR experience.

2.3 Concerns Surrounding Extended Reality

As with most emerging technologies, the introduction of XR brings with it some concerns, both new and old. As of yet, most of these concerns have been raised in relation to VR rather than AR or MR due to it offering immersion in a completely virtual world. As Steinicke notes: "The immersive nature of VR raises questions regarding risks and adverse effects that go beyond those aspects in existing media technologies such as smartphones or the Internet" (2016: 145). One of the most salient concerns is VR-induced motion sickness, or cybersickness. Due to the immersive capabilities of VR, "discrepancies between the senses, which provide information about the body's orientation and motion, cause those perceptual conflicts which cannot be naturally handled by the body" (Steinicke, 2016: 47). In other words, immersion causes the user to believe they are moving within in a virtual space and, because their actual body is not moving in the same way, this may cause cybersickness. Symptoms can include nausea, headaches, disorientation and vomiting (Evans, 2019; Greengard, 2019; Steinicke, 2016). Much research has been carried out to determine the causes of cybersickness in order to reduce it (for a review see Chang, Kim and Yoo, 2020). Despite this, cybersickness remains one of the major barriers to the acceptance of consumer VR (Davis, Nesbitt and Nalivaiko, 2015; Evans, 2019). Therefore, the attention the news gives to cybersickness could have a significant effect on readers' willingness to adopt XR.

As opposed to cybersickness, some concerns about VR are similar to those associated with videogames. For instance, just as with videogames, there have been concerns over VR users becoming addicted to the virtual experiences the technology provides (Greengard, 2019). Blascovich and Bailenson (2011) even argue that VR could be more addictive than previous media forms due to immersion. A further worry is that this addiction can lead to social isolation or reduce social skills (Greengard, 2019). Also in line with videogame concerns, there are worries surrounding violence in VR experiences. Firstly, being repeatedly exposed to violent scenarios in immersive virtual worlds could lead users to become desensitised to violence (Greengard, 2019). In line with the media violence debate (see Section 2.9), experiencing this violent content could then encourage users to be violent or aggressive in the real world (Greengard, 2019). Again, the immersive capabilities of VR have made this concern greater with this technology than it has been previously.

Related to violent content, there are additional concerns that some users may experience panic attacks and even strokes or heart attacks when immersed in a disturbing scene (Greengard, 2019). Similarly, distress could be caused to the user if their avatar is assaulted or if their account is hacked (Greengard, 2019; Steinicke, 2016). There are also a range of ailments associated with VR, including eyestrain due to the close proximity of a screen to the face, repetitive strain injury and accidents caused by colliding with real objects while wearing a headset (Greengard, 2019). Other concerns relate to the psychological impact of VR on the user. For instance, some users have reported a disillusionment with the real world after experiencing VR (Chan, 2014; Greengard, 2019). Users of VR can also experience depersonalisation-derealisation syndrome, making it difficult to distinguish between the physical and virtual worlds (Steinicke, 2016). Based on these points, it is clear that there are a wide range of concerns when it comes to VR in particular.

For AR and MR, on the other hand, the major concern that is highlighted is privacy (Brigham, 2017; Pase, 2012). This centres around the fact that AR and MR devices can capture or record the physical environment the user is looking at. For instance, when Google Glass was first launched, concerns were raised that confidential information could be recorded without others being aware of it (Brigham, 2017; Greengard, 2019). In addition, this privacy issue links with another concern over surveillance. In order to provide accurate content, AR and MR devices use a mapping technique to monitor where the user is positioned and what they are looking at, leading to fears over the monitoring of the user's location and actions (Carter and Egliston, 2020; Harborth, 2019). Although this discussion of concerns surrounding XR is not exhaustive, these main issues are useful to keep in mind throughout the analysis of XR news to uncover how much attention the news gives to these areas.

2.4 Benefits of Extended Reality

Alternatively, the extent to which the news highlights the benefits of XR could work towards framing the technology in a more positive light. With this in mind, it is worth overviewing some of the main benefits of XR. While many of the concerns surrounding VR have arisen due to the immersive capabilities of the technology, others have argued that immersive VR experiences can lead to increased empathy towards certain social

groups. This idea was introduced in a TED talk by VR filmmaker, Chris Milk, who called VR the “ultimate empathy machine” (Milk, 2015). He argued that immersion can allow users to experience what it feels like to be someone else (for instance, a child refugee), thus leading to increased empathy for such people. In this vein, VR experiences that allow the user to view the world through the perspective of another have been developed. This includes the *New York Times*’ 360 degree VR video, *The Displaced* (2017), which shows the story of a child refugee and *Becoming Homeless: A Human Experience* (2017), created by Stanford University’s Human Interaction Lab. In addition to content including pre-recorded footage, BeAnother Lab offers a VR experience that allows two users to swap their perspectives to begin to understand what it is like to be in a different body.

However, there is some contention over whether VR can actually make people more empathic. Bollmer criticises that “technologies intended to foster empathy merely presume to acknowledge the experience of another, but fail to do so in any meaningful way” (2017: 63). Additionally, Herrera et al.’s (2018) study of VR-induced empathy found that, in the long term (eight weeks after the first stage of the research), the empathy generated by a VR experience simulating homelessness was no greater than the empathy felt by participants who had read a written account of what it was like to be homeless. On the other hand, even after eight weeks, the participants that experienced the VR simulation were more likely than the group that read the written account to have a positive attitude towards the homeless. The VR group was also more likely to take action that could help improve the lives of the homeless, including signing a petition. This indicates that, even if VR may not be the “ultimate empathy machine”, as proposed by Milk, it could at least be more effective in bringing about social change than previous methods. While it is too early to be certain of this, being aware of both sides of this debate is useful when analysing how (and if) the news mentions VR empathy.

Other benefits surrounding XR are more closely related to the applications of the technology than its immersive capabilities. For instance, XR can be used for pain management (Pourmand et al., 2018) as well as in treating phobias and post-traumatic stress disorder (Greengard, 2019). More specifically, previous studies have found that XR has certain benefits in both education and the industrial sector. For instance, Garzón, Pavón and Baldiris (2019) carried out a meta-analysis of studies examining AR use in education. They found that the technology had several advantages in this area, including

improvement of academic performance, an increase in motivation and improved understanding of abstract concepts. Similarly, de Souza Cardoso, Mariano and Zorzal (2020) reviewed the literature about AR/MR use in industrial settings (including engineering and manufacturing). Based on these previous studies, they found that some of the main benefits of AR/MR in these areas were improved product quality, reduced workload, improved decision-making and the increased health and safety of workers. Therefore, it appears that AR and MR in particular have notable benefits in these sectors. Again, this discussion does not represent every (potential) benefit of XR. It is possible that the news may mention other advantages of XR or, indeed, not mention any at all. Either way, the attention the news gives to any benefits of XR could point to the overall framing of the technology.

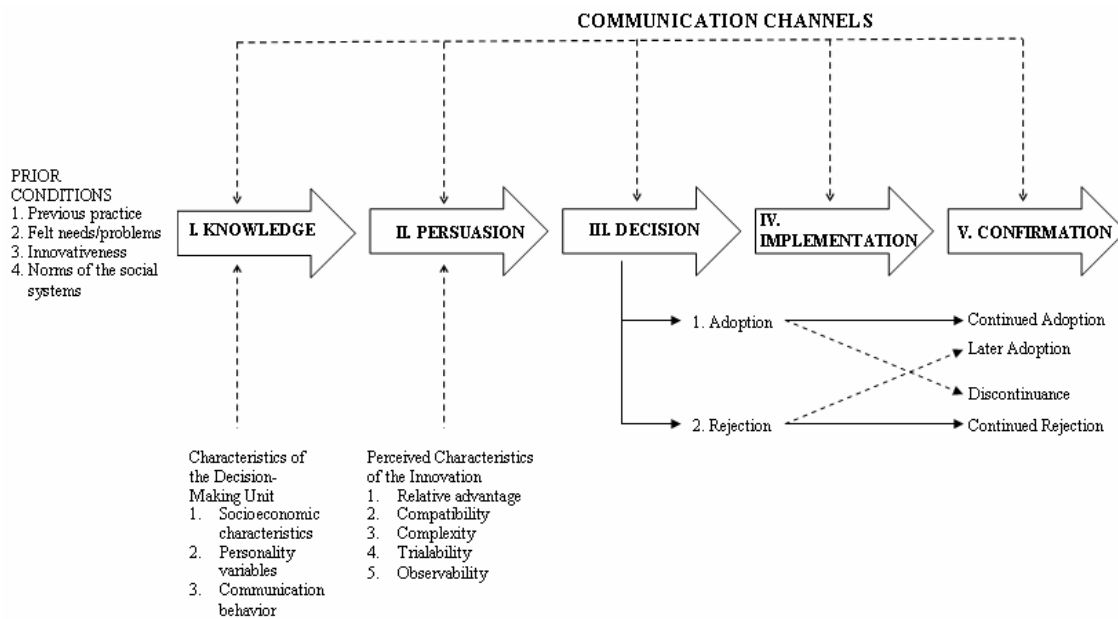
2.5 Diffusion of Innovations

Having explored the details specifically relevant to XR, it is worth widening the discussion to technology and innovation in general. While there are varying definitions of what constitutes an innovation, a common thread is that innovation is considered different to invention (Storsul and Krumsvik, 2013). For instance, Storsul and Krumsvik state that “[a]n invention is a new idea or a new theoretical model, while an innovation is the implementation of this invention in a market or social setting” (2013: 14). Similarly, Roberts (2007) argues that innovation is invention plus exploitation. To expand, he defines invention as “all efforts aimed at creating new ideas and getting them to work” (2007: 36). The exploitation of an invention refers to “all stages of commercial development, application and transfer” (2007: 36). Roberts’ classification of exploitation relates to Storsul and Krumsvik’s idea of implementation. In other words, while invention is simply the development of a new idea, “innovation is *introducing* something new” (Nordfors, 2009: 7, original emphasis). Based on these definitions, all three technologies under the XR umbrella can be understood as innovations.

Considering the third question of this study investigates whether the news promotes XR diffusion, Rogers’ (1962/2003) diffusion of innovation theory is particularly relevant to the current study. The diffusion of innovations model considers the various stages of the diffusion process to map how and why innovations may be adopted or rejected. According to Rogers, diffusion is “the process in which an innovation is

communicated through certain channels over time among the members of a social system" (2003: 5). Of most interest for this thesis is the innovation-decision process which splits the potential adoption of an innovation into five stages: knowledge, persuasion, decision, implementation and confirmation (see Figure 2.1). The first two stages in this model are particularly relevant to the current study (due to their focus on the construction of meaning) and will therefore be discussed in more detail.

Figure 2.1 A Model of Five Stages in the Innovation-Decision Process (Rogers, 2003: 170)



The first stage of the innovation-decision process (knowledge) begins when someone "is exposed to an innovation's existence and gains an understanding of how it functions" (Rogers, 2003: 171). Several authors have argued that the news may be the public's first and main source of information about an innovation or emerging technology (Cacciatore et al., 2012; Scheufele and Lewenstein, 2005; Sun et al., 2020; Whitton and Maclure, 2015; Williams, 2003). Moreover, Rogers claims that mass media channels are "the most rapid and efficient means of informing an audience of potential adopters about the existence of an innovation" (2003: 18). Therefore, the news may play an integral role in this knowledge-building process, making how they frame XR important in how it is understood by the public.

In the second stage (persuasion), "the individual forms a favorable or unfavorable attitude toward the innovation" (Rogers, 2003: 174). Although Rogers argues that peers are the most powerful communication channel in the persuasion stage, this contention

assumes that the innovation in question has already been adopted by some. For innovations that are yet to become publicly available (such as XR in most of the years this study analyses), other communication channels must play a role in the persuasion stage. Certainly, the Bass model of marketing assumes that “individual independent adopters are initially influenced mostly by media; and later, adopters are more influenced by interpersonal communication and channels” (Tidd, 2010: 15). Therefore, the news outlets examined in this study could be strongly influential in both the knowledge and persuasion stages of the innovation-decision process. In the persuasion stage, the perceived attributes of innovations are particularly important (Rogers, 2003). With this in mind, these characteristics will now be explored.

2.5.1 Perceived Characteristics of Innovations

According to Rogers, there are five characteristics of innovations that are the most important in explaining the rate of their adoption. These are: (1) relative advantage; (2) compatibility; (3) complexity; (4) trialability; and (5) observability. First, relative advantage “is the degree to which an innovation is perceived as better than the idea it supersedes” (Rogers, 2003: 15). Rogers notes that relative advantage could be presented in terms of economic advantages (such as value for money in comparison to older technologies), or in relation to convenience, satisfaction or social prestige. Second, compatibility is defined as “the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters” (2003: 15). Third, Rogers describes complexity as “the degree to which an innovation is perceived as difficult to understand and use” (2003: 16). Fourth, trialability is “the degree to which an innovation may be experimented with on a limited basis” (2003: 16). Finally, observability is “the degree to which the results of an innovation are visible to others” (2003: 16). Importantly, Rogers states that “[i]nnovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, and observability and less complexity will be adopted more rapidly than other innovations” (2003: 16). The key point here regarding the current study is that individuals must *perceive* an innovation to have these characteristics for it to be adopted, rather than an innovation objectively having these characteristics. Therefore, how (and whether or not) the mass media frames XR in terms of these five characteristics could impact public perception of it and, thus, adoption.

While it is not the purpose of this study to measure adoption or diffusion of XR, these five characteristics defined by Rogers can work as a useful analytical tool to consider the way the news coverage of XR may promote the diffusion of the technology.

2.5.2 Models of Technology Acceptance

In addition to Rogers' perceived characteristics of innovations, other models to predict the adoption of technologies specifically have been developed. In particular, the Technology Acceptance Model (TAM) is the theoretical model that has been most widely applied in understanding the acceptance of technology (Lee, Kozar and Larsen, 2003; Sohn and Kwon, 2020). This even includes some studies of wearable technology (e.g. Yang et al., 2016). Since XR headsets can be classified as wearable technology, this shows that TAM is clearly relevant to the adoption of XR. Developed by Davis (1989), TAM posits that there are two main factors that affect acceptance of new technologies: perceived usefulness and perceived ease of use. Davis defines perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort" (1989: 320). Additionally, perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (1989: 320). While this definition is most relevant within an organisational context, other authors have applied perceived usefulness to general consumers. For instance, Jung, Perez-Mira and Wiley-Patton operationalised perceived usefulness as "an individual's perception of the degree to which a technology helps the user attain the purpose for the technology usage" (2009: 124). Therefore, comparable to Rogers' (2003) perceived characteristics of innovations, the way usefulness and ease of use are perceived can impact the chances of a new technology being adopted.

Similar to TAM, Kim, Chan and Gupta (2007) proposed a Value-based Adoption Model (VAM) in which the perceived value of a technological innovation affects adoption intention. According to this model, the perceived value of a technology is impacted by two main benefits (usefulness and enjoyment) and two main sacrifices (technicality and perceived fee). The usefulness factor is borrowed from Davis (1989) and technicality relates to Rogers' (2003) concept of complexity discussed above. In addition, the enjoyment benefit suggests that experiencing "immediate pleasure or joy from using a technology", as well as perceiving "any activity involving the technology to be personally

enjoyable in its own right" make it more likely to be adopted (Kim, Chan and Gupta, 2007: 116). On the other hand, "higher fee perceptions [of a technology] are associated with lower value perceptions" (2007: 117). Therefore, in addition to the variables already mentioned above, both enjoyment and perceived value for money could impact consumer adoption choices.

Aside from models referring broadly to the acceptance of technology, Buenaflor and Kim's (2013) contribution is particularly relevant to the current study since it focuses on acceptance of wearable computers. Upon reviewing the relevant literature, Buenaflor and Kim present six groups of factors affecting the acceptance of wearable computers. Importantly, Buenaflor and Kim focus on *human* factors, meaning they are aspects of the technologies that impact the user, rather than the technological characteristics of a product. The first factor (fundamental needs) suggests that "[w]earable computers that support the fulfilment of the most basic human needs", such as monitoring sports activities, "are likely to be more accepted than those supporting the higher level needs" (Buenaflor and Kim, 2013: 111). Secondly, the cognitive attitude factor group includes perceived usefulness and perceived ease of use, referring to Davis' (1989) TAM. Buenaflor and Kim define perceived usefulness as "the degree to which an individual believes that using a particular system will enhance their performance of a certain task" (2013: 107). Additionally, perceived ease of use is defined as "the degree to which an individual believes that using a particular system would entail little physical and mental effort" (2013: 107). Moreover, Buenaflor and Kim also note four other cognitive attitudes that can impact the acceptance of a wearable computer: perceptions of fear, risks and disadvantages, as well as benefits of the new technology over an existing one (relating to Rogers' [2003] relative advantage concept).

The third factor group, social aspect, relates to personal privacy, social influences and culture. According to Buenaflor and Kim, consumers are less likely to adopt a wearable computer when it is perceived as posing a risk to the personal privacy of the user. This links to the privacy concerns discussed in relation to AR/MR in Section 2.3. On the other hand, individuals are more likely to adopt a product if it has already been accepted by their social group. In a similar way, depending on the culture of a certain individual, they may be more or less accepting of wearable technology. Fourth, the physical aspect group includes: physical comfort and safety; aesthetic and appearance;

and mobility. The authors state that “[p]hysical comfort and safety is an essential consideration” in terms of “the absence of physical burden or disturbance on the wearer” (2013: 109). Additionally, they also note that, because wearable products are *worn* by the user, how they look when being worn also plays a role in their acceptance. Moreover, the mobile nature of wearable products can support their adoption (Buenaflor and Kim, 2013).

Regarding factor five (demographic characteristics), the age and gender of users can also impact the willingness to adopt wearable devices (Buenaflor and Kim, 2013). That is to say, according to the authors, elderly people are less likely to adopt wearable devices than younger consumers due to being unfamiliar with technology. Similarly, Buenaflor and Kim argue that men are more likely to be accepting of such products than women, again due to a lack of knowledge of technology. Finally, the sixth factor refers to the technical experience of individuals. Buenaflor and Kim argue that those who have had more experience interacting with other technological devices previously “tend to be more confident and are expected to be more willing to use wearable computers than those with less technical experience” (2013: 110-111). Buenaflor and Kim conclude that “[w]earable computing systems must gain acceptance from the intended users before they will be adopted and used” (2013: 111). With this in mind, just as with Rogers’ (2003) perceived characteristics of innovations, the extent to which the news discourse positively or negatively emphasises these factors of XR could impact the audience’s perception of the technology. Certainly, Buenaflor and Kim argue that “perception of a new technology significantly affects acceptance” (2013: 107). Thus, depending on how the news media write about any of the factors and characteristics mentioned in the different models in this section, they could either support or hinder the adoption of XR. These models will act as useful analytical tools to address RQ3 when discussing the frames that exist in XR news coverage.

2.6 Media Representations of Extended Reality

In addition to exploring contextual and theoretical literature, it is important to examine previous research related to the current study. The remainder of this chapter does just that, beginning with media representations of XR. In the preface of *Virtual Reality Headsets* (Fuchs et al.), Guitton argues that the recent emergence of VR devices has

resulted in “a large quantity of news items in the media but, unfortunately, most of them offer an incomplete or false analysis, because of a misunderstanding of VR” (2017: xi). Additionally, Fuchs et al. state “[t]he subject of ‘virtual reality for the general public’ has been widely covered by online media, with mixed reviews” (2017: 190). On the nature of the coverage, Steinicke notes that most VR news focuses on the devices that were commercially released in 2016, with little attention “devoted to ethical issues and responsibilities that might come with the widespread use of VR” (2016: 145). However, although several authors have made such statements, they have not been supported by empirical research.

Furthermore, extensive literature searches returned only one published academic study in English that examined XR news. Grandinetti and Ecenbarger (2018) analysed news articles about the AR smartphone game Pokémon Go. The authors uncovered various concerns highlighted in the news about the application. This included users being directed towards dangerous or undesirable locations, such as “strip clubs, sex shops, gravestones” (2018: 444). Additionally, Pokémon Go “was positioned as part of new gaming-related hazards including armed robbery, falling from a cliff face, stumbling upon a dead body” (2018: 444). Moreover, the application was said to have negative effects in that it could cause car accidents and be used as a reason for men to accost female players. The articles also raised concerns regarding the collection of data about users (e.g. where they were travelling). Still, some benefits of Pokémon Go were mentioned, such as increased exercise and the game helping with anxiety and stress. Lastly, the authors found that the news coverage highlighted the political potential of Pokémon Go in both positive and negative ways. The game was shown to promote political beliefs and as able to “mak[e] the world a better place”, but it was also highlighted that it was used by Russian hackers “to inflame political and racial tensions leading up to the 2016 US presidential election” (2018: 448). Therefore, it seems as if news coverage of Pokémon Go was more negative than positive overall. However, the authors do not specify their criteria for the selection of the news articles, or the news outlets used, besides stating that they were published “in the months following the game’s release” (2018: 443). This raises questions as to the reliability of their findings. Moreover, while the study provides some useful insight into news coverage of XR, it is very limited in its scope in that it only focuses on one AR smartphone game (Pokémon

Go). This highlights the need for research that examines XR more broadly – a gap addressed by this thesis.

On the other hand, some academic studies have analysed media representations of XR in film and literature. Since XR news coverage has received very little scholarly attention, it is worth briefly discussing how XR is presented in these fictional media. While Section 2.1 provided a brief overview of the history of XR, even before the first XR products were developed, the technology had appeared in fiction for many years. As early as 1901, L. Frank Baum published *The Master Key* which featured a pair of glasses that allowed the wearer to see objects overlaid on the real world – an early idea of AR. Similarly, in 1935, Stanley G. Weinbaum published *Pygmalion's Spectacles*, a short story about glasses that allowed the wearer to feel as if they were in a movie – relating to the immersive capabilities of VR. Other novels also presented virtual worlds able to be inhabited by humans, including Daniel F. Galouye's *Simulacron 3* (1964) and William Gibson's *Neuromancer* (1984). Similarly, the holodeck in *Star Trek: The Next Generation* (1987-1994) presented another form of VR. Other cinematic representations of VR appeared in the films *The Lawnmower Man* (1992) and *The Matrix* trilogy (1999-2003). As opposed to VR, while AR has appeared in many science fiction works, it is not usually the main focus, but rather a tool used in futuristic settings. For instance, in the *Iron Man* film series (2008-2013), Tony Stark's suit allows him to see a digital overlay on the real world. A similar technique was used even earlier than this for the cyborg policeman in *RoboCop* (1987). More recently, VR has appeared as the focus in a wider range of fictional texts, including the Japanese manga and anime series *Sword Art Online* (2012-present), the Channel 4 TV series *Kiss Me First* (2018) and Ernest Cline's *Ready Player One* series of novels (2011-2020), the first of which was adapted into a Warner Bros. produced film of the same name and released in 2018. Certainly, it is clear that there is no shortage of fictional XR texts.

Regarding VR in particular, Steinicke argues that fictional texts "often show dystopic visions in which humans live their lives with a VR-based user interface while they are immersed into a virtual or remote location by means of avatars or surrogates" (2016: 89). Both Ariel (2017) and Bailenson (2018) reiterate that VR fiction is usually dystopic. On the other hand, in her extensive study of fiction novels and films from the 1980s to 1990s, Chan (2014) found both celebratory and critical representations of VR. Such

positive, or celebratory, portrayals of VR in fiction include depicting it “as a revolutionary and unprecedented immersive experience” (2014: 58) and highlighting the transcendental capabilities of VR. Taylor (1997) agrees that this transcendence is often emphasised, not just in literary representations of XR, but also in artistic and musical texts. On the critical side, Chan’s findings coincide with Steinicke’s statement in that many fictional texts offer cautionary tales of real-life VR. Therefore, although there might be mixed fictional portrayals of VR, it is clear that at least some of these are negative and even dystopian. Hayles notes that literary texts “actively shape what the technologies mean” (1999: 21). Since so little research has analysed how the news portrays XR, the way the technology is represented in fiction acts as a useful comparison for the results of the current study.

2.7 News Coverage of Science and Technology

While there is a lack of research on XR news portrayals, there is a substantial amount of literature examining the news coverage of other technologies. It is therefore beneficial to widen the scope of this literature review to technology more broadly. This section first defines technology journalism before discussing previous research on news coverage of science and technology in general. It then explores studies focusing on specific emerging technologies, including nanotechnology, information and computing technologies and artificial intelligence.

Technology journalism lacks a concrete definition. It is sometimes grouped with science journalism, while some see it as part of wider lifestyle journalism or even business journalism (Brennen, Howard and Nielsen, 2020a). For instance, in an analysis of science journalism, the participants in Bauer et al.’s (2013) study typically worked on a beat including science, technology and environmental coverage. Similarly, Hanusch, Hanitzsch and Lauerer (2017) interviewed lifestyle journalists in a range of fields, including travel, fashion/beauty, health and wellness, food, living, parenting, celebrity and personal technology. In Brennen, Howard and Nielsen’s (2020a) study of technology journalists, they found that technology journalism was broadly split into three types (or “schools”): reporting on products, reporting on the business of technology and social implications/effects of technology. This demonstrates the link with business journalism. With this in mind, it is useful to examine studies that have analysed both science and

lifestyle journalism, as well as those focusing on technology, since these areas appear closely related. Business journalism is not considered since this study focuses on news targeted towards a general audience rather than companies. This section therefore discusses studies of science and technology news, while lifestyle journalism is explored in Chapter 3.

An early project that aimed to extensively map news coverage of science and technology was carried out by Bauer et al. and published by the London Science Museum in 1995. This study applied content analysis to 6,031 news articles about science and technology from 1946 to 1990 in national daily newspapers (*The Telegraph*, *The Mirror*, *The Independent*, *The Times*, *The Express*, *The Sun* and *The Guardian*). The authors found that the tone of the news coverage seemed to be broadly split into two phases. The first phase, from 1950 to 1965, was generally positive and celebratory towards science and technology. In the second phase, from 1965 to 1990, "the overall tone is negative and critical" (1995: 8). However, Bauer et al. note that at the end of the sample period (1990), the tone of the articles shifted from negative to positive. In addition to studying the evaluative tone of the articles, Bauer et al. also analysed the discourse of benefits and risks within their sample. Overall, they found that "[a] discourse of benefits dominates science coverage in the press until the end of the 1960s", when the risk discourse "increases rather sharply" (1995: 8). Furthermore, they state that one of the peaks for the risk argument was the mid-1980s. These are significant findings in relation to the topic of the current study as the first HMD used for XR was created in the 1960s and the term VR was coined in the mid-1980s (see Section 2.1). This means it is possible that VR developed alongside a period of negativity towards science and technology.

Another study carried out by Dimopoulos and Koulaidis (2002) analysed the presentation of science and technology in the Greek press from 1996 to 1998. The authors applied content and framing analysis to 1,867 articles from four Greek national newspapers. Dimopoulos and Koulaidis argue that "[t]he press attributes to science and technology a mainly *instrumental* role, either as tools for legitimizing (or more rarely de-legitimizing) political decisions or for achieving high levels of economic development" (2002: 236, original emphasis). Moreover, Dimopoulos and Koulaidis found that the Greek press most commonly focused on "technological/scientific innovations and applications (35.7%)" (2002: 230). Regarding impacts, 93.4 percent of articles mentioned

the social impact of science and technology. The authors state: "These social impacts are described in most cases as positive (59%), while a considerable percentage of articles (30.9%) focus on the negative social impacts of science and technology" (2002: 234). This shows that coverage of science and technology during this time was fairly positive, at least in the Greek press. Importantly, only 3.8 percent of articles presented both positive and negative impacts of science and technology, which highlights the lack of balanced reporting on these topics.

In the Italian context, Ricci (2010) applied framing analysis to five popular Italian science and technology magazines from July 2004 to January 2006. The author found one "super frame" (2010: 588), as well as other sub-frames. This super frame is technological orientalism in which "technology and technological devices are recounted as amazing and incredible, as well as something to be feared" (2010: 587). Ricci states that, although technology is sometimes represented in contradictory ways, the discourse always "illustrates 'magnificent' and 'marvelous' new technological devices for us" (2010: 587). This demonstrates the technological orientalism super frame. Out of these three studies analysing science and technology news broadly, Bauer et al.'s is the only one that found mostly negative coverage. This could be due to the different time period covered, or the different context (Bauer et al. researched UK newspapers whereas Dimopoulos and Koulaidis and Ricci researched Greek and Italian news respectively). However, other studies focusing on *emerging* technologies show more consistent results, as will now be discussed.

One topic that is often examined in the literature on news coverage of emerging technology is nanotechnology. For instance, Anderson et al. (2005) examined the news framing of nanotechnology in 18 UK national news outlets (10 daily and eight Sunday publications). Content analysis was applied to 344 news articles about nanotechnology from 1 April 2003 to 30 June 2004. Anderson et al. found that "the possible benefits to be derived from nanotechnology receive more extensive coverage than do possible risks" (2005: 216). A similar result was uncovered by Lewenstein, Gorss and Radin (2005) in the US context. The authors applied content analysis to 620 articles from 1 January 1986 to 30 June 2004 to identify the themes and frames in nanotechnology news. This was based on a sample of three elite media outlets in the US (*New York Times*, *Washington Post* and *Wall Street Journal*) as well as one news wire service (*Associated Press*). The authors

summarise that “positive stories tend to be much more strongly positive than the negative stories are negative” (2005: 16). Lewenstein, Gorss and Radin note that this is in line with their previous study on biotechnology news, suggesting the same could also be the case for other emerging technologies – including XR.

Strongly related frames were also uncovered in these two studies. Lewenstein, Gorss and Radin found that the “progress” and “economic prospects” frames were used the most. Similarly, two of the most common frames in Anderson et al.’s research were “scientific discovery or project” (relating to Lewenstein, Gorss and Radin’s “progress”) and “business” (relating to Lewenstein, Gorss and Radin’s “economic prospects”). However, another common frame in Anderson et al.’s study was “science fiction and popular culture” which did not emerge from Lewenstein, Gorss and Radin’s research. Since the current study analyses UK news as Anderson et al. did, it may be the case that science fiction and popular culture are also mentioned in news coverage of XR.

Furthermore, Lewenstein, Gorss and Radin note that some articles did mention the risks surrounding nanotechnology, though this was rare. To examine risks more closely, Weaver, Lively and Bimber (2009) analysed the framing of nanotechnology in news articles that specifically mentioned ethical, legal or social concerns. Weaver, Lively and Bimber’s sample consisted of 137 articles from the 10 US newspapers with the largest circulation figures, as well as *Associated Press* as a newswire service. The coders searched for four predefined frames within the news articles (progress, conflict, generic risk and regulation) from January 1999 to September 2008. Despite purposely sampling articles that focused on risks, the authors found that the “progress” frame was still the most dominant (being the main frame in 40 percent of articles), supporting the findings from the above authors further. Based on these similar results, it may be that XR news coverage also focuses on the progress or development of the technology.

Aside from nanotechnology, other researchers have examined the news coverage of information and computing technologies. For instance, Rössler (2001) used content and framing analysis to examine German magazine coverage of the internet from January 1995 to June 1998. This included 374 articles from “the three most popular weekly news magazines in Germany” (2001: 54). Showing continuity with the findings for nanotechnology news, Rössler uncovered that 76.8 percent of articles were positive. He states: “Generally speaking, the internet was framed as a new media technology with

positive outcomes in most domains of social, political and individual life and particularly a great potential for economic progress" (2001: 61). Therefore, in relation to these areas, the internet was presented positively. Regarding the topics of the articles, the development of the internet was the most common, appearing in 46.5 percent. Politics and economics were also mentioned in 39 percent of articles, though Rössler notes that this large number is likely because the magazines in the sample were mostly focused on these areas. Still, these results also show similarities with news coverage of nanotechnology discussed above regarding the topics they focus on.

Based on a larger sample period, Hetland also analysed media coverage of the internet in "three large Norwegian newspapers" (2012: 6) from 1995 to 2006. This included 2,772 articles. Hetland argues that new technological innovations are usually surrounded by three narrative types: "utopian narratives containing the pro-innovation position, dystopian narratives containing the anti-diffusion position, and technology as-risk narratives containing the control position" (2012: 4). Hetland defines the pro-innovation position as strongly positive, particularly in relation to technological development. Secondly, the anti-diffusion position includes articles rejecting the innovation and focusing on its negative aspects. Lastly, the control position highlights technological risks and states technologies should be regulated and controlled. Throughout his study, Hetland found that the pro-innovation position dominated the most news articles (68.7 percent). Furthermore, the control position dominated 31.3 percent of articles and the "anti-diffusion position was more or less absent from the press reports" (2012: 7). Moreover, he states that even when risks were presented, they were always shown as controllable; thus lessening the negative impact of mentioning risks. Again, the common thread throughout the majority of these studies is that positive representations are favoured over negative.

Focusing on a different technology, Cogan (2005) used framing analysis to explore the news coverage of the personal computer (PC) during its inception. Examining the *New York Times*, the *Washington Post* and the *Wall Street Journal* across three years (1982-1984), he found that the predominant way the sample framed computers was as "useful". This was accomplished by detailing the many applications the computer could be used for, which echoes the findings from Dimopoulos and Koulaidis' study above. Similarly, coverage of the personal computer was rarely found to be negative or critical

in Cogan's study. When articles were negative, this was usually related to the technical capabilities of the PC rather than social implications. Furthermore, although the press acknowledged fear related to the computer, they framed this fear "as something that could be overcome with the right training" (2005: 256). Thus, fears were not emphasised, as was also found in the news coverage of nanotechnologies discussed above. Cogan notes that the central frame (usefulness) "was no doubt very important to the computer industry and adequately reflected the aims and marketing strategies of the industry during this time period" (2005: 262). In other words, the way the news framed the PC aided the promotion of the technology. Cogan adds that future studies would benefit from analysing such marketing material. The current study addresses this point in a different context by examining not only news coverage of XR but how it relates to the marketing of XR products.

Indeed, the only known study that examined news and marketing was Kelly's (2009) study of microcomputer news and this was limited to the articles and advertisements within magazines. Kelly's study involved a quantitative framing analysis of 83 feature stories and 233 adverts from 14 different US magazines published between 1974 and 1997. Kelly found that "[e]ditorial and advertising texts were similar in their use of frames" (2009: 48). Indeed, the tool frame was the most common in both advertisements (71.2 percent) and magazine feature articles (30.1 percent). The tool frame represented microcomputers as tools that can be used to make "business functions and/or household chores more efficient and cost-effective, controlled, productive, fast and easy" (2009: 39). Again, this is a commonality with the findings from Dimopoulos and Koulaidis (2002) on science and technology in general and Cogan (2005) on the PC. Therefore, it seems likely that applications will be a major focus of the news coverage in the current project. Moreover, these results show correlations between promotional material and magazine articles. The current study will uncover whether this extends to news coverage in national news outlets within the context of XR.

Although not comparing news and marketing, Chyi and Lee (2018) examined the so-called commercialisation of technology news about phones and tablets from Apple, Samsung, Amazon and Google, paying particular attention to the iPhone. The authors applied content analysis to the headlines of 434 articles in two US newspapers (*New York Times* and *USA Today*) about the iPhone. This analysis found that 36.2 percent of

headlines represented the iPhone positively, 46.3 percent were neutral and 17.4 percent portrayed it negatively. Although the largest portion of these articles were neutral towards the iPhone, over twice as many were positive compared to negative, showing similarities with the above studies. Moreover, the authors found that the article content very often emphasised the positive aspects of the products (although no figure is provided), which they argue could “serve advertising purposes or resemble press releases” (2018: 596). That is to say, the news aids the promotion of the iPhone. Although the content analysis of this study is limited to the headlines of news articles, Chyi and Lee reference Lake (2011) to argue that these headlines present “clues as to what they [journalists] think are the essence of the news articles, or what they think will effectively grab news readers’ attention” (cited in Chyi and Lee, 2018: 600). Therefore, it is likely that these headlines still reflect the general news coverage of iPhones and iPads in these US newspapers. These results, the authors argue, hint at the commercialisation of technology news. In other words, it is possible for technology news to be so positive that it is actually promotional in tone. Since Chyi and Lee’s study was carried out in a similar time period as the research for this thesis, it may be that there are similarities between these two enquiries.

Related to Chyi and Lee’s focus on mobile devices, Cole and Lovejoy (2018) analysed news coverage of mobile phones in general in *The New York Times* and *USA Today* from 1991-2015; a period covering the invention of the smartphone. Based on 630 articles randomly selected from those that met the criteria, Cole and Lovejoy found that the vast majority of articles (94.4 percent) discussed mobile phones using a utilitarian paradigm. According to the researchers, this paradigm presents the mobile phone as a useful neutral tool, linking to the useful/tool theme uncovered by Cogan, Dimopoulos and Koulaïdis and Kelly. Additionally, Cole and Lovejoy note that “most articles read like a marketing brochure, listing the mobile phone’s features, colors and details on how to purchase” (2018: 305). As a result, such news verifies the mobile phone’s “existence and prevalence” without “critically examining its role in society” (2018: 306). This echoes Chyi and Lee’s concerns surrounding the commercialisation of technology news.

Kang, Lee and De La Cerda (2015) focused more specifically on smartphone news in US television. They carried out a quantitative content analysis from a framing perspective of 2,792 news items broadcast on *ABC*, *CBS*, *NBC* and *CNN* from 2000 to

2012. The authors found that the sample focused on ease of use and device performance over any other frame. Kang, Lee and De La Cerda emphasise the importance of news coverage of emerging technologies since it can impact the decisions of consumers as well as policy makers. Indeed, they argue that “[t]he emphasis on ease of use and performance [...] would be a positive factor for meeting consumers’ needs since they are what consumers expect most when they evaluate mobile technology devices” (2015: 187). This links to the characteristics of innovations discussed in Section 2.5, suggesting such framing could encourage consumers to adopt smartphones.

Examining another emerging technology, Arceneaux and Weiss (2010) took a grounded approach to analysing news about Twitter. Using the LexisNexis database, they retrieved articles from newspapers, news wires, magazines and weblogs published between March 2006 and March 2009. Their sample consisted of 237 news items purposefully sampled from the overall search results. Arceneaux and Weiss found that the most common theme within the sample was “explanation”, meaning articles most frequently explained the basic functions of Twitter. There were two aspects to this; brevity (focusing on the 140-character limit of tweets) and speed (referring to the way messages could be disseminated instantly). Additionally, when stories provided subjective judgement of Twitter, “the sample overwhelmingly favored Positive themes” (2010: 1268). These positive themes focused on benefits such as how Twitter can be used by businesses to promote their products or civic uses such as distributing emergency information to the public. While negative comments were rare, the most common negative view was that “the service unleashed a torrent of useless information upon users” (2010: 1271). Nevertheless, such results show the same pattern as in the above studies where positive coverage dominates.

However, news coverage of social media does not appear to be positive in all contexts. Applying narrative and discourse analysis to two Spanish newspapers (*El Heraldo de Aragón* and *El Periódico de Aragón*), Bacallao Pino (2010) found that, in articles where social networks were the main focus, dangers and negative uses were the most common topics. Additionally, he notes that most articles were informative, such as discussing the origins of social networks or company financial data. Although this second point seems to contradict the first (for instance, it would be unusual to find mentions of dangers and negative uses in articles about financial data), Bacallao Pino argues that

these results suggest journalists have adhered to the principle of objectivity within their reporting. This is quite different from Chyi and Lee's study above which found news of the iPhone could serve marketing purposes. Bacallao Pino highlights that new information and communication technologies "rais[e] hopes and fears in the analysis of their potential and possible modes of employment" (2010: 114). His study shows that, at least for Spanish news about social media, this discourse appears to be more negative (focusing on fears) than positive.

In more recent years, studies about news coverage of emerging technologies have turned to examining artificial intelligence (AI) in the news. For instance, Chuan, Tsai and Cho (2019) presented one of the first (according to the authors) studies of AI in the news. They examined 399 articles from *USA Today*, the *New York Times*, *Los Angeles Times*, *New York Post* and *Washington Post* between January 2009 and September 2018. Chuan, Tsai and Cho found that the dominant topics were Business and Economy (35.1 percent) and Science and Technology (23.6 percent), although they note that most articles covered several topics. Again, the prevalence of the business and economy topic shows similarities with the research discussed above. Relatedly, the most used sources were those associated with companies or businesses (64.7 percent) and scientists (29.1 percent). In terms of positive or negative valence, coverage was first mostly positive or mixed until 2015, when it became increasingly negative and mixed. The authors point out that, in the years from 2015 onward, the volume of articles started to increase dramatically. In other words, the more coverage there was, the more negative/mixed the valence became. Moreover, Chuan, Tsai and Cho also found that benefits were mentioned in slightly more articles than risks (52.9 percent compared to 47.6 percent). Therefore, this study indicates that news coverage of AI differs from the other technologies discussed above in the sense that much more attention is paid to risks and negative coverage, although it is still not mostly negative or risk-focused.

In other research, Sun et al. (2020) examined a much larger corpus of articles (1,776) about AI from June 1977 to January 2019. The authors used computer assisted content analysis techniques alongside manual coding to analyse articles from the *New York Times*, *Washington Post*, *The Guardian* and *USA Today*. Sun et al. uncovered that AI was presented "as a viable solution to common problems (e.g., economy, health) in everyday life" (2020: 12). A wide range of topics were mentioned in AI news coverage,

although the most prevalent were robots/humanoid, brain science/intelligence and government regulation. Again, this is quite different to the topics that were given the most attention in news coverage of the technologies discussed previously. Moreover, and similarly to Chuan, Tsai and Cho, Sun et al. found that reporting on AI was quite mixed, with some articles emphasising the “promise and hope that AI may bring about”, while others presented “dystopian nightmares of humanity loss and robot uprisings” (2020: 13). However, in line with other research on nanotechnology, they also found that argumentation patterns regarding the benefits of AI appeared more frequently than any that emphasised risks or limitations. Also showing similarities with Chuan, Tsai and Cho’s study, the sources that dominated AI news were government agencies, business giants and research institutes. It seems that these voices are most prominent in AI news.

Lastly, Brennen, Howard and Nielsen (2020b) examined AI news in a wider range of national, specialist and public news outlets. They carried out a critical discourse analysis of 56 news stories about AI from *The Guardian*, *HuffPost*, *The Telegraph*, *Daily Mail*, *Wired UK* and the *BBC*. This included a mix of news, analysis and commentary articles from January to August 2018. Brennen, Howard and Nielsen note that several expectations surrounding AI emerged from the news articles, though one was the most persistent: “the expectation that artificial intelligence will be seamlessly integrated across our lives, serving as a solution to a wide variety of problems” (2020b: 7). This is in line with Sun et al.’s finding above. Brennen, Howard and Nielsen also found that the articles countered the challenges with AI, thus legitimising AI as a good solution to a range of issues. In addition to these results, Brennen, Howard and Nielsen summarise that coverage of emerging technologies in general is usually positive and highlights the benefits of technologies. Regarding frames, those relating to scientific progress and economic prospects are most common. This certainly reflects the studies discussed above, meaning this may also be the case for XR news.

The above authors have highlighted several implications related to the news coverage of emerging technologies. Dimopoulos and Koulaidis (2002) argue that the Greek press plays a positive role in the public understanding of technology and science by explaining terms and concepts and reporting on impacts. In a different way, Anderson et al. highlight that media framing is important because “it has the potential to legitimize certain definitions over and above others” (2005: 202). Thus, news coverage of emerging

technologies can contribute to setting “the initial parameters of debate” (Anderson et al., 2005: 202). Others emphasised the important role that the news media can play in the diffusion of these emerging technologies (Cogan, 2005; Hetland, 2012; Kang, Lee and De La Cerda, 2015; Rössler, 2001). For instance, Cogan states that “[j]ust as newspapers can help to determine what political subjects are worthy of thought, they can also emphasize which products are important to own” (2005: 250), thereby impacting diffusion. Relatedly, Kelly (2009) suggests that the dominant frame (the tool) in magazine coverage of microcomputers created consumer demand for the technology, supporting the ideological values of capitalism. He argues that “publishers’ interests are invested heavily in the overall success of the national and international economy” because they need to make money, which leads to “the favorable presentation of consumer products and a more general ‘pro-capitalist ethos’” (2009: 42). Since variations of this “tool” frame were found in other studies discussed above (Cogan, 2005; Cole and Lovejoy, 2018; Dimopoulos and Koulaidis, 2002), it is possible that such coverage extends to XR news. These various considerations demonstrate the importance of continuing to analyse technology news from other contexts, such as XR.

2.8 News Coverage of Videogames

As the current major application of XR (see Section 1.1), it is also beneficial to consider research that has been carried out about news coverage of videogames. Firstly, Williams (2003) carried out a content analysis examining the way three US magazines (*Time*, *Newsweek* and *US News & World Report*) framed videogames from 1970 to 2000. He discovered both utopian and dystopian frames surrounding videogames in the magazines. Regarding utopian frames, videogames were shown as educational and able to improve skills. However, dystopian frames appeared in the sense that videogames were shown to be a health risk and were related to drugs and addiction. Therefore, in a similar way to Chan’s (2014) analysis of VR in fiction, there seem to be contradictory representations in magazine coverage of videogames.

Focusing on the earlier part of the time period examined by Williams, Rogers (2013) analysed the fears expressed about videogames in the popular US press between 1972 and 1985. Rogers’ study looked at a wider range of texts than Williams, including not just magazines but also newspapers and news broadcasts. Throughout this research,

Rogers found that the news coverage was dominated by four main frames. These were: physical ailments (e.g. repetitive strain injury); addiction (e.g. videogame players compared to drug addicts); the dangers of videogame lifestyle (e.g. isolation and antisocial behaviour); and linking videogames to violence (e.g. desensitisation towards violence). In relation to violence, Rogers notes that videogame violence was depicted as more concerning than violence in other media due to the interactive nature of games. If this is the case, it may be that concern over violent content in VR would be even more intense due to its immersive capabilities (see Section 2.3). Rogers' study did not mention any positive frames relating to videogames because it was the purpose of the research to examine the types of fears that were expressed.

Still, another study with a larger sample found that news articles were much more likely to focus on the negative aspects of videogames than the positive. McKernan (2013) analysed videogame coverage from 1980 to 2009. He applied narrative analysis to 2,000 news articles containing the terms "video game" or "computer game" from the *New York Times*. This long time period and large sample suggests his findings could be highly reliable, even if they are only based on one news outlet in the US. Unlike the studies on news coverage of technology discussed above, McKernan found that only approximately 10 percent of articles morally evaluated videogames. Instead, it was most common to focus on topics such as financial forecasts of videogame publishers. However, in those that did evaluate videogames, McKernan found five narrative types: dumbing of the US; violence; health issues; other threats; and social benefits. He highlights that social threats outweighed social benefits in every decade of the sample (all between 84 and 88 percent). McKernan argues that representing videogames as a social threat "reflects entertainment media's semipolluted position in civil society", whereby entertainment is viewed as socially dangerous (2013: 320). Furthermore, these narratives usually centre on the effects on children rather than adults, linking to the moral panic concept which will be discussed in the following section.

Nevertheless, McKernan also found that coverage became more positive in the later years of his sample (2000s). He argues that the reason for this shift could possibly be that people who have grown up playing videogames are now old enough to become journalists themselves and therefore bring a different perspective to the coverage. Additionally, he states that "the newspaper's shift in portrayal may serve as an attempt

at appealing to as large an audience as possible by including positive coverage of what by the early 2000s had become one of America's most popular pastimes" (2013: 323). This highlights two important points. Firstly, it hints at the possible commercialisation of the press (as indicated by Chyi and Lee [2018]) in that they may change their framing of issues in order to gain more revenue by reaching a larger audience. Secondly, in the sample period of the current study, the videogame industry had grown even further. Since videogames are the main commercial application of VR (Steinicke, 2016), if McKernan's argument holds, this may lead to more favourable XR news coverage. Still, it is important to keep in mind that McKernan's findings were based on only one news outlet in the US and the UK press may not follow this same pattern.

Certainly, in the UK context, Whitton and Maclure's (2015) study supports the idea that videogame coverage is more negative than positive. The authors applied discourse analysis to 112 articles from UK national newspapers (*Daily Mail*, *Daily Telegraph*, *Daily Mirror* and *The Guardian*) published in 2013. Broadly, the authors found that the majority of articles in their sample represented videogames negatively (60 percent) and only 16 percent focused on the benefits of videogames. When videogames were represented negatively, this was usually by relating them to real-life violence, though other common themes were health risks and addiction. Therefore, there are strong similarities between Whitton and Maclure's study and Rogers'. Furthermore, also relating to the other studies discussed, the authors state that videogames were portrayed as "part of a much broader narrative of technological evil that corrupts our innocent children" (2015: 5). The focus on the impact of technology on children is clear. While this is a smaller study, it is particularly relevant to the current project for two reasons. Firstly, the year covered by Whitton and Maclure was 2013 which is within the sample period for the current study (2012-2017). Moreover, online versions of two of the news outlets in Whitton and Maclure's sample (*Daily Mail* and *The Guardian*) were used in the current study as well. Therefore, it may be more likely for there to be similarities between Whitton and Maclure's findings and the present study, rather than McKernan's.

Lastly, Kirkpatrick (2016) analysed coverage of videogames in three UK magazines: *Computer and Video Games*, *Commodore User* and *Zzap!*. Using a combination of content and discourse analysis, Kirkpatrick found that the magazines attempted to normalise videogames across the sample period. In other words,

videogames were presented as a typical activity. Furthermore, gaming was also framed as “youthful, male and rebellious” (2016: 1452) and as something that encourages creativity. Some concerns were raised about videogames, such as pornographic games and addiction. However, the author notes that addiction was not shown to be unique to videogames in the early 1980s – it was attributed to the entirety of computer use. Moreover, sometimes events that could have easily been portrayed as addictive were actually framed positively instead. Kirkpatrick highlights one example from 1984 which:

describ[es] the achievement of a university student who showed ‘amazing stamina and dedication’ by playing an arcade game for charity for 30 hours. [...] This could have been constructed as an instance of crazed addiction [...] but the magazine is concerned to present it as commendably well motivated (2016: 1447).

This shows how the magazine coverage opted for a more positive angle when reporting on videogames rather than highlighting the concern of addiction as in McKernan’s sample. Moreover, although the addiction theme became common throughout the sample period, this is often not seen as a negative thing. In fact, Kirkpatrick states that within the discourse, “[a] true game is addictive and a real gamer is an avowed junkie” (2016: 1447). She also notes that drug-related metaphors such as getting “hooked” on games or becoming a “games junkie” were common in describing gameplay and game players (2016: 1447). Whereas computer addiction is sometimes seen as bad, videogame addiction is celebrated. Moreover, gaming-induced ailments were mentioned in the late 1980s, though this was often in the context of humour, Kirkpatrick argues. These differences between McKernan’s and Kirkpatrick’s studies demonstrate the various ways potentially negative factors can be framed in the media. This could be due to one study analysing newspaper discourse and the other focusing on magazine coverage. Nevertheless, each of these studies provide valuable insight into news coverage of XR’s main application.

2.9 Moral Panics

The previous two sections have demonstrated that emerging technologies are usually represented positively rather than negatively in the news, although news coverage of videogames is typically more negative. In addition to this, others have argued that the

introduction of a new technology is often accompanied by a moral panic (Lim, 2013; Critcher, 2003; Markey and Ferguson, 2017). The concept of the moral panic was first introduced by Stanley Cohen in his PhD thesis which was adapted into his 1972 monograph *Folk Devils and Moral Panics*. This was further developed by Hall et al. (1978) in *Policing the Crisis*. In the third edition of Cohen's book, he describes a period of moral panic as when "[a] condition, episode, person or group of persons emerges to become defined as a threat to societal values and interests" (2002: 1). Importantly, in the foreword to Critcher's book, *Moral Panics and the Media*, Stuart Allan notes that, despite there being different definitions of a moral panic, one thing they have in common is the idea that "the media play a crucial role in determining the characteristics of a moral panic" (2003: ix). Therefore, analysing news coverage (as this study does) is an important part of examining a moral panic.

Furthermore, Hall et al. describe how a moral panic can be identified:

When the official reaction to a person, groups of persons or series of events is *out of all proportion* to the actual threat offered, when 'experts', in the form of police chiefs, the judiciary, politicians and editors *perceive* the threat in all but identical terms, and appear to talk 'with one voice' of rates, diagnoses, prognoses and solutions, when the media representations universally stress 'sudden and dramatic' increases (in numbers involved or events) and 'novelty', above and beyond that which a sober, realistic appraisal could sustain, then we believe it is appropriate to speak of the beginnings of a *moral panic* (1978: 16, original emphasis).

In sum, Hall et al. highlight four features of a moral panic: (1) concern over a threat is out of proportion; (2) "experts" perceive the threat in similar terms; (3) a threat is shown to have suddenly developed or increased; and (4) the threat is perceived as novel or different from anything before it. Thus, if XR news discourse includes some, or all, of these characteristics, it could be classified as moral panic style coverage.

Additionally, Goode and Ben-Yehuda present five characteristics of a moral panic with some similarities to Hall et al.. First is concern: "there must be a heightened level of concern over the behavior (or supposed behavior) of a certain group or category and the consequences that that behavior presumably causes for the rest of society" (1994: 156-157). Different to Hall et al., Goode and Ben-Yehuda's second feature is hostility: "there must be an increased level of hostility toward the category of people seen as engaging

in the threatening behaviour" (1994: 157). Thirdly, a moral panic generates consensus: "there must be a certain minimal measure of agreement in the society as a whole or in designated segments of the society that the threat is real, serious, and caused by the wrongdoing of group members and their behaviour" (1994: 157). This shows similarity with Hall et al.'s second point which states that threats are perceived in similar terms. Goode and Ben Yehuda's fourth characteristic of a moral panic is disproportionality: "the concern is out of proportion to the nature of the threat" (1994: 158). This relates to Hall et al.'s idea that the concern is out of proportion. Cohen also highlights this point, stating that "the moral panic label means that the 'thing's' extent and significance has been exaggerated" (2002: vii). The last factor mentioned by Goode and Ben-Yehuda is volatility: moral panics "erupt fairly suddenly (although they may lie latent for long periods of time and may reappear from time to time), and, nearly as suddenly, they subside" (1994: 158). While Goode and Ben-Yehuda's characteristics differ slightly from Hall et al., both works offer guidance for identifying a moral panic.

Moral panics have occurred on a wide variety of topics, from benefit cheats, to migration, to child abuse (Cohen, 2002). However, of particular interest in relation to the current study are media panics and technopanics. Drotner used the term "media panics" (1999) to refer to moral panics specifically focusing on forms of media, often new or emerging. Cohen also references media panics, stating that "[t]here is a long history of moral panics about the alleged harmful effects of exposure to popular media and cultural forms" (2002: xix). For instance, Markey and Ferguson state that "[t]he dangerous phonograph, the salacious radio, immoral moving pictures, and the surely corrupting television set" have each been the topic of moral panics across the years (2017: 102). This suggests that not all emerging technologies have been presented positively as was found by the authors in Section 2.7.

In addition to media panics, there is the more specific "technopanic" as defined by Marwick (2008). As the term suggests, this refers to moral panics focusing on technology. Marwick states that there are three aspects to a technopanic. Firstly, they focus on new media forms, which she classified as "computer-mediated technologies" (2008: n.p.). Secondly, they usually highlight young peoples' use of technology in a negative way. Thirdly, Marwick states: "this cultural anxiety manifests itself in an attempt to modify or regulate young people's behavior, either by controlling young people or

the creators or producers of media products” (2008: n.p.). In other words, Marwick argues that technopanics aim to influence the behaviour of young people, perhaps by prompting regulation to be put in place for a new technology.

In her own research, Marwick uncovered that a technopanic was created about the use of online social networking site MySpace. Marwick found that the concerns in this technopanic were mostly about online predators and the privacy of children on MySpace. Finally, she concludes that “breathless negative coverage of technology frightens parents, prevents teenagers from learning responsible use, and fuels panics, resulting in misguided or unconstitutional legislation” (2008: n.p.). Indeed, other authors have found that moral, media or technopanics have resulted in regulation being put in place. Dwyer and Stockbridge (1999) uncovered links between moral panics of violent media and several Australian regulatory policies, including ratings systems. Relatedly, Rogers argues that the persistent frame of videogame addiction in the news was the reason for it being “officially recognized as a condition [in the American Psychological Association diagnostic manual] starting in May 2013” (2013: n.p.). This further highlights the importance of examining whether moral panic style coverage exists in news coverage of XR since it could influence regulation.

Regarding other technologies, the mobile phone has also been found to be the topic of a moral panic, or as Goggin termed this – a “mobile panic” (2006: 109). Goggin’s 2010 work highlighted the panic over the imaging capabilities of mobile phones linked to sexting. Similarly, in a discourse analysis of Australian newspapers, Jeffery (2018) examined a moral panic about the sexualisation of children that focused on their use of digital technologies, including sexting. Before this, Lemish (2015) discussed the moral panic surrounding teenagers’ use of screens. From these examples, the idea that a moral panic would often focus on the impacts on young people seems to hold true. It will therefore be beneficial to uncover whether this was the case in the current study.

Moreover, media panics are often associated with the media violence debate, which considers how (or whether) violence in media may induce aggression (Murray, 2013, cited in Piotrowski and Fickers, 2020). For instance, a moral panic was created surrounding so-called “video nasties” in the 1980s (Petley, 1984). This moral panic focused on “the supposed threat to children posed by their easy access to video cassettes of all kinds” (Petley, 1984: 68). Reports highlighted research by America’s National

Institute of Mental Health that claimed there was overwhelming evidence linking TV violence to real-life aggression in young people. Petley argues that this was untrue, "but throughout the campaign it has been taken as read, as a given, that there is a direct causal link between violence on screen and violence in real life" (1984: 68). This caused a moral panic to erupt in relation to so-called video nasties. The news media coverage of video nasties led to films being withdrawn by producers, as well as the creation of new legislation and regulation of these texts.

Additionally, Critcher (2003) highlights that a second video nasties narrative emerged in 1993 to 1994. This second phase began after two 10-year-old boys were charged with the murder of 2-year-old James Bulger. The trial judge suggested that violent films may have been partly to blame for their actions since the murder had similarities to the film *Child's Play 3*. Therefore, subsequent news coverage of this focused on the effects of violent media, reinstating the video nasties moral panic. Again, this was followed by the implementation of further legislation in the UK, including tighter classifications and an increased fine for providing children with unlicensed videos (Critcher, 2003). Considering the video nasties example alongside other moral panics highlights the common themes of focusing on the effects on children and on regulation.

However, as has been demonstrated in Section 2.7, not every new technology will be accompanied by a moral panic. De Keere, Thunnissen and Kuipers (2020) found that this can even be the case if the technology appears to have similarities with others that a moral panic *has* been created about. The authors analysed 681 US news articles about binge-watching (the back-to-back viewing of several episodes of a series using video streaming services such as Netflix). They note that, despite television being the subject of a moral panic and "despite the alarmist label, binge-watching has not sparked a fully-fledged moral panic" (2020: 2). Instead, the articles legitimised binge-watching by framing it as manageable and as a high-quality form of entertainment. De Keere, Thunnissen and Kuipers do not suggest any reasons as to why a moral panic has not been created surrounding binge-watching. Nevertheless, the study provides useful insight by showing that moral panics do not always occur when they might be expected to. This will be beneficial to keep in mind when analysing whether or not a moral panic exists surrounding XR.

2.10 Final Remarks

This chapter has provided contextual information about XR technology that is beneficial when it comes to analysing the data in later chapters. More broadly, the theories of diffusion and technological acceptance work as useful analytical tools when examining whether the framing of XR can support its diffusion (RQ3). In a different way, the examination of science and technology news has shown that most emerging technologies are presented favourably as opposed to critically, with Chyi and Lee's (2018) study even finding that news headlines about the iPhone were promotional in tone. On the other hand, news coverage of videogames was found to be mostly negative. Since XR is an emerging technology and the main commercial application of VR is videogames (Steinicke, 2016), each of these studies are useful comparative tools in the current thesis. It remains to be seen whether XR news has more in common with the news coverage of emerging technologies or that of its main application. Finally, and most importantly, it appears that there is a lack of research examining the news coverage of XR. Therefore, the current thesis fills this gap by providing a detailed textual analysis of XR news. At the same time, it contributes to the literature focusing on the news framing of emerging technologies. The next chapter discusses some theoretical considerations surrounding frame-building in the news, as well as reviewing previous research that has looked at the link between news and promotional content.

Chapter 3: Frame-Building and Journalistic Practices

While the previous chapter examined relevant concepts and research regarding XR and technology news, this chapter focuses on the literature relevant to the nature of news discourse. In particular, it discusses the concept of frame-building and the various factors that can influence the framing of a topic in the news, based on Shoemaker and Reese's (2014) hierarchy of influences model. The chapter considers the impact of routine practices, media organisations, social institutions and social systems on the frame-building process. In addition to this, the chapter ends with a discussion of studies that have examined the relationship between news and promotional content. Since one of the aims of this study is to investigate the interplay between XR news and marketing, these studies provide useful insight into what this relationship is like in other contexts.

3.1 Frame-Building

As noted in Chapter 1, this study takes framing as its main theoretical approach to the analysis of XR news. Within framing theory, it is argued that there are two stages to the framing process: frame-building and frame-setting. Moy, Tewksbury and Rinke clearly differentiate frame-building from frame-setting:

Frame-building refers to the development of frames and their inclusion in news stories. *Frame-setting* describes audience consumption of news with frames and audience members' consequent adoption of frames as ways to understand issues and problems (2016: 7, original emphasis).

In other words, frame-building focuses on the construction and use of frames, whereas frame-setting is concerned with audience interaction with these frames. Thus, the current study deals with the frame-building stage because it examines what frames exist and how they have been created rather than the impact frames have on the audience.

The term frame-building developed from agenda-setting research and is similar to the idea of agenda-building (Scheufele, 1999). Indeed, "[b]oth frame building and agenda building refer to macroscopic mechanisms that deal with message construction rather than media effects" (Scheufele and Tewksbury, 2007: 12). However, Scheufele and

Tewksbury make an important distinction between framing and agenda-setting. They state that “[h]ow forces and groups in society try to shape public discourse about an issue by establishing predominant labels is of far greater interest from a framing perspective [...] than from a traditional agenda-setting one” (2007: 13). Due to one of the aims of this study being to examine the relationship between XR news and marketing, frame-building appears more appropriate than agenda-setting or agenda-building. Therefore, it is worth examining frame-building in more depth.

Put simply, in the creation of news, “[f]rame-building occurs when journalists construct news stories out of the bits and pieces of everyday life” (Moy, Tewksbury and Rinke, 2016: 8). In other words, by choosing what to include in a news story and how to write about a topic, the journalist constructs certain frames. Frame-building considers not only which frames are created but how or why they have been used. As Druckman notes, “any group wishing to push an agenda [...] frames the relevant issue in a way that advances its cause” (2010: xiii). Therefore, it is not only journalists that use frames. Instead, the frames that appear in the news could have been “suggested by various sources, including people and groups interested in the issue at hand” (Moy, Tewksbury and Rinke, 2016: 8). This hints at the various influences on news frames.

Based on an analysis of previous frame-building research, Tewksbury and Scheufele (2009) argue that there are three main factors that can influence the creation of news frames: (1) practices of news production; (2) political and corporate actors; and (3) cultural contexts. Similarly, Moy, Tewksbury and Rinke argue that “[t]hree forces are particularly powerful in shaping the production of frames” (2016: 8). These are: (1) organisational pressures and constraints; (2) frame advocates; and (3) culture and social norms (Moy, Tewksbury and Rinke, 2016). These three forces clearly overlap with those specified by Tewksbury and Scheufele; practices of news production link to organisational pressures, political and corporate actors relate to frame advocates and cultural contexts come under culture and social norms.

Encompassing these factors, Shoemaker and Reese’s (2014) hierarchy of influences model defines five levels of influence on the frame-building process: (1) social systems; (2) social institutions; (3) media organisations; (4) routine practices; and (5) individuals. Instead of representing strength of influence, the hierarchy is arranged from macro (social systems) to micro (the individual) factors. Shoemaker and Reese stress that

“higher-level factors do not eliminate influences from a lower level”, rather it is important to consider the different levels and how one might impact the other (2014: 11). The authors further define each level, which can be summarised as follows. The first level, social systems, refers to the widest impact factor comprising of ideological and sociocultural influences. Less broadly, the second level (social institutions) refers to influences based on the place of a media organisation in relation to other organisations and institutions. At the third level, media organisations may influence news content based on their own ideologies, such as political leaning. Fourthly, the routine practices level refers to how the newsroom routine may influence news. Finally, the fifth level (individuals) refers to the journalist’s own characteristics and beliefs. Based on this model, it is clear there are a wide range of factors that can impact the way topics are framed in the news.

In the current study, the hierarchy of influences model acts as a useful analytical tool to examine the factors that might impact the news framing of XR. However, since a textual study of news (as opposed to an ethnographic study in a newsroom) uncovers little detail about specific journalists aside from their name, position and perhaps gender, the fifth factor (individuals) will not be considered here. Instead, the study will consider how the social systems, social institutions, media organisations and routine practices factors can impact framing in XR news. Therefore, the following sections discuss these four factors in more detail, starting with routine practices.

3.2 Routine Practices

The fourth factor of Shoemaker and Reese’s (2014) hierarchy of influences model indicates that the routine practices of journalists can impact the frame-building process. This section considers a range of practices that can influence how a news topic is framed, including journalistic principles, news values and sourcing practices.

3.2.1 Journalistic Principles and the Fourth Estate

Like many other disciplines, there are norms and principles that drive the profession of journalism in western democratic countries. Traditionally and idealistically, journalism has been seen as a fourth estate in which they “keep a skeptical eye on the powerful,

guarding the public interest and protecting it from incompetence, corruption, and misinformation" (Norris and Odugbemi, 2010: 16). Within the fourth estate model, journalists take on a watchdog role (Hampton, 2010). In other words, they are responsible for holding those in power to account (Hansen, 2018), whether that may be governments, corporations or others. As Deuze argues, journalism should "share a sense of 'doing it for the public', of working as some kind of representative watchdog of the status quo in the name of people" (2005: 447). Indeed, Göpfert states that "the most important social task of journalism [is] to critically inform the public and act as a controlling entity" (2007: 224). Fourth estate journalism prioritises the interests of the general public by "provid[ing] information to help us understand the world and our position in it" (Richardson, 2007: 83). Fjæstad makes a similar point, claiming that journalists' "mission in Western societies is to serve their audiences, the citizens, by informing them about recent developments ('news'), and by naming and warning of insufficiencies of various kinds" (2007: 126). If journalists follow the fourth estate model, such principles could impact the frame-building process.

Furthermore, journalistic independence is essential in the fourth estate model (Hampton, 2010). Indeed, Bauer and Gregory stress that "[i]ndependent critical journalism is the life-blood of democracy" (2007: 48). That is to say, good quality journalism "should be uninfluenced by personal connections with sources or subjects" (Shapiro, 2010: 155). Relatedly, it should also be uncensored, or "presented without influence by sources, owners, advertisers, political groupings and the state" (Shapiro, 2010: 157). Independence is important because it means journalism can "speak truth to power" which "allows readers to engage [in] society more critically" (Alexander, 2015: 11). Journalistic independence is particularly important for new developments and emerging technologies since they "create new problems that have to be solved by public debate, either in ethical councils, citizens' groups, or by public vote" (Göpfert, 2007: 225). Without independent journalism on such topics, there is the risk of a lack of critical insight into these issues which could result in a lack of debate and regulation for new developments.

Related to independence, the concepts of impartiality and objectivity "emerged as journalistic norms to describe a professional editorial discipline that sought to avoid personal and political biases and to encourage trust in newspaper journalism" (Sambrook, 2012: 3). Simply, Sambrook defines impartiality as the "absence of bias", while

objectivity involves “identifying facts and evidence” (2012: 3). Journalistic practices were developed in the interests of impartiality and objectivity, such as including both sides of a story, fact-checking, fairness and accuracy and ensuring news is clearly distinguished from editorial or opinion content (Sambrook, 2012). Relatedly, Bednarek and Caple state that journalism as a profession “is built on the values of objectivity, fairness, truthfulness and accuracy” (2012: 36). Therefore, it is clear that these have been important norms that could guide the frame-building process.

Moreover, Bednarek and Caple note that these principles are “the basic tenets of all journalistic codes of practice” (2012: 36). Certainly, the Editors’ Code of Practice set out by the UK’s Independent Press Standards Organisation (IPSO) shares these ideas, with “accuracy” being the first clause mentioned in the Code (IPSO, 2016). Out of the news outlets in the sample for this study, both *The Sun* and *MailOnline* state they are members of IPSO (*The Sun*, 2019; *MailOnline*, n.d.), indicating that they would be held accountable for not following these guidelines. Similarly, the UK’s National Union of Journalists (NUJ) is available for individual journalists working in the UK. The NUJ has its own Code of Conduct to guide its members in their journalistic work. The second principle in this Code is very similar to those already discussed above, stating that a journalist “[s]trives to ensure that information disseminated is honestly conveyed, accurate and fair” (NUJ, 2013). In addition, *The Guardian* has its own internal editorial guidelines. Summarising these guidelines, *The Guardian* states that “[o]ur most important currency is trust” (2011). Therefore, trust, objectivity and accuracy appear to be key journalistic standards in the UK. These journalistic principles can affect which framing devices are chosen by journalists in the frame-building process (Pan and Kosicki, 1993).

Nevertheless, some argue that these principles are often not upheld. Bednarek and Caple contend that “they can be grossly undermined” (2012: 36) and Davies’ book *Flat Earth News* claims that “[t]he ethic of honesty has been overwhelmed by the mass production of ignorance” (2009: 28). Similarly, even before this, Franklin (1997) criticised the state of journalism. According to Franklin, although the assumption is that “journalism is about the quest for truth”, in practice, this is generally not the case (1997: 27). Moreover, Sambrook argues that these norms are now under pressure, leading to “increased signs of propaganda, entertainment and fiction seeping into journalism” (Sambrook, 2012: 3). Therefore, the negligence of these principles has highlighted

concerns about the state of the news media. An often cited reason for this negligence is the increase of commercial pressures on newsrooms to produce content at a fast pace (e.g. Currah 2009; Fjæstad, 2007; Lewis et al., 2008), as will be discussed in Section 3.5.

3.2.2 News Values

In a different way, news values are a major part of the routine practices that impact frame-building (Shoemaker and Reese, 2014). Simply put, news values can be defined as factors that “determine what makes something newsworthy – worthy of being news” (Bednarek and Caple, 2012: 40). Galtung and Ruge (1965) were the first to hypothesise a set of news values (or, as Galtung and Ruge called them, news factors), which they tested on a study of foreign news stories reported in four Norwegian newspapers. These 12 factors were as follows: frequency, threshold (absolute intensity or intensity increase), unambiguity, meaningfulness (including cultural proximity and relevance), consonance (including predictability and demand), unexpectedness (including unpredictability and scarcity), continuity, composition, reference to elite nations, reference to elite people, reference to persons and reference to something negative (Galtung and Ruge, 1965: 70-71). Since then, many other authors have adapted, developed and added to these news values (see, for example, Bell, 1991; van Dijk, 1988; Gans, 1980; Harcup and O’Neill, 2001, 2017), resulting in a variety of news values with overlap and linkages between them.

Making this expanse of literature more manageable, Caple and Bednarek (2013) collated the news values posited by various researchers since Galtung and Ruge’s publication, organising them into groups. According to Caple and Bednarek, news values can be based on 16 different factors: (1) the size, scale or scope of an event; (2) conflict and negativity; (3) positivity; (4) the real or potential impact, significance or relevance for the audience; (5) relevance in terms of how current the event is; (6) geographical and cultural nearness or proximity; (7) consonance; (8) novelty; (9) the prominence or elite status of those involved with the event; (10) personalisation; (11) human interest; (12) sensationalism; (13) news writing objectives; (14) balance; (15) news agenda or news cycle; and (16) external factors. Each of these news values can impact the decisions journalists make in selecting and framing news stories.

In addition to this broad overview, it is useful to mention two studies of news values that are of particular relevance to this thesis due to their focus on UK news. Harcup and O'Neill (2001) revised Galtung and Ruge's news values based on analysis of 1,276 news articles published during March 1999 in three UK national newspapers (*Daily Telegraph, The Sun* and *Daily Mail*). They coded which of Galtung and Ruge's news values appeared to have been used during news item selection, as well as considering what other factors might be at work. From this analysis, Harcup and O'Neill produced a set of 10 news values: the power elite, celebrity, entertainment, surprise, bad news, good news, magnitude, relevance, follow-up and newspaper agenda. The authors state that "news stories must generally satisfy one or more" of these news values to make it into the news (2001: 278-279). More recently, and after Caple and Bednarek (2013) collated set of news values, Harcup and O'Neill (2017) took to revising this list again with an analysis of 711 articles across 10 UK national newspapers (*The Sun, Daily Mail, Daily Telegraph, Daily Mirror, Daily Express, The Times, The Guardian, The Independent, Metro* and *Evening Standard*) published in November 2014. To analyse news values in an online context, the authors also examined which UK news stories were the most shared on social media. This study led them to add the following news values to their previous conceptualisation: exclusivity, conflict, audio-visuals, shareability and drama.

Considering that all three news outlets included in the sample of the current study were also analysed by Harcup and O'Neill (2017), there are some particularly relevant findings to highlight in relation to those publications. Harcup and O'Neill found that the bad news value was favoured by all newspapers over the good news value, but particularly so in the *Daily Mail* and *The Guardian*. Moreover, the entertainment news value was most prominent in the *Daily Mail* and *The Sun*. Similarly, *The Sun* appeared to be most affected by the celebrity news value. On the other hand, broadsheet or quality outlets appeared to appropriate the power elite news value more so than the tabloids or middle-market newspapers. Lastly, the newspaper agenda news value was found to be most prominent in mid-market titles (including the *Daily Mail*). Therefore, Harcup and O'Neill's analysis not only provides a timely conceptualisation of news values relevant to the current study, but may help to explain why certain stories about XR have made it into the news.

Moreover, while news values have been described as selection criteria, a discursive approach to news values also considers “how news production texts [...] construct the newsworthiness of an event, issue or news actor through language, photography, layout and so on” (Caple and Bednarek, 2016: 437-438). As de Vreese argues, “news values not only influence the selection of events and issues, they also affect the presentation of issues” (2003: 43-44, quoted in Boesman and Van Gorp, 2018: 115). That is to say, journalists may themselves attempt to make a news story appear more newsworthy to the audience by including or emphasising certain aspects of the topic. In this case, news values could explain why a journalist has chosen a certain frame or technique when writing about a topic. With this in mind, the news values literature is useful to the current study in two ways: firstly, it can help to explain the attention paid to XR in the news; and, secondly, it could shed light on why journalists have framed XR in certain ways.

3.2.3 Sourcing Practices

Another routine practice that impacts the frame-building process is the selection of sources. Indeed, Van Leuven et al. state that “[t]he use of reliable sources is one of the most important aspects of the journalistic news production process” (2018: 798). In order to maintain an aura of facticity in their news items, journalists gravitate toward sources that will be perceived as credible by the audience (Berkowitz, 2009). That is to say, “[j]ournalists establish factuality by using credible sources who make statements that can be quoted as fact without further investigation” (Ericson, 1998: 85). This means that those in elite positions and who are believed to possess authority will be chosen as news sources most often (Atton, 2010; Bell, 1991; Berkowitz, 2009; Coleman and Ross, 2010; Van Leuven et al., 2018).

Moreover, when a source appears in the news, this has a reciprocal effect on the credibility of both the news article and the source. To expand, for a source to be included in a news article emphasises the legitimacy of that source and, in turn, the credibility of the news article itself is bolstered (Carlson and Franklin, 2011). Additionally, once a relationship has been established between a source and a journalist, that source is more likely to be used again, due to ease of access, leading to the reliance on a small number of elite sources and the exclusion of alternate voices (Carlson and Franklin, 2011; Van

Leuven et al., 2018). Therefore, sourcing practices can impact the frame-building process by favouring certain voices in the interests of emphasising credibility.

The choice of sources matters “because access to the media is access to persuasive influence” (Coleman and Ross, 2010: 49). Likewise, Carlson and Franklin state that “to be a news source is to have the power to define the world” (2011: 2). This relates to Hall et al.’s (1978) concept of primary and secondary definers. Primary definers, as news sources, are able “to set down the initial definition or primary interpretation of the news topic to be processed” (Allan, 2010: 84). Alternatively, by using certain sources, “[t]he media act as secondary definers whose function is to reproduce the definitions of primary definers” (Cricher, 2003: 134). Put differently, the news media act as secondary definers of a topic by including the words of certain sources – the primary definers. Since different sources will put forward varying interpretations of XR, which voices are included can have an impact on the way XR is framed. This is strongly related to another factor that can influence the frame-building process that will now be discussed: frame advocates.

3.3 Media Organisations

There are various characteristics of media organisations that could impact how they frame topics in the news. This section discusses two of particular relevance to the current study – the characteristics of the tabloid and quality press and media ownership.

3.3.1 Characteristics of Tabloid and Quality News

Although originally used to refer to the size of newspapers, the terms tabloid (or popular) and broadsheet (or quality) have come to define different styles of journalism (M. Carlson, 2009). Tabloids typically include news stories “in a popular, simplified, sensational, titillating, emotional or easily accessible fashion” (Zelizer and Allan, 2010: 150-151). On the other hand, quality newspapers are considered to produce more serious reporting, with “broadsheet journalism” connoting “quality in-depth, serious news” (M. Carlson, 2009: 225). Unlike quality news media, tabloids pay “relatively little attention to politics, economics, and society and relatively much to diversions like sports, scandal, and popular entertainment” (Sparks, 2000: 10). The topics of crime, sex and celebrity gossip are also

common in tabloid news outlets (Bastos, 2019; Carvalho and Burgess, 2005; Zelizer and Allan, 2010). Additionally, tabloids are known for their attention-grabbing headlines, with shorter articles and a greater focus on images than quality outlets (M. Carlson, 2009). These characteristics of tabloids help them meet their main commercialised goal of “attracting the attention of as many recipients as possible” (Magin, 2019: 1706). Alternatively, quality publications supposedly aim to produce news that is objective and impartial (Bastos, 2019). Overall, tabloids are expected to prioritise entertainment over information, whereas quality news outlets are associated with more serious reporting. Although the tabloid and broadsheet traditions were originally related to print news, these same values can carry over into their online counterparts (Karlsson and Clerwall, 2012). Therefore, it might be that the type of news outlet reporting on XR could impact the frame-building process.

However, the concept of tabloidization argues that the characteristics typically associated with tabloids have gradually been adopted by quality news media (Magin, 2019), creating a blurring of distinctions between the two. This leads to “increasing trivialization, where celebrity gossip crowds out serious news, and human interest stories receive more coverage than important international events” (Bird, 2009: 1364), even in traditionally quality news outlets. This persists in the online news environment. In a study of UK and Swedish online news outlets, Karlsson found that “*all* media types, regardless of publishing history or context, move in the same *tabloidization* direction” (2016: 160, original emphasis). Therefore, it may be that the quality and tabloid news outlets in the current study do not frame XR very differently if they all gravitate toward the same values that are typically associated with tabloid news.

Additionally, the audiences of media organisations can impact the frame-building process. Williams argues that “[t]here is a strong correlation between newspaper reading and social class in Britain. [...] Those with higher levels of income, educational attainment and social status tend to read the upmarket or broadsheet papers” (2010: 9). On the other hand, the audience of tabloid newspapers is presumed to be mostly working-class with a greater interest for entertainment rather than serious news (Zelizer and Allan, 2010). Moreover, tabloid readers are generally younger and less educated (Bastos, 2016). In a different way, the middle-market publications such as the *Daily Mail* typically have more tabloid characteristics but still share some readership with the quality news outlets

(Johansson, 2007). In the online context, a similar pattern is found. Based on a survey of news consumption, Kalogeropoulos and Nielsen (2018) compared the readership of different online news brands for higher and lower social grade audiences. Their results for the news outlets that are included in this study are of particular interest here. They found that *The Guardian* attracted significantly more readers from the higher social grade (19 percent) than the lower social grade (nine percent). On the other hand, readers of the *MailOnline* equally came from higher and lower social grades (both 14 percent). Similarly, seven percent of *The Sun* readers were in the higher social grade, while eight percent were in the lower social grade group. In order to reach these audiences, the different publications may adjust their news coverage, thus impacting the frame-building process.

3.3.2 Media Ownership and Industry Relationships

In addition to broad genre groups, each specific media organisation could have an impact on the frame-building process due to their different ownership structures and relationships with individuals or companies in other industries. Regarding media ownership, Witschge, Fenton and Freedman state that “[t]here have always been anxieties over the ownership of the media because of its agenda-setting role” (2010: 15). In line with Witschge, Fenton and Freedman, Dearing and Rogers further argue that “certain prestigious media and specific news events play particularly important roles in boosting an issue up the media agenda” (1996: 31). Based on this position, it is not surprising that there are concerns about media ownership. Furthermore, Witschge, Fenton and Freedman expand on their previous point, stating: “In short, media owners can influence the way their organisations present news and, in turn, have some bearing on public debate and political opinion (2010: 15). Indeed, through interviews with journalists, Kovach and Rosenstiel found that: “The nature of a newspaper [...] is heavily influenced by the values of the ownership” (2014: 285). Therefore, the ownership of media companies can impact the frame-building process.

The news outlets in the sample of this study (*The Sun*, *The Guardian* and *MailOnline*) each have different ownership structures. *The Sun* is part of Rupert Murdoch’s global News Corp, under the News UK subsidiary (*The Sun*, 2019). Though *The Sun* itself does not appear to have any connection to XR, News Corp Australia was the lead investor in the first funding round of AR company Plattar in 2016 (Bennett, 2016).

Additionally, as of 2017, News Corp was the largest shareholder of PropTiger, a real estate company which, according to a News Corp press release, “has developed best in class 3D visualization and Virtual Reality capabilities” (News Corp, 2017). However, it does not seem as if News Corp or *The Sun* had any involvement with XR before 2016. Since News Corp owns such a large number of companies and brands and invests in even more, it is possible that there are other connections between News Corp and XR. Nevertheless, it is clear that, as of 2016, the company had invested in AR, which could impact the frame-building process of *The Sun* when it comes to XR news.

As opposed to the international corporation *The Sun* is owned by, the *MailOnline* is part of DMG Media, a subset of the UK-based Daily Mail and General Trust Plc (DMGT). This includes the *Daily Mail*, *Mail on Sunday*, *MailOnline*, *Metro* and *Metro.co.uk* (DMG Media, n.d.). More broadly, as well as the media companies of DMG Media, DMGT operates in four business to business sectors: “Insurance Risk, Property Information, EdTech and Events and Exhibitions” (DMGT, 2019). Additionally, as with News Corp, DMGT has invested in several other companies aside from these (DMG Ventures, 2020). However, none of the organisations are XR-related and there are no obvious links between DMGT and XR companies. As with *The Sun*, it is possible that there are some connections due to the large number of businesses involved, but this cannot be determined. Therefore, it may be that the *MailOnline* is not as motivated as *The Sun* to frame XR favourably.

On the other hand, *The Guardian* has a very different ownership structure and makes substantial effort to promote this. *The Guardian* is part of the Scott Trust under the Guardian Media Group, which includes not just *The Guardian* but also *The Observer*. According to the outlet: “The Trust forms part of a unique ownership structure for the Guardian that ensures editorial interests remain free of commercial pressures” (*The Guardian*, 2015). Moreover, the company produced a video stating that *The Guardian* creates “honest, fearless journalism free from commercial or political interference. There’s no billionaire owner, no hidden influences” (*The Guardian*, 2016a). In this way, the ownership of *The Guardian* means it is not linked to many other businesses through parents, subsidiaries or investment. However, that does not mean that *The Guardian* has no connections to XR or XR companies. Indeed, unlike the other two news outlets in this sample, *The Guardian* creates its own VR content to be used through its smartphone

application, launched in 2016 (*The Guardian*, 2016b). This shows that *The Guardian* is directly invested in the success of XR, which could cause the outlet to frame the technology more favourably than the other publications. Whether or not this is the case, the ownership structures of these news outlets and their relationships with XR are useful to keep in mind when analysing their framing of the technology.

3.4 Social Institutions

The social institutions factor of the hierarchy of influences model refers to actors that are external to the media organisation that can impact news (Shoemaker and Reese, 2014). While this was touched upon in the previous section when considering industry relationships, the current section provides more detail about how three other external factors can affect the frame-building process: frame advocates, advertisers and news aggregators.

3.4.1 Frame Advocates

Carragee and Roefs state that “journalistic framing of issues and events does not develop in a political vacuum; it is shaped by the frames sponsored by multiple social actors” (2004: 216). The social actors that sponsor frames have been termed frame advocates or frame sponsors. Although the two terms are used interchangeably, this thesis will maintain the use of frame *advocates*, rather than *sponsors*, due to the connotation that sponsoring something involves monetary investment and that does not have to be the case with frame advocates/sponsors. Frame advocates “aim to steer news coverage through framing” (D’Angelo, 2018: xxv). They use frames strategically with the aim of getting their preferred frame into the news (Van Gorp, 2010), in order to achieve a certain outcome (Kee, Hassan and Ahmad, 2012). For instance, during political debates, party leaders may frame the issue in such a way that ultimately incentivises the audience to vote for that party. More relevant to the current study, developers of a new technology would likely apply favourable frames to it in order to motivate readers to adopt the innovation. Indeed, frame advocates could be interest groups, corporations or government actors who “often have a direct stake in the frames that journalists use to present and explain events and issues in the news” (Moy, Tewksbury and Rinke, 2016: 8).

That is to say, individuals and organisations can have some influence over the frames that journalists use to present certain topics in the news.

The frames of advocates do not exclusively appear in the news. Instead, “[j]ournalists operate as gatekeepers who, to some degree, control the visibility of frame sponsors and packages [frames]” (Wichgers, Jacobs and van Spanje, 2020: 5). Therefore, framing contests can take place between advocates, wherein they “compete by sponsoring their preferred definitions of issues” (Carragee and Roefs, 2004: 216). There are a variety of factors that can impact whether an advocate’s frame makes it into the news, including the economic and cultural resources of the advocate, as well as their knowledge of journalistic practices (Carragee and Roefs, 2004). For instance, advocates aware of the news values discussed above could increase the newsworthiness of their preferred frame, thus making it more likely to appear in the news. Moreover, in a recent study, Wichgers, Jacobs and van Spanje (2020) found that frame advocates were particularly successful at getting their chosen frames into the news when two conditions were met: high authority and high stakes. Regarding high stakes, the authors note that “journalists tend to cover messages of actors who are actively involved and, therefore, more influenced by the issue than other frame sponsors” (2020: 4). However, even when actors had similarly high stakes in an issue, they found that the frames from those in powerful positions (i.e. elites) were used most often. This is in line with the journalistic practice to favour elite news sources as discussed in the previous section.

Aside from the use of quotations from sources, another way in which frame advocates attempt to get their desired frames into the news is through the use of information subsidies. Introduced by Gandy, “[a]n information subsidy is an attempt to produce influence over the actions of others by controlling their access to and use of information relevant to those actions” (1982: 61). They are used by organisations “to obtain time and space within the news media to convey their messages” (Hecht et al., 2017: 740). According to Wigley and Fontenot (2009), information subsidies are most often conceptualised as content supplied by public relations departments, notably press releases. Because the current study examines not only news content but also marketing (including press releases), the concept of the information subsidy is particularly useful here. Van Gorp states that the purpose of press releases created by frame advocates “is to convince the receiver as much as to inform them” (2007: 68). This means that, if a

journalist uses information from a press release, it would allow advocates to get their preferred frame to reach the general public. Examining the overlap between news content and press releases is one way this study can analyse the relationship between XR news and marketing.

3.4.2 Advertisers and Incentives

As opposed to news sources as frame advocates, there is a direct financial relationship between media outlets and their advertisers that can impact the frame-building process. News outlets rely on advertising as their main form of income (Bednarek and Caple, 2012; Bettig and Hall, 2012), meaning that advertisers can influence journalists to run/not run a story or to write about a topic in a certain way (Bettig and Hall, 2012; McManus, 1995). Advertisers "have considerable power to dictate favorable public messages" (Shoemaker and Reese, 2014: 116), whether this is directly or indirectly. Regarding direct influence, advertisers have been known to retract support if their products or services have been written about critically by an outlet (Bettig and Hall, 2012). This links to the indirect influence that can occur as a result of journalists attempting to prevent such issues. That is to say, news outlets may be less likely to include critical coverage of their advertisers' products and services in order to avoid backlash from those advertisers. Because of this, Hampton notes that "a press whose finances are based on circulation and advertising revenues" threatens "the independence and serious purpose required of a 'Fourth Estate' role" (2010: 6). This makes advertising influence particularly problematic.

Moreover, McManus notes that the economic logic that gives advertisers power over content "is not restricted to transactions where money changes hands" (1995: 305). This could include the exchange of information for news coverage (such as the press releases mentioned above), free gifts in the case of areas such as games and travel journalism (R. Carlson, 2009; Hanusch, Hanitzsch and Lauerer, 2017) and even to maintain relationships between journalists and sources. Indeed, through interviews with lifestyle journalists, Hanusch, Hanitzsch and Lauerer (2017) found that both advertising and free gifts were key commercial influences in news production. In particular, the authors found that travel, technology and fashion journalism were most impacted by free gifts. This is significant considering the current study's focus on technology. Rather than using paid advertising, providing free goods is a way to encourage journalists to write favourably

about a product or service. Hanusch, Hanitzsch and Lauerer highlight that “editorial coverage tends to give the appearance of unbiased assessment, while audiences easily recognize advertisements” (2017: 151), meaning such content could be more effective. This links to the concept of native advertising that will be discussed in Section 3.6.1.

3.4.3 News Aggregators

There is another important factor to consider when discussing the influences on online news in particular: news aggregators. Nielsen states that “[a]ll over the world, search engines and social media are increasingly important ways of finding and accessing news online” (2017: 81). Similarly, a report by the Media Reform Coalition states that: “The UK’s media markets cannot be considered in isolation from the digital platforms and intermediaries that increasingly determine how audiences access and consume media content” (2019: 14). Indeed, Currah’s research found that “over 70 per cent of the traffic to a news website tends to enter from the ‘side door’ of search results and ‘really simple syndication’ (RSS) feeds, rather than the home page of the website” (2009: 14). This means external sources such as search engines and social media platforms become gatekeepers of online news (Media Reform Coalition, 2019; Nielsen, 2017), thus potentially having the power to influence news content as news organisations attempt to maintain positive relationships with them.

More recently than Currah’s study, this trend has been found to be increasing. The Reuters Institute has produced a Digital News Report for every year of the sample covered by the current study, which helps to assess this trend. In 2012, 51 percent of participants accessed online news by browsing the news site of a news source (Newman, 2012: 46). By 2017, 65 percent of participants worldwide found news articles with side door access (Newman et al, 2017: 14). As noted above, side door access most commonly takes the form of search engines, news aggregators or social media. In 2012, news was accessed through search engines by 30 percent of participants, news aggregators by 22 percent and social media by 20 percent (Newman, 2012: 46). News aggregators became less used in 2017 (just 5 percent) whereas search engines were used by 25 percent of participants and social media by 23 percent (Newman et al, 2017: 14). Considering the major role search engines and social networks play in accessing news content, it is worth examining which companies own these platforms.

In 2012, the Reuters Institute report stated that Google accounts for more than 90 percent of the search engine market in the UK (Newman, 2012: 45). This rose slightly to 92 percent in 2018 (Media Reform Coalition, 2019: 14), so it is sensible to estimate that this number was between 90 and 92 percent in the final year of the study's sample (2017). Additionally, in 2012, Facebook accounted for 65.3 percent of the social media market share, rising to 83.6 percent in 2017 (Statcounter, n.d.). These figures suggest that search engines and social networks are responsible for a large portion of traffic to news websites. Additionally, since Google and Facebook dominate the search engine and social media markets respectively, these two companies could have a strong impact on the dissemination of news. Therefore, online news outlets depend strongly on these two services for audiences accessing their content. This is highly significant in the current study since Google and Facebook play major roles in the XR industry, with both companies having their own headsets. Watson (2016) notes that it is difficult for publications to produce critical stories about technology companies since they increasingly rely on such companies to reach readers. Indeed, as Watson posits, if publications rely on Facebook to reach audiences, "[w]here might critical reporting about Facebook be published?" (2016: 31). With this in mind, it is possible that this relationship could have an impact on the news framing of XR.

3.5 Social Systems

The social systems factor encompasses all other factors in the model, adding in a focus on ideology. According to Shoemaker and Reese, the factors in the model "combine to maintain a system of control and reproduction of the dominant ideology" (2014: 65-66). In the current context, "[m]edia content is a cultural commodity within a capitalist system" (Shoemaker and Reese, 2014: 80). Therefore, capitalist ideologies can impact the level of influence of certain social institutions, change routine practices and affect the agendas of media organisations. As this chapter has shown, each of these factors can impact news framing. The current section will add more detail about how the social systems factor affects the frame-building process, focusing on the environment within which news content is produced.

3.5.1 A “Crisis” in Journalism

Since news readership shifted online and away from print, news outlets have faced a reduction in revenue. Advertising, news organisations’ largest income-generator (Bettig and Hall, 2012), is much less profitable online than it is in print (Rosenkranz, 2016; Williams and Clifford, 2009). This loss of revenue has resulted in staff cuts alongside higher demand for news content which means “journalists are now required to do far more with the same amount of time” (Williams and Clifford, 2009: 18). Indeed, even as of 2004, Lewis et al. note that “[w]hile the number of journalists in the national press has remained fairly static, they now produce three times as much copy as they did twenty years ago” (2008: 3). Additionally, Williams and Clifford (2009) found that 53 percent of science and technology journalists felt their workloads had increased a lot in the last five years and 35 percent said it had somewhat increased.

Some have called this a crisis in journalism (e.g. Bauer et al., 2013; Lewis, Williams and Franklin, 2008; Rosenkranz, 2016) since news producers no longer have sufficient time and resources to create high-quality, independent content. For instance, Currah notes that “[d]ue to commercial pressures, it is no longer feasible for news publishers to maintain an extensive network of newsgathering” (2009: 62). Bauer et al. (2013) found that almost two thirds (though they do not provide a precise figure) of science journalists “recognise that working pressures are harming the quality of science stories” (2013: 29; see also Schäfer, 2017). Similarly, in Williams and Clifford’s study, 46 percent of science and technology journalists said they have less time to fact-check stories than previously and 22 percent noted they no longer have time to properly fact-check stories, thus damaging news quality. This is particularly the case in the context of online news, where “the time lapse between the gathering of the raw information and dissemination can now often be a matter of minutes” (Forde and Johnston, 2013: 115). Because of this, journalists have become increasingly dependent on easily accessible and pre-packaged sources, such as press releases.

Lewis et al.’s study of British journalism found that even quality news media are not immune to this and, overall, “60% of press articles [...] come wholly or mainly from one of these ‘pre-packaged’ sources” (2008: 3). The authors also stress that these figures are likely underestimated since it could not always be identified whether a press release or other source had been used. There have not been any other studies of this scale carried

out in the UK context more recently. However, summarising research on this topic, Macnamara states that, overall, between 40 and 75 percent of “allegedly independent media is routinely sourced from or influenced by PR” (2014: 741). Others have termed this as churnalism, which is “forcing the mass of reporters to spend hours recycling second-hand wire copy and PR material without performing the ‘everyday practices’ of their trade” (Davies, 2009: 59). Therefore, it may be that, in XR news coverage, press releases play a significant role in the frame-building process due to the social system the news is produced within.

3.5.2 Commercialisation

This so-called crisis in journalism links to the increased commercialisation of the news. According to McManus, news commercialisation can be defined as “*any action intended to boost profit that interferes with a journalist’s or news organization’s best effort to maximise public understanding of those issues and events that shape the community they claim to serve*” (2009: 219, original emphasis). Indeed, McNair notes: “With some exceptions, such as the public service broadcasters, news media are engaged above all in selling information, attracting customers, and selling those customers on again to advertisers” (2010: 386; see also Bettig and Hall, 2012). This means that news is effectively “a product that must be made attractive or appealing to a market of consumers.” (Richardson, 2007: 77). Furthermore, the larger the audience, the more revenue news outlets can generate from advertising (McManus, 1995; Richardson, 2007). In a sense, the news generates audiences for advertisers in the interests of gaining more money from the advertisers. From this perspective, “the audience shift from being *consumers* of a product, to being the *product themselves*” (Richardson, 2007: 79, original emphasis). The audience becomes a commodity for news organisations and advertisers’ gains, rather than a public with a right to information as in the fourth estate model.

As McManus highlights: while the norm of journalism “is to inform the public”, the “*norm of business* is to maximise profits over an indefinite period” (McManus, 1995: 308, original emphasis). McManus argues that commercialisation has led journalism to prioritise the norms of business. In other words, “for mass-mediated news supported by advertising, achieving the greatest return requires a subordination of most journalism norms to market norms” (McManus, 1995: 327). Picard agrees, stating that the profit-

making incentive has “diminished the place of the public interest orientation” of journalism (2004: 63). These profit-making goals result in a lack of diversity in news content (Bettig and Hall, 2012). As Picard elaborates:

stories that may offend are ignored in favor of those more acceptable and entertaining to larger number of readers, that stories that are costly to cover are downplayed or ignored and that stories creating financial risks are ignored. This leads to homogenization of newspaper content, to coverage of ‘safe’ issues and to a diminution of the range of opinion and ideas expressed (2004: 61).

Such news is problematic because it “leaves little room for ethics, professionalism, objectivity and the things that constitute *journalism*” (Richardson, 2007: 79, original emphasis). Instead, “[t]his process of commodification encourages journalists to internalize the values of media owners as being consistent with professionalism” (Allan, 2005: 9). Thus, the capitalist social system that news organisations operate within could lead journalists to frame a topic in a certain way that prioritises a profit-making agenda.

3.6 The Relationship Between News and Promotional Content

Considering the impact of commercialisation on news content, it is not surprising that previous research has examined the relationship between news and promotional content. Some such studies discussed in Chapter 2 touched on this area (see Section 2.7). Kelly (2009) looked at magazine coverage of microcomputers, comparing the frames used in both the advertisements and articles within these magazines. She uncovered much similarity between the two. In a different way, Chyi and Lee (2018) analysed what they called the commercialisation of technology news, finding that news coverage of the iPhone often emphasised the positive aspects of the device. They argue that such discourse could “serve advertising purposes” (2018: 596). Based on these findings, Chyi and Lee state that “the boundary between news and promotional content is tenuous at best” (2018: 585). Since one of the aims of the current study is to examine the relationship between news and marketing (which is, of course, promotional), it is beneficial to discuss additional research that has analysed the interplay between news and promotional discourse. Studies of this nature usually focuses on one of two areas: (1) the inclusion of native advertising; and (2) the reliance on public relations material. Research on other

genres of journalism, such as lifestyle journalism, is also useful here since it is sometimes seen as an extension of marketing (English and Fleischman, 2019; Kristensen, Hellman and Riegert, 2019). This section first introduces some concepts related to the relationship between news and promotional content before discussing the studies analysing such discourse.

3.6.1 Native Advertising and Marketization

The Interactive Advertising Bureau (IAB) describes native advertisements as “so cohesive with the page content, assimilated into the design, and consistent with the platform behavior that the viewer simply feels that they belong” (2013: n.p.). Conill provides a similar definition: “a form of paid content marketing, where the commercial content is delivered adopting the form and function of editorial content with the attempt to recreate the user experience of reading news instead of advertising content” (2016: 905). In other words, it is difficult for the viewer to determine if the content they are looking at is an advert or not. Wojdyski (2016) notes that native advertising can appear in a wide variety of formats, including videos and hyperlinks. In addition to this, Wojdyski highlights the main benefit of using native advertising:

By delivering to the consumer content that is similar to the rest of the site, these advertisements seek to diminish the traditional competition between the content a consumer is seeking and the annoying-but-necessary advertising that subsidizes its production (2016: 203-204).

Therefore, native advertising appears to be an effective way of exposing audiences to promotional material without them realising it, thereby making them more susceptible to it.

Such a trend contests the journalistic principle of maintaining a clear boundary between news and promotional content in the interests of remaining independent. Indeed, journalism is supposed to be “an activity conducted independently of government and other powerful individuals and groups” (Franklin, 1997: 28). Therefore, it should be “immune to interference from even the most influential in society” (Franklin, 1997: 28). Indeed, the tenth principle of the NUJ Code of Conduct states that a journalist “[d]oes not by way of statement, voice or appearance endorse by advertisement any commercial product or service save for the promotion of her/his own work or of the

medium by which she/he is employed" (2013: n.p.). Additionally, *The Guardian's* editorial guidelines present two rules regarding endorsement:

Endorsements Journalists should not agree to promote through copy, photographs or footnotes the financial interests of prospective interviewees or contributors, or their sponsors, as a means of securing access to them. Promotional information about a subject or author provided in footnotes should be included only where, in the editor's judgment, it is of genuine interest or assistance to the reader.

Commercial products No Guardian journalist or freelance [sic] primarily associated with GNM should endorse commercial products unless with the express permission of their head of department or managing editor. Neither should they be involved in producing advertisement features (advertorials) (*The Guardian*, 2011: n.p., original emphasis).

Despite these guidelines, native advertising has somehow become an accepted practice. Native advertising is strongly linked to Fairclough's concept of marketization which suggests that "advertising and promotional discourse have colonized many new domains of life in contemporary societies" (1993: 139). This can lead to the discourse of consumerism, typically found in advertising, "colonizing" other areas (Fairclough, 1989: 209). While Fairclough originally used this concept to refer to texts such as university prospectuses, the practice of native advertising certainly suggests this is relevant for news content as well. Indeed, several of the studies that will now be discussed support this idea.

3.6.2 Promotional News and Public Relations Influence

Relating to native advertising, Erjavec analysed promotional news, which she defines as "all those texts that have been paid for, have been published in the form of news, and that seek to influence audiences for commercial benefit" (2004: 554). Erjavec examined news texts as well as the processes used to create those texts through an ethnography of journalists in four Slovenian quality daily newspapers. For the textual analysis, Erjavec applied discourse analysis to 38 news reports that she had identified as "'paid for' (or extorted) by the advertisers" in the ethnographic stage of the study (2004: 562). At a basic level, Erjavec found that these promotional news reports "were in no way separated from the editorial content by layout, position or labelling" (2004: 562). Similarly, the structure

of the promotional news reports was no different from others that had not been paid for. This means that readers would not be able to determine that the article had been paid for by appearance alone, as in native advertising (see Section 3.6.1). Moreover, these articles only focus on the positive aspects of the organisation, product or service being written about. Erjavec's findings indicate that including non-attributed content could act as a way to promote certain companies or products to the public without readers being aware that the content they are reading has been paid for.

Harro-Loit and Saks (2006) carried out a similar study to Erjavec, focusing on Estonian news media. They used both ethnography and textual analysis to examine promotional content in news discourse. Regarding textual analysis, Harro-Loit and Saks applied discourse analysis to newspaper articles from three quality Estonian national dailies, three Estonian magazines and two commercial TV channels from May to November 2003. News items were analysed if the researchers thought they included hidden-advertising. In line with Erjavec, Harro-Loit and Saks found that these hidden advertisements were made to look and read like a standard editorial news report, "thereby making it difficult for the reader to recognise it as promotional material" (2006: 317). In addition to the textual analysis, the authors found there were varying attitudes amongst the journalists towards what is considered promotional material. Thus, the authors conclude that "[t]he border that separates journalism from advertising is, as a result, losing its definition and purpose" (2006: 321). In other words, there exists a blurring between advertising and journalism, which coincides with Chyi and Lee's (2018) argument above.

Similar findings were present in Pander Maat's (2007) study of press releases in Dutch media. As with the other two studies mentioned, Pander Maat analysed the press releases themselves as well as journalists' responses to these. In particular, he examined two samples of Dutch press releases and their resulting news articles. One sample consisted of 39 press releases from the aviation industry and 62 news articles from daily newspapers as well as free and subscription magazines. The second consisted of 50 press releases from major companies within a range of industries such as financial, retail and information technology, compared to 95 articles from the economics sections of daily newspapers. One finding that is of particular interest to the current study is that press releases about new products were some of the most promotional. Pander Maat found

that, out of the entire data set, 80 percent of promotional elements were retained in the aviation sample, whereas 22 percent of promotional elements survived in the economic sections of Dutch daily newspapers. Based on these figures, Pander Maat summarises that promotional language survives the most in specialist travel magazines and travel sections of newspapers, whereas economics journalists eliminate the majority of promotional language. This might indicate that, if promotional discourse exists in news coverage of XR, it would be more likely to appear in the technology-specific sections of the news sites rather than general news.

In a different context, Lewis, Williams and Franklin (2008) analysed the influence of public relations material on UK news media. This included 2,207 news items in UK national newspapers as well as 402 items broadcast on radio and television. Similarly to Harro-Loit and Saks (2006) and Chyi and Lee (2018), Lewis, Williams and Franklin argue that the "line between journalism and PR – between factual reporting and partisan narrative – becomes blurred" due to news companies' "drive for profit maximisation" (2006: 2). They also emphasise that this "compromises the independence of the press" (2006: 2). With this in mind, the authors specifically included what are considered to be elite British newspapers (*The Guardian, The Independent, The Times and Daily Telegraph*) in their sample as these should be the least likely to rely on pre-packaged news in the form of public relations material. Nevertheless, they found that "at least 41 *per cent* of press articles and 52 *per cent* of broadcast news items contain PR material which play an agenda-setting role or where PR material makes up the bulk of the story" (2006: 10, original emphasis). Even so, Lewis, Williams and Franklin also uncovered that "[o]nly 1 per cent of [news] stories were *directly attributed* to Press Association (PA) or other agency services" (2006: 5, original emphasis). In other words, the press conceal the fact that the content is not directly from their own journalists. Moreover, 87 percent of all news items (print and broadcast) were based on a single source. These findings "*portray a picture of the journalistic processes of news gathering and news reporting in which any meaningful independent journalistic activity by the media is the exception rather than the rule*" (Lewis, Williams and Franklin, 2006: 17, original emphasis). This is similar to Erjavec's (2004) results and highlights the concern of the lack of balanced reporting in the samples of these studies.

Indeed, newsrooms' reliance on pre-packed public relations material is also found in other studies. For instance, in an analysis of 35 media releases from New Zealand-based companies and their resulting news items, Sissons (2012) argues that this reliance may even be getting worse. She found that 23 of the 35 press releases "were produced word-for-word, or almost word-for-word, in the media" (2012: 279). Sissons argues that the journalists in her sample "behaved not as reporters, interpreters or critics, but as 'churnalists', or replicators of the words of others" (2012: 278). Here, Sissons references Davies' (2009) concept of churnalism discussed in Section 3.5.1. Moreover, consistent with findings from Erjavec (2004) and Lewis, Williams and Franklin (2008), journalists only added new material (such as additional sources) to articles resulting from 8 of these press releases. In addition, Sissons looked at two case studies within this sample in detail. She states: "Both news stories are promotional in tone and message, yet in neither case is their origin admitted to the reader" (2012: 292). This mirrors the findings from other authors discussed above regarding the obscuring of the original source of the content. Sissons shows great concern over this as the news report reproduces the "purely commercial promotion of a product" and "encourages the reader to believe that what is being reported is the result of a journalist's impartial and corroborated research" (2012: 292). Sissons' sample came from industries ranging from charities to pharmaceutical companies, meaning such practices may also occur for XR news.

Although some of these studies include technology news as part of a broad analysis, very little research has been carried out on this topic that *specifically* focuses on technology. Indeed, the only study that analysed native advertising or press releases in regards to technology news was very limited in its scope. Van Hout, Pander Maat and De Preter (2011) analysed a case study of one senior business reporter for Dutch newspaper *De Standaard* as he transformed a press release about the Apple TV. This involved a textual analysis of the original press release and the news article, keystroke logging to monitor how the journalist edited the release and a final interview with the journalist. Differently from the aforementioned studies, these authors found that, although "there is clear intertextual overlap between the press release and the news story", no passages appear to have been replicated verbatim in the final article and the final article includes extra elements not present in the press release (2011: 1879). The authors also found that the reporter tried to lessen the effect of the promotional content of the press release.

They argue that this shows an absence of the churnalism (Davies, 2009) practice found in other studies. On the other hand, coinciding with the above studies, the press release was not referenced as a source in the final article. The reason for the discrepancies between these findings and others could be that Van Hout, Pander Maat and De Preter's study was only based on one instance of a journalist transforming a press release into a news article, whereas the other studies had larger samples. Nevertheless, based on this review of the literature, it is clear that several studies have uncovered a blurring between news and promotional content in various contexts across Europe, Australasia and the US. The current study adds to such literature by providing further insight into the relationship between technology news and marketing.

3.6.3 Lifestyle Journalism

In addition to studies focusing on traditional news, others have examined promotional discourse in other areas of journalism, namely lifestyle journalism. Hanusch defines lifestyle journalism as "primarily focus[ing] on audiences as consumers, providing them with factual information and advice, often in entertaining ways, about goods and services they can use in their daily lives" (2012: 2). Lifestyle journalism covers topics such as travel, fashion, food, videogames and (most relevant to the current study) personal technology (Foxman and Nieborg, 2016; Hanusch, Hanitzsch and Lauerer, 2017). According to Kristensen, Hellman and Riegert, lifestyle journalists "perform a *marketing role*, as news stories and reviews serve as public relations for the (positively) reviewed works, even though this is not necessarily their primary purpose" (2019: 259, original emphasis). In a study that examines the relationship between news and marketing discourse, it would be beneficial to discuss previous research into this type of journalism.

Related to the above studies, Arik and Çağlar (2005) analysed what they term "messages of consumption" (i.e. discourse that encourages consumption) in the weekend supplements of two Turkish newspapers. Applying content analysis to 514 articles published across four weekends in January and February 2005, Arik and Çağlar found that 64 percent of articles included messages that encourage consumption. This, they posit, indicates that the newspapers support consumption culture. Out of all topics, these consumption messages most often appeared in articles about culture and the arts, such as plays, films and books. They also note that in 158 instances, the articles mentioned

where the product can be purchased. While the authors do not specify the percentage of articles this occurred in, any such mentions give readers the information they need to make that purchase. The authors argue that, under capitalism, Turkish society has internalised the ideology of consumption, thus affecting journalists approach to news.

Rather than focusing on lifestyle journalism in general, Stone (2018) uncovered a similar trend in US travel journalism specifically. He examined itinerary-based travel journalism (which recommends a list of activities to do when in a certain city) from *The New York Times*, *Reuters* and United Airlines' in-flight magazine *Hemispheres* between 2009 and 2014. This generated a sample of 15 articles. Compared to the other studies discussed above, Stone's sample was relatively small, particularly for a quantitative study. Nevertheless, he highlights some valuable points about how such journalism relates to marketing. Stone notes that, by providing a set itinerary to follow, these articles "intended to spur the reader into action" (2018: 1004). Added to this, the authors encouraged excessive consumption of food and drink, with articles recommending such activities approximately 4.28 times per day on average. Shopping was also presented as "an essential portion of a short city visit" (2018: 1005), encouraging consumption in another way. As Stone notes, this suggests that "the purpose of the articles was to encourage consumption and visitation", thus acting as an extension of marketing (2018: 2009). This is in line with Arik and Çağlar's study of lifestyle journalism in general.

Taking a different approach, English and Fleischman examined food reviews in four quality newspapers; *The Weekend Australian* and *The Sydney Morning Herald* in Australia and *The Guardian* and *The Times* in the UK. Using content analysis, they standardised and compared the food ratings of the four news outlets between 2014 and 2016. English and Fleischman acknowledge that reviews are typically different from traditional journalism as they "focus on taste, which reflects the journalist's opinion, instead of a focus on objective reporting" (2019: 92). The authors found that the average review score was 69.37 percent, with little variation between the news outlets. Additionally, ratings most commonly appeared in the 71-80 percentile, with only two articles rating a restaurant in the 0-10 percentile. However, only six articles appeared in the 91-100 percentile. These results suggest, as the authors state, "food reviews could be interpreted as an extension of marketing rather than independent and detached journalism" (2019: 100), though they do note that the lack of articles in the 91-100

percentile show that this does not go so far to act as cheerleading for the restaurant industry. Still, it is clear that, in lifestyle journalism as well as wider journalism, the boundary between news and promotional content is blurred.

3.7 Addressing Gaps in the Literature

The current chapter has outlined studies that have analysed the relationship between news and promotional content, whether that be through native advertising, the influence of press releases or alternative forms of journalism such as lifestyle journalism. The previous chapter discussed studies analysing a range of news on science and technology. All of this scholarship provides valuable insight into the areas related to the current study. However, it is clear that, although there is substantial research on news coverage about a range of emerging technologies, there is a lack of research on news coverage of any technologies within the XR umbrella. Additionally, while some of these studies acknowledge the role this news can play in the diffusion of innovations (Cogan, 2005; Hetland, 2012; Kang, Lee and De La Cerda, 2015; Rössler, 2001), none of the authors have used the characteristics of innovations (Rogers, 2003) or technological acceptance models as analytical tools to understand this relationship in more depth. Therefore, this study fills a gap by using these concepts as analytical tools to examine the news coverage of a technology that has received very little attention previously.

Furthermore, the current chapter has discussed studies that consider the relationship between news and promotional content. The majority of these studies have focused on the impact of press releases or native advertising on news content. Others have focused on lifestyle journalism as an extension of marketing. However, none of these studies have examined the wider marketing materials (as opposed to purely press releases) of a company and compared this to the news coverage. While Kelly's (2009) research on magazine coverage of microcomputers discussed in Chapter 2 compared news and advertising, this was limited to those texts within the same magazine. A wider investigation is important because it can show to what extent the news supports the values of technology companies aiming to sell products, even when not accompanied by advertising. Moreover, this chapter has also shown that very little research has been carried out to examine the relationship between news and promotional discourse in *technology* news. Van Hout, Pander Maat and De Preter's (2011) study did focus on the

Apple TV but the authors considered just one case of a reporter translating a press release into an article. Research with a wider scope is needed. Thus, the current study makes an original contribution to research by filling the following gaps: (1) the near-absence of research on news coverage of XR; (2) the lack of theoretical insight from diffusion of innovations and technological acceptance models in such research; (3) the lack of research focusing on technology news that examines the relationship between news and promotional content; and (4) the absence of studies looking at this relationship by analysing the comparison between news discourse and wider marketing materials.

3.8 Final Remarks

This chapter has, on the one hand, considered the various factors that can impact the frame-building process. These include the type of news outlet, media ownership, journalistic principles, news values, sourcing practices, frame advocates and the commercial context news is produced within. Such factors could help to explain why XR has been framed a certain way, or why there are (or are not) differences between the news outlets in this study. The four factors of Shoemaker and Reese's (2014) model will therefore act as analytical tools throughout the data analysis chapters to consider how routine practices, media organisations, social institutions and social systems have affected the framing of XR.

Additionally, the studies on promotional discourse in the news have displayed a common argument that the boundary between journalism and public relations/advertising is being eroded, providing useful insight into the relationship between news and promotional content. However, it is limited in that it mostly focuses on news stories that include public relations copy or native advertising, rather than marketing generally. As Chyi and Lee (2018) found in the previous chapter, it is possible for news discourse to be promotional even when public relations content or native advertising are not used, as was also found to be the case in lifestyle journalism. Therefore, as Cogan (2005) suggested (see Section 2.7), it would be beneficial to examine the wider context of marketing and its relationship to news discourse. The second research question of this study is concerned with just that because it aims to assess the news framing of XR and how this relates to the marketing of XR products. Therefore, this thesis not only fills the gap identified in the previous chapter (the lack of studies on news

coverage of XR) but also examines the relationship between news and marketing more broadly than has been done before. That is to say, rather than being limited to native advertising or press releases, it compares the broader marketing of XR (including websites, social media posts and video advertisements) to the news articles. With these aims in mind, the following chapter presents the research methodology.

Chapter 4: Methodology and Theoretical

Approach

This study applies a mixed methods framing analysis to news and marketing of XR in order to address the aims and research questions set out in Section 1.4. The current chapter details the theoretical approach of the project as well as the research process. It begins with a discussion of framing theory and how it underpins the research and analysis. Next, the mixed methods nature of the study is introduced and explored. This is followed by a discussion of the two methods used (quantitative content analysis and qualitative framing analysis). Finally, the research design will be explained in detail, including sampling, coding sheet design, frame identification and data analysis procedures.

4.1 Theoretical Approach: Framing Theory

Framing theory provides the theoretical underpinning for this study. The concept of framing has its roots in sociology and psychology, where it is concerned with how individuals make sense of the world by processing information based on already established ideas. One of the first to introduce this theory was Goffman (1974) in his book *Framing Analysis*. Goffman argued that “we tend to perceive events in terms of primary frameworks, and the type of framework we employ provides a way of describing the event to which it is applied” (1974: 24). A “primary framework allows its user to locate, perceive, identify, and label” occurrences (1974: 21). In other words, a primary framework (or frame) helps an individual to make sense of the world around them.

Since Goffman’s conception of framing, this theory has been adapted to several other disciplines. Entman (1993) attempted to synthesise what he called the “fractured” concept of framing into a coherent theory. Thus, he defines framing as follows:

Framing essentially involves *selection* and *salience*. To frame is to *select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation* for the item described (1993: 52, original emphasis).

That is to say, a frame is used to emphasise some issues or ideas and de-emphasise others. Gitlin also highlights emphasis and exclusion in his definition of media frames as "*persistent patterns of cognition, interpretation, and presentation, of selection, emphasis, and exclusion, by which symbol-handlers routinely organize discourse*" (1980: 7, original emphasis). Furthermore, Hallahan states that "framing involves processes of *inclusion* and *exclusion* as well as *emphasis*" (1999: 207, original emphasis). Thus, in framing, salience is particularly important. Entman explains that salience involves "making a piece of information more noticeable, meaningful, or memorable to audiences" (Entman, 1993: 53). Information can be made more or less salient in a number of ways. This includes where it is placed, whether or not it is repeated and by associating it "with culturally familiar symbols" (Entman, 1993: 53). Therefore, to uncover a frame is to uncover the aspects of reality that have been given prominence (or salience) by a communicating text, which points to their power in influencing perceptions of an issue or topic.

This is particularly true within media texts. Certainly, Van Gorp states that "the media provide the public not only with information on the event itself but also on how it should be interpreted" (2007: 65). Hallahan agrees, positing that "a *frame* limits or defines the message's meaning by shaping the inferences that individuals make about the message" (1999: 207, original emphasis). Furthermore, writing in the foreword of D'Angelo and Kuypers' book on framing, Druckman highlights that "any group wishing to push an agenda [...] frames the relevant issue in a way that advances its cause" (Druckman, 2010: xiii). Therefore, framing theory allows the current study to consider the ways XR has been framed in the news as well as XR marketing.

The importance of news framing specifically has been highlighted by several authors. For instance, Baresch, Hsu and Reese argue that "[n]ews media are no doubt the most important actors in the framing process" (2010: 638). This is because "news frames lay the foundation on which we citizens build our collective understanding of our world" (2010: 638). Lecheler and de Vreese also reiterate a similar point, stating: "*when journalists select and produce news, how they frame it is consequential for citizens' understanding of important issues*" (2019: 1, original emphasis). Expanding upon this argument further, Baresch, Hsu and Reese stress the importance of the messages that appear in the news:

News content is not mere combinations of words; it carries embedded social meaning and reflects the prevalent organizing principles in society

through journalists' selection of words, news sources, and metaphors. This process sets the boundary of an issue, reduces a complex situation to a simple theme, and shapes people's interpretations by making some elements salient while ignoring others (2010: 638).

Again, the authors highlight salience, the power of frames to influence perceptions and the journalistic techniques that may be used to create frames.

Regarding the media framing of technological innovations, several of the studies examined in Section 2.7 used framing in their analyses of the internet (Rössler, 2001); computers (Cogan, 2005); microcomputers (Kelly, 2009); and science/technology in general (Dimopoulos and Koulaidis, 2002; Ricci, 2010). In particular, Cogan highlights the power of news frames in relation to emerging technologies. He states that news media play an "enormously influential role in the dissemination of new technologies" due to their framing function (2005: 249). Further to this, Vishwanath argues that frames have a "simple, subtle, and effective way of influencing adoption" (2009: 201). With this in mind, it is important to uncover the frames being used to represent XR in its inception.

Additionally, framing also plays an important role in marketing. Specifically regarding public relations, Hallahan was one of the first to adapt framing theory to this area. He states that:

Framing decisions are perhaps the most important strategic choices made in a public relations effort. It is out of strategic framing that public relations communicators develop specific themes (i.e., key messages or arguments that might be considered by publics in the discussion of topics of mutual concern) (1999: 224).

Therefore, studying the framing of XR in its marketing can provide valuable insight into how the creators of these devices want their products to be viewed. This, then, allows comparison to be made with the news framing of XR to examine the relationship between the two discourses. Indeed, Hallahan acknowledges the power of public relations content in affecting news framing when he states that "public relations practitioners are extricably involved in the framing of the news" (1999: 228). Although Hallahan refers to public relations specifically, since public relations is a part of marketing, this statement can also apply to marketing generally. Despite this, there appears to be a lack of studies that have applied framing theory to the study of news and marketing materials combined. While Kelly's (2009) study on microcomputers discussed in Section 2.7 did analyse the framing

of advertisements in comparison to other discourse, this was limited to magazine coverage rather than newspaper coverage. Therefore, this study fills this gap by applying framing theory to the study of not only news coverage but also the marketing materials of emerging technologies.

4.1.1 Framing Devices

One aspect of framing theory that is of particular relevance to the current study is the idea of framing devices. Entman posits that frames “are manifested by the presence or absence of certain keywords, stock phrases, stereotyped images, sources of information, and sentences that provide thematically reinforcing clusters of facts or judgements” (1993: 52). These elements that make up a frame have been termed “framing devices” (Gamson and Lasch, 1983; Linström and Marais, 2012; Pan and Kosicki, 1993). Several researchers have developed lists of framing devices (also known as signifying elements) which “are tools for newsmakers to use in composing or constructing news discourse as well as psychological stimuli for audiences to process” (Pan and Kosicki, 1993: 59). These framing devices “make a frame communicable through the news media” (Pan and Kosicki, 1993: 59). An early attempt at mapping such techniques came from Gamson and Lasch (1983) who noted five framing devices used to construct a frame: metaphors, exemplars, catch-phrases, depictions and visual images.

Gamson and Lasch define each of these framing devices as follows. First, a metaphor as a framing device relates a principle subject (the object or person being referred to) to an associated subject “that the metaphor evokes to enhance our understanding” (Gamson and Lasch, 1983: 4). Second, and similarly to metaphors, exemplars relate the current subject of a news article to other real events from the past or present. Third, catch-phrases include taglines, slogans or summary statements that become commonly associated with a news topic. Fourth, depictions involve characterising the subject or object in certain ways. This could be achieved by using the metaphors and exemplars already mentioned, or using grammatical modifiers that impact the meaning of a sentence or phrase. Lastly, the visual images framing device refers to using iconic or symbolic imagery to emphasise a particular frame.

In addition, Pan and Kosicki (1993) argue that framing devices can be categorised into two different groups: rhetorical and syntactical structures. According to Pan and Kosicki, Gamson and Lasch's (1983) five framing devices can be classified as "rhetorical structures", which "describe the stylistic choices made by journalists in relation to their intended effects" (1993: 61). Pan and Kosicki state that "journalists also use rhetorical devices to invoke images, increase salience of a point, and increase vividness of a report" (1993: 62). Considering the importance of salience within framing, this makes clear how such devices can work to construct a frame. In addition to Gamson and Lasch's framing devices, Pan and Kosicki highlight "designators" as another rhetorical framing device (1993: 61). They state that a designator adjusts the meaning of a word or sentence by making associations with said designator and this can point to which frame is being used. A major part of this concerns how sources are labelled "to give indications of the authoritativeness of an action or a statement" (1993: 62). For instance, a statement about technology would appear to have greater validity if the designator was a "technological specialist" as opposed to a "mum of three". As there are many different designators, "[c]hoosing a particular designator [...] is a clear and sometimes powerful cue signifying an underlying frame" (1993: 63). Thus, designators act as one type of rhetorical framing device.

As well as rhetorical structures, Pan and Kosicki suggest another category of framing devices – syntactical structures. At a basic level, "syntactical structures refers to the stable patterns of the arrangement of words or phrases into sentences" (Pan and Kosicki, 1993: 59). However, it also encompasses the professional conventions that exist within journalism. This includes the typical journalistic practice of using the inverted pyramid approach to structure a news article, where the "signifying power" of elements varies in descending order, from the headline to the closing paragraph (Pan and Kosicki, 1993: 59). Thus, where certain elements of a news article appear can point to the use of a particular frame. Additionally, the "professional conventions in news writing that have been developed to indicate balance or impartiality [...] are also part of the syntactical structure of news" (Pan and Kosicki, 1993: 60). Pan and Kosicki give three examples of how such conventions can be used as effective framing devices in terms of sourcing practices:

claiming empirical validity or facticity by quoting experts or citing empirical data, linking certain points of view to authority by quoting official sources, and marginalizing certain points of view by relating a quote or point of view to a social deviant (1993: 60).

Therefore, according to Pan and Kosicki, the type of sources used, as well as how they are referred to, can play major roles in constructing a frame.

More recently, Linström and Marais (2012) produced a list of framing devices that combines most of those mentioned in this section (Entman, 1993; Gamson and Lasch, 1983; Pan and Kosicki, 1993). To synthesise the framing devices highlighted by other authors, Linström and Marais have classified them into two categories: rhetorical devices and technical devices. Put simply, rhetorical devices refer to issues of language, whereas technical devices refer to the elements of a news article. Specific examples of each are displayed in Table 4.1. While the framing devices in this list have already been discussed above, Linström and Marais' clear categorisation of them acts as a useful tool to analyse how news frames have been constructed.

However, there are some aspects of Linström and Marais' list that are not well-suited to a study of online news. These are page placement (on what page of a print newspaper the article appears) and layout (referring to how a print news article appears on the page). Since online news sites are not bound by the material restriction of the number of pages in a newspaper, it is more difficult to judge whether the article has been placed in a prominent position that is more likely to be given attention by news readers. Some studies of online news have measured this prominence by regularly recording the articles that appear on the homepage of a news site (e.g. Quandt, 2008). However, this technique was not appropriate for the current study since it analysed previous news coverage of XR rather than the news stories that were being released at the time of data collection. Alternatively, the section an online news article appears in could contribute to framing it in a certain way or impact the credibility of a used frame. For instance, a technology article appearing in the science section of a news site would contribute to framing it in a more serious light than if it appeared in the entertainment section. Therefore, instead of "layout" and "page placement", the current study will consider "article location" (in terms of where it appears on the website) as a technical framing device.

Table 4.1: Linström and Marais' List of Framing Devices, Recreated From Linström and Marais (2012)

Category	Examples
Rhetorical devices	Word choice; Metaphors; Exemplars Keywords (presence and/or absence) Stock phrases (presence and/or absence) Sentences that provide thematically reinforcing clusters of facts or judgement Concluding statements and paragraphs
Technical devices	Headlines; Subheadings; Photo captions; Leads; Photographs; Layout (prominence of the article) Page placement (front page, etc.) All sources of information in article Who is quoted How they are identified Where is the quote placed in the story Quoting experts to claim empirical validity or facticity Quoting official sources to link certain points of view to authority Quoting a social deviant to marginalise certain points of view

With this slight adjustment, Linström and Marais' list guides the research design and analysis in several ways. First, based on these framing devices, the content analysis recorded the following information about the news articles: (1) the use of keywords; (2) the location of the article; and (3) the types of sources used. This will be discussed in more detail in Section 4.2.1. Second, the qualitative framing analysis identified which of the remaining framing devices from the list appeared in the news articles. This included identifying metaphors, exemplars and the labelling of sources as well as noting the location of these devices and the content of visual materials (e.g. images and videos). Lastly, the data analysis chapters discuss which rhetorical and technical framing devices were found to be present in XR news coverage, particularly in those chapters that focus on specific frames (6-9).

4.2 A Mixed Methods Approach to Researching Media Frames

As stated previously, this study employs a mixed methods approach to analyse the news framing of XR and its relationship with the frames in XR marketing. Although there have been varying definitions of mixed methods research, Creswell and Plano Clark (2018) note that they usually share the central idea that this approach involves combining quantitative and qualitative research methods to address the research aim(s). Put simply, “[a] mixed methods design is characterized by the combination of at least one qualitative and one quantitative research component” (Schoonenboom and Johnson, 2017: 108). The current study uses one quantitative method (content analysis) and one qualitative method (framing analysis) to address the research aims and questions set out in Section 1.4. The exact way these methods were applied will be detailed later in this chapter. For now, the current section explains the rationale for choosing a mixed methods research design. It then provides a brief overview of how these quantitative and qualitative approaches interact with each other.

The major benefit of using a mixed methods approach is that the drawbacks of quantitative research can be offset by the advantages of qualitative research – and vice versa. For instance, an advantage of using quantitative content analysis is that the research can cover a large sample (Krippendorff, 2012). However, because this approach deals with only numerical data, it is limited in its ability to uncover deep meaning within the sample. On the other hand, qualitative methods can produce richer data (Merriam and Tisdell, 2016) but are usually limited to a smaller sample size because of the labour intensive nature of qualitative analysis. Regarding framing specifically, David et al. highlight that a qualitative approach is advantageous because it “can reveal very important frame-relevant elements that might be completely missed by other automated approaches” (2011: 331). However, “such intensive readings of text cannot be applied to large samples and thus would not be able to generate data to reveal how pervasive certain frames are” (David et al., 2011: 331). With this in mind, using a mixed methods approach means that this study can benefit from including the large sample size afforded by a quantitative approach, combined with the ability to uncover deep meaning offered by a qualitative approach.

Furthermore, "qualitative research is seen as deficient because of the personal interpretations made by the researcher" (Creswell and Plano Clark, 2018: 12), which could lead to bias in the research design and/or the analysis of the results. Indeed, Tankard states that "[m]uch of the early research on framing relied on a qualitative, text-analysis approach" but this approach was criticised for being too subjective (2001: 97). However, due to the systematic and replicable nature of quantitative research, the level of subjectivity involved in quantitative research is much lower. Therefore, using mixed methods allows the study to gain deep and valuable insight with qualitative analyses while compensating for potentially biased interpretations with the use of more objective quantitative data.

Overall, a mixed methods approach "provides more evidence for studying a research problem than either quantitative or qualitative research alone" (Creswell and Plano Clark, 2018: 13) due to being able to consider both types of data together. Similarly, Schoonenboom and Johnson state that "[t]he overall goal of mixed methods research [...] is to expand and strengthen a study's conclusions" (2017: 110). In other words, if findings can be supported by both quantitative and qualitative data, this increases the validity of the results. Moreover, Creswell and Plano Clark also stress that, by combining quantitative and qualitative methods, "researchers gain new knowledge that is more than just the sum of the two parts" (2018: 13). This suggests that using qualitative and quantitative methods together can uncover findings that would not be apparent if either method was used on its own. For these reasons, in combination with the benefit of compensating for the disadvantages for one research paradigm (quantitative or qualitative) with the advantages of the other, a mixed methods approach to the study of XR news coverage was deemed the most appropriate and beneficial to this project.

Creswell and Plano Clark define three core designs of mixed methods research: convergent, explanatory sequential and exploratory sequential. In a convergent design, quantitative and qualitative data are collected separately and only combined for data analysis. On the other hand, an explanatory sequential design first involves the analysis of quantitative data which informs the areas of focus during qualitative analysis. In a similar way, an exploratory sequential design first implements qualitative analysis which informs the research method or instrument that will be used in the quantitative data collection. In addition to these three designs, Creswell and Plano Clark state that often,

“mixed methods designs are more complex” (2018: 101). Indeed, the current study has most in common with the explanatory sequential design, though the qualitative data also informed part of the quantitative analysis.

To specify, Table 4.2 shows how the three stages of data collection relate to each other. More details about data collection will be provided in the following sections, though it is worth including a brief overview here. Quantitative content analysis was first carried out by applying a coding sheet to the news articles. The results from this analysis informed which news articles and marketing materials were analysed in the next qualitative step. The second step involved identifying the frames that were applied to XR in the news and marketing samples. During this stage, keywords used in these texts were recorded which then formed a dictionary of search terms. In Stage 3, all terms in this dictionary were searched within the entire sample of news articles to provide further quantitative insight. Thus, the quantitative analysis informed the sampling strategies for the qualitative analysis (Stage 2) and the qualitative analysis informed which words would be searched for in the third stage of data collection.

Table 4.2: The Three Stages of Data Collection Using a Mixed Methods Research Design		
Stage 1	Stage 2	Stage 3
<i>Quantitative</i>	<i>Qualitative</i>	<i>Quantitative</i>
Procedures: Coding sheet (content analysis) applied to news articles.	Procedures: Framing analysis applied to news and marketing samples. Recorded keywords relating to the framing of XR.	Procedures: Frequency of terms analysis (content analysis) applied to news articles using dictionary.
Informs next stage by: Data regarding topics of articles and which XR devices mentioned used to determine news and marketing samples for qualitative analysis.	Informs next stage by: Dictionary of terms created based on keywords identified in Stage 2.	

Such an approach makes a valuable contribution to research on the news framing of emerging technologies. According to Van Gorp, using a mixed methods approach for a framing analysis is recommended: “The strongly abstract nature of frames implies that

quantitative research methods should be combined with the interpretative prospects of qualitative methods" (2007: 72). Despite this, very few studies have used a mixed methods approach to analyse the media framing of emerging technologies, as was seen in Chapter 2. Therefore, one of the ways this study makes an original contribution to knowledge is by applying the recommended mixed methods design to the examination of news discourse about an emerging technology. The chapter will now provide more detail about how the quantitative and qualitative approaches were applied.

4.2.1 Quantitative Approach: Content Analysis

Regarding the quantitative side of the study, content analysis was used to obtain numerical data about the news articles. According to Neuendorf, content analysis involves "the systematic, objective, quantitative analysis of message characteristics" (2017: 1). In other words, this method analyses the types of messages portrayed in a text following a set process defined by the researcher. Similarly, Krippendorff defines content analysis as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (2012: 18). This replicability, states Krippendorff, refers to the idea that multiple researchers should obtain identical results if the same research techniques were applied to the same sample. Replicability and validity are also highlighted as key characteristics of content analysis by Neuendorf (2017). In order to create a replicable content analysis design, this study produced an extensive coding sheet and dictionary of search terms to apply to the news articles. The following section first provides the rationale for the coding sheet design and then explains how the dictionary for the frequency of terms analysis was developed.

Neuendorf (2002) suggests that, in order to ensure objective data collection, an a priori design of the coding sheet should be produced. However, Neuendorf also stresses that "a lot of exploratory work can and should be done before a final coding scheme is 'set in stone'" (2002: 11-12). The current study followed this approach, with an initial design for the coding sheet created before any data collection took place. Additions were made to the coding sheet as the data collection progressed to avoid the loss of valuable data. Whenever an addition was made, the news articles that had already been analysed were revisited to ensure the coding was accurate. The full definitions of categories and variables for the coding sheet can be seen in Appendix A. However, some

important notes should be made about the rationale for the different categories in the coding sheet and their contribution to analysing the news framing of XR.

Firstly, the picture frame metaphor is often used in relation to the theory of framing (Tankard, 2001). As Hallahan notes, "the framing metaphor is better understood as a window or portrait frame drawn around information that delimits the subject matter and, thus, focuses attention on key elements within" (1999: 207). That is to say, by putting a frame around certain aspects of reality, those aspects become emphasised while others become excluded. However, it is not just what is *within* the frame that matters. Tankard states that "[a]nother function of a picture frame can be to suggest a tone for viewing a picture. For instance, an elaborately carved, wooden frame provides a different feeling from a mass-produced, metal one" (2001: 98). Therefore, how a news article is presented can also impact the way a topic is framed. This relates to the framing devices discussed above. In print news, this could refer to where an article appears in a newspaper, how much of the page it takes up or what other elements surround the article. For online news, this could be how the article is classified (e.g. news or feature) as well as where it appears on the website. With this in mind, the coding sheet recorded the article type (e.g. news or feature), the section it was published in (e.g. technology, science, entertainment) and the categories an article was associated with. To clarify, whereas "section" refers to the indexed location of the news article on the website, "category" refers to topics that the article has been associated with which are usually shown at the end of the news article (see Appendix B for an example of the differences between the two). Recording these features of the news articles means the study can examine not only the content of the articles but how they have been presented to the audience, which could impact which frame has been used.

Another section of the coding sheet recorded the main topic of an article. Importantly, one article may have included multiple topics from the list of variables. However, only one topic was recorded to represent the main focus of the article. These topics are not considered frames but follow Pan and Kosicki's definition of a topic as "a summary label of the domain of social experiences covered by a story" (1993: 58-59). Recording these topics contributes to understanding the overall framing of XR by demonstrating which aspects of the technology were focused on the most/least by the news articles. Appendix A.2 defines each of the variables within the topic category.

Furthermore, Section 1.1 noted the many types of applications XR is used for. The types of applications mentioned by the news could contribute to framing XR in a certain way. For instance, if articles focus on its uses in education, science and health care, it would be framed in a more serious light as opposed to if the news focused on entertainment applications such as videogames and film. Therefore, the coding sheet recorded the mention of 41 different XR application types (see Appendix A.5 for definitions of each type). Importantly, this does not refer to specific applications (such as the AR HoloStudio application) but rather use types (such as “education” or “videogames”).

Section 1.1 also mentioned that various XR products were introduced to the public during the sample period of this study. Therefore, examining which (and how many) specific products were mentioned would demonstrate which devices have been the focus of the news coverage. In uncovering these details, it is possible to glean which products (and companies) were framed as important players in the market based on the attention the press gave to them. With this in mind, the coding sheet recorded whenever a commercial XR device was mentioned within a news article. The full list of devices is shown in Appendix A.6.

Additionally, sources play a major role as framing devices in the framing process (see Section 4.1.1; Pan and Kosicki, 1993). Therefore, recording the sources used in the news articles was an important part of this study. The coding sheet included 28 different variables under this category to record the types of sources that were used (see Appendix A.4 for definitions for all variables). Both paraphrased material and direct quotations were counted. Moreover, just as sources of verbal or written information can contribute to the framing of a topic, so can sources of visual material. Thus, another category of the coding sheet recorded the attribution types for any media that were used within an article (see Appendix A.3 for definitions for all variables). This allowed the study to examine which individuals, organisations or groups have contributed to the framing of XR in a visual form.

Lastly, two aspects of the coding sheet were specifically designed to address the third research question in this study which is concerned with whether the framing of XR news promotes the diffusion of the technology. Section 3.6.2 discussed studies that found native advertising to be present within news articles. Two categories of the coding

sheet quantitatively assessed the potential inclusion of native advertising. The first recorded whether the article told readers how or where to buy an XR product or application. Additionally, the second recorded the destination of any external links used within articles. For instance, the coding sheet recorded whether an article linked to an online retailer or the website of an XR company (see Appendix A.3 for definitions for all variables). The results from both of these categories could also reveal the extent to which XR news appears to be commercialised which could explain the existence or absence of certain frames.

In addition to the use of a coding sheet, the content analysis also involved recording the use of certain terms. The purpose of this part of the content analysis was to provide some quantitative data to: (1) examine the prominence of certain frames uncovered in the qualitative framing analysis; and (2) reveal the overall tone of the coverage. Regarding the first point, Section 4.1.1 noted that rhetorical framing devices can include the use of specific keywords. Therefore, throughout the qualitative framing analysis, a list of such keywords was made for each frame to be included in the frequency of terms analysis. If words were used to counter a frame, they were also listed within their own counterframe category. Regarding the second point, the frequency of terms list also included positive and negative words and terms referring to the concerns or ailments of XR (also identified during the qualitative framing analysis). Words were added to these lists based on the literature about XR and the previous research on technology discussed in Chapter 2. The combination of these word lists created a dictionary of search terms to be applied to the news articles. A full list of the search terms and their categories can be found in Appendix C.

4.2.2 Qualitative Approach: Identifying Media Frames Through Framing Analysis

While content analysis was used to collect quantitative data that would show insight into the framing of XR in the news specifically, a qualitative approach to framing analysis was used to identify how XR was framed in the news *and* the marketing materials. Framing analysis involves identifying frames within texts and examining how they have been constructed. Approaches to identify frames can be either deductive or inductive. A deductive approach involves analysing texts to look for specific frames that are defined before the research begins (Matthes and Kohring, 2008). Under a deductive approach,

frames could be developed based on previous theoretical literature (Tankard, 2001). This would allow the frames to “gain validity and coherence from the previous theoretical work” (Tankard, 2001: 104). However, a deductive approach is “limited to already established frames”, which risks missing important frames that may be present within the texts, particularly for evolving issues (Matthes and Kohring, 2008: 262). Since this study focused on a new, emerging technology, it is very possible that new framing techniques could have been used in XR news and marketing. Therefore, this study adopted an inductive approach to framing analysis.

As opposed to a deductive approach, in an inductive framing analysis, “[f]rames emerge from the material during the course of analysis” (de Vreese, 2005: 53). Lecheler and de Vreese state that “[a]n inductive approach produces rich knowledge about the framing of the issue at hand” (2019: 4). Indeed, using an inductive approach meant the current study could provide a comprehensive overview of the frames used by not being restricted to focusing on frames established elsewhere. Inductive approaches to framing analysis have been criticised for being too objective and for lacking replicability (e.g. Tankard, 2001). However, this issue with inductive approaches can be avoided in the current study due to the combination of quantitative data with the qualitative frame identification. Further details about how frames were identified will be provided in Section 4.4.2.

4.3 Sampling Strategies

As mentioned in Section 1.4, this study analyses online news coverage of XR in *The Sun*, *The Guardian* and *MailOnline* from 2012 to 2017. A secondary aim was to compare the framing of XR in the news and marketing. Therefore, the marketing materials of five XR products were also examined: Oculus Rift, Samsung Gear VR, Google Glass, Magic Leap and Microsoft HoloLens. This section explains and justifies the sampling strategies of the research project, starting with the chosen sample period and moving on to the selection of news articles and marketing materials.

4.3.1 Sample Period

Section 2.1 noted that the XR products introduced from 2012 onwards can be considered the second attempt at commercial XR, with the first beginning in the 1990s. At the outset, analysing the news and marketing of XR from 1986 (the year Jaron Lanier coined the term “virtual reality”) was considered. However, although analysing news articles around the first wave would have provided insight into how the technology was framed, it would have been difficult to examine how this compared to the marketing materials due to the low number of commercially released XR products at that time as well as the lack of archived marketing texts. On the other hand, due to the digitised nature of much marketing in the 21st century (and during the second attempt at commercial XR), it is possible to access the vast majority of these texts online for analysis. This means the secondary aim of the research, to consider the relationship between the news and marketing discourses, could be addressed with higher accuracy and greater scope by focusing on the second wave of commercial XR rather than the first.

Thus, to examine the news coverage of XR as an emerging technology and its relationship with the marketing, a sample period of 1 January 2012 to 31 December 2017 was chosen. This period covers the initial announcements and development of the second wave of XR products as well as several subsequent releases. Specifically, the Kickstarter campaign for Oculus Rift – the headset considered to be the one that started this new XR trend (Parisi, 2016; Steinicke, 2016) – was launched in August 2012 (Oculus, 2012a). Similarly, the first mainstream AR device, Google Glass, was announced in April 2012 (Ariel, 2017). As mentioned previously, 2016 saw several releases of commercial VR products to the market (Steinicke, 2016), making it vital that this period be included in the study. Ending the sample period in 2017 meant the study could examine the news coverage during the introduction of these products as well as the aftermath of what some have called “the year of VR” (Steinicke, 2016). On a practical level, another reason 2017 was chosen as the final year of the sample period was because it was the last full year before the sample was collected (during early 2018) and the intention was to analyse data which was as recent as possible. Collecting the sample from only part of a year was avoided since this would have made it difficult to compare the results from that year with the other full years.

4.3.2 Online News

In addition to defining a sample period, a decision had to be made regarding the type of news to analyse. Again, one of the aims of this study was to compare the news and marketing of XR. Marketing involves much more than just words – it utilises visual imagery and audio to portray its desired message. Thus, to effectively compare XR news and marketing, it was necessary to be able to see how the news visually represented XR. This ruled out radio news due to it being solely audio-based. While broadcast news involves both visual and audio content, archives of news programmes (such as Box of Broadcasts or the British Library's Broadcast News Service) are either not exhaustive or do not include comprehensive search features that would allow relevant news items to be found in a reasonable amount of time. Therefore, it would be unlikely the study could provide a full picture of XR broadcast news coverage. With these considerations in mind, it was decided to focus on articles from UK national newspapers.

Moreover, the online versions of these newspapers were chosen over print for four main reasons. Firstly, while the audience for print news is shrinking, the audience for online news is expanding. According to figures from the Audit Bureau of Circulations (ABC), UK national newspapers had a combined circulation of 21.2 million in January 2000 (Mayhew, 2020). However, by January 2020, this had reduced by approximately 55 percent to just 7.4 million (Mayhew, 2020). On the other hand, the audience for the digital versions of UK national newspapers has been increasing. The ABC also reported figures on digital readership, showing that, in October 2012, news sites had 16.6 million unique views per day on average (Newsworks, 2012). By November 2017, this had increased to 32.9 million, again according to ABC figures (Pirzada, 2017). With digital news receiving more attention than print news during the sample period for this study, news about XR published in online outlets is very likely to reach a wider audience than those in print publications. This means that it is even more important to understand how XR is being represented online than in print newspapers that reach a smaller proportion of the population.

Secondly, and related to this, as the target audience of XR products, technology enthusiasts are more likely to access news online than in print for the very reason that they *are* technology enthusiasts. Again, this means that XR is likely to reach a wider audience online than in print, making how online news represents the technology even

more significant. Thirdly, as mentioned in Section 3.6.1, native advertising may appear in online news through the use of hyperlinks (Wojdyski, 2016). Thus, studying online news instead of print allows this research to provide further insight into the relationship between news and promotional content. Finally, and from a more practical perspective, sampling online news articles meant the entire content and presentation of the articles could be easily retrieved. In order to assess the text, images and layout of print articles, this would have involved searching for XR articles in microfilm newspapers. Considering the other benefits of focusing on online news discussed above, this would have been unnecessarily time consuming. Based on each of these reasons, online news was clearly the superior choice for the current project.

4.3.3 Online News Outlets

Once it was decided that the study would focus on the online versions of UK national newspapers, the specific news outlets that would make up the sample had to be chosen. Firstly, to examine news content that had significant reach, it was necessary to focus on outlets that had high readership figures. To determine the news outlets with the largest readerships, a range of sources were used to compensate for the gaps they each had during the sample period. Audience metric data based on website views and application usage were examined from the ABC and the National Readership Survey (NRS; which became PAMCo in 2017). Additionally, data from Ofcom's large audience surveys on news consumption was also considered.

As well as selecting publications with large audience reach, it was important to include outlets that varied in terms of their traditional categorisation (i.e. quality, mid-market and tabloid) because this would be most effective in producing quantitative results that would be representative of the wider UK national news landscape. Therefore, the data from the ABC, NRS and Ofcom was examined to determine which news outlet in each category had the highest readership across the years of the sample period (2012-2017). However, the available data was quite sparse in the last year of the sample (2017) since only the ABC provided figures for this year and not all news outlets were included. Therefore, readership figures from 2018 were also considered to compensate for this lack of data. Appendix D presents an in-depth breakdown of this data. Additionally, this

current section highlights the most important insights from the sources and explains how the data was used to choose the news outlets that would be included in the sample.

Firstly, the most straightforward decision occurred regarding which mid-market news outlet would be included. Only two publications fell into this category (*The Express* and *MailOnline*). As seen in Appendix D, in every year that data was available, the *MailOnline* was estimated to have higher readership than *The Express* in every source (ABC, NRS/PAMCo, Ofcom). *The Express* did not even appear in Ofcom's top 20 news sources, meaning the *MailOnline* audience was significantly larger across the years. Thus, the *MailOnline* was selected as the mid-market news outlet to be included in the sample.

Secondly, data regarding the readership of four quality news outlets was available: *The Telegraph*, *The Guardian*, *The Independent* and *The Times*. *The Guardian* was shown to have the largest audience by all available sources in 2012, 2013, 2014, 2016 and 2018. In 2015, data from the ABC and Ofcom indicates that *The Guardian* had the largest readership, while the monthly audience estimates from the NRS suggest *The Telegraph* audience was slightly larger than *The Guardian* (11.7 million compared to 11.3 million). In 2017, only ABC data was available and even this only covered *The Telegraph* and *The Independent*. Out of these two outlets, *The Independent* had the largest daily average unique browsers (5.6 million compared to 4.4 million). However, based on the larger figures for *The Guardian* in previous years, it is likely that *The Guardian* readership was higher this year as well. Indeed, PAMCo and Ofcom both place *The Guardian* as the quality news outlet with the largest online readership in 2018. Regardless of these two discrepancies in 2015 and 2017, *The Guardian* still had the largest readership in the majority of years of the sample period. Therefore, this news outlet was chosen as the quality publication to be included in the sample.

Finally, selecting the tabloid news outlet was slightly more difficult. Three news outlets appeared in this category: *The Sun*, *The Mirror* and *The Star*. The outlet with the largest audience varied per data source as well as per year. For instance, the ABC data shows that *The Sun* had the largest audience in 2012 and 2013, while *The Mirror* had the largest audience in 2014-2017. For the three years that NRS data was available (2014-2016), *The Mirror* was shown to have the largest audience according to this source. On the other hand, in every year that Ofcom data was available, they estimated that *The Sun* had the largest audience, with the exception of 2016 in which two percent of respondents

used *The Sun* and/or *The Mirror*. Furthermore, the PAMCo data from 2018 placed *The Sun* as the most read tabloid news outlet. Due to this variation, a decision had to be made based on other factors.

As discussed in Section 3.3.2, the owners of media platforms can impact the way topics are framed and represented. *The Mirror* is owned by Trinity Mirror Group, now called Reach plc. *The Sun* is part of News UK, a subsidiary of Rupert Murdoch's News Corp. While Reach plc focuses solely on news and magazine distribution, as a multi-national media conglomerate, News Corp has "incredible power in terms of providing information and shaping public opinion" (Chan, 2014: 152). Many have highlighted concerns over the power of media concentration (Baker, 2007; Bettig and Hall, 2012; Media Reform Coalition, 2019; Noam, 2016). Moreover, in 2018, the UK and Ireland segment of News Corp had the highest turnover out of all UK national newspaper publishers at £727.8 million (Media Reform Coalition, 2019: 7). With all these details considered, in a critical study of news discourse with an eye on the power of media texts (particularly in relation to commercialisation), a publication owned by News Corp would provide valuable insight into such power relations. With this in mind, *The Sun* was chosen as the tabloid news outlet to be included in the sample. Thus, the final sample consisted of *The Sun*, *The Guardian* and *MailOnline*.

4.3.4 Online News Sample Collection

Once the news outlets had been chosen, the next step was to collect the news articles that would make up the sample. As one aim of this study was to examine the relationship between XR news and marketing, it was imperative that the news articles could be analysed multimodally because marketing relies on much more than written text. This ruled out the use of text-only newspaper databases such as LexisNexis. Instead, to preserve the entire content and layout of the online news items, articles were collected from the specific websites of *The Sun*, *The Guardian* and *MailOnline*.

Articles were identified using a combination of Google searches and search features on the specific news sites. The combination of these searching techniques meant that the sample could be as comprehensive as possible. To expand, the individual search features on the news websites functioned differently and some were restricted. For

instance, the search on *The Guardian's* website uses a Google plugin and did not allow the user to browse more than 10 pages of results. Similarly, *The Sun's* search only displayed articles back to the year 2016. These drawbacks meant valuable data could be missed from these two news outlets. The *MailOnline* website was the only news source out of the three to have a comprehensive search feature. Therefore, an additional search technique was needed to maintain consistency in the collection process for all three publications. This involved a Google search of the three news sites.

Google was chosen over other search engines for the following reasons. Firstly, Google is estimated to have the largest index of webpages (van den Bosch, Bogers and de Kunder, 2016), which means it has the most comprehensive database of webpages, including online news articles. Secondly, at the time of sample collection, Google was the only search engine to offer the option to set a custom date range to search within. Searching through hundreds of pages of results on other search engines from years not in the sample period would have been unnecessarily time consuming when an alternative was available.

Still, it is important to acknowledge the potentially problematic use of a Google product in a study of XR (since Google has its own XR devices) and how the study overcame these issues. Firstly, there is a chance that the search engine may prioritise results relating to their own XR products. However, this was not an issue in the current study since the results were ordered by date and all pages of results were examined to ensure nothing was missed. Secondly, it is possible that Google may filter out negative content relating to their products. This was compensated for by combining the Google searches with the searches on the specific news websites themselves. Therefore, the use of Google to find news articles for this study should not have negatively impacted the articles that made up the sample. Instead, the combination of searches on news websites and Google searches ensured the sample was as comprehensive as possible.

A search string was developed to find relevant news articles using these search tools. There were two parts of this search string. Firstly, the news article must contain one of three exact terms: "virtual reality", "augmented reality", or "mixed reality". However, since these terms are sometimes used to refer to non-XR technology (e.g. the virtual world of a non-XR videogame is sometimes termed "virtual reality"), additional words referring to the headset-based XR this study focuses on were also included in the string.

These were as follows: headset(s), helmet(s), goggles, glasses, head mounted display(s) and hmd(s). Thus, articles were identified that included the term “virtual reality”, “augmented reality” or “mixed reality” as well as any one of the terms referring to headsets mentioned above for the period of 1 January 2012 – 31 December 2017. This string was used in the search tool for each news website as well as in Google searches. Moreover, an additional requirement was added to the Google search to ensure relevant articles were found. Google’s advanced search was used to specify the web address that should be searched within. Articles were identified from the following URLs for each news outlet (Table 4.3).

News Outlet	URL
<i>The Sun</i>	www.thesun.co.uk
<i>The Guardian</i>	www.theguardian.com
<i>MailOnline</i>	www.dailymail.co.uk

After retrieving all the news articles with the above criteria, each was checked to ensure its relevance and suitability in the final sample. Articles were omitted at this stage if they fell into any of the following six categories. First, although the search string helped find relevant articles, sometimes only a portion of a news article was about XR. Only articles in which the majority of content was about XR were included in the final sample. Second, articles were omitted if the searched words did not appear in the body of the article. For instance, if the words appeared in the text of a link leading to another article. Third, as one of the aims of the content analysis was to examine the use of written words within the texts, results that simply displayed a video or image gallery were also not included. Fourth, articles in review sections or including star ratings were omitted because the aim of the study was to find out how XR had been framed in the news rather than how it had been evaluated in reviews. That is to say, a reader would expect to find subjective comments in a review but less so in an article presented as news. Fifth, sometimes articles were published a few days apart that were very similar to each other, appearing to be edited versions of the original. In these cases, the article with the most content was included in the final sample (i.e. the most words, pictures and so on). If the articles were exactly the same, only with different publication dates, the most recent article was included. Sixth, and finally, the *MailOnline* website publishes newswires as well

as their own articles. These articles were included in the final sample only if they had not been adapted and published again by a *MailOnline* journalist. After articles with those six features were omitted, the final sample consisted of 977 articles; 61 from *The Sun*, 248 from *The Guardian* and 668 from the *MailOnline* (see Appendix E for a list of all sampled articles).

In order to prepare the articles for analysis, all 977 texts were downloaded in two formats: PDF documents and text files. The PDFs captured the article's text, images, layout and links which were necessary to carry out the multimodal analysis. Every article was given a unique ID for organisation and reference purposes. These files were imported into an NVivo project for analysis. Additionally, the text files only included the text of the news article (headline, image captions and article body) in preparation to apply the frequency of terms analysis to the news articles.

While quantitative analysis was applied to all 977 news articles, it is important to note that qualitative framing analysis was only applied to a subset of these articles due to the labour intensive nature of this method (Van Gorp, 2007). The qualitative framing analysis was vital in comparing the framing in the news articles and the marketing. As mentioned previously, the sample of marketing materials consisted of the promotional content for five XR devices (Oculus Rift, Samsung Gear VR, Google Glass, Magic Leap and Microsoft HoloLens) which will be discussed further in the following section. To compare the news and the marketing, it was necessary that the news articles analysed qualitatively also focused on these XR devices or companies rather than another aspect of XR, such as specific applications. Therefore, a purposeful sampling technique was used to select the news articles that would be analysed qualitatively, based on the results from the first stage of content analysis (see above, Section 4.2).

To reiterate, the coding sheet recorded the main topic of all news articles. The data from this part of the coding sheet allowed relevant articles to be selected for qualitative analysis. There were two requirements for articles to be included in this sub-sample. First, the main topic of the article needed to be one of the following: Business, Company, Development, Product(s) > Commercial or XR Overview (see Appendix A.2 for detailed descriptions of each topic). Second, the article must mention at least one of the devices that were analysed during the marketing materials research (Oculus Rift, Samsung Gear VR, Google Glass, Magic Leap, Microsoft HoloLens). This resulted in a sub-

sample of 219 articles (22.42 percent of the overall sample) to which the qualitative framing analysis was applied; three from *The Sun*, 52 from *The Guardian* and 164 from the *MailOnline*. Focusing on these articles would allow the study to effectively compare the frames that appeared in the news articles with those in XR marketing.

4.3.5 Sampling of Marketing Materials

In order to consider the relationship between XR marketing and XR news, it was necessary to examine the marketing materials of the XR products that were featured in the news coverage. As mentioned in Section 4.2, the content analysis of the news articles informed which marketing materials were sampled. The content analysis revealed that there were 61 different commercial XR products mentioned across the news articles. However, it was not possible to analyse the marketing of every single device due to the time constraints of this study. Nor would it have been a valuable use of time since only nine of these devices were mentioned in more than 10 articles. Because of this, it was decided to focus on the VR, AR and MR products that were mentioned the most within the news articles. While the devices that were the most cited overall were all VR products, as this is a study of XR rather than VR specifically, the marketing of AR and MR products should also be included in this analysis. The only AR/MR products that were mentioned in at least 10 articles were Google Glass (AR), Microsoft HoloLens (MR) and Magic Leap (MR). Thus, the marketing of these devices was included in the sample. Additionally, the VR devices mentioned in the most articles were also included: Oculus Rift and Samsung Gear VR. This also allowed the study to examine a dedicated VR headset (Oculus Rift) in comparison to a smartphone-based headset (Samsung Gear VR). Therefore, the marketing materials of these five devices (Oculus Rift, Samsung Gear VR, Microsoft HoloLens, Google Glass and Magic Leap) were collected and analysed as follows.

An extensive search was carried out to collect digital marketing materials for each of these five devices. This included any content that was accessible/published during the sample period of the study (2012-2017). A range of content was collected: video adverts, press releases, historical versions of websites and social media posts. More detail will now be provided about each of these. Firstly, video adverts were found on the YouTube channels for each device/company as well as their websites and social media pages.

Secondly, press releases about the products were collected from the product/company websites, although these were not available for every device.

Thirdly, historical versions of the websites for these devices were accessed using the Wayback Machine, which has been an incredibly valuable tool in this part of the research. The Wayback Machine (WBM) is part of the Internet Archive project which aims to create “a digital library of Internet sites and other cultural artifacts in digital form”, including webpages, books, audio records, videos, images and software programmes (Internet Archive, n.d.). The WBM part of this “allows people to visit archived versions of Web sites” (Internet Archive, 2018: n.p.). Furthermore, Arora et al. (2016) found 2,593 articles, books or papers on Google Scholar that had used the WBM between 2000 and 2013. This increased from less than 50 in 2000 to almost 350 in 2013. The authors also found that these studies came from a wide range of areas, including information technology, archive or library, legal and social science. Certainly, it appears many other researchers have also found this to be a useful and valid research tool. In this case, using the WBM allowed the study to examine past versions of the websites for XR products and companies to ensure what was found was relevant to the sample period. Websites were examined over the duration of the sample period and captured for analysis whenever changes were made to the content of the page.

Finally, social media posts were collected from Twitter and Facebook for each device. This involved using the search engines of those platforms to find all posts from the pages for those devices/companies between 2012 and 2017. However, there were some limitations to this approach that should be mentioned. First, because the consumer version of Google Glass was discontinued, the Facebook and Twitter pages for this product have been deleted. This meant it was not possible to use the searches of the social media sites themselves to find past posts. In the case of Google Glass, the only way social media posts could be found was by using the WBM. This tool worked well to find the Facebook posts for Google Glass, but it did not have a comprehensive record of the Twitter page. Therefore, there are some gaps where data of Google Glass tweets could not be found.

A second limitation was that the Facebook search would only display up to approximately 45 posts in a given search and the time period of a search could not be reduced to less than one particular month. This was not a problem for most of the devices

as they did not have more than 45 posts per month. However, the Oculus page appeared to exceed 45 posts in some months because posts could not always be found that ranged from the start to the end of a certain month. To compensate for this, the WBM was again used to view past versions of this page during the missing periods. Still, some of these pages were absent from the WBM as well. Therefore, it is possible that there could be missing data for the Oculus Facebook page. Though it is important to keep this in mind, when analysing the Twitter page for Oculus (which was fully comprehensive for 2012 through 2017) it was found that the majority of the posts were very similar to those on Facebook, meaning it is likely that nothing significant was missed by not being able to view every individual Facebook post.

The final sample of marketing materials consisted of 171 items; 32 for Oculus Rift, 26 for Samsung Gear VR, 37 for Google Glass, 48 for Microsoft HoloLens and 28 for Magic Leap. Appendix F displays a table listing the details about every individual text. Each of these marketing materials were downloaded so that they could be analysed. The files were in a range of formats depending on which best suited the original format, including videos, PDFs and images. As with the news articles, every piece of marketing was assigned a unique ID so that it could easily be referred to in the analysis. Also similarly to the procedure for content analysis, all marketing materials were put into an NVivo project to be examined.

These sampling strategies allowed the current study to effectively address the research questions using a mixed methods approach. The next section provides more detail about the data collection and analysis.

4.4 Data Collection and Analysis

As a mixed methods study, the data collection processes were different for the quantitative and qualitative parts of the research. This section details how the data for each method were collected, starting with the quantitative content analysis and moving on to the qualitative framing analysis.

4.4.1 Quantitative Content Analysis of the News Articles

As noted in Section 4.2.1, a coding sheet and dictionary of terms were developed to ensure a replicable content analysis design. Data was collected using different techniques for these two tools, as will now be discussed. A manual approach was taken to apply the coding sheet and data was recorded using a combination of an Excel spreadsheet and an NVivo project. The spreadsheet recorded the basic information about the article, including the unique ID, publication, publication date, URL, article title, byline, the section the article appeared in, the number of multimedia elements (such as images) present and which XR devices were mentioned. Additionally, within NVivo, nodes were created that matched the coding sheet for the categories referring to multimedia attributions, external links, the sources referenced, the types of applications mentioned and information about how/where to buy XR products. This meant that, when reading through an article, the specific part of the text could be highlighted and the relevant node applied to it. When analysis of an article was completed, NVivo was used to create a report of the file which displayed all the different nodes applied to it and the number of times they appeared. This data was then recorded in the Excel spreadsheet for later analysis. The same process was carried out for all 977 news articles in the sample.

Although NVivo is typically used for qualitative research, particularly in the social sciences, it was a very valuable tool in this project. Carrying out the content analysis in this way was beneficial for two reasons. Firstly, it meant that there was less room for human error. For example, instead of counting the number of times a source was quoted (which could result in miscounting), applying the node to each individual quote meant that NVivo itself would calculate how many times it had appeared. Secondly, if, for any reason, it was necessary to refer back to the occurrence of a category variable, then it could be found with ease by looking at the specific node, rather than having to re-read through the whole article to identify where it appeared. Both of these factors demonstrate how using NVivo helped enhance the reliability and validity of the data and, thus, the findings presented in this thesis.

In addition to the coding sheet, the frequency of certain terms were also recorded. As mentioned in Section 4.2.1, the terms were selected based on previous literature and the qualitative framing analysis of the news and marketing materials. This resulted in a large list of 257 terms to search for within every news article. Manually, such

a task would have been extremely time consuming. Therefore, computer-aided text analysis (CATA) was used to ensure the study could cover this large list of terms efficiently. Neuendorf notes that CATA “[a]lmost always [...] means using software that analyses a set of text, counting key words, phrases, or other text-only markers” (2017: 39). Indeed, this was how CATA was appropriated in this study. As suggested by Neuendorf, a tool named Yoshikoder (Lowe, 2015) was used to collect the data regarding the frequency of terms. The list of terms was made into a dictionary on Yoshikoder which could then be applied to the text file versions of the news articles. This produced an Excel spreadsheet showing the occurrence of each search term per individual news article.

However, as Neuendorf highlights, “the lack of direct human contact in the CATA process often leaves us questioning the validity of the automatically applied measures” (2017: 39). Certainly, “[m]ost CATA programs do not include disambiguation procedures (e.g., differentiating among *well* the adverb, *well* the adjective, *well* the interjection, and *well* the noun), nor do they accommodate meaningful negation” (2017: 154, original emphasis). Therefore, to overcome this drawback, a further measure was taken. Another tool named #LancsBox (Brezina, McEnery and Wattam, 2015) was used in addition to Yoshikoder. #LancsBox has multiple features but the one that was of interest to this study was its ability to display keywords in context (KWIC). Searching a word or phrase would display any instances of its use in the context it was used, along with the name of the text file it appeared in. To avoid recording the use of terms in a context that may change their meaning, every term in the dictionary was also searched using the KWIC function on #LancsBox. If the context a word appeared in changed its meaning, its use did not count towards the total appearances of that term. More precisely, a word was omitted in the following cases: (1) if an evaluative word was negated (e.g. *not* good – “good” would be omitted); (2) if a word was being debated (e.g. “*if* VR is successful” – “successful” was omitted); (3) if a word was used in the name of a company, product or job role/position; (4) if a word was used to describe something not XR-related. This last point was important to ensure the figures represented the words that had been used in the framing of XR, rather than in relation to another issue. For example, in one article about how VR could change cinema, the term “advanced” is used in relation to other technology: “It’s now common for filmgoers to enjoy *advanced* digital 3D and 4K projections” (Page, 2015: n.p., emphasis added). Therefore, the use of advanced would not be recorded in this instance.

Furthermore, there was an additional benefit to using #LancsBox to search these terms. When KWIC searches are carried out in #LancsBox, the programme also displays the number of times the term appeared and how many articles it appeared in. This meant these figures could be compared to those generated by Yoshikoder to ensure both tools were counting the terms accurately. Whenever an inconsistency was found (which was rare), the text file itself was checked to make sure an accurate figure could be recorded. Again, this has improved the reliability of the resulting data.

Once the quantitative data had been collected, it was analysed using Excel. This involved examining the raw figures, calculating percentages and averages and creating charts and graphs to visually interpret the data. Comparisons were also made between the results for different news outlets, time periods and XR type (i.e. VR or AR/MR). While comparisons between news outlet and time period could easily be made using the data collected by the coding sheet, comparisons between XR type was not as straight forward. During data analysis, two subsets were created within the sample, with one consisting of articles focusing on VR and another consisting of those focusing on AR/MR. It was decided to group AR and MR together since the terms are sometimes used interchangeably (Carter and Egliston, 2020) and such a small portion of articles focused on MR that it would not allow any valuable comparisons to be made.

To create these subsets, several steps were taken. Firstly, the articles mentioning only VR products and not AR or MR products were identified as focusing on VR. However, since not all articles mentioned a device, the second step identified articles only mentioning "virtual reality" and not "augmented reality" or "mixed reality". These articles were then added to the VR subset with those only mentioning VR devices. Added together, this comprised the VR subset. The same process was carried out for the AR/MR subset, though including both AR and MR devices and terms. Of course, some articles mentioned both VR and AR/MR, meaning these subsets do not include every article in the overall sample. After this process had been completed, the VR subset consisted of 734 articles and the AR/MR subset consisted of 149 articles. Quantitative data could then be compared between news articles focusing on either VR or AR/MR.

4.4.2 Qualitative Framing Analysis of the News and Marketing

As noted in Section 4.2.2, an inductive approach was used to identify the frames appearing in XR news and marketing. Broadly, there were three steps to this. The first step was applied to the news and marketing samples separately. This involved highlighting themes (rather than frames) in the texts. An in-depth examination of each news article and marketing material was carried out. Throughout this process, whenever the texts highlighted a certain theme (whether in written text or visually), a node was created to represent that theme and the relevant part of the text was coded in NVivo, meaning it could be referenced again later. Once this had been carried out for all articles and marketing materials, this resulted in a list of 110 themes that appeared in the news articles and 68 that appeared in the marketing materials.

As these numbers are very large, the second step organised these specific themes into more easily manageable groups. This involved synthesising any related themes across both samples into broader themes. For instance, in the first stage, NVivo nodes had been created for the themes of "intuitive", "convenient", "unobtrusive" and "natural", which all broadly referred to the ease of using XR devices. Therefore, they were grouped together under the theme of "ease to use". The same process was carried out for all other themes. Of course, any themes that did not relate to a broader category remained separate.

Finally, the third step involved revisiting these themes to see which of them could be defined as frames. This thesis treats a frame as more than a theme in that framing involves salience. That is, it involves "making a piece of information more noticeable, meaningful, or memorable to audiences" (Entman, 1993: 53). Once the themes had been identified in the previous step, they were revisited to determine whether they could be considered frames based on this idea of salience. On the one hand, this meant examining how many times these themes appeared in the news and marketing, since themes that only appeared a handful of times would not be particularly salient. Using NVivo nodes was notably useful here since it clearly displays how many times a node (in this case, a node represented a theme) was used and references the specific texts it appeared in. Additionally, this also involved examining all instances of a theme for any framing devices that might have been used (see Section 4.1.1; Linström and Marais, 2012). If a theme was

made particularly salient by repetition and through such framing devices, it was considered a frame.

This process resulted in identifying a total of 15 frames. Eight of these frames appeared in both the news and marketing samples (Immersive; Transcendent; Different and Unique; Revolutionary and Transformative; Advanced and High-Quality; Social; Easy to Use; and Comfortable), while four additional frames were present in the news sample (Important; Successful; Affordable; and Much-Anticipated) and three further frames were only salient in the promotional materials (Personal; Boundless; and Magical). In other words, 12 frames were used in XR news coverage, with the majority of these (eight) being the same as the marketing. These 12 frames used to represent XR can be organised into four broader categories (see Table 4.4). Each of these frames will be discussed in detail across the following chapters. However, the three frames only present in the marketing materials will not be explored in detail within the data analysis chapters since the main focus of this study is on news discourse.

Table 4.4: Four Categories of Frames Appearing in XR Discourse			
(1) Frames conceptualising XR	(2) Newness frames	(3) User Experience frames	(4) Evaluative frames
Immersive	Different and Unique	Social	Important
Transcendent	Revolutionary and Transformative	Easy to Use	Successful
	Advanced and High-Quality	Comfortable	Affordable
			Much-Anticipated

4.5 Final Remarks

This chapter has defined framing theory as the main theoretical approach to the study and has detailed the research design of the project. The next five chapters present the findings from this research. Chapter 5 focuses on the quantitative data resulting from the application of content analysis. It addresses RQ1 (What are the key patterns of XR news coverage and how does this contribute to the framing of the technology?) and provides some insight into RQ3 (To what extent does news coverage of XR promote the diffusion of the technology and what does this say about journalistic principles in a commercial

context?). Following this, Chapters 6-9 discuss both quantitative and qualitative data to analyse the specific frames that exist in XR news coverage. These chapters are particularly relevant to answering RQ2 (What are the key frames through which the news represents XR and how do these compare to the frames present in XR marketing materials?), but also provide additional insight into RQ3. As their titles suggest, Chapters 6-9 are each based on one of the four frame categories presented in Table 4.4. These chapters are structured by frame, with each section considering the framing devices that have been used to construct them.

Chapter 5: Patterns in Extended Reality News

Coverage

This chapter analyses quantitative data uncovered through the application of a coding sheet to the news sample. The chapter begins by exploring the contextual details of the news reports. This includes the volume of news articles, bylines and how articles were categorised on the news sites. Next, results regarding the content of the articles are discussed. This section investigates which XR devices were included, the main topics of the articles, which XR application types were mentioned, the types of sources that have been used and practices that could indicate native advertising. Although the general methodological information was introduced in Chapter 4, some of the sections in this chapter make additional methodological clarifications to support the comprehension of certain data. These findings are discussed primarily using framing theory, supported by diffusion of innovations theory. Specifically, framing theory allows the thesis to consider what this quantitative data says about the way XR has been framed (RQ1). Within this, the frame-building literature discussed in Chapter 3 supports the evaluation of whether and how four factors of the hierarchy of influences model (social systems, social institutions, media organisations and routine practices; Shoemaker and Reese, 2014) have affected the framing of XR. Additionally, diffusion of innovations theory (Rogers, 2003) helps to analyse the significance of the results regarding whether the choices made by the news outlets in this study could promote the diffusion of XR (RQ3).

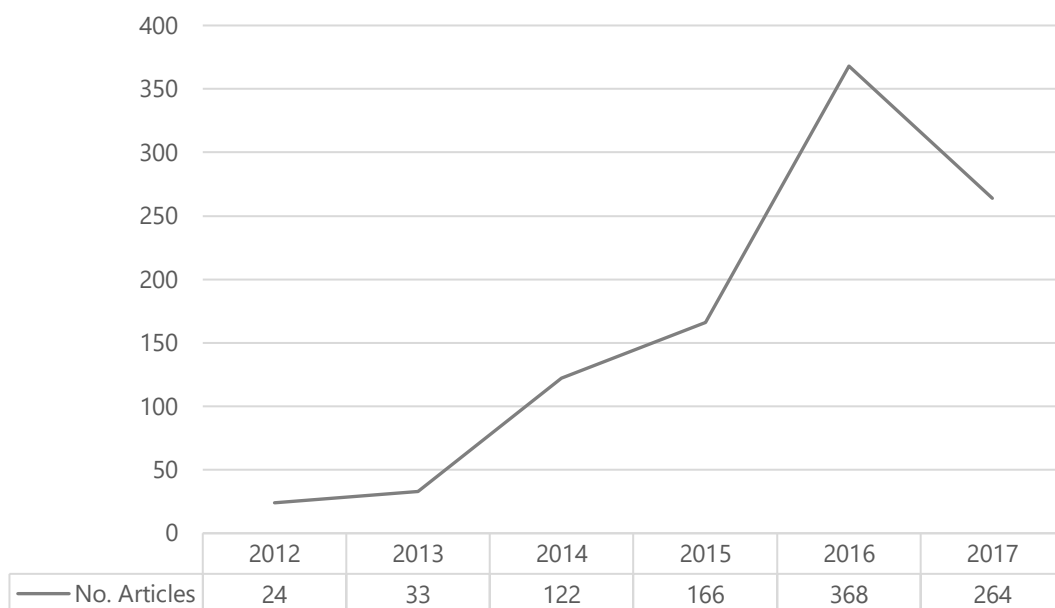
5.1 Context of Extended Reality News Coverage

To begin, the current section analyses the contextual information regarding XR news coverage. This starts with an examination of the volume of news articles over time and per news outlet. Following this, data regarding article bylines is discussed while also making comparisons between news outlets. The last part of this segment analyses the placement and categorisation of articles on the three news sites. Throughout, it is considered what each of these findings mean in terms of the framing of XR in the news.

5.1.1 Volume of Articles

Investigating the number of articles published about XR shows how much attention the topic was given across the sample period (2012-2017). As detailed in Section 4.3, the sample criteria of this study uncovered 977 news articles about XR, spanning *The Sun*, *The Guardian* and the *MailOnline*. However, the number of articles published about XR each year varied significantly (see Figure 5.1). Section 4.3.1 mentioned that 2012 was chosen as the first year of the sample period because this was the year the first products of the second wave of XR (Google Glass and Oculus Rift) were publicly announced. Despite this, only 24 news articles were published about XR in 2012, increasing very slightly to 33 in 2013. Therefore, those initial announcements of Google Glass and Oculus Rift do not appear to have garnered much attention from the news outlets in this sample. On the other hand, this figure increased substantially in 2014 when 122 articles were found using the search criteria. In 2014, a major event for the XR industry was Facebook owner Mark Zuckerberg acquiring the independent VR company Oculus for \$2.3 billion (Steinicke, 2016). The increase of news articles in this year suggests that Facebook's involvement in the XR industry made the technology appear more newsworthy to journalists, thus resulting in increased coverage. This indicates that the power elite news value (Harcup and O'Neill, 2017) has impacted the amount of attention the news gave to XR. Within the frame-building process, Shoemaker and Reese (2014) consider news

Figure 5.1: Number of Articles per Year



values as routine practices, meaning that this factor has affected the framing of XR, at least at the basic level of attention given to the topic.

While 2014 marked the first year XR was given substantial attention by the news, the number of articles written about the technology peaked in 2016. In 2016, 368 articles were published across the news outlets in this study; 2.2 times more than the previous year. Dubbed by many as “the year of virtual reality” (Fuchs et al., 2017; Steinicke, 2016), 2016 saw the release of Oculus Rift as well as other dedicated VR products, including HTC Vive and PlayStation VR. This means that 2016 would have been the year that many early adopters made their decision of whether to purchase a VR product. As noted in Section 2.5, the innovation-decision process has five main stages “(1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation” (Rogers, 2003: 20). Entman argues that when many reports are published about a topic, they “may penetrate the consciousness of a mass public” (Entman, 1991: 9). Therefore, the fact that a large number of news articles were published about XR in 2016 could have increased the awareness of XR, thus supporting the first stage of the innovation-decision process (knowledge-building). In other words, through paying particular attention to XR news in this year, these news outlets have supported its adoption by increasing the potential consumer base for the technology.

As well as examining changes over time, further insight can be gained by considering how many articles were published by each news outlet. There were some notable differences regarding the specific publications in this sample. By far, the *MailOnline* published the most news articles about XR, with 668 articles making up 68.37 percent of the total sample (see Table 5.1). *The Guardian*, though much less than the *MailOnline*, still published a substantial number of articles that met the sample criteria (248). The volume of articles in both the *MailOnline* and *The Guardian* followed the same trend as displayed in Figure 5.1 in the sense that they each had significant increases in 2014 and peaked in 2016. Alternatively, *The Sun* paid very little attention to XR at all, with just 61 articles appearing on their website that met the sample criteria. Moreover, *The Sun* did not publish any articles about XR that met the sample criteria until 2015 when just one article was found. It was only in 2016 that this news outlet started paying more attention to XR, though even this figure was low compared to the other news outlets (24). On the other hand, *The Sun* was the only news outlet to publish more articles about

XR in 2017 than 2016 which suggests this publication judged the newsworthiness of XR differently to the *MailOnline* and *The Guardian*.

There could be a number of reasons for this result. As mentioned in Section 3.3.2, it was in 2016 that *The Sun's* owner, News Corp, began investing in XR companies. Since the owners of news outlets can affect how they present topics in news articles (Witschge, Fenton and Freedman, 2010), this could have prompted *The Sun* to start reporting on XR in that year. However, *The Sun* still did not publish a high volume of articles on its website about XR in any year of the study, meaning this is likely not the cause. Alternatively, it may be that XR is simply not high on *The Sun's* agenda due to the typical focus of tabloid news outlets on sensationalist and celebrity news (Zelizer and Allan, 2010) rather than subjects such as technology and science. Nevertheless, Entman (1991) argues that the amount of attention news outlets give to a topic indicates how much importance is assigned to it. Thus, it appears that *The Guardian* and the *MailOnline* have attributed much more importance to XR than *The Sun* has. This indicates that the media organisation factor (Shoemaker and Reese, 2014) has had an impact on the frame-building process of XR news as the news outlets paid varying attention to the technology.

Table 5.1: Number of News Articles per News Outlet per Year							
News Outlet / Year	2012	2013	2014	2015	2016	2017	TOTAL
<i>The Sun</i>	0	0	0	1	24	36	61
<i>The Guardian</i>	6	10	42	53	99	38	248
<i>MailOnline</i>	18	23	80	112	245	190	668

5.1.2 Article Bylines

While the amount of attention given to a topic can insinuate importance (Entman, 1991), who writes news articles can also impact how a topic is framed. Whereas journalists are expected to abide by journalistic norms – such as producing objective reporting (Bednarek and Caple, 2012) – the same cannot be said for all writers of articles published by news outlets. Therefore, it was important for this study to examine the bylines of the sampled news articles. These results reveal that the vast majority of articles (80.45 percent) were written by journalists (see Table 5.2). Additionally, 15.05 percent of articles were written by news agencies. However, only one article in *The Sun* and two in *The*

Guardian had agency bylines. Instead, the *MailOnline* was the only publication to include a large portion of XR articles written solely by news agencies (21.56 percent). While it is possible that *The Sun* and *The Guardian* journalists integrated agency copy into their reports without specifying this (as was found by Lewis, Williams and Franklin's [2008] study discussed in Section 3.6.2), what is known for certain is that the *MailOnline* has been particularly reliant on agency material when reporting on XR.

This shows that the routine practice (Shoemaker and Reese, 2014) of the *MailOnline* to publish unedited agency copy has played a role in the frame-building process, allowing these agencies to have substantial opportunities to frame XR through this outlet. It also indicates the practice of "churnalism" (Davies, 2009; see Section 3.5.1) exists in the *MailOnline*, suggesting that time shortages due to commercial pressures have led to the overreliance on pre-packaged content. Thus, the capitalist social system (Shoemaker and Reese, 2014) that these news organisations operate within has impacted the frame-building process by resulting in power being afforded to news agencies over the discourses defining XR. Since this agency material is sent to many other news outlets that may either adapt or publish the copy verbatim (Lewis et al., 2008), this could result in a lack of diversity in viewpoints and topics in XR news.

Table 5.2: Article Bylines per News Outlet

Byline	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Journalist(s)	60	98.36	223	89.92	503	75.30	786	80.45
Agency	1	1.64	2	0.81	144	21.56	147	15.05
Agency & Journalist(s)	0	0.00	2	0.81	14	2.10	16	1.64
XR Application Creator	0	0.00	5	2.02	1	0.15	6	0.61
Specialist	0	0.00	12	4.84	2	0.30	14	1.43
No Byline	0	0.00	4	1.61	4	0.60	8	0.82
TOTAL	61	100.00	248	100.00	668	100.00	977	100.00

In addition to articles written by journalists and news agencies, this analysis also uncovered that some news articles were actually written by creators of XR applications. Overall, six such articles appeared in the news outlets. The majority of these (five) appeared in *The Guardian*, while the *MailOnline* published one such article. *The Sun* did

not publish any articles written by application creators. Although these numbers are very small in comparison with articles written by journalists or agencies, the fact that any articles at all were composed by application creators is significant for two main reasons. Firstly, creators of XR content are clearly invested in the success of XR, as it affects the success of their own applications. They would therefore advocate the use of positive frames in XR news. Regarding news sources, Coleman and Ross state that “access to the media is access to persuasive influence” (2010: 49). In a similar way, allowing application creators to publish news articles on these outlets provides them with a platform to share these favourable views with the public.

Secondly, the appearance of articles written by application creators suggests that these news outlets (specifically *The Guardian* and, to some extent, the *MailOnline*) have connections with XR companies, since they must be in contact with individuals who make XR content. On the topic of health reporting, Lipworth et al. note that “relationships between companies and journalists may impact negatively upon journalistic principles such as integrity and fairness” (2015: 252). Such effects could extend to other areas of journalism, such as technology news. To maintain such connections, journalists writing for these publications may also avoid writing critically about XR. This provides insight into how the social institutions factor (Shoemaker and Reese, 2014) could impact the frame-building of XR regarding the relationships between news organisations and other stakeholders, particularly frame advocates. According to Moy, Tewksbury and Rinke (2016), frame advocates are one of the most powerful forces in frame production. This finding is the first indication that XR companies as frame advocates have played a role in the framing of XR in the news.

5.1.3 Article Placement and Categorisation

Part of framing involves not only what is said about a topic but also how and where the article appears, which can set the tone for what the audience is reading (see Section 4.2.1; Tankard, 2001). With this in mind, examining how news articles were categorised helps to uncover the context they were presented in. To do this, the coding sheet recorded the article type as specified by the publisher (e.g. news or feature), the section of the website an article was published in (e.g. technology, science, entertainment) and the more specific

categories assigned to an article (e.g. virtual reality, Facebook). This section discusses these results.

Firstly, regarding article types, the majority of articles were presented as news (86.46 percent), while the remaining were labelled with other variables such as feature and opinion (see Table 5.3). The journalistic norm of labelling articles that are not purely news “reinforce[s] the legitimacy and authority of the other news stories as being factual” (Pan and Kosicki, 1993: 62). Thus, for the majority of articles in this sample to be presented as news means the specific frames applied to XR will appear to be based on factual information rather than opinions that could be disputed. Certainly, as Pan and Kosicki expand upon this point: “the truthful value of the frames of news discourse is enhanced as is the likelihood of these frames being accepted” (1993: 62). Therefore, this type of labelling could make the frames applied to XR in these news articles more persuasive.

However, it is important to note that there were some substantial differences between the news outlets regarding this labelling. All articles in *The Sun* were presented as news and, similarly, all but two *MailOnline* articles were portrayed as news. Considering Pan and Kosicki’s argument, this could mean that readers of these publications would perceive this content to be based on factual information rather than opinions. On the other hand, less than half of *The Guardian* articles were labelled as news (47.58 percent). Instead, a substantial portion of *The Guardian* articles were labelled as features (32.66 percent) and blogs (12.9 percent). As opposed to the factual connotation of news, the feature label insinuates something slightly different to the reader. For instance, in his guidebook for journalists writing feature articles, Hennessy states that “a feature, like a news story, aims to inform, but it may also narrate, describe, explain, persuade or entertain, and sometimes all five” (2013: 17). Additionally, labelling a news item as a blog creates the expectation that it will not adhere to typical journalistic standards of impartiality, since blogs are considered to be more opinionated (Borah, 2018; Mackay and Lowrey, 2011). While it may simply be the case that *The Sun* and *MailOnline* do not differentiate between article types as rigorously as *The Guardian* does, the important point here is that this labelling insinuates something to the audience regarding the style and quality of the article they will be reading. This means that readers may be less

accepting of frames appearing in articles with the labels of blog and feature since they do not carry the legitimising effect of articles labelled as news.

Table 5.3: Number of Articles of Each Type per News Outlet

Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
News	61	100.00	118	47.58	666	99.70	845	86.49
Feature	0	0.00	81	32.66	0	0.00	81	8.29
Blog	0	0.00	32	12.90	0	0.00	32	3.28
Event Listing	0	0.00	1	0.40	0	0.00	1	0.10
Interview	0	0.00	4	1.61	2	0.30	6	0.61
Opinion/Comment	0	0.00	12	4.84	0	0.00	12	1.23

In addition to article types, the section of a news website an article appeared in was also recorded. The news outlets operated differently in terms of how many sections they had on their websites, as well as any sub-sections within those. Because of this, for data analysis, all sub-sections were combined into a string. For instance, an article from *The Sun* might appear under the main heading of “News” with a sub-heading of “World News”. During data analysis, this was combined into a string as follows: “News > World News”. Similarly, some articles in *The Sun* had a third-tier section, with the main heading of “News”, a sub-heading of “Tech” and another sub-heading under this as “All News”. This was combined into the string “News > Tech > All News”. This process was carried out for every news article so that the individual strings could be quantified. As each news outlet used different unique strings, the most common strings for each news outlet will now be discussed.

Firstly, the most common section XR articles appeared within *The Sun* and *The Guardian* websites were very similar. In *The Guardian*, 49.6 percent of articles appeared in the “News > Tech” section. Likewise, XR articles in *The Sun* were most frequently placed in the section “News > Tech > All News” (19.67 percent). However, 19.67 percent is by no means a majority of *The Sun* articles, showing that the sections XR articles appeared in on this website were more dispersed across different sections than they were in *The Guardian*. On the other hand, the majority of *MailOnline* articles were placed in the “Science” section of the website (60.03 percent). Thus, whereas both *The Sun* and *The Guardian* have included XR news in technology sections, the *MailOnline* has published

these articles in its science section. At the time of sample collection, the *MailOnline* did not have a specific technology section on its website, which explains the difference between how the publications have classified XR news. However, this labelling is still significant since the term "science" carries with it more serious connotations than "technology", particularly when this is shortened to the simpler "tech". Thus, for XR articles to be classified as science news in the *MailOnline* affords the topic more importance than it is given by *The Sun* and *The Guardian*. This coincides with the above finding that the *MailOnline* published more articles about XR than the other two news outlets, which, as Entman (1991) argues, can also contribute to emphasising importance.

While XR articles appeared most often in science and technology sections in all news outlets, it is also important to note that the total number of sections these articles were placed in was quite varied. In *The Guardian*, XR articles appeared in 38 unique sections. Additionally, XR articles in the *MailOnline* appeared in 21 unique sections. Even in *The Sun* (which published a much lower volume of articles about XR than the other news outlets), articles were spread out over 19 unique sections. Across all news outlets, these sections included technology, sport, education, entertainment, sex, business, health, environment, motoring, politics and many more (see Appendix G for all sections). The fact that these news articles have appeared in such a wide variety of sections infers two main points about the framing of XR. Firstly, it presents XR as a technology that has wide-reaching implications, which again relates to framing it as important. Secondly, dispersing XR articles across a range of sections means that the articles may reach a wider audience than those only interested in technology. This potentially increases public awareness of XR in a larger area of the audience, which supports the first stage of the innovation-decision process: knowledge (Rogers, 2003). By presenting XR articles in a wide range of sections, a variety of readers with different interests could see them and gain knowledge about the technology. The news outlets thus support the first stage of the innovation-decision process by widening the reach of such knowledge into areas beyond science and technology.

A similar finding was uncovered regarding the categories assigned to XR articles. Instead of sections, which concerns the location on the website the article was placed, the category refers to a more specific subject that the article featured. *The Sun* and *The Guardian* use these categories as another way of grouping the articles and also provide

hyperlinks for users to view more articles within that same category. The *MailOnline* did not use categories on its website at the time of data collection so is not included in this part of the analysis. Multiple categories were typically used for each article in *The Sun* and *The Guardian*. This ranged from very specific titles such as companies (e.g. Facebook, Samsung) or people (e.g. Mark Zuckerberg) to more general areas such as culture, UK, gaming, philosophy, wildlife, astronomy and so on. An even wider range of categories were assigned to the news articles than the sections they appeared in (see Appendix H). In *The Sun*, although only 50 articles had categories assigned to them, XR articles were associated with 51 different categories overall. Additionally, 387 different categories were assigned to XR articles in *The Guardian*, even more than the number of articles it published on XR (248). These figures, again, highlight that XR has been associated with a wide range of topics. As with the variety of sections articles appeared in, associating XR with such a diverse array of categories increases the reach of the articles by attracting the attention of audiences with different interests. In the same way, this contributes to building knowledge about XR; the first stage of the innovation-decision process (Rogers, 2003), again showing that these news outlets support the early stages of XR diffusion.

Although a large number of categories were applied to XR articles, one category was used much more than any other in both *The Sun* and *The Guardian*. The category “virtual reality” was applied to 42.62 percent of articles in *The Sun* and 72.58 percent of articles in *The Guardian*. For *The Sun*, the second most used category was “porn”, but even this was only applied to 9.84 percent of articles; thus demonstrating the prominence of the “virtual reality” category. Similarly, the second most used category in *The Guardian* (“games”) was applied to 27.02 percent of articles; again, much less than “virtual reality”. As VR comes under the umbrella of XR and VR is often used to refer to XR in general, this is not particularly surprising. What *is* significant is that these outlets even have a category labelled “virtual reality” at all. Dedicating a category on their website to news of this type suggests that *The Sun* and *The Guardian* consider XR to be established enough to warrant its own category, further framing it as important. Therefore, the routine practice (Shoemaker and Reese, 2014) for these two news outlets to assign categories to news articles has contributed to framing XR in this way.

In sum, the way XR news has been classified has: (1) worked to legitimise the frames within those articles (i.e. by portraying it as “news”); (2) highlighted XR’s

importance through including it in science sections in the *MailOnline* and by having dedicated “virtual reality” categories in *The Sun* and *The Guardian*; and (3) increased the reach of the articles by including them in a wide variety of sections and applying an even wider array of categories to them. While points one and two provide useful insight into how the patterns of news coverage can affect the framing of XR (RQ1), point three indicates that the news articles promote the diffusion of XR (RQ3) by supporting the knowledge stage of the innovation-decision process.

5.2 Content of Extended Reality News Coverage

Thus far, this chapter has examined data relating to the *context* of news articles (how many have been published, who they have been written by and how they have been classified). The remainder of this chapter discusses the quantitative results relating to the *content* of XR news articles. Firstly, data regarding which XR devices are mentioned is explored. Following this, the chapter examines the main topics of the news articles. In addition to topics, the next segment provides further insight by considering which types of XR applications were mentioned in the articles. Then, the chapter analyses the types of sources used in the articles for quotations, paraphrased statements and multimedia content (e.g. images and videos). Lastly, data that could indicate whether native advertising is present within the news articles is investigated. This involves an examination of retailer hyperlinks used as well as whether the articles included information about how or where to buy XR products. Throughout, every section looks at the data as a whole, while also considering any variations between news outlets, over time and by the type of XR the articles focus on (VR or AR/MR).

5.2.1 Types of Extended Reality Devices

As noted in Section 1.1, XR is an umbrella term for virtual, augmented and mixed reality technologies. To understand how much importance the news outlets attributed to each type, as well as specific products, it was necessary to examine how often they were referenced. To achieve this, the coding sheet recorded whenever a commercial XR device was mentioned and categorised it as VR, AR or MR. The results from this part of the coding sheet will now be explored.

Overall, it was found that 61 different XR headsets were mentioned, with 41 of these being VR devices, 17 AR and three MR. Additionally, 63.37 percent of articles cited VR products, whereas 14.23 percent mentioned AR devices and 11.16 percent named MR products. These initial figures suggest that the news was much more likely to report on VR devices than AR or MR. Moreover, although 61 different devices were mentioned at least once, only nine of these appeared in more than 10 articles (see Table 5.5). Out of these nine, six were VR headsets, one was an AR device and two were MR headsets. This further emphasises the focus on VR as opposed to AR or MR. This was fairly consistent per news outlet (see Table 5.4), showing that the media organisation (Shoemaker and Reese, 2014) reporting on XR has not had a significant impact on the type of XR given the most attention.

	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
XR Device Type	No.	Percent	No.	Percent	No.	Percent	No.	Percent
VR	37	60.66	170	68.55	412	61.68	619	63.36
AR	3	4.92	38	15.32	98	14.67	139	14.23
MR	3	4.92	25	10.08	81	12.13	109	11.16

During the sample period of this study, several VR products were released for general consumer use, whereas AR and MR products were mostly targeted towards developers of these platforms. Since the news outlets in the sample write for the general public, the choice to focus on VR displays the relevance news value which suggests that “information is preferred about events or actions that are relevant for the reader” (van Dijk, 1988: 122; see also Harcup and O’Neill, 2017). Products that are targeted towards the same audience as the news outlet are arguably of higher relevance to readers than products that are targeted towards a more specialised audience. This could explain the focus on VR as opposed to AR or MR. As mentioned above, news values relate to the routine practices factor of the frame-building process (Shoemaker and Reese, 2014), thus highlighting another instance of this factor impacting the framing of XR.

In addition to VR, AR and MR generally, further insight can be gleaned by examining which specific devices were mentioned the most. Oculus Rift was cited, by far, in the largest portion of articles overall (49.64 percent). Every news outlet mentioned this

product the most (see Table 5.5), demonstrating that the headset that is thought of as being the one to start the new XR trend (Steinicke, 2016) was a major focus for all publications. Therefore, it appears that the news outlets have highlighted the importance of Oculus Rift in particular (and more so) than any other XR product. Furthermore, every device that was mentioned in more than 10 articles was created by, or had connections with, a large and influential company (Facebook, Samsung, HTC, Sony, Google and Microsoft). Therefore, as well as the relevance news value, the power elite news value (Harcup and O'Neill, 2017) also appears to have played a role in which devices were framed as important by the news outlets. This indicates that routine practices (Shoemaker and Reese, 2014) in terms of news values have, again, affected the frame-building process in XR news.

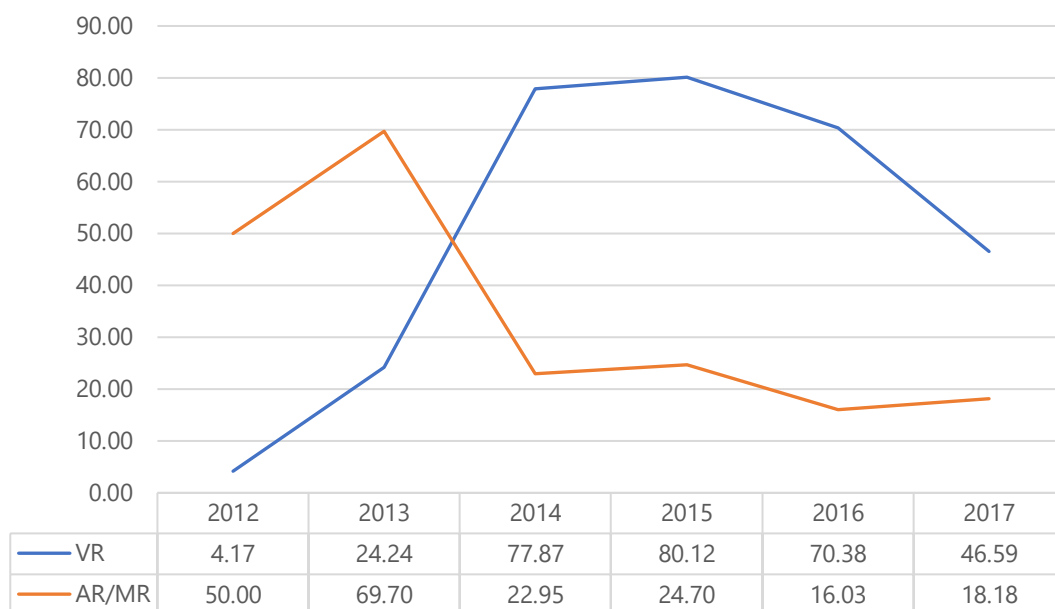
Table 5.5: Number of Articles Mentioning Top Devices per News Outlet

Device (Type)	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Oculus Rift (VR)	17	42.50	147	75.77	321	64.46	485	49.64
Samsung Gear VR (VR)	14	35.00	55	28.35	143	28.71	212	21.70
HTC Vive (VR)	9	22.50	57	29.38	133	26.71	199	20.37
PlayStation VR (VR)	9	22.50	62	31.96	123	24.70	194	19.86
Google Cardboard (VR)	5	12.50	50	25.77	85	17.07	140	14.33
Google Glass (AR)	3	7.50	36	18.56	88	17.67	127	13.00
Microsoft HoloLens (MR)	3	7.50	20	10.31	70	14.06	93	9.52
Magic Leap (MR)	0	0.00	12	6.19	28	5.62	40	4.09
Google Daydream View (VR)	2	5.00	8	4.12	28	5.62	38	3.89

However, it is important to note that not every year of the sample focused on VR. Figure 5.2 displays the percentage of articles per year mentioning VR devices in comparison to AR/MR devices (grouped together due to their similarities and because so few MR devices were mentioned). In the first year of the sample period (2012), AR/MR products were mentioned in 50 percent of articles, while VR devices only appeared in 4.17 percent of articles. Additionally, in 2013, 69.7 percent of articles mentioned AR/MR devices, in comparison with the 24.24 percent that included VR products. Thus, VR

products have not been the focus in every year of the sample. Examining this data more closely shows that the focus on AR/MR in the first two years was led by the Google Glass device. To expand, in 2012, 12 articles mentioned devices and only two different devices were cited. Google Glass appeared in every one of these articles, whereas the other product (Sony HMZ-T2) only appeared in one article. Similarly, in 2013, Google Glass was mentioned in 66.67 percent of articles and the second most cited device (Oculus Rift) appeared in 21.21 percent. As discussed in Section 5.1.1, the volume of coverage on a topic can contribute to framing it as important (Entman, 1991). Therefore, in the first two years of the sample, AR/MR (and in particular, Google Glass) was assigned more importance than VR by the news outlets.

Figure 5.2: Percentage of Articles per Year Mentioning Each Device Type



Still, it should be remembered that the number of news articles published in these years was relatively low (see Section 5.1.1), meaning that this importance was not highlighted strongly. In 2014, when Facebook acquired Oculus and the news outlets began publishing more articles on XR in general, VR products became the focus of the coverage. From then onward, VR products were mentioned significantly more than AR/MR devices every year (see Figure 5.2). This is further evidence to suggest that Facebook’s involvement with XR had a substantial impact on the focus of the coverage, as was indicated by the sharp increase in number of articles published in 2014.

5.2.2 Article Topics

While the sections XR articles appeared in and the categories that were applied to them (see Section 5.1.3) give some indication of the topics covered by these news reports, this was more reliably identified by recording the main focus of each article. Seventeen different topics were used as coding variables in this section, including an Other option for articles that did not fit into any of the specified topics. Additionally, three of these topics were further broken down into sub-topics (see Appendix A.2 for all definitions). Firstly, Application(s) was split into XR Element and XR Focus. Secondly, the Products topic was split into four types: Commercial Product(s), Industry Product(s), Conceptual Product(s) and Rumoured Product(s). Lastly, the Demo topic was split into three sections depending who was experiencing the demo: Celebrity, Journalist and General Public. Identifying the main topic of each article allowed the study to uncover which aspects of XR were focused on when framing the technology.

The data obtained from this analysis reveals that the most used topic overall was Application(s), which was found to be the main focus of 49.33 percent of articles. This was consistent for every news outlet as all three wrote about this topic the most (see Table 5.6). In other words, the news outlets paid the most attention to XR software. Second to this, Product(s) were the main topic of 24.77 percent of articles, showing that XR hardware was also the focus of a significant number of reports. Again, this was consistent for all news outlets. Aside from Application(s) and Product(s), the third most common topic was Demo, though this was only the main focus of 5.83 percent of articles. This makes clear just how much the Application(s) and Product(s) topics dominated the coverage. Indeed, this is corroborated by examining changes over time. Application(s) and Product(s) topics were the most common every year, although there was some fluctuation in which was the most used out of the two (see Appendix I.1). Additionally, there were no substantial differences between the topics of VR articles in comparison to AR/MR articles (see Appendix J.1). Both subsets included the Application(s) topic the most (52.32 percent of VR articles and 29.53 percent of AR/MR articles) and Product(s) topic the second most (17.03 percent of VR articles and 46.31 percent of AR/MR articles). Therefore, the vast majority of articles focused on describing the features and uses of XR regardless of news outlet, year or XR type, with a particular emphasis on software.

Topic	The Sun		The Guardian		MailOnline		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Application(s)	35	57.38	149	60.08	298	44.61	482	49.33
XR Focus	33	54.10	144	58.06	273	40.87	450	46.06
With XR Element	2	3.28	5	2.02	25	3.74	32	3.28
Product(s)	10	16.39	32	12.90	200	29.94	242	24.77
Commercial Product(s)	5	8.20	29	11.69	135	20.21	169	17.30
Rumoured Product(s)	3	4.92	1	0.40	40	5.99	44	4.50
Industry Product(s)	2	3.28	2	0.81	20	2.99	24	2.46
Conceptual Product(s)	0	0.00	0	0.00	5	0.75	5	0.51
Demo	6	9.84	4	1.61	47	7.04	57	5.83
General Public	2	3.28	1	0.40	35	5.24	38	3.89
Journalist	1	1.64	3	1.21	6	0.90	10	1.02
Celebrity	3	4.92	0	0.00	6	0.90	9	0.92
Business	0	0.00	13	5.24	25	3.74	38	3.89
Concerns	2	3.28	10	4.03	17	2.54	29	2.97
Peripherals/Accessories	2	3.28	5	2.02	20	2.99	27	2.76
XR Overview	0	0.00	6	2.42	21	3.14	27	2.76
Future	2	3.28	4	1.61	10	1.50	16	1.64
Figurehead	2	3.28	7	2.82	4	0.60	13	1.33
Legal Disputes	0	0.00	4	1.61	5	0.75	9	0.92
Development	0	0.00	5	2.02	3	0.45	8	0.82
Company	0	0.00	2	0.81	3	0.45	5	0.51
History	0	0.00	2	0.81	2	0.30	4	0.41
Crime	0	0.00	0	0.00	3	0.45	3	0.31
Fiction	0	0.00	0	0.00	3	0.45	3	0.31
Regulation	1	1.64	0	0.00	1	0.15	2	0.20
Other	1	1.64	5	2.02	6	0.90	12	1.23

Rogers argues that, during the first stage of the innovation-decision process (knowledge building), “an individual mainly seeks software information” about an innovation (2003: 21). Therefore, this focus on the applications (i.e. software) of XR could support the diffusion of the technology by providing potential adopters with the information most relevant to them in these early stages. Additionally, focusing on

products and applications increases the observability of XR as an innovation. According to Rogers, the observability attribute “is the degree to which the results of an innovation are visible to others” (2003: 16). Publishing news articles specifically focusing on these products and applications does just that. Rogers continues: “The easier it is for individuals to see the results of an innovation, the more likely they are to adopt” (2003: 16). With this in mind, these findings suggest that focusing on Application(s) and Product(s) topics could support the diffusion of XR.

Lastly, these results suggest that the frames applied to XR in the news will mostly be related to the hardware and software of the technology, rather than other areas such as specific companies or concerns about XR. Moral panic style coverage is typically characterised by exaggerated concerns or fears as well as calls for regulation (Cohen, 2002; Marwick, 2008; see Section 2.9). Therefore, it is significant that only 29 articles (2.97 percent) focused on concerns surrounding XR and Regulation was the least common topic (aside from Other), being the focus of just two articles. The low attention paid to these two topics is the first indication that the news outlets have not attempted to create a moral panic about XR. To the other extreme, the lack of articles about concerns and regulation suggests that the news may not be paying *enough* attention to the potential risks and negative implications of this technology (as discussed in Section 2.3) that the public should be aware of when deciding whether to adopt XR.

In any case, these results show that news representations of XR may differ from those of other technologies that have been found to be the subject of a moral panic, such as radio, TV (Markey and Ferguson, 2017), mobile phones (Goggin, 2006) and videogames (Rogers, 2013). Instead, the focus on applications coincides with the findings presented by Dimopoulos and Koulaidis (2002) about science and technology in the Greek press, Cogan’s (2005) study of the PC in the US and Kelly’s (2009) analysis of microcomputers in US magazines, which all uncovered a focus on how these technologies could be used (see Section 2.7). Moreover, the fact that the vast majority of articles pay the most attention to XR applications and products suggests that the content of these articles may have more in common with lifestyle journalism than traditional news. To expand, Hanusch defines lifestyle journalism as providing audiences with information “about goods and services they can use in their daily lives” (2012: 2). This is what articles about products and applications do. Thus, despite articles most often being

presented as news and appearing in science and technology sections, this focus on commercial products suggests that many XR articles may be in the style of lifestyle journalism that treats audiences as consumers.

5.2.3 Applications

Considering the prominence of the Application(s) topic, the data referring to the type of applications that were mentioned becomes even more important in uncovering how XR was framed. Section 1.1 noted that there were many varying uses for XR. The coding sheet recorded how often 41 different application types were mentioned, ranging from uses such as videogames and film to education and health care (see Appendix A.5 for all definitions). This segment will now discuss these results.

Firstly, it is important to note that, in addition to applications being the focus of 49.33 percent of articles (see previous section), an even larger portion of articles mentioned at least one use of XR. In fact, applications were mentioned in 93.96 percent of articles overall – the vast majority of the sample. This shows that it was extremely common for news articles to note the uses of XR, which could again increase the perceived observability (Rogers, 2003) of the technology. Furthermore, as uses were mentioned very frequently, the types of applications cited could have a substantial impact on the framing of XR. Out of all application types, Videogames were mentioned in the most articles (47.29 percent) and much more than any other application type (see Table 5.7). Second to this, Film/TV/Video applications were mentioned in 18.83 percent of articles overall. Both of these application types involve using XR for entertainment or leisure, which could frame it as a technology to be used for fun, rather than it having serious implications. How a technology can or should be used is defined in its emergence by discursive outlets (McKernan, 2013), such as the news. Therefore, focusing on leisure applications could encourage readers to perceive XR as an entertainment medium.

However, aside from the focus on Videogame applications, there were some variations between the news outlets regarding the applications that were mentioned. *The Guardian* and *MailOnline* were fairly similar in which applications they focused on, with each citing Videogames, Film/TV/Video and Social Media and Communication uses the most. On the other hand, *The Sun* differed quite drastically. The second most mentioned

application in *The Sun* was Pornography, Teledildonics and Sex (22.95 percent), whereas this use was only mentioned in 7.66 percent of *The Guardian* articles and 6.29 percent of *MailOnline* articles. Similarly, the third most mentioned application in *The Sun* was Theme Park and Rides (13.11 percent) which only appeared in 3.63 percent of *The Guardian* articles and 7.78 percent in the *MailOnline*. Traditionally, tabloid news outlets such as *The Sun* are expected to put more emphasis on sensationalist and entertainment news styles than quality news outlets (Zelizer and Allan, 2010), which could be the reason for this difference. Indeed, tabloids are also known for their focus on sex (Carvalho and Burgess, 2005), which explains the extra attention paid to Pornography, Teledildonics and Sex uses by *The Sun*. Therefore, it appears that, in terms of applications, *The Sun* has framed XR slightly differently than *The Guardian* and the *MailOnline*, albeit still focusing on entertainment or leisure uses.

Application Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Videogames	18	29.51	135	54.44	309	46.26	462	47.29
Film/TV/Video	5	8.20	49	19.76	130	19.46	184	18.83
Social Media and Communication	4	6.56	50	20.16	111	16.62	165	16.89
Tourism/Travel	6	9.84	35	14.11	92	13.77	133	13.61
Health	3	4.92	45	18.15	71	10.63	119	12.18
Education	2	3.28	43	17.34	62	9.28	107	10.95
Sport	1	1.64	30	12.10	60	8.98	91	9.31
Pornography, Teledildonics and Sex	14	22.95	19	7.66	42	6.29	75	7.68
Theme Park and Rides	8	13.11	9	3.63	52	7.78	69	7.06
Art/Design	0	0.00	15	6.05	53	7.93	68	6.96
Training	6	9.84	16	6.45	41	6.14	63	6.45
Music	1	1.64	26	10.48	31	4.64	58	5.94
Social Change and Awareness	0	0.00	26	10.48	32	4.79	58	5.94
Marketing and Advertising	1	1.64	24	9.68	30	4.49	55	5.63
Photography/ Video Recording	1	1.64	9	3.63	44	6.59	54	5.53
Retail	1	1.64	14	5.65	36	5.39	51	5.22

Table 5.7: Number of Articles Mentioning Each Application Type per News Outlet (cont.)

Application Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Simulation	1	1.64	4	1.61	44	6.59	49	5.02
Journalism	0	0.00	28	11.29	12	1.80	40	4.09
Museum/ Exhibition/ Archive Viewing	1	1.64	14	5.65	17	2.54	32	3.28
Space and Science	1	1.64	4	1.61	27	4.04	32	3.28
Industrial and Workplace Management	0	0.00	9	3.63	22	3.29	31	3.17
Documentary	0	0.00	20	8.06	8	1.20	28	2.87
Military and Defence	2	3.28	5	2.02	20	2.99	27	2.76
Other	0	0.00	5	2.02	22	3.29	27	2.76
Accessibility	0	0.00	4	1.61	18	2.69	22	2.25
Research	2	3.28	7	2.82	13	1.95	22	2.25
Architecture/ Planning	0	0.00	11	4.44	10	1.50	21	2.15
Web Browsing	1	1.64	6	2.42	13	1.95	20	2.05
Real Estate	0	0.00	6	2.42	9	1.35	15	1.54
Product Development and Testing	1	1.64	3	1.21	10	1.50	14	1.43
Organisation	0	0.00	4	1.61	10	1.50	14	1.43
Fitness	0	0.00	2	0.81	12	1.80	14	1.43
Drones	0	0.00	1	0.40	11	1.65	12	1.23
Wellness	0	0.00	5	2.02	6	0.90	11	1.13
Food and Drink	0	0.00	2	0.81	9	1.35	11	1.13
Children's Toys/ Interactive Stories	0	0.00	6	2.42	5	0.75	11	1.13
Theatre	0	0.00	5	2.02	5	0.75	10	1.02
Automotive Support	0	0.00	0	0.00	9	1.35	9	0.92
Crime Prevention and Justice	1	1.64	2	0.81	5	0.75	8	0.82
Cosmetics	1	1.64	1	0.40	4	0.60	6	0.61
Emergency Services	0	0.00	1	0.40	5	0.75	6	0.61

Further differences were uncovered between the news outlets when examining which serious applications were mentioned. Overall, the serious application types mentioned the most were Health (appearing in 12.18 percent of articles) and Education

(appearing in 10.95 percent of articles). However, *The Sun* rarely mentioned Health or Education applications (4.92 and 3.28 percent of articles respectively). The *MailOnline* mentioned Health uses in 10.63 percent of articles and Education in 9.28 percent, showing that it was more likely than *The Sun* to refer to serious uses. On the other hand, *The Guardian* was most likely to include references to Health applications (18.15 percent of articles) and Education uses (17.34 percent of articles). Furthermore, *The Guardian* also noted Social Change and Awareness applications in 10.48 percent of articles; substantially more than the *MailOnline* and *The Sun* (see Table 5.7). Therefore, *The Guardian* appears to have made more attempts at framing XR as a serious technology as opposed to the other news outlets. Since quality news outlets are typically expected to offer more sober reporting than middle-market or tabloid outlets (Bastos, 2019), these results offer some support for this claim in relation to XR news. Overall, it appears that the media organisation factor (Shoemaker and Reese, 2014) has impacted the frame-building process of XR news in terms of representing how the technology can be used.

In a different way, it is also significant that Health and Education uses were the most commonly mentioned serious XR applications. Other serious uses were rarely referenced by the news articles, such as Training (6.45 percent), Military and Defence (2.76 percent) and Architecture/Planning (2.15 percent). This shows that, when the news coverage *has* mentioned serious applications, it is the kind that impacts the majority of the population (education and health) rather than more niche areas. Thus, it appears that the relevance news value (van Dijk, 1988; Harcup and O'Neill, 2017) has again played a role in the frame-building process in XR articles. Therefore, this shows another way in which routine practices (Shoemaker and Reese, 2014) have impacted the framing of XR.

As well as variations between news outlets, there were some notable differences between the applications mentioned in the different years of the sample (see Appendix I.2). In 2012, Social Media and Communication uses were mentioned the most (25 percent of articles). Additionally, in 2013, the most mentioned application type was Photography/Video Recording (39.39 percent). Other uses mentioned in a large portion of articles in 2012 and 2013 were Tourism/Travel (which in these years referred to map navigation) and Web Browsing (see Appendix I.2). On the other hand, since 2014, Videogame applications were mentioned the most every year. Considering this data alongside a comparison between VR articles and AR/MR articles (see Appendix J.2)

suggests that this change is due to a shift in focus on XR type. To expand, although Videogame applications were mentioned by far the most in VR articles (49.05 percent), articles about AR/MR mentioned Social Media and Communication uses as often as they did Videogames (both being mentioned in 28.19 percent of articles). Furthermore, although Film/TV/Video uses were mentioned the second most in VR articles, this application type only appeared in 3.36 percent of AR/MR articles. Aside from Videogames, AR/MR articles were more likely to focus on uses that are typically associated with smartphones, such as Photography/Video Recording (16.11 percent), Web Browsing (11.41 percent) and Tourism/Travel (24.16), which in AR/MR articles referred to map navigation. Therefore, VR seems to have been framed slightly differently to AR/MR in terms of its uses.

The focus on smartphone-related uses for AR/MR products means these articles highlight the compatibility attribute of the innovation. According to Rogers, compatibility “is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters” (2003: 15). As smartphones are familiar to a wide portion of the population (particularly those accessing online news), mentioning applications that are related to smartphones presents AR/MR as highly compatible with the past experiences and needs of potential adopters. The same can be said for the focus on Videogames and Film/TV/Video applications in VR coverage, since these are leisure activities a large portion of the general public are familiar with. Therefore, framing the uses of XR in this way could potentially support the diffusion of the technology.

5.2.4 Sources

The sources journalists use in their reports can have a significant impact on how a topic is framed in the news. For instance, Coleman and Ross argue that “the choice of sources influences both its [a news article’s] shape and its orientation, casually but irrevocably promoting a particular perspective which goes unchallenged” (2010: 49). Sources can impact a news article through quotations or paraphrased statements as well as by providing multimedia content (e.g. images or videos) to the news outlet. To gain an understanding of the types of sources used by journalists when reporting on XR, the coding sheet recorded the source of any quotes or paraphrased statements in addition

to the source of any multimedia content within an article. This section now discusses these results.

5.2.4.1 Quotes and Paraphrased Statements

As noted in Section 3.2.3, who is allowed to speak within a news article can determine which individuals or groups become the primary definers of a topic (Hall et al., 1978). For instance, Critcher states that “[t]he media act as secondary definers whose function is to reproduce the definitions of primary definers and, in the popular press especially, to ‘translate’ official statements into everyday language” (2003: 134). Therefore, it is important to uncover who is given a platform to share their voice in news coverage of XR. Thus, direct quotations and paraphrased messages in the news articles were coded across 28 different variables (see Appendix A.4 for all definitions).

This analysis revealed that two types of sources were used much more than any others. Overall, Application Creators (referring to individuals or businesses creating XR software) were used as sources in 39.61 percent of articles. Similarly, quotes or paraphrased statements from Device Creators (referring to individuals or businesses producing XR hardware, such as headsets or peripherals) appeared in 39.3 percent of articles. The source type mentioned in the third largest portion of articles was Other Industry (or General) Specialists (referring to specialists of sectors not specific to XR, technology or gaming; such as health care specialists), who were quoted or paraphrased in 19.34 percent of articles. While this is a substantial portion of articles, it is much less than either Application Creators or Device Creators. These results show that, not only have applications and products been the main focus of articles (see Section 5.2.2), but the companies and individuals creating this software and hardware have been the groups able to define them. In other words, they have been the primary definers (Hall et al., 1978; Critcher, 2003) of XR, meaning their voices have been particularly prominent in the framing of the technology.

Since such sources are invested in the success of XR, this means that the publications have afforded substantial power to voices that are unlikely to be negative or critical about XR. If journalists use these types of sources the most when producing XR news, it is unsurprising that topics such as Concerns and Regulation were rarely the main

focus of articles (see Section 5.2.2). Certainly, moral panic style coverage would directly conflict with the interests of these sources that are aiming to sell XR hardware and software. Thus, the social institutions factor (Shoemaker and Reese, 2014), in terms of which sources are selected, appears to have impacted the frame-building process in XR news.

Table 5.8: Number of Articles With at Least One Quote/Paraphrased Statement of Each Type per News Outlet

Source Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Application Creator	17	27.87	120	48.39	250	37.43	387	39.61
Device Creator	10	16.39	80	32.26	294	44.01	384	39.30
Other Industry or General Specialist	7	11.48	45	18.15	137	20.51	189	19.34
Other News Source	6	9.84	23	9.27	135	20.21	164	16.79
Researcher/Analyst	4	6.56	29	11.69	95	14.22	128	13.10
User (General)	11	18.03	14	5.65	93	13.92	118	12.08
Technology Industry Specialist	5	8.20	15	6.05	57	8.53	77	7.88
General Public	7	11.48	17	6.85	49	7.34	73	7.47
XR Facilitator	7	11.48	21	8.47	40	5.99	68	6.96
Game Industry Specialist	1	1.64	11	4.44	43	6.44	55	5.63
Official Reports/Documentation	1	1.64	6	2.42	45	6.74	52	5.32
Platform Creator	0	0.00	5	2.02	46	6.89	51	5.22
XR Industry Specialist	1	1.64	16	6.45	23	3.44	40	4.09
Peripheral Creator	2	3.28	5	2.02	23	3.44	30	3.07
User (Professional)	0	0.00	4	1.61	22	3.29	26	2.66
External Journalist/Blogger	1	1.64	7	2.82	18	2.69	26	2.66
Investor/Funder	0	0.00	5	2.02	9	1.35	14	1.43
Marketing Materials	2	3.28	2	0.81	10	1.50	14	1.43
XR Event Organiser	1	1.64	5	2.02	8	1.20	14	1.43

Table 5.8: Number of Articles With at Least One Quote/Paraphrased Statement of Each Type per News Outlet (cont.)

Source Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Celebrity	3	4.92	5	2.02	5	0.75	13	1.33
XR Job Advert	0	0.00	0	0.00	10	1.50	10	1.02
Politician	0	0.00	3	1.21	6	0.90	9	0.92
Retailer	2	3.28	0	0.00	6	0.90	8	0.82
Fiction Creator	0	0.00	1	0.40	2	0.30	3	0.31
Other Article by Same Publisher	1	1.64	1	0.40	0	0.00	2	0.20
Unclear	8	13.11	23	9.27	70	10.48	101	10.34
Not Specified	4	6.56	23	9.27	92	13.77	119	12.18
Other	5	8.20	12	4.84	21	3.14	38	3.89

Still, there were some slight differences between the news outlets regarding which sources were used the most. Whereas Application Creators and Device Creators were most often used as sources in *The Guardian* and *MailOnline* (see Table 5.8), the two most used sources in *The Sun* were Application Creators (27.87 percent) and General Users (as opposed to professional users), which were quoted or paraphrased in 18.03 percent of articles. Device Creators were still the third most used source in *The Sun* (16.39 percent), though they appeared significantly less than in *The Guardian* and *MailOnline*. The reason for this variation could be that *The Sun* only started substantially reporting on XR in 2016 (see Section 5.1.1) when more XR products had been released to consumers and thus more people were able to use them and share their experiences. Additionally, tabloid news outlets such as *The Sun* are known to focus more on human interest stories than quality news outlets (Bird, 2009), perhaps explaining this publication's preference to use the general public as sources. Regardless of the reasoning, this shows that *The Sun* has been less reliant on elite sources (such as Application Creators and Device Creators) than *The Guardian* and the *MailOnline* in the process of framing XR. Since the use of elite sources can make discourse more persuasive (van Dijk, 1988: 87), it may be that the framing of XR in *The Guardian* and *MailOnline* could have a stronger impact than the frames that appear in *The Sun*. Furthermore, this shows that the media organisation factor of the frame-building process (Shoemaker and

Reese, 2014) has affected whose voices are heard to some degree, although the differences were not very stark.

In addition to variations between the news outlets, analysing the use of sources over time provides further insight. Device Creators and Application Creators were the two most used sources in every year of the sample, with the exception of 2013 when several other source types were used more often than Application Creators (see Appendix I.3). Most notably, statements from Other News Sources were the second most common in 2013 (36.36 percent), when Application Creators were used as sources in only 12.12 percent of articles. In 2012, Other News Sources were also quoted or paraphrased in the same portion of articles as Application Creators (28.83 percent). This finding suggests that, in the early years of the sample period, Other News Sources had a substantial role in defining XR. Previous studies have shown that journalists use other news sources when covering topics they are not very familiar with (e.g. Weiss-Blatt, 2016). This could explain the higher use of external news sources in these first years.

Further evidence of this can be gleaned by comparing the results for articles focusing on VR to those focusing on AR/MR (see Appendix J.3). While Device Creators were used in similarly large portions of VR articles and AR/MR articles (35.97 percent and 40.94 percent respectively), Application Creators were used as sources in VR articles much more than AR/MR (44.28 percent compared to 20.81 percent). Instead, the second most used type in AR/MR articles was Other News Sources which appeared in 31.54 percent of articles. As AR/MR products were less developed than VR at the time of this study, journalists may have been less familiar with AR/MR technology, resulting in them turning to other news sources for more information. In this way, in terms of the social institution factor (Shoemaker and Reese, 2014), there has also been some inter-media influence on XR framing.

As discussed in Section 3.5, the commercial pressures on newsrooms mean that journalists are increasingly expected to produce large volumes of content as quickly as possible, leading to a reliance on easily accessible sources (e.g. Lewis, Williams and Franklin, 2008). This is amplified in online news, where the time between gathering information and publishing an article can be "a matter of minutes" (Forde and Johnston, 2013: 115). In interviews with UK technology journalists, Brennen, Howard and Nielsen (2020a) found that these time shortages were problematic because journalists had a lack

of resources to both understand and translate complex technological issues for the audience. This led to relying on industry insiders (such as company announcements) and other media outlets as sources. Based on the above results, such practices could explain why these sources dominate the news coverage, thereby providing XR companies with the power to define XR to the general public in a way that benefits their commercial interests. Again, the social system (Shoemaker and Reese, 2014) of capitalism that these news outlets operate in appears to have impacted the frame-building process by affecting which sources are included in the news content.

5.2.4.2 *Multimedia Attribution*

In addition to quotes and paraphrased statements, multimedia content in news articles (such as images and videos) can come from sources external to the news outlet itself. To uncover where journalists sourced this multimedia content, the coding sheet recorded the type of source each element was attributed to. Across the entire sample, 4,642 instances of multimedia use were found. This included images, videos and GIFs. Each time these media were used, their attribution was coded.

These results show that the largest portion of multimedia originated from Device Creators (17 percent). The second most common attribution type was Agencies (16.63) and Application Creators ranked third (14.13 percent). There were no notable differences between XR type regarding the sourcing of multimedia as identified by their attributions (see Appendix J.4). Moreover, while there was some variation in the sources that were used the most in the three news outlets (see Table 5.9), either Device Creators or Application Creators were amongst the three most used sources for every publication. Further to this, examining changes over time shows that Device Creators were the most used source for multimedia in every year of the sample, until 2017 when Application Creators became the most used (see Appendix I.4). Similarly, from 2014 onward, multimedia content was attributed to Device Creators, Application Creators and Agencies the most. It is clear from this data that these sources were consistently used the most across the sample period. Since 16.69 percent of articles had agency bylines (with or without contribution from a journalist; see Section 5.1.2), it is not surprising that multimedia often came from news agencies. However, whereas the *MailOnline* was the only news outlet to publish several articles directly from news agencies, these results

suggest that *The Sun* and *The Guardian* have had more input from news agencies than was initially implied by the article bylines, since multimedia are usually accompanied by a press release. Therefore, within the social institutions factor (Shoemaker and Reese, 2014), news agencies have impacted the frame-building process in all three news outlets, not only *MailOnline*.

On the other hand, the use of media from Application Creators and Device Creators follows the same trend as was observed in the previous section which discussed the reliance on Device Creators and Application Creators as sources for comments. These findings show that creators of XR hardware and software have not only been able to define XR in their own words through quotations, but have also been able to define XR visually through the inclusion of their own imagery and videos. As not all sources will frame a topic in the same way, framing contests may occur (Hallahan, 1999). Gamson states that “[f]rame contests do not take place on a level playing field. They highlight the central importance of the relationship between journalists and sources and the process of selecting sources to quote” (2001: ix). Certainly, the selection of sources in XR news has prioritised the groups that are invested in the success of XR, and thus advocates of positive frames. By prioritising these voices, the news media avoids critical comments about XR (and, indeed, moral panic style coverage), instead focusing on those sources that would frame XR in a positive light.

Another notable finding is that a substantial portion of multimedia did not have an attribution at all (21.5 percent). Since it is considered best practice to label multimedia with a source (Bull, 2010), this perhaps indicates a lack of journalistic integrity regarding multimedia use in all three news outlets. In *The Sun*, 30.17 percent of multimedia were missing an attribution, 22.83 percent of multimedia were unattributed in the *MailOnline* and, even in *The Guardian*, 8.22 percent of multimedia had no attribution (see Table 5.9). Thus, while it was more common for multimedia to be unattributed in the tabloid and mid-market outlets, the quality publication also had this flaw. A similar finding can be observed regarding the use of sources for quotes and paraphrased statements; 12.18 percent of articles included statements without listing their source and this occurred in articles from every news outlet (see previous section, Table 5.8). This finding is further evidence to suggest that the commercial pressures (and thus the social systems factor [Shoemaker and Reese, 2014]) of the newsroom have caused a reduction in news quality,

as was also indicated by the *MailOnline's* reliance on news agencies and all outlets' repeated use of XR creators as sources. As this is the case, it is likely that this same issue has impacted other areas of the news framing process.

Table 5.9: Number of Attributions to Each Type per News Outlet

Attribution Type	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Device Creator	21	7.12	39	6.82	729	19.31	789	17.00
Agency	41	13.90	107	18.71	624	16.53	772	16.63
Application Creator	36	12.20	131	22.90	489	12.95	656	14.13
Stock Image	21	7.12	59	10.31	213	5.64	293	6.31
Other News Outlet	18	6.10	11	1.92	130	3.44	159	3.43
Other Industry Specialist	1	0.34	13	2.27	140	3.71	154	3.32
Publisher	6	2.03	24	4.20	72	1.91	102	2.20
General Public	2	0.68	8	1.40	67	1.77	77	1.66
Journalist	0	0.00	40	6.99	34	0.90	74	1.59
Social Media	12	4.07	1	0.17	54	1.43	67	1.44
General Media	17	5.76	3	0.52	38	1.01	58	1.25
Technology Industry Specialist	2	0.68	1	0.17	52	1.38	55	1.18
XR Facilitator	0	0.00	12	2.10	30	0.79	42	0.90
Celebrity	3	1.02	0	0.00	5	0.13	8	0.17
Other	14	4.75	20	3.50	131	3.47	165	3.55
No Attribution	89	30.17	47	8.22	862	22.83	998	21.50
Unclear	12	4.07	56	9.79	105	2.78	173	3.73

5.2.5 Native Advertising

Some of the studies discussed in Section 3.6.2 investigated the supposed blurring of news and promotional content by examining native advertising within the news (Erjavec, 2004; Harro-Loit and Saks, 2006). To recap, native advertising can be understood as “a form of paid content marketing, where the commercial content is delivered adopting the form and function of editorial content” (Conill, 2016: 905). This study attempted to uncover whether native advertising was present within the news articles by recording the

destination of hyperlinks and whether the news articles included information about how or where to purchase XR products. This section discusses these results.

One way in which native advertising can be identified is through the use of hyperlinks to retailers (Wojdyski, 2016). This study found that 7.68 percent of the total links used directed the reader to a retail site where they could purchase XR hardware or software (see Table 5.10). In addition, the use of links to retailers peaked in 2016 when 11.17 percent of all links were directed to this type (see Figure 5.3). Since 2016 was the year several VR products were commercially released, this suggests that the news articles have supported the adoption of XR during this crucial year by directing traffic towards sites where readers could buy those products. Indeed, this is supported by the fact that links to retailers were more common in VR articles than they were in AR/MR articles (see Appendix J.5). Out of all news items focusing on VR, 4.77 percent included links to retailers, whereas 2.68 percent of articles focusing on AR/MR did this.

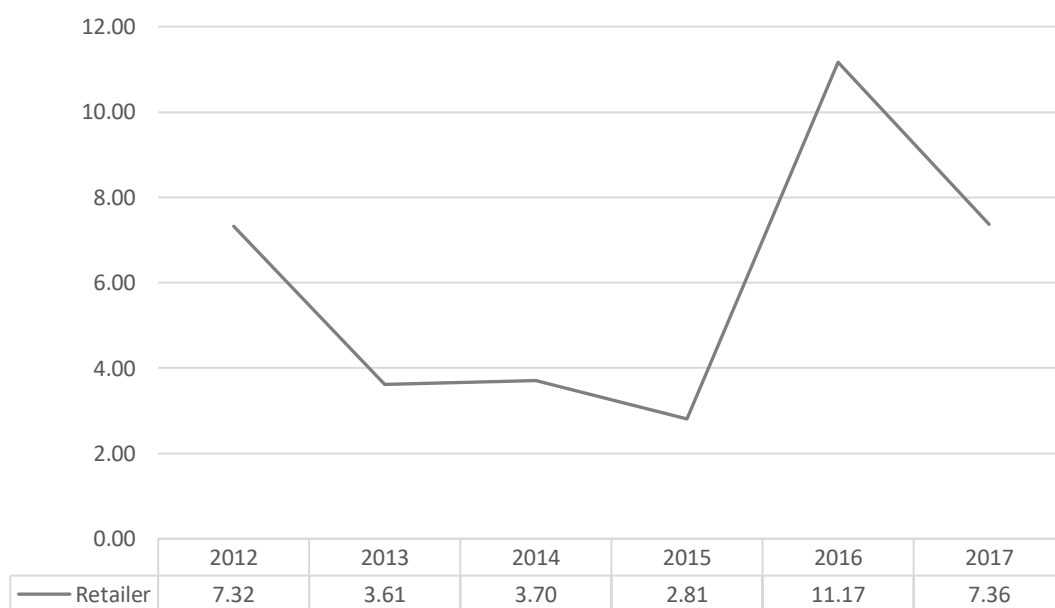
Table 5.10: Percentage of External Link Types per News Outlet (percentage based on number of links per news outlet)				
Link Type/News Outlet	<i>The Sun</i>	<i>The Guardian</i>	<i>MailOnline</i>	OVERALL
Application Info	23.08	14.85	8.20	12.67
Retailer	5.13	9.72	4.26	7.68
XR Company	10.26	7.74	6.47	7.34
Product Info	5.13	6.48	6.15	6.33
Application Creator	0.00	5.40	3.31	4.54
XR Event Info	0.00	2.07	0.95	1.63
Actual Application	0.00	0.00	2.21	0.78
Other XR-Related	10.26	2.52	1.89	2.47
Non-XR-Related	46.15	50.13	65.14	55.38
Unclear	0.00	1.08	1.42	1.18

Moreover, while these are not high figures, the use of any links to retailers at all hints that these news outlets may have some financial incentive for framing XR positively. Indeed, 11 articles in *The Guardian* included the following statement:

This article contains affiliate links, which means we may earn a small commission if a reader clicks through and makes a purchase. All our journalism is independent and is in no way influenced by any advertiser or commercial initiative.

Although *The Guardian* stresses that they are not influenced by commercial forces, the appearance of links to retailers raises doubts about this claim. Certainly, out of all news outlets, *The Guardian* was most likely to include links to retailers (9.72 percent; see Table 5.10). As the quality news outlet in this sample, the fact that *The Guardian* did this most often is surprising, since it would be expected for them to follow journalistic standards (such as the independence they cite) more strictly (Bastos, 2019). Still, *The Sun* and *MailOnline* both included some links to retailers as well (5.13 percent and 4.26 percent respectively), showing that this practice was not exclusive to *The Guardian*. Each news outlet has included at least some links to retailers, suggesting native advertising may be present within these articles. Since it is in the news organisations' commercial interests to maintain positive relationships with advertisers, as well as for native advertisements to be successful, this highlights another way that the capitalist social system (Shoemaker and Reese, 2014) could impact the frame-building process in XR news.

Figure 5.3: Percentage of Links per Year Directing to Retailers



Furthermore, including links was not the only way the news articles directed readers towards locations they could purchase XR products. Overall, 9.93 percent of articles included details about how or where XR products could be purchased (see Table 5.11). Both *The Guardian* and *The Sun* included such information in similar portions of their articles (14.52 percent and 14.75 percent respectively). Alternatively, 7.78 percent of *MailOnline* articles did this. There was not a large difference between articles focusing on VR and AR/MR. However, following the same pattern as found relating to hyperlinks, this

was more common in VR articles. To specify, 10.35 percent of VR reports included this information, compared to 7.38 percent of AR/MR articles. While these figures do not represent the majority of articles, the fact that any articles included this information is further indication that native advertising may be present. This is one way in which the news articles have *directly* promoted the diffusion of XR.

If the news promotes XR diffusion and adoption, this indicates that news content has been marketized. That is to say, as Fairclough’s (1993) concept of marketization states, the type of discourse that usually appears in advertising appears in other texts; in this case – news. There is a blurring between the supposedly factual content of news and the promotional tone of advertising, as was found to be the case in the studies carried out by Erjavec (2004), Lewis, Williams and Franklin (2008), Iris Chyi and Lee (2018) and others discussed in Section 3.6. This is also in line with Arik and Çağlar’s (2005) study of Turkish lifestyle journalism in which they found messages that encourage consumption, including articles mentioning where a product could be purchased. According to the authors, such coverage supports consumption culture. The results from the current study suggest that, despite being presented as news, articles about XR also encourage consumption. This compromises the independence of the press (Lewis, Williams and Franklin, 2008) and benefits the XR companies aiming to sell these devices and applications.

Table 5.11: Articles Mentioning Where/How to Buy per News Outlet

<i>The Sun</i>		<i>The Guardian</i>		<i>Mail</i>		OVERALL	
No.	Percent	No.	Percent	No.	Percent	No.	Percent
9	14.75	36	14.52	52	7.78	97	9.93

5.3 Final Remarks

This chapter aimed to assess the quantitative data regarding the patterns in XR news coverage and how this impacts the framing of the technology. It presented data regarding both the context and content of the news sample. Regarding context, it investigated the volume of news articles per news outlet and over time, article bylines and the organisation of articles on the news sites. Regarding content, it analysed which XR devices were mentioned, the main topics of articles, the types of applications

mentioned, which source types were used and whether native advertising may be present within the news articles. In doing so, the chapter has addressed RQ1 which was concerned with what the key patterns of XR news coverage are and how they contribute to the framing of the technology. It also showed insight into RQ3 by considering how these patterns could impact the diffusion of XR and how journalistic principles may have been affected by commercialisation. These results can be summarised as follows.

First, several features of the news discourse contribute to emphasising the importance of XR. In the *MailOnline*, XR news was mostly included in the science section, which connotes a higher level of importance than if it were to appear in a technology section. Although XR articles mostly appeared in technology sections in *The Sun* and *The Guardian*, these two news outlets deemed XR significant enough to have their own “virtual reality” categories. This further emphasises the importance of XR. Moreover, if the volume of articles reporting on a topic indicates importance as Entman (1991) posits, 2014 was the first year that the news outlets emphasised the importance of XR. Since 2014 was the year Facebook acquired Oculus, this indicates that Facebook has played a key role in making XR appear important. Additionally, in 2016 – the “year of virtual reality” (Fuchs et al., 2017; Steinicke, 2016) – the volume of published news articles reached its highest point, showing that the importance of XR was emphasised most in this year. Following the same premise, more importance was attributed to VR as opposed to AR or MR since the vast majority of coverage focused on VR technology. According to Rogers (2003), the higher the perceived importance of an innovation, the more likely it is to be adopted. Therefore, these findings indicate that the news has supported the diffusion of XR in this way, particularly since this importance was emphasised the most in the year several VR products were released.

Second, additional data discussed in this chapter also suggests that the news coverage may promote the adoption of XR. It was discovered that XR articles appeared in a wide range of sections on news websites and in an even wider range of categories. This increases the potential reach of XR news and, as a result, the potential consumer base for the technology. Moreover, the XR applications mentioned the most were those that would be familiar to a wide audience, including smartphone-related uses (photography and communication) as well as entertainment uses (videogames and film/TV). While the focus on XR as a technology for entertainment or leisure does not

emphasise its importance as much as if serious uses were referenced the most, it does mean that the product may appeal to a wider audience, thus supporting its diffusion.

Linked to this, it was found that all news outlets included information about where or how to buy XR products, as well as links to retailers in their articles. Aside from supporting the diffusion of XR by increasing the ease of the purchase process, this finding also indicates that these publications could gain some financial reward for getting their readers to purchase an XR product. Indeed, *The Guardian* even included a disclaimer stating they could gain commission if a reader made a purchase using the link they provided. In other words, it is likely that this is an example of native advertising. Considering these two points together, it appears that these news outlets support their own commercial agendas while simultaneously supporting the commercial agendas of XR companies. This is problematic since journalists writing XR news are not maintaining their fourth estate role in which the interests of the public are held above all else (Fjæstad, 2007).

Third, application creators and device creators were the most used sources in XR news in terms of quotations and paraphrased statements as well as multimedia content. In other words, the groups that are invested in the success of XR have been the primary definers (Hall et al., 1987; Critcher, 2003) of the technology. This indicates that the coverage will be primarily positive since such sources are unlikely to be critical about XR. Furthermore, although the majority of articles had journalist bylines, some articles were actually written by creators of XR applications. This could hint at the relationships between the news outlets and those in the XR industry, thus potentially leading journalists to avoid writing critically about the technology. The main topics of articles also suggests a lack of negative coverage since they were most likely to focus on XR applications or headsets rather than any more critical areas such as concerns or regulation. This indicates that a moral panic has not been created about XR as it has for other new technologies.

Fourth, several results suggest that the time constraints put on journalists due to commercial pressures have impacted the quality of XR news. A lack of journalistic integrity in terms of multimedia attributions was found, as well as sources to a lesser extent. Moreover, the *MailOnline* frequently published verbatim news releases and all outlets included multimedia attributed to news agencies, showing the influence that

these agencies have on XR news content. The issue of time constraints can also explain why creators of XR software and hardware were the most used sources since they are easily accessible and thus more suitable to a rushed schedule. If the commercial pressures journalists work within have impacted their work in these ways, it is likely that these issues could also impact the specific frames that are applied to XR, as will be later discussed.

Finally, the chapter highlighted that XR articles were most likely to be categorised as “news” rather than, for example, “features”, which reinforces their legitimacy and makes frames more likely to be accepted by readers (Pan and Kosicki, 1993). Despite this, XR news appears to have more in common with lifestyle journalism that treats audiences as consumers and provides them with information about goods and services (Hanusch, 2012). This is evidenced by the focus on products and applications as topics, as well as the presence of native advertising and messages that encourage consumption (Arik and Çağlar, 2005) by mentioning where products can be purchased. This indicates a blurring of news and promotional content, as found by Erjavec (2004), Lewis, Williams and Franklin (2008), Iris Chyi and Lee (2018) and others (see Section 3.6). The inability to distinguish between factual and persuasive discourse compromises the independence of the news (Lewis, Williams and Franklin, 2008), supporting the interests of XR companies over the audience. Overall, these quantitative findings also provide valuable background information about the news sample as a whole to aid the qualitative framing analysis that will be discussed in the upcoming chapters.

Chapter 6: Frames Conceptualising Extended Reality

6.1 Introduction to Frame Analysis Chapters

The next four chapters in this thesis discuss the specific frames that emerged from the qualitative framing analysis. In the interests of clarity, this introduction addresses two points: (1) to reiterate what each of these chapters will focus on and how they will be structured; and (2) to define the referencing techniques used.

6.1.1 Structure of Chapters

Firstly, as Section 4.4.2 noted, 12 specific frames emerged from the news articles during qualitative framing analysis and these frames could be organised into four broader categories (see Table 6.1). Categories one to three represent frames that were found to exist within both the news and marketing samples, whereas category four includes frames that appeared only in the news articles. Each of the following chapters are based on one of these four categories, organised into sections for each specific frame. In more detail, the current chapter (Chapter 6) examines the first category: frames conceptualising XR. This includes the Immersive and Transcendent frames. Chapter 7 then analyses newness frames (category two): Different and Unique; Revolutionary and Transformative; and Advanced and High-Quality. Next, Chapter 8 focuses on frames relating to user experience (category three): Social; Easy to Use; and Comfortable. Finally, Chapter 9 discusses the evaluative frames (category four) applied to XR: Important; Successful; Affordable; and Much-Anticipated. In addition to specific frames, Chapter 9 also explores the overall framing of XR by examining the use of positive and negative discourse and any attention to concerns or ailments related to XR.

Every chapter analyses the framing devices used to construct each frame, following the same approach. To expand, for each frame, quantitative data resulting from the frequency of terms analysis is first explored. In the same way as the previous chapter that has focused on quantitative data, these sections examine any variations between news outlet, year of the sample and XR type (VR or AR/MR). After this, qualitative data

based on the framing analysis is discussed to gain further insight into which framing devices were used. Additionally, in the chapters that focus on frames that appeared in both the news and marketing samples (Chapters 6-8), qualitative data is also used to compare the construction of each frame in the two discourses.

(1) Frames conceptualising XR	(2) Newness frames	(3) User Experience frames	(4) Evaluative frames
Immersive	Different and Unique	Social	Important
Transcendent	Revolutionary and Transformative	Easy to Use	Successful
	Advanced and High-Quality	Comfortable	Affordable
			Much-Anticipated

Furthermore, all chapters apply the same theories to analyse this data. Primarily, framing theory is utilised to consider the significance of specific framing devices. Within framing theory, the chapters also make use of the frame-building literature reviewed in Chapter 3 to examine whether and how the social system, social institutions, media organisations and routine practices factors of the hierarchy of influences model (Shoemaker and Reese, 2014) have affected frame construction. Supporting this, the diffusion of innovations theory (Rogers, 2003) and technological acceptance models (Buenafior and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007) presented in Section 2.5 are employed to discuss the implications of these frames being used regarding whether they could promote the diffusion of XR.

6.1.2 Referencing Techniques

Now that these structural and theoretical clarifications have been made, it is important to make some notes about the various referencing techniques used throughout these chapters. Firstly, to aid the analysis, these chapters include excerpts from the news articles and marketing materials which demonstrate the appearance of every frame. Importantly, these examples do not represent the entirety of instances a frame could be observed. Instead, the examples have been chosen because they best demonstrate the appearance

of a frame or framing device. Whenever an example is used, it is referenced with a specific ID (rather than the typical Harvard referencing style) in the interest of concision. To expand, as mentioned in Section 4.3, every news article and marketing material was given a unique ID during data collection. For the news articles, this simply consisted of "ID" followed by a number (e.g. ID0001). For the marketing materials, this consisted of a letter prefix corresponding to the device the marketing was for, followed by a number (e.g. GG01). Table 6.2 specifies the number ranges and letter prefixes used for each news outlet and device. Corresponding to these IDs, the full information for every news article can be seen in Appendix E and Appendix F lists the details for the marketing materials.

News Articles		Marketing Materials	
ID Number Range	News Outlet	ID Prefix	Device
ID0001-0060, ID0997	<i>The Sun</i>	GG	Google Glass
ID0061-0308	<i>The Guardian</i>	GVR	Samsung Gear VR
ID0309-0976	<i>MailOnline</i>	HL	Microsoft HoloLens
		ML	Magic Leap
		OR	Oculus Rift

Secondly, these chapters refer to frames, word categories and specific search terms and it is important to clearly differentiate between them throughout. Therefore, each will be formatted differently when written. Frames will have the first letter of each word capitalised (e.g. Immersive; Advanced and High-Quality). On the other hand, word categories refer to the categories of terms searched for during the quantitative content analysis. The names of these categories will not appear in capitals but will be shown in quotation marks (e.g. "immersive", "advanced and high-quality"). Within each of these word categories were specific search terms. When mentioning a specific term, it will appear in italics (e.g. *presence*, *superior*). Some search terms will be shown with an asterisk (*) to denote that they include any possible ending to a stem. For instance, the stem *immers** includes immerse, immersion, immersive and so on. Additionally, other search terms will include brackets or slashes to demonstrate that specific variations of the word were searched rather than using an asterisk to find all possible word endings. For example, *easy/easily/easiest* shows that the figures relate to the use of those three specific words rather than any word beginning with the stem *eas**. Similarly,

terrify(y*/ies/ied) indicates that the stem *terrify** was searched, as well as the specific words *terrifies* and *terrified*. Appendix C shows the dictionary of terms which clarifies when a stem was searched and when specific words were searched for. Having stated these important clarifications, the current chapter will now introduce the discussion of the Immersive and Transcendent frames.

To reiterate, this chapter analyses the frames that come under the first category noted in the previous section: frames that conceptualise XR. Since “[i]nnovation is about change” (Krumsvik et al., 2019: 193), each emerging technology has its own features that differentiate it from existing products. As an actor in the social construction of technology, the news media play an important role in how an innovation is conceptualised (McKernan, 2013). The current study found that two frames worked toward conceptualising XR: Immersive and Transcendent. This chapter discusses the framing devices used to construct the Immersive and Transcendent frames in XR news and compares this with XR promotional materials. Primarily, framing theory is used to discuss the significance of which framing devices have been used. Additionally, within framing theory, it is considered whether (and how) four factors of the hierarchy of influences model (social systems, social institutions, media organisations and routine practices; Shoemaker and Reese, 2014) have impacted the frame-building process of XR. This is supported by diffusion of innovations theory (Rogers, 2003) and models of technological acceptance (Buenaflor and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007) to consider whether these frames could promote the diffusion of XR.

6.2 Immersive

Section 2.2 highlighted that immersion and presence are the two key features of XR technology. If effective, XR experiences provide users with a sense of immersion and presence (Evans, 2019). This allows them to believe they are actually inside a virtual environment, thus resulting in the user trying to interact with it as such (Lombard and Ditton, 1997; Steptoe, Julier and Steed, 2014). During the qualitative framing analysis, it was discovered that an Immersive frame was applied to XR. This involved representing the technology as able to make the user feel a sense of immersion and presence when experiencing XR. In what follows, the framing devices used to construct the Immersive frame in the news discourse are analysed, alongside considerations of how this relates to

XR marketing. It begins by discussing quantitative data regarding the use of specific keywords as framing devices to construe this frame. Comparisons are made between the news outlets, XR type and year of the sample to examine whether these variables affected the strength of the frame. The discussion then moves on to analyse qualitative data that shows which additional framing devices were employed to construct the Immersive frame. This qualitative data is also used to assess the relationship between the news and marketing materials. Lastly, the significance of the Immersive frame appearing in XR news discourse is explored.

As noted in Section 4.1.1, word choices and keywords can act as framing devices (Entman, 1993; Linström and Marais, 2012). Therefore, the frequency of words pertaining to each frame were recorded to give some indication as to the prevalence of these frames. Examining this data shows that words relating to the Immersive frame were mentioned the most out of any category (see Table 6.3). Terms in the “immersive” category appeared 1,457 times in 56.4 percent of articles. Aside from this, words in the “advanced and high-quality” category were mentioned in the second largest portion of articles, though substantially less than words in the “immersive” category (30.3 percent). This demonstrates just how prominent the Immersive frame was. Furthermore, examining the use of specific terms provides additional insight into the prevalence of the Immersive frame (see Table 6.4). Out of all individual search terms (across all categories), the stem *immers** was used, by far, the most times (963) and in the most articles (45.14 percent). For comparison, the second most used term, *excit**, appeared 246 times in 18.32 percent of articles; significantly less than *immers**. Thus, these figures indicate that it was very common for articles to apply the Immersive frame to XR.

Moreover, all news outlets used words in the “immersive” category more than any other frame category (see Table 6.3). Likewise, every news outlet used *immers** more than any other search term (see Table 6.4). This shows that the media organisation factor (Shoemaker and Reese, 2014) has not had much impact on the prevalence of the Immersive frame, since there is little difference in how often the three news outlets presented XR as Immersive. On the topic of innovation news, Nordfors states that “[m]any who read a news item feel that new knowledge is confirmed when others discuss it or when they see it again in a different news outlet. Such news is more likely to be accepted

as fact” (2009: 21). Therefore, the reiteration of the Immersive frame in multiple news outlets increases the likelihood that readers will come to accept this framing of XR.

Table 6.3: Appearance of Terms in All Frame-Based Categories per News Outlet

Category	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
Immersive	48	49.18	399	57.66	1010	56.59	1457	56.40
Advanced and High-Quality	30	34.43	101	28.63	369	30.54	500	30.30
Much-Anticipated	10	11.48	141	32.66	329	25.90	480	26.71
Successful	11	13.11	97	25.40	122	14.37	230	17.09
Revolutionary and Transformative	6	8.20	63	17.74	146	15.42	215	15.56
Affordable	5	6.56	74	18.55	173	15.12	252	15.46
Transcendent	12	11.48	52	14.11	164	16.02	228	15.25
Important	4	6.56	52	15.32	123	12.28	179	12.69
Social	4	3.28	94	16.53	137	10.93	235	11.87
Easy to Use	2	3.28	42	11.29	109	12.43	153	11.57
Comfortable	2	1.64	23	5.65	183	14.22	208	11.26
Different and Unique	9	14.75	41	13.71	62	6.14	112	8.60

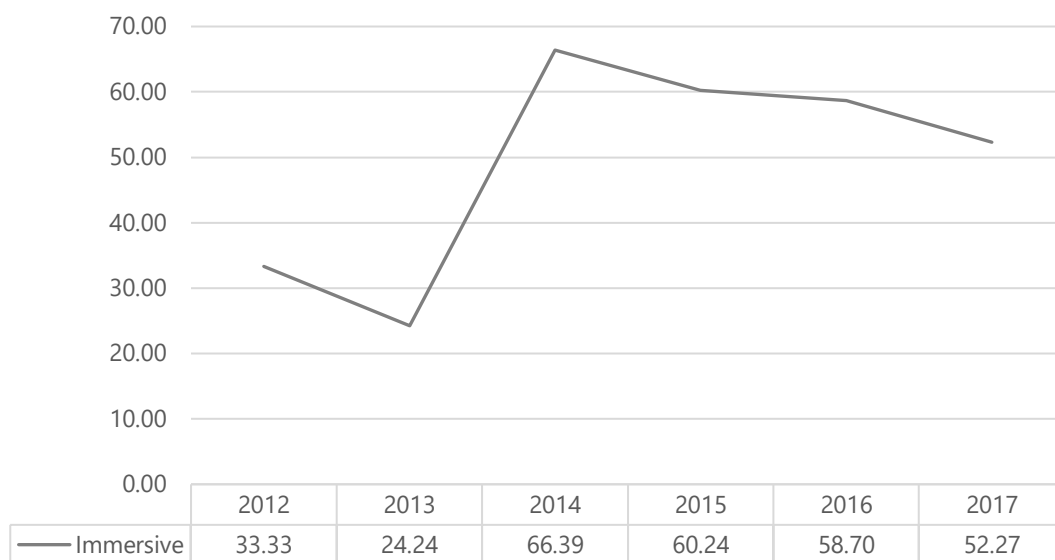
Table 6.4: Search Terms Used in At Least 10 Percent of Articles per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>immers*</i>	25	34.43	268	46.37	670	45.66	963	45.14
<i>excit*</i>	8	8.20	90	25.40	148	16.62	246	18.32
<i>transport*</i>	3	4.92	45	14.52	139	13.02	187	12.90

On the other hand, the use of terms in the “immersive” category varied quite dramatically between articles focusing on VR and those focusing on AR/MR (see Appendix J.6). Words in the “immersive” category appeared in 62.67 percent of VR articles and 23.49 percent of AR/MR articles. While 23.49 percent is still a substantial amount, it is clear that the Immersive frame was used more often in relation to VR products than AR/MR products. This finding also helps to explain the variation in how often these terms appeared across the sample period. As shown in Figure 6.1, the use of words in the “immersive” category increased dramatically in 2014 and continued to appear in at least half of articles for the rest of the sample period. The shift in 2014 coincides with the year

the news articles started to focus more on VR products than AR/MR, which were most common in the first two years (see Section 5.2.1). Since VR works by replacing the users view of the real world with a virtual environment (Brigham, 2017), the concepts of immersion and presence are more important in VR experiences than they are for AR/MR products. Therefore, the technological characteristics of the devices appear to have impacted the way they are framed in the news coverage.

Figure 6.1: Percentage of Articles per Year With at Least One Term From the “Immersive” Category



As well as word choice, additional rhetorical framing devices were used to construct the Immersive frame. For instance, examining the stem *immers** within the context of the news articles reveals that journalists use certain modifiers to emphasise the effectiveness of this immersion. One *MailOnline* article describes a PlayStation VR demo as “incredibly immersive” (ID0526). Additionally, journalists writing in *The Guardian* and the *MailOnline* both claim they were “completely immersed” (ID0146; ID0584) during their HoloLens experiences. Here, the modifiers “incredibly” and “completely” work to emphasise the Immersive frame by insinuating that the sense of immersion is of a high quality. Significantly, a similar technique was observed in the marketing of Oculus Rift which describes the product as “truly immersive” in its Kickstarter campaign (OR06) and the press release about that campaign (OR05), implying it is a highly immersive experience. A sense of immersion and presence is not guaranteed by all XR products and experiences, but instead requires combining “a number of elements of different sensory stimuli and preparedness on the part of the VR user” (Evans, 2019: 50). Despite this, the

news and marketing discourses have both suggested the technology allows users to be highly immersed in a virtual environment. Since the news is the general public's main source of information about emerging technologies (Whitton and Maclure, 2015; Williams, 2003), this reinforces the message present in the marketing and thus supports the promotion of XR.

While *immers** and *excit** were the two most used terms in the news sample, it is also significant that the only other word used in at least 10 percent of articles was *transport**. This term appeared 187 times in 12.9 percent of articles. The use of this term was recorded when it implied that an XR user could be metaphorically transported with the technology, rather than literal forms of transport. This, therefore, demonstrates the use of the transportation metaphor as a framing device to portray XR as Immersive. In more detail, an article in *The Guardian* about PlayStation VR states: "All perception of your real-world surroundings become removed as you place the headset on and are instantly transported to another world" (ID0090). Suggesting XR can transport a person to another world creates the impression that the user believes they are in that virtual world, highlighting the idea of immersion.

Importantly, regarding the relationship between the news and the marketing, it was found that this same metaphor was employed in the promotional materials of XR. For instance, both Oculus Rift and Gear VR marketing used the word "transport":

It's easy to transport yourself with the Gear VR (GVR06).

Transport yourself to Japan's spectacular Motenashi Dome of Kanazawa Station in 360° on Rift and Gear VR (OR33).

Similarly, in a table detailing the differences between VR, AR and MR on the HoloLens website, VR and MR are said to be able to "transport you to a virtual world" (HL22). Relatedly, a major part of Oculus Rift marketing alluded to the metaphor of transportation without using the word itself. The tagline of the product is "Step into the game", or sometimes "Step into the Rift", which appeared on their Kickstarter campaign (OR06), as well as their website (OR18; OR20) and promotional videos (OR17; OR28). The idea of "stepping into" another world highlights the sense of being transported to another place. That is to say, users will feel as if they are really there – immersed in a virtual world. These findings highlight a similarity between XR news and marketing in the

sense that both discourses employ metaphors as framing devices to highlight immersion and presence. According to Luokkanen, Huttunen and Hildén, “[m]etaphors can be assumed to have an especially important role when the ideas being communicated are novel, abstract or without stabilized context” (2014: 967). Since XR was in its early stages of innovation diffusion during the sample period of the study, this argument suggests that the use of metaphors to highlight immersion could be particularly effective in emphasising the Immersive frame. This is enhanced further since the metaphors are repeated in both discourses.

Within the news articles specifically, other descriptions of XR experiences have also framed the technology as Immersive through the use of active verbs. For example, a *MailOnline* article about PlayStation VR claims the device allows “players to fly like an eagle, drive sports cars in high-speed races, and explore castles” (ID0742). The words “fly”, “drive” and “explore” suggest users will feel as if they are actually doing these activities, thus implying immersion. A similar example can be observed in the following two paragraphs which appear in a side-note about Oculus Rift in the *MailOnline*:

While the resolution still doesn’t give the feeling of quite being in the real world, it does make you think you are actually in a virtual world.

During several demonstrations we entered a vast dungeon and flew through space (ID0363).

First, although the journalist argues that the experience does not appear realistic, it is still said to make the user feel as if they are in a virtual world, framing it as Immersive. Additionally, instead of using a sentence such as “we saw a vast dungeon and a space scene”, the journalist writes that they “entered” a dungeon and “flew” through space. Though the journalists did not actually perform these actions, using active verbs suggests the experiences felt real enough that they believed they were in these spaces. Therefore, active verbs have also been employed as rhetorical framing devices in the news sample to create the Immersive frame.

Furthermore, this *MailOnline* side-note appeared not just in one article but in 16 different *MailOnline* reports from March 2014 to January 2016. Sheaffer, Shenhav and Amsalem’s frame repetition hypothesis claims that “the frames that have greater influence on public opinion are those that are repeated more frequently” (2018: 264).

This idea is shared by Fredlin who states that “incessantly repeated” frames can “have considerable control over how people think about various issues and events” (2001: 272). Therefore, the reiteration of this side-note has put particular emphasis on the Immersive frame. Moreover, the *MailOnline’s* routine practice (Shoemaker and Reese, 2014) to repeat its side-notes in multiple articles has impacted the frame-building process for this particular frame.

As mentioned in 2.2, immersion and presence go hand-in-hand with each other. The word *presence* was rarely used within the news articles (3.17 percent), perhaps to avoid the use of jargon. However, both immersion and presence were depicted using technical framing devices in the form of imagery. Firstly, if a user feels a sense of presence, they tend to respond in a realistic way toward the virtual environment (Lombard and Ditton, 1997; Steptoe, Julier and Steed, 2014). With this in mind, the qualitative framing analysis found that the news articles depicted presence by including pictures of users holding out their hands as if instinctively attempting to interact with the virtual world they are seeing through a VR headset. Examples of such images can be seen in Figures 6.2, 6.3 and 6.4. Importantly, considering the relationship between the news and marketing samples, the same type of imagery also appeared in XR promotional material (see, for example, Figures 6.5, 6.6 and 6.7). This shows that, not only have XR company owners been used as sources the most in the news articles (see Section 5.2.4), but similar imagery has been used to portray presence even when it does not originate from these company owners. This further reinforces the desired frames of those invested in the success of XR.

Figure 6.2: Google Cardboard in *The Guardian* (ID0100)



Figure 6.3: Oculus Rift in *The Guardian* (ID0141)



**Figure 6.4: Oculus Rift in
MailOnline (ID0464)**



**Figure 6.5: Oculus Rift Website
Still (OR27)**



**Figure 6.6: Image From Gear VR
Social Media Post 07/12/2015
(GVR21)**



**Figure 6.7: Image From Gear VR
Social Media Post 16/08/2016
(GVR21)**



The same can be said for images depicting immersion – both samples used visuals to represent this concept. However, images representing immersion were not as visually similar in the two samples as they were in regards to presence. In the news articles, images of users wearing headsets often had very plain backgrounds with a large amount of empty space above or in front of the headset (see Figures 6.8, 6.9 and 6.10). What the user is viewing cannot be seen in the images, but a space is still left blank for this. The empty space indicates that the user is unaware of anything apart from what they are seeing through the headset, which ultimately implies they are immersed. On the other hand, in the marketing materials, immersion is depicted using more visually complex techniques. For example, in a video advertisement for Oculus Rift (OR28), four different users are shown experiencing VR. In each instance, after they put on the headset, their living room splits open and the virtual world can be seen to surround them (see Figure 6.11). Again, this suggests that the XR experience is convincing enough that the user

believes it is real. Thus, in both samples, visuals have been used as framing devices to construct the Immersive frame.

Figure 6.8: PlayStation VR in *The Guardian* (ID0194)



Figure 6.9: Oculus Rift in *The Guardian* (ID0235)



Figure 6.10: PlayStation VR in *MailOnline* (ID0526)



Figure 6.11: Four Stills From “Step Into Rift” Promotional Video (OR28)



Previous research has suggested that images have a significant impact on viewers' attention and perceptions of a topic (Jenner, 2012; Müller, Kappas and Olk, 2012). Coleman agrees, stating it is thought that "the unique, vivid features of pictures make them more readily available in memory; thus, images exert a more powerful influence on memory and perceptions than text" (2010: 243). Therefore, the use of images as technical framing devices, in combination with the other devices discussed above, highlights the strength of the Immersive frame in both the news and marketing samples.

Overall, these findings show that the Immersive frame was very prominent in XR news coverage and marketing materials, particularly in relation to VR. Nordfors states that "[w]ith all innovations come new words and stories" (2009: 18). Although immersion as a concept is not new, the type of immersion offered by XR technologies is different to what was previously available (Ryan, 2015; see Section 2.2). By introducing and spreading this new language, journalism "speeds up the introduction of new things, enabling people to discuss them before they are widely spread. This facilitates introduction" (Nordfors, 2009: 18). Thus, for the Immersive frame to be highly prominent supports the introduction of this concept and, thus, the diffusion of XR generally.

Moreover, while it is the aim of a VR experience to be immersive, a sense of immersion is certainly not a given simply with the use of a VR headset (Evans, 2019). Nevertheless, both the news articles and marketing materials have presented XR as highly immersive. As immersion is the key selling point of VR (Evans, 2019), it is not surprising that this frame was present in XR marketing. However, the existence and strength of this frame in XR news coverage reinforces the idea that XR achieves its aim of creating an immersive experience. In other words, the news articles effectively aid the promotion of XR since they support its unique selling point. It appears that the use of native advertising through links to retailers and information about where to buy products as discussed in Section 5.2.5 is not the only way XR news has been marketized (Fairclough, 1993). Again, there appears to be a blurring of news and promotional content as was identified by Erjavec (2004), Lewis, Williams and Franklin (2008) and Iris Chyi and Lee (2018), amongst others.

Despite there being several concerns surrounding VR related to its immersive capabilities (such as cybersickness and physical isolation; see Section 2.3), the Immersive frame did not draw on these issues and instead presented immersion as something

positive and enjoyable. In line with the results from the previous chapter, this is further indication that the news coverage is not fostering a moral panic for XR. Instead, the use of the Immersive frame supports the interests of XR companies since it presents the key selling point of the technology in a positive light. This is particularly the case since the quantitative data suggests Immersive was the most commonly used frame in the news articles.

6.3 Transcendent

Another concept relevant to XR is transcendence, involving “going beyond” (Anderson, 2003), in this case, what was possible without XR technology. Chan states that “the hype and hope that are associated with transcending the physical body for exalted wonderment in virtual realities can be traced back to the seventeenth century” (2014: 8). Indeed, this study found that the current generation of XR is no exception, with Transcendent being one of the frames that emerged from the qualitative framing analysis. This involved presenting XR as able to overcome physical or bodily limitations, as well as limitations of previous technologies. The current section examines the framing devices used to construct this frame in the news articles and its relation to XR marketing. As in the previous segment, quantitative data is analysed first to understand the prominence of the Transcendent frame and whether there were any variations dependent on the news outlet, XR type or year of the sample. Next, the discussion is supported by qualitative data that demonstrates which other framing devices were used to portray XR as Transcendent, as well as to compare this to the marketing materials. The last paragraph considers how this frame relates to other representations of XR, as well as its significance in terms of supporting XR diffusion.

To begin, quantitative data demonstrates the prominence of the Transcendent frame in each news outlet. Although not used as often as words in the “immersive” category, terms in the “transcendent” category appeared in 15.25 percent of articles overall (see Table 6.5). There was little difference between the news outlets in how often they used words in this group, ranging from 11.48 percent of articles in *The Sun* to 16.02 percent of *MailOnline* articles. Thus, as with the Immersive frame, the prevalence of the Transcendent frame does not appear to differ significantly per news outlet. This shows

that the media organisation (Shoemaker and Reese, 2014) reporting on XR has not had much effect on the strength of the Transcendent frame.

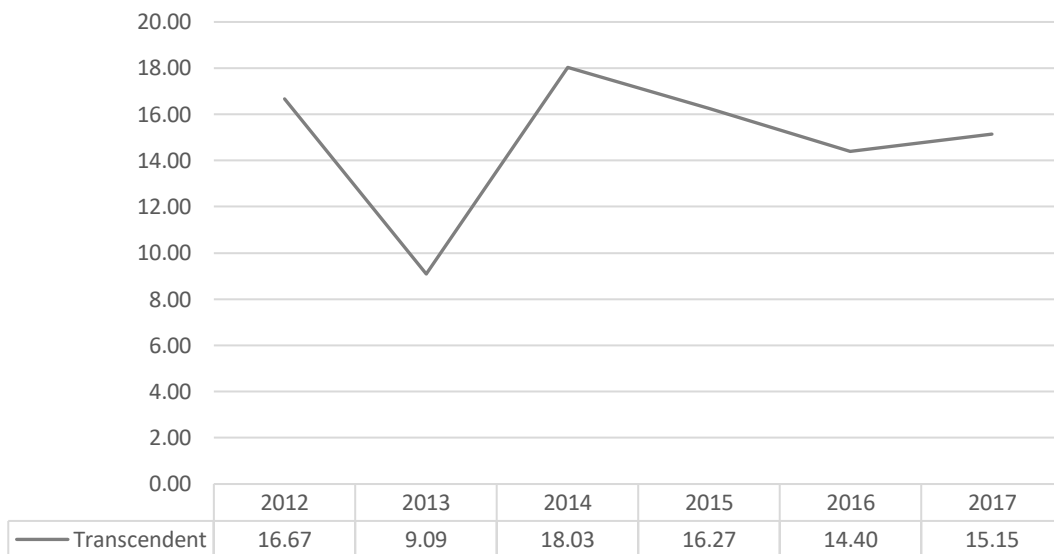
	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
Term	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>improv*</i>	10	8.20	11	3.63	61	5.69	82	5.32
<i>beyond</i>	1	1.64	12	4.03	42	5.24	55	4.71
<i>enhanc*</i>	1	1.64	17	4.84	43	4.49	61	4.40
<i>exten*</i>	0	0.00	8	3.23	5	0.60	13	1.23
<i>empower*</i>	0	0.00	3	0.81	9	1.05	12	0.92
<i>liberat*</i>	0	0.00	1	0.40	4	0.60	5	0.51
<i>transcend*</i>	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	12	11.48	52	14.11	164	16.02	228	15.25

Moreover, analysing the use of these terms in the different years of the sample also reveals that they appeared in a fairly consistent portion of articles every year, with the exception of a trough in 2013 (see Figure 6.12). On the other hand, there were substantial differences between VR and AR/MR articles (see Appendix J.6). Out of the subset of VR articles, 12.67 percent included words from the “transcendent” category, whereas 24.83 percent of AR/MR articles used such terms. Therefore, the Transcendent frame appears to have been applied more so to AR/MR products than VR, although the frame broadly gained the most traction from 2014 onward. Since to “augment” is “to achieve a higher or intensified state of reality” (Ariel, 2017: 31), it is clear that the idea of transcendence is highly relevant to AR and, due to its close links, MR. These figures suggest that this is reflected in the news media and shows that the technological characteristics of these devices has impacted their framing.

Although words in the “transcendent” category appeared in 15.25 percent of articles overall, it is important to note that the stem *transcend** itself was not used in any articles (see Table 6.5). As with the lack of the term *presence*, this may be due to the typical journalistic practice to use lay terms that a wider audience would understand. Certainly, Carlson states that “the public relies on journalism to translate complex discourses into understandable ones” (Carlson, 2017: 43). Instead of using *transcend**, the

idea of transcendence was explained in other ways, using simpler terms. For example, the stem *improv** appeared in 5.32 percent of articles, *enhance** was used in 4.4 percent and *beyond* appeared in 4.71 percent. Therefore, the routine practices (Shoemaker and Reese, 2014) of journalism have impacted the construction of the Transcendent frame by affecting the specific words chosen when referring to this concept.

Figure 6.12: Percentage of Articles per Year With at Least One Term From the “Transcendent” Category



In addition to word choices, exemplars were also used as rhetorical framing devices when presenting XR as Transcendent. Specifically, XR’s transcendental capabilities were related to a wide range of areas. For instance, the technology was said to be able to improve education (ID0068), the wellbeing of the terminally ill (ID367; ID0844), the lives of those with autism (ID0386) and the detection of breast cancer (ID0382). Furthermore, other articles claimed XR could enhance rollercoasters (ID902), storytelling (ID534) and military safety and intelligence (ID0376; ID476), amongst other areas. Since improving or enhancing something means it has become better than it was previously, this links to overcoming limitations and thus transcendence. Shen states that “[t]he persuasive impact of any given frame will likely depend on how the messages interact with individuals’ own predispositions or knowledge structure” (2004: 126). Thus, relating transcendence to this broad selection of areas increases the salience of the frame by causing it to be relevant to a range of readers. In other words, some readers will see the value in improving the lives of those with autism and others will see the value of enhancing military intelligence. Mentioning a wide array of areas that XR will positively

impact increases the portion of the audience this frame will resonate with, thereby increasing the strength of the frame.

Moreover, these exemplars are enhanced further with the use of a technical framing device: quotations from sources that are established in the technology industry. Electronics company LG was quoted in one article claiming that VR could “improve lives” (ID0447) and Apple CEO Tim Cook highlighted the same point in relation to AR (ID0822). Go, Jung and Wu state that “the credibility of information is often determined by the believability of its source” (2014: 359). Due to their status in the technology industry, these sources could be seen as credible sources by readers. Therefore, journalists’ decision to use such sources increases the strength of the Transcendent frame. This also shows that an XR company owner (LG) and a technology specialist (Tim Cook) have acted as frame advocates (Moy, Tewksbury and Rinke, 2016) for the Transcendent frame. In other words, regarding the impact of the social institutions factor (Shoemaker and Reese, 2014), these frame advocates have played a role in presenting XR as Transcendent.

Regarding the relationship between XR news and promotional content, it was found that the marketing also used similar exemplars to depict the Transcendent frame. HoloLens marketing claims the device can enable “you to make decisions more confidently [and] work more effectively” (HL04), particularly in product design. Moreover, the device is said to be able “to increase students’ engagement and understanding of abstract concepts” (HL38) in relation to education. Here, the exemplars are enhanced by the modifiers “more” and “increase” to further emphasise the Transcendent frame. Moreover, when Google Glass was relaunched as an enterprise product in 2017, its new website highlighted several ways it could be used to improve productivity and efficiency. For instance, a quote on the website from one business that had used Google Glass states that “Glass really gives our operators the ability to do their jobs faster, smarter, and safer” (GG25). This repetition of comparative words (faster, smarter and safer) combined with “really” stresses the transcendent effect of Google Glass, thus increasing the power of the exemplar in highlighting the Transcendent frame. This shows that both samples framed XR as Transcendent and used exemplars to do so. Van Gorp argues that “[t]he more often schemata [or frames] are confirmed by further information, or by congruent framing devices, the more difficult it becomes to refute or change them by counterframing” (2007: 69). Therefore, the appearance of the Transcendent frame in the news discourse

reinforces the frame in the marketing and vice versa, showing that the news supports the ideas put forward in XR marketing.

Additional similarities were also uncovered between the news and marketing samples in the way that they constructed the Transcendent frame. One rhetorical framing device used was the argument that XR transcends the limitations of the traditional screen interface. For instance, Magic Leap is described in *The Guardian* as aiming to get “rid of dependence on screens” (ID0109). Similarly, AR contact lenses being developed are said to have the potential to “do away with TV screens” in the headline of a *MailOnline* article (ID0350). Another report in *The Guardian* about the HoloLens Minecraft application quoted Microsoft’s corporate vice-president Kudo Tsunoda, stating “there’s a level of immediacy and intimacy that goes beyond anything you can experience while sitting in front of a television screen” (ID0146). In these excerpts, the Transcendent frame is created by relating the widely understood concept of the traditional screen to XR – claiming XR will improve upon the older technology. Furthermore, in the last case (ID0146), the exemplar originates from a source that is established in the field (Kudo Tsunoda). This gives the statement credibility (Go, Jung and Wu, 2014) and further emphasises the frame itself.

In XR marketing, the same framing device was used. For example, on Magic Leap’s website homepage, the interface of the device is described as allowing users to “break free from outdated conventions of point and click interfaces, delivering a more natural and intuitive way to interact with technology” (ML28). “Breaking free” implies that the current way of interacting with technology is restrictive and limiting, whereas MR (and Magic Leap) can transcend this. Similarly, in an early promotional video for HoloLens, a creator of the device states that the way we usually interact with technology (through a screen) is a very “cold” and limited experience (HL02). She continues to say that they aim to overcome this with HoloLens, which goes “beyond the screen” (HL02). Indeed, “go beyond the screen” was a very common phrase in HoloLens marketing, appearing in various promotional materials (HL02; HL04; HL07; HL08; HL18; HL20; HL22; HL30; HL31; HL34). It is therefore significant that the stem *beyond** was used in 4.71 percent of articles, as mentioned above. Therefore, this idea of going beyond something that already exists to a superior experience appears to be shared between the news and the marketing of XR. Importantly, framing XR as Transcendent in this way highlights its relative advantage

in comparison to other technologies. As one of the five perceived attributes of innovations, Rogers defines relative advantage as “the degree to which an innovation is perceived as better than the idea it supersedes [...] The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be” (2003: 15). With this in mind, framing XR as Transcendent could potentially support its diffusion, particularly since this is reinforced by both the news and marketing discourses.

As well as transcending previous technology, another rhetorical framing device involved claiming that XR can be used to do things that would be difficult or even impossible without the technology. For example, an article in *The Guardian* claims that:

One of the key selling points for VR technology is its ability to put you in places you’re unlikely to visit in the flesh, whether too expensive, too dangerous, out of bounds because of mobility issues or just because you don’t like flying (ID0259).

Here, focusing on travel, VR users are said to be able to experience locations virtually that they may be unable to physically due to various factors. Regarding other uses, one *MailOnline* article describes a demonstration of the Fove headset in which “a bed-ridden grandmother wears a Fove headset to ‘attend’ her grandson’s wedding” (ID0608). In the same article, it is noted that, by using the headset, “a young man with spinal muscular atrophy, an illness that has weakened his arms and fingers, used eye movements to play a piano” (ID0608). In all of these examples, XR is framed as allowing users to transcend certain limitations, whether that is money, risk, mobility issues or physical disability. This, again, demonstrates the use of exemplars as framing devices in the construction of the Transcendent frame.

Moreover, the same framing device was also present in XR marketing, though to a more extreme level. Aside from Google Glass, the promotional materials of every device analysed highlighted the Transcendent frame by implying that the products allow the impossible to become possible. Firstly, the HoloLens website explains that the headset allows NASA scientists to: “work as if they can walk on the surface of Mars, an experience previously impossible” (HL25). Another sentence is used regarding car manufacturer Volvo in which HoloLens is said to bring “its cutting edge car features to life in ways never before possible” (HL25). For the Magic Leap device, a post on their Facebook page included a quote from one of the developers with a similar sentiment: “Mixed reality is

the mixture of the real world and virtual worlds so that one understands the other. This creates experiences that cannot possibly happen anywhere else" (ML30). Moving on to VR products, the Oculus Facebook page mentions that their VR For Good initiative "explores VR's ability to inspire and make people feel things they might have previously thought were impossible" (OR31). Each of these excerpts present XR as allowing certain experiences to be had that are "impossible" without the technology, thus framing XR as Transcendent.

Furthermore, the idea of the impossible becoming possible is perhaps the strongest in a Gear VR advert that features an ostrich using the device to learn how to fly (GVR14). When the ostrich puts on the headset, it is shown a flight simulator. Since ostriches are known to be one of the few birds that cannot fly, this allows the ostrich to experience something it could not in reality. As the video continues, the ostrich attempts to fly in the real world while using the headset, without any success. At the end of the advert, the ostrich is shown without the headset, finally taking off into the sky in the real world. Thus, the advert insinuates that the ostrich is able to accomplish something that was previously thought impossible, with the help of VR. This is emphasised by the text that appears at the end of the video: "We make what can't be made", followed by "So you can do what can't be done" and finally the hashtag #DoWhatYouCant (GVR14). These words extend the transcendent effect from allowing an ostrich to fly to suggesting that Gear VR can allow anyone to do anything they could not previously. It is clear that Samsung intended to present transcendence as one of the key features of its device, making it even more significant that this frame also appeared in the news articles.

Indeed, it was also found that a news article from the *MailOnline* (ID0838) was dedicated to writing about this Gear VR advert. The *MailOnline's* interpretation of this advert provides valuable insight into how XR marketing has been treated in the news, particularly relating to transcendence. The report opens with the following paragraphs:

Samsung has given an ostrich the ability to fly with the power of virtual reality.

The South Korean firm has released a new commercial that highlights an ostrich strapping on a headset playing a flight simulation – **giving the large bird the courage to spread its wings and take to the sky.**

Ending the clip with **#DoWhatYouCan't**, the advert for the Gear VR headset is a bid to convince viewers that **all of their dreams can come true in a virtual world** – they just need to purchase the technology (ID0838).

The sections in bold emphasise the rhetorical framing devices used by the journalist to create the Transcendent frame. To expand, the first sentence states that the ostrich has been able to do something that the species is known to be unable to do – fly – by using VR. This is reiterated in the second paragraph, with more detail. Calling the ostrich a “large bird” implies that this is a substantial feat due to its size and weight potentially making it more difficult to fly than other birds. Moreover, the third paragraph notes Samsung’s hashtag that insinuates transcendence, as discussed above. The journalist summarises that Samsung is aiming to convince viewers that Gear VR would allow any user’s dreams to come true. While dreams coming true does not necessarily relate to transcendence, this implies that it was the ostrich’s dream to do something previously impossible, suggesting the same can apply to the dreams of real users. Therefore, highlighting this reinforces the message, and frame, from the advert itself.

After these introductory paragraphs, the article continues to describe the whole advert in depth. It then includes several paragraphs with details about Gear VR itself, such as specifications. This is an important finding in relation to RQ3 because it potentially reduces the number of steps a consumer might go through when deciding whether to purchase a product. To expand, while there are several stages to the innovation decision-making process (Rogers, 2003), the news article has allowed the consumer to view the advert, read the journalist’s interpretation of it and see information about the product all in one location. This has the effect of condensing the decision-making process.

Additionally, featuring the advert in this news article has increased its reach, allowing it to be seen by a wider audience of news readers rather than those who may see it on TV or online. As Schudson states: “when the media offer the public an item of news, [...] they not only distribute the report of an event or announcement to a large group, they amplify it” (1995: 19, quoted in Fuglsang, 2001: 197). Therefore, this is also a particularly significant finding regarding RQ2 because it shows that the news articles have not only reinforced the Transcendent frame present in XR marketing, but this article has done so by spreading the reach of the video advert itself. Still, only one article in the

sample was entirely dedicated to discussing the marketing of an XR product. However, the findings discussed in Section 5.2.4.2 show that the largest portion of multimedia were attributed to XR device creators (17 percent) and 14.13 percent included multimedia content from application creators. In other words, a substantial portion of images and videos from these groups were used in the news articles. Thus, the Gear VR advert is not the only example of these companies having their promotional content included in the news, even if this was the one instance in which an entire article was dedicated to a marketing text. This perhaps suggests a blurring of news and promotional content, as was found by Erjavec (2004), Lewis, Williams and Franklin (2008), Iris Chyi and Lee (2018) and others discussed in Section 3.6.

The existence of the Transcendent frame in both the news and marketing samples coincides with fictional portrayals of VR which have been found to highlight the transcendent capabilities of the technology (Chan, 2014; Taylor, 1997). However, it extends this past VR alone to the broader spectrum of XR. In addition, this news and marketing has not highlighted XR transcendence to the extreme extent of transhumanism as it appears in fiction. Rather, it is focused on how XR can improve or enhance the lives of its users, to make the impossible possible, or to transcend the traditional screen. In this way, it links to the "better than life" discourse found in the T3 article that initially inspired this research (see Section 1.4). More broadly, the Transcendent frame also relates to what Roderick (2016) calls the discourse of technological satisfaction. This involves a focus on what a technological innovation "will do immediately to improve everyday life by overcoming some problem or limitation" (Roderick, 2016: 190). The Transcendent frame does this by representing XR as offering users the chance to do something that could not be done before, or at least to a higher quality than was previously possible.

As such, the Transcendent frame presents XR positively, again showing that the frames used in the news articles to conceptualise XR do not contribute to building a moral panic about the technology. On the other hand, the Transcendent frame also appeared in the marketing materials, suggesting that it would be beneficial to XR companies to expand the reach of this frame to news coverage. Coupled with this, the salience of the Transcendent frame in the news increases the perceived relative advantage (Rogers, 2003) of XR, thus promoting its diffusion. Therefore, including the

Transcendent frame in the news supports the commercial interests of XR companies by reinforcing the messages from the marketing and presenting a favourable view of the technology that should positively impact XR diffusion. In essence, the news acts as a promotional tool.

6.4 Final Remarks

The above discussion has analysed the frames that were used to conceptualise XR in the news articles and considered how this related to XR marketing. It was found that two key frames worked to conceptualise XR: Immersive and Transcendent. Based on quantitative data regarding keywords, it was uncovered that the Immersive frame was, by far, the most prominent in the news articles. This is significant because immersion is the main aim of VR (Evans, 2019), meaning the news articles have effectively supported the promotion of these products by portraying this immersion in a positive light. In other words, XR news appears to have been marketized (Fairclough, 1993), creating a blurring between news and promotional content which shows similarities with the previous research (Chyi and Lee, 2018; Erjavec, 2004; Harro-Loit and Saks, 2006; Lewis, Williams and Franklin, 2008; Pander Maat, 2007; Sissons, 2012) discussed in Section 3.6.

Secondly, the existence of the Transcendent frame could support the diffusion of XR because it depicts the relative advantage (Rogers, 2003) of the innovation. That is to say, it presents XR as an improvement over previous technologies, such as the traditional screen interface. Moreover, Rogers states that the innovation-decision process involves an individual seeking to *"reduce uncertainty about the advantages and disadvantages of the innovation"* (2003: 14, original emphasis). The Transcendent frame clearly highlights the advantages of XR since it focuses on how the technology can allow users to move beyond certain limitations, thereby reducing uncertainty about XR in a positive way.

This chapter also examined the framing devices used to construct the Immersive and Transcendent frames in XR news and marketing discourses, contributing to answering RQ2. It was found that both the Immersive and Transcendent frames appeared in the news *and* marketing samples. Furthermore, similar framing devices were employed in the two discourses to construct these frames. For instance, all of the rhetorical framing devices used to construct the Transcendent frame appeared in both samples. This

included using exemplars to portray XR as able to improve a wide range of areas, the idea that XR goes beyond the traditional screen interface and the argument that XR can make the impossible possible. For the Immersive frame, both the news and the marketing used the metaphor of transportation to present XR in this way. They also both employed modifiers to emphasise the effectiveness of immersion, such as “incredibly” and “truly”. The two samples each visually represented XR as Immersive by using images of users reaching out their hands, instinctively trying to interact with the virtual environment.

Adding to this, three further framing devices were employed by the news articles. A technical framing device was used which involved the repetition of *MailOnline* side-notes (which included the Immersive frame) in multiple articles. The news outlets also used active verbs, such as “flying” to insinuate the VR experience feels believable and thus immersive. Regarding the Transcendent frame, a quotation from a well-known and credible source (Apple’s Tim Cook) was used to present AR in particular as Transcendent. Finding that these frames were shared between the two samples is significant because it shows that the news has reinforced the frames from the marketing and vice-versa. This potentially means the news has aided the promotion of XR products, again linking to the idea that news and promotional discourses are not clearly separated.

The separation of news and promotional content is necessary to maintain the independence of the press (Lewis, Williams and Franklin, 2008). As opposed to traditional news, lifestyle journalism is sometimes seen as an extension of marketing (English and Fleischman, 2019; Kristensen, Hellman and Riegert, 2019). These results suggest that, despite being presented as news, XR articles share characteristics with lifestyle journalism. Without being aware, news readers are being subject to promotional frames, thus making them more susceptible to them in the same way that native advertising does. Both of these frames present XR positively, avoid critical considerations of XR (and, indeed, any moral panic style coverage) and reinforce the marketing efforts of XR companies. In this way, instead of prioritising the interests of the general public as the news should, it instead prioritises the commercial interests of XR companies.

Chapter 7: Newness Frames

Krumsvik et al. state that “innovation implies introducing (and implementing) something *new* into the socioeconomic system” (2019: 194, emphasis added). That is to say, one of the major features of an innovation such as XR is that it is new. This study found that three of the frames applied to XR link to the newness of the technology: Different and Unique; Revolutionary and Transformative; and Advanced and High-Quality. Following the same format as the previous chapter, this chapter examines the framing devices used to construct these frames and makes comparisons between the news and marketing samples. Both quantitative and qualitative data regarding these framing devices will be analysed. The qualitative data in particular allows the discussion to investigate how the news coverage compares to XR marketing, since all of these frames were found to be present in both samples. Throughout, framing theory is utilised to discuss the implications of the choices made by these news outlets regarding framing devices. Additionally, each section looks at whether and how the social system, social institutions, media organisations and routine practices factors (Shoemaker and Reese, 2014) have impacted the frame-building process of XR. Further insight will be gleaned by applying diffusion of innovations theory (Rogers, 2003) and models of technological acceptance (Buenaflor and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007) to consider whether these frames could support the diffusion of XR.

7.1 Different and Unique

The characteristics of an innovation that make it different from existing technologies give it an element of newness, since it does something that previous innovations did not. This study uncovered that a Different and Unique frame was applied to XR, both in the news coverage and marketing. Broadly, this involved portraying XR (either the technology or applications) as different or unique to other technology/forms of media. The current section examines the framing devices employed in the news discourse to construct the Different and Unique frame and considers the relationship with XR marketing. As in the previous chapter, this begins with an analysis of quantitative data regarding the frequency of terms related to this frame. Any variations between news outlet, over time or by XR type are explored. This is followed by qualitative data that demonstrates the

other framing devices used to construct the Different and Unique frame in the news. These results are also compared with qualitative data regarding this frame in the marketing sample to examine the relationship between the two discourses. Unlike the frames discussed in the previous chapter, it was found that there were some attempts to counter the Different and Unique frame in the news articles. Therefore, the section also explores how this happened and analyses its effectiveness. The final paragraph considers how these results relate to previous research and whether this frame could promote XR diffusion.

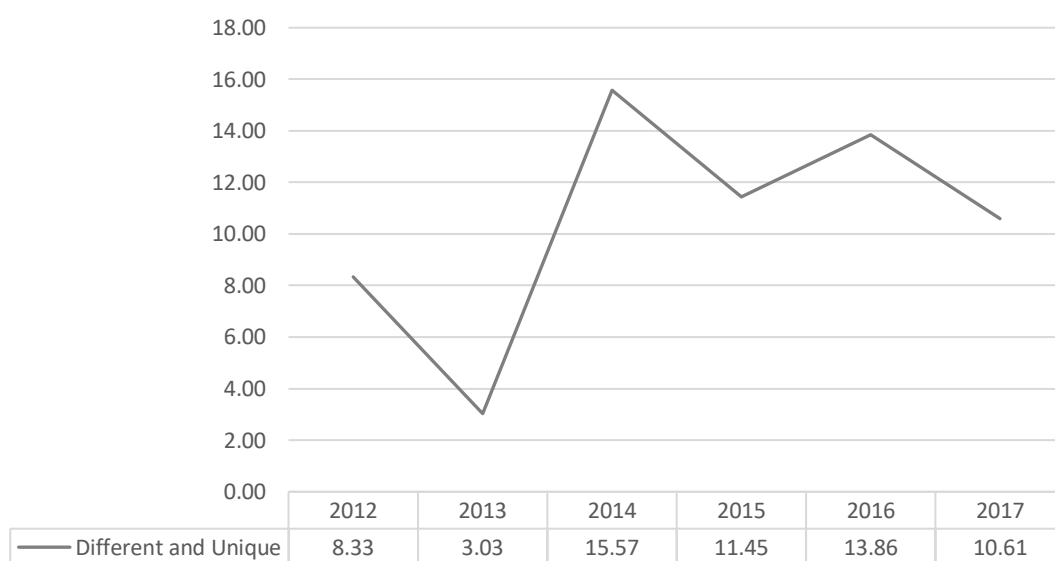
Firstly, as certain words can act as framing devices (Entman, 1993; Linström and Marais, 2012), the existence of this frame in the news articles is indicated by the use of words in the “different and unique” category. Such terms appeared 112 times in 8.6 percent of news articles overall (see Table 7.1). However, in a different way to the Immersive and Transcendent frames discussed previously, this frame was not similarly prevalent in all news outlets. Whereas both *The Sun* and *The Guardian* used these words in a comparable portion of articles (14.75 percent and 13.71 percent respectively), the *MailOnline* included “different and unique” words in just 6.14 percent of its articles. While these figures show that each news outlet used words that highlight the Different and Unique frame, it appears that the strength of the frame has been affected by the media organisation (Shoemaker and Reese, 2014) writing about XR.

	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
Term	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>unique*</i>	8	13.11	26	9.27	52	5.24	86	6.76
<i>different</i>	1	1.64	27	8.06	21	3.14	49	4.30
<i>weird*</i>	0	0.00	14	4.84	6	0.90	20	1.84
<i>unprecedented</i>	1	1.64	1	0.40	4	0.45	6	0.51
TOTAL	9	14.75	41	13.71	62	6.14	112	8.60

On the other hand, in a similar way to the Immersive and Transcendent frames, the type of XR being focused on in the news articles impacted how often this frame was used. Words in the “different and unique” category appeared in 13.22 percent of articles focusing on VR compared to 7.38 percent of those about AR/MR (see Appendix J.6).

Therefore, the frame-building process appears to have been influenced by the technological characteristics of the devices being written about in the news. This finding also helps to explain the low percentage of articles using words in the “different and unique” category in 2012 and 2013, since these years focused predominantly on AR/MR (see Section 5.2.1). After 2013, the use of terms in the “different and unique” category ranged from a high of 15.57 percent in 2014 to a low of 10.61 percent in 2017 (see Figure 7.1). Though this shows a slight fluctuation, these figures suggest that the Different and Unique frame appeared relatively consistently between 2014 and 2017. As mentioned in Section 6.2, the frame repetition hypothesis argues that “the frames that have greater influence on public opinion are those that are repeated more frequently” (Sheafer, Shenhav and Amsalem, 2018: 264). As a result, the repetition of the Different and Unique frame across multiple years could have a significant impact on how readers view XR.

Figure 7.1: Percentage of Articles per Year With at Least One Term From the “Different and Unique” Category



In more detail, examining the individual words within this category shows that the stem *unique** was used the most out of the four (6.76 percent), closely followed by *different* (4.3 percent). Alternatively, *weird** was only used in 1.84 percent of articles and *unprecedented* very rarely appeared (0.51 percent). For *unique** to be the most common term within this category demonstrates that the news articles have not only portrayed XR as different from other forms of media, but that they have moved beyond this to suggest the technology is unlike anything that has come before it. In a study of 177 businesses creating new products, Cooper found that “[t]he single most important

dimension leading to new product success is Product Uniqueness and Superiority" (1979: 100). More recently, Flight et al. linked "uniqueness of features" (2011: 110) to the perceived characteristic of relative advantage as one factor supporting innovation diffusion. Thus, for *unique** to be the most used term in this category suggests the news articles could promote the diffusion of XR. Furthermore, it is significant that *weird** was rarely used within the news articles since this term typically has more negative connotations than *different* and *unique**. It appears that word choice, as a framing device, has contributed to framing XR as Different and Unique, specifically in a positive light.

Additionally, the qualitative framing analysis of the news articles examined this frame in more detail. Across the sample, news articles framed XR as Different and Unique by describing several specific devices as the first of their kind. The following examples demonstrate this:

the world's first really viable virtual reality headset (ID0088)

World's first true augmented reality ski goggles (ID0437)

Fove is the first virtual reality headset to use eye-tracking technology (ID0481)

Samsung has made history of a sort by launching the first major consumer-oriented virtual-reality headset (ID0533)

Whether broadly in relation to VR (ID0088), for a specific scenario (skiing in ID0437) or regarding the technology the devices use (ID0481 and ID0908), each product is portrayed as being unique because it is said to be the first to offer something. This acts as a rhetorical framing device in the construction of the Different and Unique frame. Moreover, these examples each highlight the use of technical framing devices to increase the salience of the frame. To expand, the excerpt from ID0437 appeared as the headline of the article, examples ID0088 and ID0533 both appeared in the lead paragraphs of their respective articles and the segment from ID0481 was the first bullet point in the article summary that the *MailOnline* includes at the beginning of its news items. As noted in Section 4.1.1, news articles are typically structured using the inverted pyramid design in which elements are placed "in decreasing order of importance or newsworthiness" (Bednarek and Caple, 2012: 100). Pan and Kosicki claim that the headline of an article is "the most powerful framing device of the syntactical structure", while the "lead is the next

most important device to use” (1993: 59). In other words, any points that appear in the headline and lead paragraph of articles are given particular emphasis. Therefore, the Different and Unique frame has featured quite prominently in these examples, demonstrating its strength.

Considering the prominence of the idea that these products are the first of their kind, it is significant that the same framing device was used in XR marketing. Promotional materials for both Oculus Rift and HoloLens highlighted the Different and Unique frame this way. Firstly, the Oculus Rift Kickstarter page claimed the device was “the first truly immersive virtual reality headset for video games” (OR06). The press release for the campaign also stated that users will be able “to experience VR gaming for the first time” (OR05). Secondly, the HoloLens website, as well as a promotional video, define the device as “the world’s first fully untethered, self-contained holographic computer” (HL20; HL45). This shows that the Different and Unique frame appeared in both samples, highlighting a further similarity between the two discourses. Not only that, but the same rhetorical framing device (this idea of the products being the first of their kind) was used in both samples. Again, it appears that these two texts work together to reinforce this frame to the public.

In a similar way to claiming XR products are the first of their kind, the Different and Unique frame was also constructed by representing the XR experience as unlike anything else. Again, this idea appeared in both the news and marketing of XR. For instance, in the news sample, an article in *The Guardian* claims that “VR offers the potential to put the viewer into the experience of actually being there like nothing else” (ID0191). Here, the idea of immersion (“putting the viewer into the experience”) is used to argue that the experience is unique. In XR marketing, a similar phrase is used as a framing device to imply the same sentiment: “like never before”. This phrase appeared in marketing of Gear VR, HoloLens and Oculus Rift, as demonstrated below:

Gear VR is a virtual reality headset that lets you experience games, movies and more like never before (GVR03)

Immerse yourself in entertainment like never before (GVR10)

Connect, create, and explore like never before (HL20)

See detail like never before when you build in 3D (HL42)

explore new worlds like never before (OR06)

dive into the Blade Runner universe like never before (OR31)

With the phrase appearing across the marketing of multiple devices, this is further evidence to indicate that the Different and Unique frame is salient in marketing discourse. As mentioned in the previous chapter, the persuasive power of frames is enhanced when they appear in more than one type of media (Van Gorp, 2007). Therefore, the news has reinforced the same frame from the marketing that is intended to sell the products, thus potentially supporting its adoption.

However, unlike the frames previously discussed, the qualitative framing analysis uncovered that one article in *The Guardian* attempted to counter the Different and Unique frame. The article, headlined “Facebook’s virtual reality [Oculus Rift] just attempts what artists have been doing forever” (ID0227), cites Oculus’ Mark Zuckerberg but criticises his argument. The sub-heading of the report states: “Mark Zuckerberg says VR will capture human experiences like never before – but is it really superior to what writers and artists achieved centuries ago?” (ID0227). The article goes on to argue that virtual worlds have been created by writers and artists for “centuries”; thus, Oculus Rift is nothing new or unique. Nevertheless, this is the only instance that the Different and Unique frame was contested. To reiterate, Van Gorp states that “[t]he more often schemata [or frames] are confirmed by further information, or by congruent framing devices, the more difficult it becomes to refute or change them by counterframing” (2007: 69). Since the Different and Unique frame appeared in both the news and marketing discourses and multiple framing devices were used to do this, it is unlikely that the one attempt at counterframing will have much effect on readers.

Deviance is a common focus of moral panics (Cohen, 2002), in which actors (including news media) highlight issues over something that is different to the norm. With this in mind, it might be expected for the aspects of XR that are different from other technologies to be portrayed in such a way to create a moral panic. However, this has not been the case for XR. Although the characteristics of the technology that set it apart from others are highlighted, this is done in a positive way through the Different and Unique frame to present XR as new and appealing to readers. News about XR therefore differs from other technologies that have been the subject of a moral panic, including

radio, TV (Markey and Ferguson, 2017), mobile phones (Goggin, 2006) and videogames (Rogers, 2013).

Alternatively, the appearance of the Different and Unique frame in the news coverage shows some similarity between Therrien and Lefebvre's (2017) study of videogame marketing. To expand, Therrien and Lefebvre found that "video game marketers rely on [...] the classic 'old vs. new' antithesis", which is characterised by "expressions such as 'the first of'" a particular technological novelty (2017: 62). This coincides with the finding that XR was framed as Different and Unique by claiming it is the first of its kind. As mentioned above, the uniqueness of a product makes it more likely to be adopted (Cooper, 1979; Flight et al., 2011). Therefore, framing XR as Different and Unique could arguably promote its diffusion by emphasising these supposedly unique features. Furthermore, since one of the aims of marketing is to differentiate a product from others to highlight its value to consumers (Kotler et al., 2016), it is not surprising that the promotional materials for these devices have highlighted their uniqueness. However, as this is one of the main aims of product promotion, the fact that the news articles also represent XR as unique means that they are potentially aiding the marketing of XR products. This is further evidence of the marketization (Fairclough, 1993) of XR news and the blurring boundary between news and promotional content. As a result, the news supports the capitalist ideologies of XR companies by reinforcing another positive frame that is present in the marketing.

7.2 Revolutionary and Transformative

Related to Different and Unique, another frame that appeared in both the news and marketing was Revolutionary and Transformative. A technological revolution can be defined as "a dramatic change brought about relatively quickly by the introduction of some new technology" (Bostrom, 2007). Certainly, in news and marketing of XR, the Revolutionary and Transformative frame involved presenting XR as a technology that could radically change certain areas. The current section examines the framing devices used to create this frame in the news and considers how this compares with XR marketing. It first discusses quantitative data that demonstrates how often words relating to this frame were used overall, as well as variations between news outlet, per year and XR type (VR or AR/MR). This is then complemented by qualitative results which highlight

the additional rhetorical and technical framing devices used to present XR as Revolutionary and Transformative. Qualitative data based on the marketing materials is also utilised to further analyse the interplay between the news and marketing samples. Additionally, as in the previous section, the discussion then notes any instances of the frame being contested. Finally, these results are compared with previous research and examined in terms of whether this frame could promote the diffusion of XR.

As before, the use of terms in the “revolutionary and transformative” category help to illustrate how often this frame was used. More common than terms in the “different and unique” category, words in the “revolutionary and transformative” group appeared in 15.56 percent of articles overall (see Table 7.2). *The Guardian* was most likely to use such words, with 17.74 percent of articles from this publication including terms in the “revolutionary and transformative” category. The *MailOnline* used these terms slightly less (15.42 percent). However, *The Sun* only used words from the “revolutionary and transformative” category in 8.2 percent of its articles. This indicates that the frame was fairly prominent in *The Guardian* and the *MailOnline*, though it was not used very often in *The Sun*. The media organisation (Shoemaker and Reese, 2014) reporting on XR appears to have impacted the strength of this frame, though not to the extent that it was absent from some news outlets. This shows similarities with the Different and Unique frame.

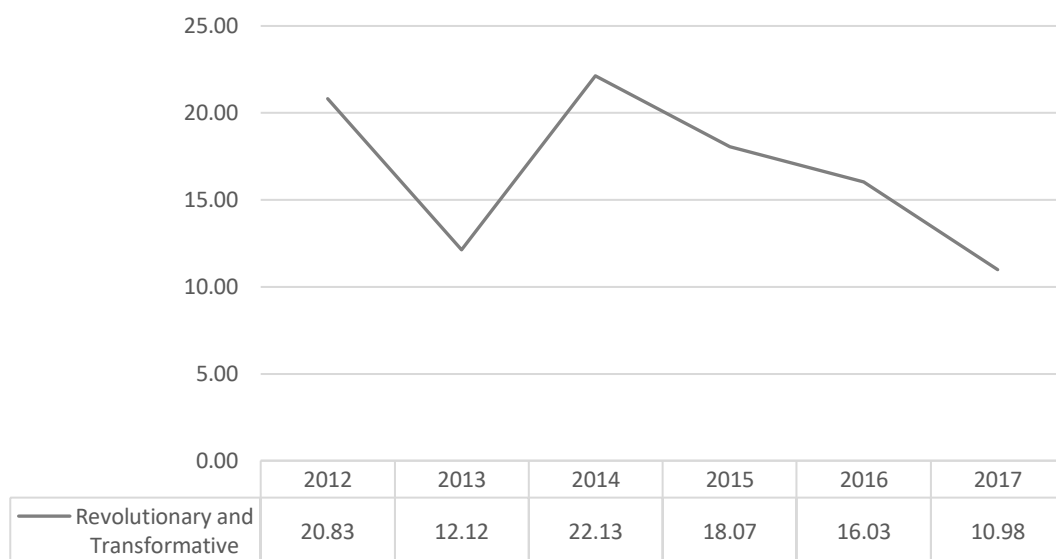
Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>revolution*</i>	4	4.92	22	7.66	85	10.03	111	9.11
<i>transform*</i>	0	0.00	30	8.47	40	5.09	70	5.63
<i>game(-) chang*</i>	1	1.64	8	2.42	16	1.65	25	1.84
<i>disruptive</i>	0	0.00	2	0.81	8	1.05	10	0.92
<i>reinvent*</i>	1	1.64	1	0.40	0	0.00	2	0.20
TOTAL	6	8.20	63	17.74	146	15.42	215	15.56

Furthermore, there was only a slight difference between the use of words highlighting this frame in articles about VR and those focusing on AR/MR (see Appendix J.6). Of those articles focusing on VR, 14.99 percent included words in the “revolutionary

and transformative” category. Similarly, 18.79 percent of articles concentrating on AR/MR used such terms. Therefore, this frame appears to have been applied to AR/MR slightly more often than VR. However, the difference is fairly small, showing that the technological characteristics of the devices do not appear to have impacted the prevalence of this frame to a great extent.

Alternatively, the use of words construing this frame varied to a slightly larger degree in the different years of the sample period (see Figure 7.2). In 2012, 20.83 percent of articles included terms from the “revolutionary and transformative” category. This shows that when XR products were first announced in 2012, it was common for the news outlets to frame it as Revolutionary and Transformative. However, the frame was not as prominent in 2013, as uses of these words dropped to 12.12 percent. On the other hand, Mark Zuckerberg’s involvement with XR through the purchase of Oculus appears to have renewed the use of the Revolutionary and Transformative frame, since 22.13 percent of articles used words in this category in 2014. Still, after 2014, this figure gradually decreased until the end of the sample period when it ended at 10.98 percent. This shows that the use of this frame has not been as stable as the Different and Unique frame. Nevertheless, words in the “revolutionary and transformative” category were still present every year, which, according to the frame repetition hypothesis (Sheafer, Shenhav and Amsalem, 2018), could increase its strength.

Figure 7.2: Percentage of Articles per Year With at Least One Term From the “Revolutionary and Transformative” Category



Examining the use of specific terms within the “revolutionary and transformative” category provides further insight into the use of this frame. Out of all words in this category, the stem *revolution** was used the most, in 9.11 percent of articles. The stem *transform** appeared the second most, being present in 5.63 percent of articles. On the other hand, the word *disruptive* was rarely used, appearing just 10 times overall in 0.92 percent of news items. As *disruptive* has more negative connotations than *revolution** or *transform**, this highlights that the supposedly revolutionary aspects of XR have not been presented in a negative light. Moreover, these results share similarities with the preference for *different* and *unique** over *weird** mentioned in the previous section. Van Dijk highlights that the choice of specific words “may signal [...] the attitudes and hence ideologies of the speaker” (1988: 81). In the cases of the frames discussed in this chapter thus far, specific word choices indicate that the news media present favourable attitudes towards XR.

As well as word choice, the qualitative framing analysis revealed that several additional framing devices were used to present XR as Revolutionary and Transformative. Firstly, exemplars have been used as framing devices in the news to relate XR’s supposedly revolutionary and transformative capabilities to a wide range of areas. For instance, a *MailOnline* article mentions that Magic Leap “could revolutionise how people shop, watch TV and even how doctors operate” (ID0435). Likewise, an article from *The Guardian* noted that: “Games, exploration, psychiatry and many other fields could all be revolutionised” by VR (ID0142). In these sentences, the revolutionary potential for the technology is presented as broad due to the range of areas mentioned. Desrosiers argues that “[f]rames resonate when they reflect what publics live, what they believe, and what they believe matters” (2012: 5). Therefore, relating the Revolutionary and Transformative frame to a wide range of areas increases the portion of readers that this will be relevant to, thus making it resonate with a wider audience and increasing the salience of the frame overall.

In a similar way, the phrase “future of” was used as a rhetorical framing device to construct the Revolutionary and Transformative frame. For example, a *MailOnline* article states that a PlayStation VR demo “clearly demonstrated the potential of the technology for the future of home entertainment” (ID0526). Claiming that the technology could be the “future of” something implies that it is not only different to what came before it

(linking to the Different and Unique frame above), but that this difference will be an improvement to the extent that it will replace its predecessor. In other words, it will change, transform or revolutionise that area. Moreover, this technique is not restricted to XR's impact in entertainment in other articles. Firstly, a *MailOnline* article highlights that Google Glass "has been touted as the future of computing" (ID0336). While this sentence only mentions one area of impact, computing in itself is very broad. Therefore, describing Google Glass as the future of computing suggests its revolutionary potential could be very meaningful. In a different way, an article in *The Guardian* focusing on PlayStation VR states that the device provides "a convincing look at the future of gaming, virtual tourism and a whole new set of experiences" (ID0090). Here, though gaming is mentioned (relating to home entertainment in the above example), XR is also said to be the future of virtual tourism and, very broadly, "experiences". Again, as in the examples discussed previously, this presents XR as affecting an assortment of areas which could make this frame resonate with a larger audience (Desrosiers, 2012).

Considering the relationship between the news and marketing, it was found that the same phrase ("future of") was used as a framing device in XR promotional content. Specifically, Oculus Rift marketing claims that the device is the future of gaming (OR19; OR31). More broadly, promotional material for both Magic Leap and HoloLens claims they are creating the future of computing (ML29; HL31; HL33), with HoloLens marketing sometimes more precisely referring to it being the future of *holographic* computing (HL20; HL21; HL24). Furthermore, HoloLens promotional texts also argue that the device will be the future of product design (HL25; HL38), architecture, learning and education, construction and home improvement (HL42). In Magic Leap marketing, this idea is extended, with a press release stating that the device is "not just the future for entertainment; it has the potential to be the future of everything" (ML18). These examples demonstrate that both samples have used the "future of" phrase to highlight the revolutionary and transformative potential of XR. This highlights further overlap between the two discourses. Again, a frame that is used to promote XR has also appeared in the news. This reinforces the frame and the likelihood of it being accepted by readers (Van Gorp, 2007), raising questions as to the separation of news and promotional content in XR coverage.

As well as mentioning a range of areas that will be revolutionised by XR, a more specific exemplar was used as a framing device when focusing on the Magic Leap headset. For example, one *MailOnline* article headline reads as follows: "Magic Leap set to revolutionise every aspect of daily life" (ID0435). Here, instead of referencing a specific area that will be revolutionised by XR, the Magic Leap device itself is described as revolutionary. As this frame appears in the headline of the article, it is particularly salient (Pan and Kosicki, 1993). The frame is also enhanced by the claim that it can revolutionise *every* aspect of life. In a similar way, *The Guardian* states that: "some say [Magic Leap] may be the most revolutionary tech gadget in years" (ID0214). The modifier "most" suggests its revolutionary capabilities are very strong. Although the lack of a specific source for this point could negatively impact its perceived credibility for readers (Duffy and Freeman, 2011), it nevertheless holds more weight than if the journalist had written it as their own opinion. These examples demonstrate that the Revolutionary and Transformative frame is particularly strong in relation to Magic Leap.

This is a significant finding when considered in relation to the marketing of Magic Leap. To expand, even the name and logo of the company frame the technology as Revolutionary or Transformative. A press release about Magic Leap's first round of funding clearly highlights this. Stryker, Magic Leap's parent company, states that the technology is "truly game changing. It is like a rocket ship for the mind" (ML01). Firstly, calling Magic Leap "game changing" suggests that it will transform the industry. This is emphasised with the rocket ship metaphor, echoing Magic Leap's logo which is itself a rocket. Since the rocket ship was revolutionary for space exploration, this implies Magic Leap will be revolutionary for "the mind", hinting at great potential for seemingly limitless areas. Furthermore, in a Facebook post (ML30), Magic Leap states that their company name was inspired by the moon landing ("one giant *leap*..."). In addition to the company's name and logo, the idea that Magic Leap is transformative is highlighted on their website. When inviting developers to consider how Magic Leap could be used, the website states: "Imagine how this would completely transform how people interact with both the digital and real-worlds. Imagine you being one of the first to help transform the world forever" (ML10). In this quote, the use of "completely" to describe Magic Leap's transformative capabilities implies that it will result in highly substantial change. The statement also stresses that this will be a lasting change because it will "transform the world forever".

This makes its revolutionary and transformative capabilities appear even stronger. Therefore, based on Magic Leap's overall branding, as well as statements such as this, it appears the company is a strong advocate of the Revolutionary and Transformative frame. With this in mind, the *MailOnline* and *The Guardian's* references to Magic Leap as the *most* revolutionary, with the potential to transform every aspect of life, shares a very similar sentiment to Magic Leap's overall marketing. Combined with the appearance of other shared frames, this finding indicates that, within the social institutions factor (Shoemaker and Reese, 2014), the marketing has impacted the frame-building of XR in the news.

Further evidence of this can be identified in the news articles' use of XR company owners as sources to portray XR as Revolutionary and Transformative. An example is a quote from Mark Zuckerberg. The statement itself originated from a press release announcing Facebook's plans to acquire Oculus. In the press release, Zuckerberg claims: "Oculus has the chance to create the most social platform ever, and change the way we work, play and communicate" (OR13). Of particular interest in relation to the Revolutionary and Transformative frame is the idea that the device can "change the way we work, play and communicate". Zuckerberg implies that Oculus Rift will change every aspect of life (work, play and communication), making its transformative capabilities seem extremely far-reaching. This quote appeared in three different articles in *The Guardian* and 18 *MailOnline* articles, indicating that information subsidies (Gandy, 1982; see Section 3.4.1) have been effective in getting a frame advocate's point into the news. Information subsidies relate to the social institutions factor of the hierarchy of influences model (Shoemaker and Reese, 2014). For a news outlet to publish information from a press release brings it into the public domain (Nordfors, 2009). Moreover, the routine practice (Shoemaker and Reese, 2014) for the *MailOnline* to copy and paste information from one article to another has strengthened this frame.

The fact that any quotations have appeared in multiple articles within the same outlet suggests that journalists are under pressure to create news content quickly, particularly in the *MailOnline* where this happens the most. This suggests that the commercial pressures within the social system (Shoemaker and Reese, 2014) have resulted in this routine practice that speeds up the creation of content. Not only does this lessen the quality of the news, but when quotations are copied and pasted, it

provides those sources with significant power. In this case, Zuckerberg has been given significant power in defining XR, which has increased the salience of the Revolutionary and Transformative frame.

Comparably, another article uses a quotation from Apple CEO Tim Cook to highlight this frame in relation to AR, showing similarities with the Transcendent frame. The *MailOnline* article reads as follows: “When asked what technologies he sees as transformative, Cook said: ‘I’m incredibly excited by AR because I can see uses for it everywhere’” (ID0945). Using the same technique as in the quotes above that have related XR’s revolutionary and transformative impact to a wide range of areas, Cook argues that AR can be used “everywhere”. This, again, makes AR’s transformative potential seem strong. Apple is a very established and successful brand, thought to be at the technological high-end. Indeed, as of 2019, Apple has been at the top of *Forbes’* list of the world’s most valuable brands for nine consecutive years, being worth \$205.5 billion (Badenhausen, 2019). Additionally, Apple (2018) reported in a press release that the number of active users of their devices reached 1.3 billion as of January 2018 (approximately three months after this news article was published). It is clear the company has a very large user base and is financially successful. Because of this, Cook’s opinion could be deemed as highly credible for readers. According to van Dijk, discourse is more persuasive when journalists select “reliable, official, well-known, and especially credible persons and institutions” as sources (1988: 94). Therefore, quoting Cook giving this opinion increases the salience of the Revolutionary and Transformative frame for AR in particular. Moreover, within the social institutions factor (Shoemaker and Reese, 2014), these two sources (Zuckerberg and Cook) have acted as advocates of this frame.

In a different way to the framing devices already discussed, another technique was used in HoloLens marketing to present XR as Revolutionary and Transformative. Instead of simply claiming the device can revolutionise an area, HoloLens is presented as a device that can allow its users to transform the world. For instance, the tagline of the product is “transform your world”, which appears on their website (HL04; HL10), at the end of their promotional videos (HL01; HL02; HL11-17; HL45; HL46; HL49; HL63; HL69) and their social media pages (HL42; HL44). This tagline in itself implies that the device can be used as a transformative tool. Additionally, the video advert for HoloLens titled “Transform your world with holograms” (HL02) further highlights this when the narrator

states: “when you change the way you see the world, you can change the world you see” (HL02). Firstly, this statement suggests that using HoloLens can change (or transform) the way the world is seen. Secondly, it implies that HoloLens allows the user to transform the world. Therefore, HoloLens is represented as transformative in the sense that it can facilitate transformation through its use, rather than the device itself being inherently revolutionary or transformative. As this idea of transforming the world is central to HoloLens marketing, this further demonstrates the prominence of the frame in XR promotional materials. For this frame to appear in both the news and marketing means it is more likely to be accepted as reality (Van Gorp, 2007), thus demonstrating the significance of this frame being shared between the two samples.

Although the Revolutionary and Transformative frame is salient within the news and marketing, it is important to note that one *MailOnline* article used a statement from a “senior research analyst” arguing the opposite (ID0742). The source argues that: “Instead of being a game-changer, VR is likely to give a boost to the gaming industry” (ID0742). This limits VR’s impact to just one area (gaming) and suggests that its effects will not be substantial enough to be classed as revolutionary or transformative. Pan and Kosicki (1993) highlight that the designator given to a source (i.e. how a source is labelled) can impact the authoritativeness of the statement. In this case, naming the source a *senior* research analyst gives them, and the statement, a strong level of authoritativeness. However, the prominence a journalist gives to a quotation is also part of the framing process (Van Gorp, 2010). Out of the 25 paragraphs in the article (not including side-notes), this statement appears in the 22nd and 23rd. In other words, according to the inverted pyramid structure, it does not appear in a prominent position. Thus, although the designator applied to this source has given them a certain credibility, this statement has not been placed in a prominent part of the news article. Considering that some of the examples above have highlighted the Revolutionary and Transformative frame within article headlines, it is clear the sample has favoured the Revolutionary and Transformative frame rather than any sources highlighting counterframes.

The appearance of the Revolutionary and Transformative frame in the news and marketing discourses shows continuity with Chan’s finding that literature and film in the 1990s presented VR as “revolutionary and unprecedented” (2014: 124). Extending past XR, both Roderick’s (2016) broad study of technology discourse and Kelly’s (2009) study

of magazine coverage of microcomputers uncovered representations of technology as revolutionary. In this way, XR appears to have been framed similarly to other technologies. Moreover, framing XR as Revolutionary and Transformative presents the technology as having substantial importance since it will supposedly have particularly meaningful implications. Regarding the diffusion of innovations, Rogers (2003) argues that the higher the perceived importance of an innovation, the more likely it is to be adopted. Therefore, framing XR in this way could arguably promote its diffusion. This is particularly the case since the frame appears in both news and marketing discourse, which work to reinforce each other and thus the facticity of the frame (Van Gorp, 2007). These results coincide with the findings regarding the frames that have previously been discussed.

Similarly to the Different and Unique frame, the revolutionary and transformative capabilities of XR could have been presented as deviant to create a moral panic. Again, this did not happen. Instead of suggesting the change XR can bring about is disruptive, the news articles have presented these effects as positive. This further shows that the news outlets have favoured positive framings of XR which can work towards supporting XR marketing. As a result, the news works in the commercial interests of the companies selling XR products.

7.3 Advanced and High-Quality

The final frame to be discussed in this chapter is Advanced and High-Quality. Mostly self-explanatory, this frame involved presenting XR technology as advanced and thus capable of providing a high-quality XR experience. The use of this frame contributes to the broader concept of newness by highlighting the advanced nature of the products; for something to be advanced suggests it is utilising some of the newest technology and features currently available. As was found in the previous sections, a range of framing devices were used in the news and marketing samples to construct the Advanced and High-Quality frame and this segment analyses them in detail. Firstly, quantitative data is used to examine how often keywords were used as framing devices to depict the Advanced and High-Quality frame. This section also explores whether there were any variations based on XR type, year or news outlet. Following on, qualitative data provides further insight into the additional framing devices used to present XR as Advanced and

High-Quality, as well as how this relates to the marketing materials. Next, it is noted that some attempts were made in the news articles to counter this frame. The section ends by comparing this finding to existing research and considering the implications of this frame appearing in XR news coverage regarding the diffusion of XR.

To begin, quantitative data from the frequency of terms analysis shows that the Advanced and High-Quality frame was particularly prominent in the news articles. Across the entire news sample, words in the “advanced and high-quality” category appeared 500 times in 30.3 percent of articles (see Table 7.3). At almost one third of the news sample, this is a substantial amount. Furthermore, out of all word categories corresponding to a specific frame, those in the “advanced and high-quality” group were used in the second largest portion of articles, after those referring to the Immersive frame (see Table 6.3). Although a frame does not always have to be repeated often to have an effect on the public (Entman, 2003; Van Gorp, 2010), “repetitive framing will strengthen a news framing effect” (Lecheler and de Vreese, 2019: 88). Therefore, the large portion of articles with words that refer to XR as Advanced and High-Quality show that this is a particularly strong frame within the news sample. While this larger figure could be due to the fact that there were more words in the “advanced and high-quality” category than in some others, it should be remembered that the words within this category were identified during the qualitative analysis of the texts. That is to say, there are more words in this category precisely because a wider range of words were used to depict this frame. This in itself highlights the prominence of the Advanced and High-Quality frame.

However, there were some slight variations between the news outlets in the use of the Advanced and High-Quality frame. Words in the “advanced and high-quality” category were used in the second largest portion of articles in *The Sun* and *MailOnline*, after those from the “immersive” group (see Table 6.3). On the other hand, the category of words used the second most in *The Guardian* was “much-anticipated”, with the “advanced and high-quality” category ranking third. Still, the difference in percentage was quite small. In *The Guardian*, 32.66 percent of articles included words in the “much-anticipated” category, whereas 28.63 percent used words in the “advanced and high-quality” group. This shows that the media organisation (Shoemaker and Reese, 2014) reporting on XR has had an impact on the strength of the Advanced and High-Quality frame, though only to a small degree. When information is corroborated by more than

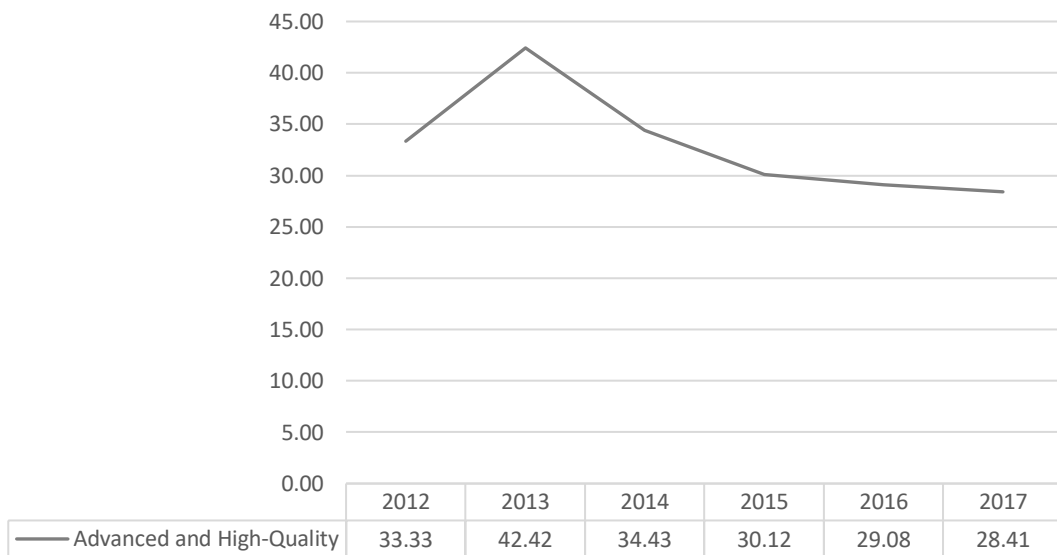
one source, audiences are more inclined to accept it as true (Nordfors, 2009). Thus, for the Advanced and High-Quality frame to be present in all these news outlets increases its potential strength in impacting public opinion.

Term	The Sun		The Guardian		MailOnline		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>advanced</i>	2	3.28	7	2.42	61	7.19	70	5.73
<i>accura*</i>	0	0.00	7	2.82	58	5.09	65	4.20
<i>cutting(-)edge</i>	6	9.84	10	4.03	28	3.59	44	4.09
<i>futuristic</i>	6	8.20	10	3.63	36	3.74	52	3.99
<i>high(-)end</i>	1	1.64	10	3.63	32	4.04	43	3.79
<i>high(-)tech</i>	7	11.48	2	0.81	26	3.74	35	3.48
<i>next(-)gen*</i>	1	1.64	2	0.81	29	3.74	32	2.87
<i>complex</i>	0	0.00	8	3.23	21	2.54	29	2.56
<i>seamless*</i>	2	3.28	9	3.63	18	1.95	29	2.46
<i>sophisticat*</i>	0	0.00	8	3.23	16	1.65	24	1.94
<i>state(-)of(-) the(-)art</i>	4	6.56	4	1.21	9	1.35	17	1.64
<i>high(-)quality</i>	0	0.00	7	2.82	8	1.20	15	1.54
<i>clever*</i>	1	1.64	9	1.61	9	1.20	19	1.33
<i>masterpiece*</i>	0	0.00	0	0.00	6	0.90	6	0.61
<i>precise</i>	0	0.00	2	0.81	7	0.60	9	0.61
<i>superior</i>	0	0.00	0	0.00	4	0.60	4	0.41
<i>bleeding(-) edge</i>	0	0.00	4	1.21	0	0.00	4	0.31
<i>mind(-) boggling</i>	0	0.00	2	0.81	1	0.15	3	0.31
TOTAL	30	34.43	101	28.63	369	30.54	500	30.30

Furthermore, there was only a slight difference in the use of words in the “advanced and high-quality” category when referring to VR or AR/MR (see Appendix J.6). Across the entire sample period, 27.66 percent of VR articles used words from this category, whereas 34.9 percent of AR/MR articles included these terms. This shows that the characteristics of these technologies has had little impact on whether or not this frame was used. Still, the fact that slightly more AR/MR articles included words from this category helps to explain the peak of the use of these terms in 2013, a year in which 69.7

percent of articles focused on AR/MR. Aside from the peak in 2013, the use of words in this category remained fairly consistent across the years (see Figure 7.3). This did decrease year-on-year from 2014, though not for a substantial amount (from 34.43 percent in 2014 to 28.41 percent in 2017). Despite minor variations, this data indicates that the Advanced and High-Quality frame was prominent in every year of the sample. Since the repetition of frames over time can increase their influence on public opinion (Dickerson, 2001; Sheafer, Shenhav and Amsalem, 2018), the consistent appearance of this frame could lead readers to believe XR to be advanced and high-quality.

Figure 7.3: Percentage of Articles per Year With at Least One Term From the “Advanced and High-Quality” Category



In addition to the appearance of certain words, the qualitative framing analysis uncovered other framing devices used to construct the Advanced and High-Quality frame. A major part of this was referencing fiction. This included stating real XR products were similar to fictional depictions of XR (some of which were introduced in Section 2.6). Several news article headlines used this technique:

Inception helmet creates alternative reality (ID0066)

Google glasses with built-in **Terminator-style** computer displays ‘could be on sale by the year’s end at a cost of \$250’ (ID0311)

Generals will be able to direct battles using new **Minority Report-style** technology including 3D goggles and even virtual reality contact lenses (ID0476)

'It was a bit **like the Matrix**': FIFO father becomes world's first man to experience son's birth from 4000km away after breakthrough in virtual technology (ID0459)

Star Wars-style moving holograms are here: Microsoft shows how HoloLens can bring distant family members into your home (ID0616)

Could virtual reality prevent depression in ASTRONAUTS? **Star Trek-style** holodecks may help them escape the isolation of space (ID0409)

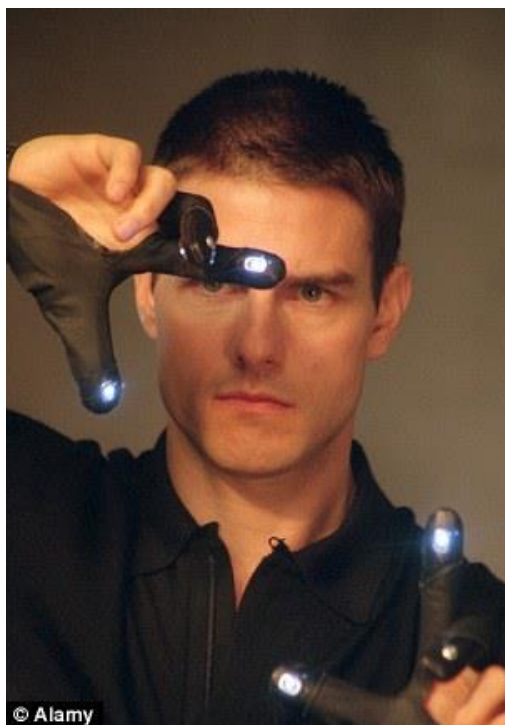
Star Trek-like headset lets woman who lost her sight as a child see her husband and baby for the first time (ID0818)

In these examples, the words highlighted in bold emphasise the comparisons of XR to fiction. As real XR was an emerging technology during the sample period of this study, readers may be unaware of what XR is. However, they are more likely to be familiar with their fictional representations. Therefore, the use of fiction analogies portrays XR as similar to how the technology appears in fiction. Fictional versions of XR are much more advanced than the real products, though this is not noted by these articles. Because of this, associating fictional XR with real devices portrays current-day XR as Advanced and High-Quality. Furthermore, this frame is particularly strong in these examples since it appears in the most salient part of the news article – the headline (Pan and Kosicki, 1993). In other words, the rhetorical framing device of fiction analogies is complemented by a technical framing device: the decision of the journalists to include these references in the headline. Since “[m]edia frames work by connecting the mental dots for the public” (Nisbet, 2010: 47), referencing fiction that audiences may be familiar with could act as a powerful framing device, particularly since it has been appropriated in article headlines.

Still, it is possible that readers may not be aware of these fictional texts. To compensate for this, news articles used an additional technical framing device to enhance the salience of the Advanced and High-Quality frame: images. One example of this can be seen in a *MailOnline* article about a smartphone-based VR headset called Pinć. This device included finger rings that allowed the user to interact with the virtual environment using their hands. One paragraph of the article states: “a user can make hand gestures to control on-screen objects, in a similar way to the gloves used by Tom Cruise in 2002 sci-fi film *Minority Report*” (ID0423). Again, comparing the product to a well-known film makes an association between real XR and the advanced technology presented in fiction.

However, for those unfamiliar with *Minority Report*, a picture was also included (see Figure 7.4) as a visual comparison. Therefore, even those unaware of *Minority Report* could make the association between the fictional technology and the real product. This increases the salience of the Advanced and High-Quality frame since these references could be more widely understood by the audience. Coleman argues that “images exert a more powerful influence on memory and perceptions than text” (2010: 243). Thus, the use of imagery to depict the Advanced and High-Quality frame further demonstrates the prominence of this frame.

Figure 7.4: Image of *Minority Report* in *MailOnline* (ID0423)



As well as simply associating fictional XR with actual XR, news articles also argued that the current generation of products represent fiction becoming a reality. For instance, the headline of a *MailOnline* article begins: “‘Holodeck’ becomes a reality” (ID0389) and another *MailOnline* article describes Google Glass as “[s]traight out of science-fiction predictions of what future homes will be like” (ID0334). Similarly, the introductory sentence of an article from *The Guardian* states: “It might look like a scene from *Minority Report*, but Constantinos Miltiadis’s hi-tech gear is science fact, not fiction” (ID0120). As mentioned above, the XR technology seen in fiction is advanced and futuristic. Therefore, suggesting these technologies from fiction are becoming real implies that the actual devices are similar to their fictional counterparts; making them appear advanced. Entman

states that the “frames that employ more culturally resonant terms have the greatest potential for influence” (2003: 417). Additionally, Chan points out that popular forms of entertainment (such as those mentioned here) can reach millions of viewers and are thus “important cultural resources” (Chan, 2014: 105). This suggests that associating XR with fiction could be a particularly powerful framing device in constructing the Advanced and High-Quality frame.

Moreover, a source is also used as technical framing device to give this claim credibility. In particular, *The Guardian* quotes Mark Zuckerberg, stating: “In just a few years, VR has gone from being this science fiction dream to an awesome reality” (ID0159). As well as highlighting fiction has become fact, Zuckerberg presents this as something very positive by using the words “dream” and “awesome”. Coleman and Ross state that source choice affects the “shape and orientation [of a news story], casually but irrevocably promoting a particular perspective which goes unchallenged” (2010: 49). The use of Zuckerberg as a source shows that, within the social institutions factor (Shoemaker and Reese, 2014), an XR company owner has acted as a frame advocate and played a role in presenting XR as Advanced and High-Quality. This coincides with the findings regarding the Transcendent and Revolutionary and Transformative frames.

The idea that fiction is becoming real also appeared in marketing of Oculus Rift, Gear VR and HoloLens to construe the Advanced and High-Quality frame. For instance, a Facebook post advertises Gear VR, stating: “With the passing of time, a lot of what we used to consider science fiction has become reality” (GVR21). The post invites the reader to follow a link to learn more about how Gear VR was made. This is accompanied by images showing various stages of Gear VR development. Combining this sentence about science fiction with the link and images suggests that the creation of Gear VR is one example of fictional technology becoming real. In a similar way, the HoloLens “Possibilities” video advert includes a developer of the device stating that what the HoloLens does was once “science fiction and now we’re bringing it into science fact” (HL01). This is repeated on their website, which includes “science fiction becomes science fact” as a section heading (HL18). These examples show that the same frame (Advanced and High-Quality) and framing device (fiction becoming real) have been used in both the news and marketing discourses, demonstrating another similarity between them. As mentioned above, the repetition of frames in different media enhances their persuasive

power (Van Gorp, 2007). It appears the Advanced and High-Quality frame is no exception to this, with both news and marketing discourses reinforcing the frame.

The use of fiction references to frame XR as Advanced and High-Quality is surprising considering the often dystopic visions of VR that appear in fiction (Ariel, 2017; Bailenson, 2018; Steinicke, 2016; see Section 2.6). These connections could have easily been utilised to present real world XR in a negative light and perhaps even to produce moral panic style discourse. Certainly, the qualitative analysis did uncover some instances of fiction being used in this way. For example, one *MailOnline* article explains that HoloLens “has been likened to a plot device in an episode of hit Netflix show Black Mirror in which humans are implanted with a gadget that records all that they do, say and hear” (ID792). This highlights the privacy concerns surrounding AR mentioned in Section 2.3. However, this statement appears in the very last paragraph of the article, with the remainder extolling the benefits of HoloLens to help find lost objects, including a quote from the Alzheimer’s Society emphasising the benefit to dementia sufferers. Considering that several references to fiction appear in article headlines as a way to represent XR as Advanced and High-Quality, this shows that journalists have favoured positive framing of the technology even when there are clear links to potential negatives.

Although fiction references were a major part of constructing the Advanced and High-Quality frame, this was not the only way the frame could be observed in the news articles. In addition to fiction references, the inclusion and description of product specifications contributed to framing XR as Advanced and High-Quality. An example of this can be seen in an article from *The Guardian* about HTC Vive, which describes the headset as a “powerful new VR headset [...] featuring two 1200 x 1080 displays, a smooth 90-frames-per-second refresh rate and a bunch of motion tracking technologies” (ID0132). Since *The Guardian* is a generalist news outlet (rather than a technology news outlet), a large portion of its audience may not understand what these specifications mean. Indeed, Crow and Stevens note that the use of jargon can “impede the persuasiveness” of a message (2012: 112). To avoid this issue, the journalist has used a rhetorical framing device in the way that they have described these specifications to attest that the figures correlate to a high-quality experience. The descriptor “powerful” is used first, implying the headset has been built with advanced components capable of providing a high-quality experience. Additionally, the refresh rate is described as

“smooth”, assuring readers unfamiliar with the terminology that this number equates to a seamless XR experience. Further to this, the use of “bunch” in relation to the device’s motion tracking creates the impression that the device is well-equipped to process movement, making it capable of providing a high-quality experience. Here, the typical routine practice (Shoemaker and Reese, 2014) for journalists to make complex issues understandable to a wide audience (Carlson, 2017) has impacted the building of the Advanced and High-Quality frame.

Moreover, the same article uses an additional framing device in the form of quotations to enhance the Advanced and High-Quality frame. Developers of VR content are quoted positively evaluating the specifications of HTC Vive. One developer claims: “The specs sound pretty solid [...] and the screen resolution seems good. The tracking volume of 15ft sounds excellent” (ID0132). As in the previous example, readers may be unfamiliar with terms such as “specs”, “resolution” and “tracking volume”. However, the developer’s quote includes the descriptors “pretty solid”, “good” and “excellent” to clarify that these details are positive. Furthermore, the same developer also notes that HTC Vive “now puts two HMDs on the market aimed at the highest possible consumer VR experience” (ID0132). The use of the superlative “highest possible” argues that there could be nothing better than this device, placing strong emphasis on the Advanced and High-Quality frame. Additionally, how sources are labelled “signify different levels of authority” (Bell, 1991: 193). The credibility of these statements is supported by the apparent expertise of the source in the area since the journalist has labelled him as a VR developer, suggesting he is knowledgeable about the industry and the quality of VR products. Developers of VR content are invested in the success of the technology because they need their content to sell. Therefore, it is not surprising that this developer speaks very positively about HTC Vive. However, simply including a source’s point of view in a news article “makes a positive contribution in the evocation of a frame” (Van Gorp, 2010: 103). Therefore, the journalist’s choice to include the developer’s words in the news article indicates that advocates of the Advanced and High-Quality frame have impacted the frame-building process within the social institutions factor (Shoemaker and Reese, 2014).

Furthermore, when investigating the relationship of the news articles with the marketing, it was found that XR promotional materials also used technical jargon

alongside descriptive modifiers to frame the technology as Advanced and High-Quality. This approach appeared in marketing of both HoloLens and Gear VR. Regarding HoloLens, a page of the device's website states it has "[s]pecialized components – like multiple sensors, advanced optics, and a custom holographic processing unit" (HL30). As above, for audiences who may not understand these technical aspects, the use of the modifiers "specialised", "multiple", "advanced" and "custom" are added to highlight that the product is advanced. Similarly, the Gear VR website includes the following description of the headset:

It's a clearly superior virtual reality experience with the wide 101° field of view through the large lens and the smooth and precise head tracking via the built-in gyro sensor and accelerometer (GVR15).

Again, although technical details are mentioned, they are combined with descriptions such as "clearly superior" and "smooth and precise" to illustrate that these features create a high-quality experience. Steinicke argues that, for a compelling VR experience, "one needs high-quality visual graphics, displayed at interactive frame rates, high resolution, precise and accurate tracking, fast connection, and low end-to-end latency" (2016: 15). Therefore, it is not surprising that XR marketing has promoted these technical aspects as being high-quality. However, what is significant is that the same occurs in the news coverage, thus reinforcing the promotional Advanced and High-Quality frame.

Nevertheless, it is important to acknowledge that some news articles countered the Advanced and High-Quality frame. Such instances centred around the idea that XR requires further development before it can be successful. For example, in a *MailOnline* side-note that is used in 16 articles from March 2014 to January 2016, Oculus Rift is described as "not quite ready for primetime yet" (first appearance in ID0363). This suggests the device must be developed further before it is ready for a mainstream audience. Importantly, these articles were published in the period before the consumer Oculus Rift headset had been released, meaning it was still in its development phase. However, when the consumer Oculus Rift *was* released, another *MailOnline* article still highlighted this idea: "Reviewers claim the Facebook-owned device is a 'wonderfully immersive' device, but it still has a way to go" (ID0617). Here, although immersion is implied to be high-quality, the product is still said to need improvements in other areas. Therefore, there have been some attempts to counter the Advanced and High-Quality

frame, at least in the *MailOnline*. However, this is not to the extent that it would eclipse the multiple framing devices used to portray XR as Advanced and High-Quality discussed above.

The findings presented here differ from previous research in the way that fiction was used in technology news. For instance, Petersen, Anderson and Allan state that science fiction imagery is often used in news that discusses “the powers and dangers of biotechnology” (2005: 338-339). On the other hand, in this study, fiction has been used in the news coverage of XR to frame it as Advanced and High-Quality, avoiding moral panic style discourse. Within lifestyle journalism about cultural products, previous studies have found that positive evaluations of quality in media “have contributed to the legitimization of popular cultural products such as films, popular music, and television” (Kristensen, Hellman and Riegert, 2019: 259). It stands to reason, then, that positively evaluating the quality of XR could have the same legitimising effect.

Furthermore, while framing XR as advanced could make it appear complex and thus reduce the likelihood of it being adopted (Rogers, 2003), this does not seem to be the case here. Instead, the Advanced and High-Quality frame has emphasised the relative advantage (Rogers, 2003) of XR. Additionally, Kotler et al. state that “the two-fold goal of marketing is to attract new customers by promising superior value and to keep and grow current customers by delivering satisfaction” (2016: 4). The first goal mentioned by Kotler et al. is the most relevant here because XR was just emerging during the sample period of this study. Since the Advanced and High-Quality frame highlights the superior value of XR, it appears that the news coverage has aided one of the main goals of marketing by applying this frame to XR. While it is not surprising that this frame appeared in the marketing, what *is* significant is that it was also prominent in XR news coverage, possibly indicating a blurring between news and promotional content. This news appears to have been marketized (Fairclough, 1993), supporting Chyi and Lee’s argument that, in technology news, “the boundary between news and promotional content is tenuous at best” (2018: 585). The positive, potentially promotional, tone of the Advanced and High-Quality frame is yet another example of frames being shared between the news and marketing that could create a positive view of XR and thus support its adoption and the commercial interests of XR companies.

7.4 Final Remarks

This chapter has analysed the framing devices used to construct three frames related to the newness of XR: Different and Unique; Revolutionary and Transformative; and Advanced and High-Quality. As was found in the previous chapter regarding the Immersive and Transcendent frames, this chapter has shown that all three of these frames appeared in both the news and marketing discourses. Moreover, both samples also employed some of the same framing devices to construct these frames. To summarise, the same two rhetorical framing devices were used in the news and marketing to construct the Different and Unique frame. This involved, firstly, describing various XR products as the first of their kind and, secondly, describing XR as unlike any other previous experience. Additionally, for the Revolutionary and Transformative frame, both samples described XR as the “future of” several different areas. More specifically, Magic Leap’s marketing put particular emphasis on this frame and the news articles mirrored this with the use of superlative modifiers to suggest Magic Leap is the most revolutionary. Regarding the Advanced and High-Quality frame, XR news and marketing each used fiction references to emphasise this aspect of the technology. This frame was also depicted in both samples through the inclusion and description of product specifications.

Some further framing devices were used in XR news coverage that did not appear in the marketing. Broadly, each of these three frames appeared at least once in the headline or lead of articles, demonstrating their salience. Additionally, as with the Transcendent frame discussed in the previous chapter, the news articles mentioned a wide range of areas that XR can change, thus emphasising the strength of the Revolutionary and Transformative frame. This is related to the tagline of Microsoft HoloLens which works to create this frame: “transform the world”. Quotations from credible sources were also used in the news articles to construct both the Revolutionary and Transformative and Advanced and High-Quality frames. To specify, quotes from Mark Zuckerberg were used that highlighted both of these frames. Additionally, just as Tim Cook was used to present AR as Transcendent, a quote from this individual was also used to frame AR as Revolutionary and Transformative. It appears that these voices in particular have had a strong impact on the framing of XR. Indeed, a further technical framing device was used in the *MailOnline* to increase the strength of the Revolutionary and Transformative frame by repeating the same Zuckerberg quote in multiple articles.

Finally, one additional technical framing device was used to create the Advanced and High-Quality frame in the news: images depicting fictional representations of XR.

Regardless of whether all the framing devices were the same or not, the fact that three more frames (in addition to Immersive and Transcendent discussed in the previous chapter) have appeared in both the news and marketing highlights further correlation between the two samples. This shows that the news has framed XR in similarly promotional tones as the marketing. Indeed, the three frames presented in this chapter each highlight a positive aspect of XR. Instead of criticising XR for being different (or deviant), this difference is presented in a positive light. Moreover, the Revolutionary and Transformative frame also portrays the technology favourably rather than making the change XR can bring about seem disruptive. Lastly, the Advanced and High-Quality frame emphasises positive aspects of the technology, suggesting that it will offer a desirable experience. Although there were some attempts to counter these frames, they were all overshadowed by the many framing devices used to emphasise the positive representations of XR. These findings further indicate that a moral panic has not been created in XR news and suggest that the barrier between news and promotional content has been diminished, in line with findings from Chyi and Lee (2018), Erjavec (2004), Lewis, Williams and Franklin (2008) and others discussed in Section 3.6.

Moreover, each of these frames highlight an aspect of an innovation that could make it more likely to be adopted. Although the Advanced and High-Quality frame highlighted the supposedly advanced nature of XR, this frame did not present the technology as complex, which could impede its adoption (Rogers, 2003). Instead, the Advanced and High-Quality frame emphasised the relative advantage (Rogers, 2003) of XR. Secondly, because the uniqueness of a product increases the chance it will be adopted (Cooper, 1979; Flight et al., 2011), the Different and Unique frame supports XR diffusion by emphasising these features. Lastly, the Revolutionary and Transformative frame highlights the importance of XR. The higher the perceived importance of an innovation, the more likely it is to be adopted (Rogers, 2003). Therefore, this frame could also support the introduction of XR technology to the general public. Thus, in relation to RQ3, it certainly seems that these frames have promoted the diffusion of XR.

The dominance of these positive frames means that, instead of prioritising the interests of the general public by paying attention to both the benefits and risks

surrounding XR, the news prioritises the commercial interests of XR companies. This compromises the fourth estate role of journalism. Chapter 5 discussed the presence of native advertising within the news articles, as well as the fact some articles were written by creators of XR content. On the social institutions level (Shoemaker and Reese, 2014), both of these points indicate that the news outlets have relationships with XR companies that they are invested in maintaining for their own commercial gain. In other words, to continue to make money within the capitalist social system, news organisations want to maintain these relationships. This could be one reason why the outlets prioritise these positive frames and pay very little attention to critical viewpoints surrounding XR.

Chapter 8: User Experience Frames

Following the same format as the previous two chapters, this chapter analyses the frames that were applied to XR related to user experience. Rogers notes that there are usually two components to a technology: "(1) a *hardware* aspect, consisting of the tool that embodies the technology as a material or physical object, and (2) a *software* aspect, consisting of the information base for the tool" (2003: 13, original emphasis). Related to this study, hardware refers to the headsets used to display virtual worlds or objects, while software refers to any applications that can be used with the headsets. Two of the frames discussed in this chapter (Easy to Use and Comfortable) relate to the hardware aspect of XR, whereas one frame (Social) refers to the software aspect of XR.

Since these frames appeared in the news and marketing of XR, each section of this chapter considers the framing devices used in both samples and how these relate to each other. As in previous chapters, quantitative data referring to the use of specific words that indicate the use of a frame is analysed. Unlike previous chapters, the discussion here also considers numerical data regarding how often words were used that could counter these frames, since they each have clear opposites (see Section 4.2.1 for more detail). This is analysed alongside qualitative insights to further explore each frame. Each section utilises framing theory and theories of innovation diffusion and technological acceptance to aid the analysis. In general, framing theory is used to examine how the framing devices have affected the strength of the frames. Additionally, under framing theory, the chapter also considers how the four factors of the hierarchy of influences model (Shoemaker and Reese, 2014) discussed in Chapter 3 have impacted the frame building process: social systems, social institutions, media organisations and routine practices. This is supported by Rogers' (2003) diffusion of innovations theory and models of technological acceptance (Buenafior and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007) to examine whether these frames could promote XR adoption.

8.1 Social

Section 2.8 reviewed studies on media representations of (non-XR) videogames which uncovered various negative ways they were portrayed – one of which was as isolating (Rogers, 2013). VR in particular literally isolates the user from the physical environment

by requiring them to wear a headset that blocks out the real world (Brigham, 2017). Since this study found that the majority of articles in the sample focused on VR as opposed to AR/MR (see Section 5.2.1) and videogames were the application type mentioned most (see Section 5.2.3), it might be expected that the articles in this sample would show even greater concern over the isolating nature of XR. However, in actuality, this study found that the news articles framed XR as the opposite of isolating: Social.

This section examines the construction of the Social frame in the news articles and how this relates to the marketing materials. In the same style as Chapters 6 and 7, it begins by analysing quantitative data regarding how often words relating to this frame were used in the news articles. However, unlike the frames already discussed, Social has a clear opposite (isolating). Therefore, quantitative data regarding the use of words that could counter this frame are also explored to better understand the strength of the Social frame. It is also considered whether there were any differences depending on the year of the sample, the news outlet reporting on XR or the type of XR being focused on. The section then moves on to analyse the qualitative data that revealed further framing devices used to present XR as Social. Additional qualitative data based on the marketing sample allows the study to compare the framing devices used in the two discourses. It was also found that there were some attempts to counter the Social frame within the news discourse and these instances are discussed. The section ends by comparing this result to previous research and discussing how the use of this frame could support or hinder XR adoption.

Firstly, since “frames can be detected by probing for particular words” (Entman, 1991: 7), evidence of the Social frame appearing in the news articles can be seen in the use of certain terms. Words in the “social” category appeared in 11.87 percent of articles overall (see Table 8.1). While this is by no means the majority of articles, when comparing this to words describing XR as isolating, the difference is stark. The search terms *isolate** and *solitary* appeared 39 times overall (see Table 8.2), whereas words in the “social” category were used 235 times. These figures show that words referring to XR as social were used over six times more (6.03) than those describing XR as isolating. Even the word *social* alone appeared 65 times; 1.67 times more than *isolate** and *solitary* combined. Therefore, it is clear that the news articles were more likely to frame XR as Social than

isolating. This shows that word choice has acted as a framing device in the construction of the Social frame.

Table 8.1: Appearance of Terms in the “Social” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>share*/sharing</i>	1	1.64	33	7.66	63	5.69	97	5.94
<i>social</i>	0	0.00	34	8.06	31	2.69	65	3.89
<i>together*</i>	3	3.28	18	6.05	22	2.10	43	3.17
<i>collaborat*</i>	0	0.00	5	1.61	18	1.95	23	1.74
<i>tele(-)presence</i>	0	0.00	4	1.21	3	0.45	7	0.61
TOTAL	4	3.28	94	16.53	137	10.93	235	11.87

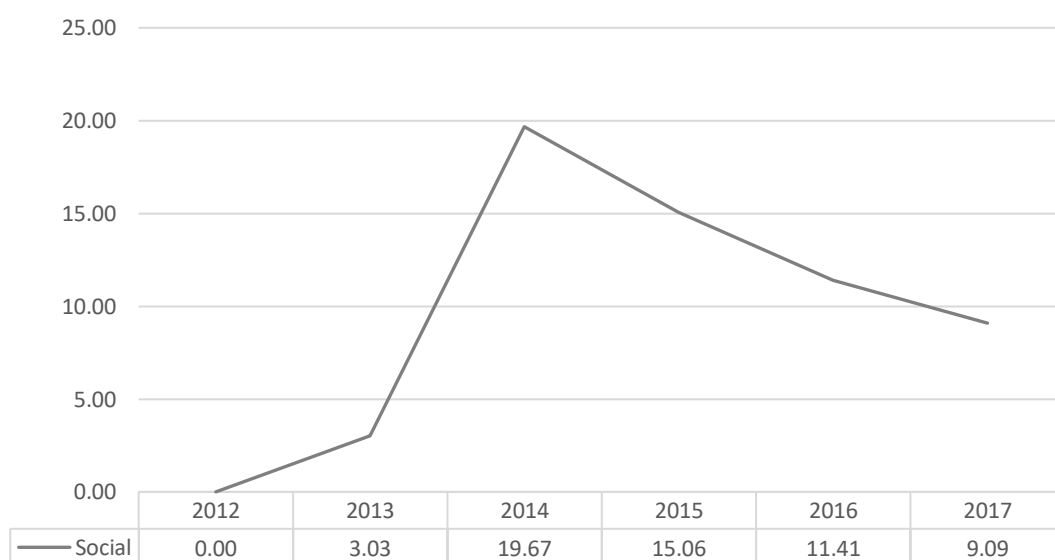
Table 8.2: Number of Articles Mentioning *isolat and *solitary***

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>isolat*</i>	0	0.00	12	4.03	19	1.05	31	1.74
<i>solitary</i>	0	0.00	7	2.82	1	0.15	8	0.82

However, there were some noticeable differences between the use of these words in the individual news outlets. *The Guardian* was most likely to use words from the “social” category, with 16.53 percent of articles from this outlet mentioning such words at least once. With a slightly lower portion, 10.93 percent of *MailOnline* articles used words in the “social” category. However, the largest difference can be seen in *The Sun* which only used “social” words in 3.28 percent of its articles. This suggests that *The Sun* rarely used the Social frame. Still, all three publications used *isolate** and *solitary* less than they used words in the “social” category. In this way, although the media organisation (Shoemaker and Reese, 2014) reporting on XR appears to have influenced the strength of the Social frame, this factor has not affected the news discourse to the extent that contrasting frames are used in different news outlets. Therefore, despite the news sample’s focus on VR and videogame applications, concerns have rarely been raised regarding the potentially isolating nature of XR. This highlights a difference between the news coverage of videogames (Rogers, 2013) and XR.

Comparing the use of words in the “social” category based on XR type shows further evidence that the physically isolating nature of VR has not lessened the strength of the Social frame (see Appendix J.6). Terms in the “social” category appeared in 11.72 percent of articles about VR, compared to 10.07 percent of AR/MR articles. These figures suggest that, despite VR headsets being more physically isolating than AR/MR products because they cover the users view of the real world (Brigham, 2017), this has not prevented journalists from framing VR as Social. Certainly, when the news coverage focused on AR/MR in the first two years of the sample, words referring to the Social frame rarely appeared, if at all (see Figure 8.1). On the other hand, the percentage of articles using words in this category peaked in 2014 (19.67 percent) when coverage shifted to focus on VR with Mark Zuckerberg’s acquisition of Oculus. Considering Zuckerberg’s link with the major social network Facebook, it appears that his involvement in XR contributed to framing it as Social. This suggests that frame advocates within social institutions (Shoemaker and Reese, 2014) have had an impact on the building of the Social frame.

Figure 8.1: Percentage of Articles per Year With at Least One Term From the “Social” Category



Indeed, findings from the qualitative framing analysis support this idea. As has been found with other frames, sourcing decisions have been used as a technical framing device to construct the Social frame. In the following example, a quotation was used that came from Zuckerberg in a press release announcing Facebook’s acquisition of Oculus. In the press release, Zuckerberg states that “Oculus has the chance to create the most social platform ever” (OR13). Zuckerberg’s use of the superlative “most” not only claims

VR can be social, but that it can be more social than any other platform. Regarding the news sample, this quote appeared in two articles from *The Guardian* and seven *MailOnline* articles. Similarly, the same press release also quotes the then CEO of Oculus, Brendan Iribe, stating: “We believe virtual reality will be heavily defined by social experiences that connect people in magical, new ways” (OR13). Here, Iribe stresses the importance of social VR experiences and claims it will enable “magical” connection, applying a strongly positive connotation to VR being social. Just as with Zuckerberg’s words, Iribe’s message was transferred to the news sample, with the quotation appearing in one article from *The Guardian* and five *MailOnline* articles. These examples highlight several important points. Firstly, the choice of journalists to use quotations from a press release brings this information into the public domain (Nordfors, 2009), thus allowing the source to reach the general public. Secondly, the routine practice (Shoemaker and Reese, 2014) for the *MailOnline* to copy and paste parts of its articles has emphasised this frame that is advocated by XR company owners. Thirdly, the combination of points one and two mean that these frame advocates within the social institutions factor have played a substantial role in the creation of the Social frame. As mentioned in Section 7.2 regarding the Revolutionary and Transformative frame, the repetition of quotes is perhaps a result of the increasing commercial pressures on journalists. This means the social systems factor has played a role in the frame-building process in this way.

As well as sourcing techniques, news articles used the concept of telepresence as an additional framing device in the creation of the Social frame. Steuer defines telepresence as “the extent to which one feels present in the mediated environment, rather than in the immediate physical environment” (1992: 76). In an opinion article from *The Guardian*, a journalist explains her encounter with a 15-year-old boy using the VR application AltspaceVR. She sums up her experience in the final paragraph of the article: “when I stood next to him, I felt aware of our closeness, despite the 1,300 miles separating our physical bodies” (ID0235). Here, the writer argues that VR allowed her to feel close to someone who was physically very far away, alluding to the idea of telepresence. In another article from *The Guardian*, AR is said to allow users to “meet a friend for coffee at their kitchen table, even if the friend is on another continent” (ID0214). This sentence suggests users will be able to have realistic-feeling social experiences regardless of geographical distance. Similarly, a *MailOnline* article about HoloLens explains how the

MR Skype application works: “Developers will be able to see the other person’s hologram during the two-way Skype call and interact with them as if they were sitting next to them on the couch” (ID0584). Though this sentence does not mention the device transcending physical space, it still implies the experience will be natural and realistic; thus suggesting it will feel as social as a physical meeting. This, again, alludes to telepresence to create the Social frame.

Furthermore, it was found that telepresence was also referred to in Gear VR marketing to frame the product as Social. Referring to sharing New Year’s Eve celebrations, the Samsung Mobile Twitter account posted a video with the message: “Celebrate together from a thousand miles away” (GVR23). This suggests users will feel as if they are in each other’s presence when experiencing VR, even if they are physically far apart. Additionally, the Gear VR website includes the following description about the Oculus Rooms and Parties application that can be accessed on Gear VR and Oculus Rift: “Whether you and your friends are worlds apart or practically next door neighbors, Oculus Rooms and Parties are a convenient and fun way to spend time together” (GVR15). Again, this sentence highlights that users can “spend time together” regardless of physical distance. These results demonstrate that referencing the concept of telepresence has been used as a framing device in both the news and marketing samples. Van Gorp argues that “[t]he more often schemata [or frames] are confirmed by further information, or by congruent framing devices, the more difficult it becomes to refute or change them by counterframing” (2007: 69). Therefore, for this frame *and* framing device to be shared between the two samples makes the Social frame particularly strong.

Aside from this direct similarity, the Social frame was depicted in marketing of AR and MR products by emphasising their value for collaborative working. For instance, the HoloLens website states that one of the main features of the device is that it allows “[n]ew ways to collaborate and explore” (HL04), which includes being able to “[s]ee holograms from your colleague’s perspective if he’s in the next room or on the other side of the world” (HL04). This not only presents HoloLens as allowing social collaboration, but highlights that it can also transcend geographical boundaries. Similarly, after the Google Glass rebrand, the website states: “Glass can connect you with coworkers in an instant [...] Invite others to ‘see what you see’ through a live video stream so you can collaborate and troubleshoot in real-time” (GG25). Interacting socially to collaborate in a workplace

environment is represented as easy, instant and useful. Therefore, the device is portrayed as able to enhance social interaction in the workplace. Finally, Magic Leap marketing takes a more whimsical approach to highlighting collaboration. Its website states that the device allows users to “[c]onnect in physical space with others, digitally. [...] Call it collaboration for another dimension” (ML28). These examples demonstrate that an exemplar in the form of collaborative working has been used as a framing device to create the Social frame in XR marketing. Moreover, each of these excerpts highlight further evidence of the Social frame being shared between the two samples and thus reinforcing their facticity (Van Gorp, 2007).

However, it is important to examine the few instances that the news sample attempted to counter the Social frame. Unsurprisingly, based on the above discussion, this centred around VR and the fact that its users must wear a headset that replaces their view of the real world with a virtual one (Brigham, 2017). Firstly, *The Guardian* criticises Zuckerberg’s social vision for VR in the following article, stating: “the current version of software being created for these headsets is focused on solo experiences while wearing a device that isolates you from the people around you” (ID0259). In a similar vein, another article from *The Guardian* notes: “There’s also the question of isolation, especially when VR involves shutting yourself off from the world around you by wearing a headset” (ID0176). Further to this, the same article defines a promotional image for Oculus’ new social application as “a rather chilling vision of how we might watch TV together in the future” (ID0176). It continues on to state:

Too many of us already struggle to focus our attention on the friends and family we’re physically with, because we’re staring down at a smartphone or tablet screen. There’s an argument – one that perhaps could be better addressed by VR evangelists – that virtual reality is a next level of physical isolation (ID0176).

In each of these cases, the way that a VR headset physically isolates the user is highlighted as a reason why the technology is isolating. In the final example, instead of suggesting VR can allow people to become more connected by having social experiences that feel more realistic (as above), it is implied that VR could make people even less social. This directly counters the framing device used to present the Social frame in the instances above.

Additionally, whereas quotes from Oculus' owners were used as framing devices for the Social frame, the voice of Apple CEO Tim Cook was used to counter this frame. The headline of a *MailOnline* article reads: "Apple's Tim Cook predicts augmented reality will be bigger than VR because it doesn't isolate people in their own worlds" (ID0945). By claiming AR contrasts with VR in that it is not isolating, VR itself is shown to be isolating. This sentiment is given significant prominence since it appears in the headline of the article (Pan and Kosicki, 1993). Moreover, the news item clarifies this point in the third paragraph, which states: "He [Cook] describes VR as isolating" (ID0945). As mentioned in previous discussions about the use of Cook's voice (regarding the Transcendent and Revolutionary and Transformative frames), his words may be respected by many readers who are aware of Apple's success and/or are owners of Apple products. Therefore, the use of his opinion may give such evaluations (i.e. VR as isolating) significant weight to readers (Go, Jung and Wu, 2014). Thus, whereas Cook acts as a frame advocate for AR being social, he acts as a frame critic for VR being social.

Nevertheless, while it is useful to note that some of the news discourse counters the Social frame, it must be reiterated that the news articles were much more likely to focus on the social aspects of XR rather than presenting it as isolating. Since framing deals with salience, or "making a piece of information more noticeable, meaningful, or memorable to audiences" (Entman, 1993: 53), it is clear that the Social frame was much more powerful in the news coverage of XR than its counterpart (isolating). Previous studies also found that moral panics were created around videogames regarding violence and social isolation (Rogers, 2013). Despite videogames being the most mentioned application within the news articles, this moral panic does not extend to XR. This is surprising since the news articles focused on VR, which, as opposed to AR or MR, covers the user's view of the real world, literally isolating them from their surroundings (Brigham, 2017). The news coverage of XR goes against previous moral panic trends, which is similar to De Keere, Thunnissen and Kuipers' (2020) findings regarding binge-watching discussed in Section 2.9. Instead, XR news includes repeated positive frames that support XR companies' marketing efforts.

Indeed, the preference for the positive Social frame over representing XR as isolating improves the perception of the compatibility of XR. Rogers states that compatibility is "the degree to which an innovation is perceived as consistent with the

existing values, past experiences, and needs of potential adopters” (2003: 240). A technology that is social is much more compatible with the existing values and needs of potential adopters than one that causes isolation. Since higher compatibility leads to higher rates of adoption (Rogers, 2003), using the Social frame as opposed to an isolating one could support the diffusion of XR. Furthermore, the fact that this Social frame appears in the news and marketing discourses increases its strength as each reinforces the other. Again, the news acts a promotional tool for XR companies and benefits their commercial interests.

8.2 Easy to Use

While the Social frame focused on the software aspect of XR, the rest of this chapter discusses those frames that are related to XR hardware. Despite XR being framed as Advanced and High-Quality (see Section 7.3), the study also uncovered that the technology was framed as Easy to Use. The current section examines the framing devices used to construct the Easy to Use frame, focusing on the news articles while also making comparisons with the marketing sample. It first analyses quantitative data regarding how often words relating to this frame were used, as well as the use of words that could counter this frame (difficult to use). This quantitative data is explored further by looking at whether there were any variations between XR type, news outlet or year of the sample. Next, qualitative data is considered which illustrates the other framing devices used to frame XR as Easy to Use. Comparisons are also made between the construction of this frame in the news and marketing materials using qualitative data. In line with other chapters, this section analyses any instances in which the Easy to Use frame was contested in the news articles. Lastly, the section ends by comparing these findings to previous research and discussing the significance of this frame being used in relation to the diffusion of XR.

Firstly, quantitative data resulting from the frequency of terms analysis illustrates the prominence of the Easy to Use frame. Across all news articles, 11.57 percent included words in the “easy to use” category. Although this is not the majority of articles, in comparison, terms in the “difficult to use” group appeared in 1.74 percent of articles overall; a much lower portion. Furthermore, every news outlet used words referring to XR as “easy to use” more than those in the “difficult to use” category (see Table 8.3 and Table

8.4). Similarly, whether articles focused on VR or AR/MR, terms in the “easy to use” group were always used more than those in the “difficult to use” category (see Appendix J.6). These figures show that the news coverage has consistently favoured a positive frame (Easy to Use) over a negative one (e.g. complex or difficult to use), regardless of news outlet or XR type. When frames are repeated in different sources, their persuasive power increases (Nordfors, 2009). This means that the Easy to Use frame could have particular influence on how readers view XR.

Table 8.3: Appearance of Terms in the “Easy to Use” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>easy/easily/easiest</i>	2	3.28	19	5.65	47	5.84	68	5.63
<i>natural*</i>	0	0.00	15	4.84	34	4.49	49	4.30
<i>intuitive*</i>	0	0.00	8	2.82	14	1.20	22	1.54
<i>convenient*</i>	0	0.00	0	0.00	13	1.80	13	1.23
<i>effortless*</i>	0	0.00	0	0.00	1	0.15	1	0.10
TOTAL	2	3.28	42	11.29	109	12.43	153	11.57

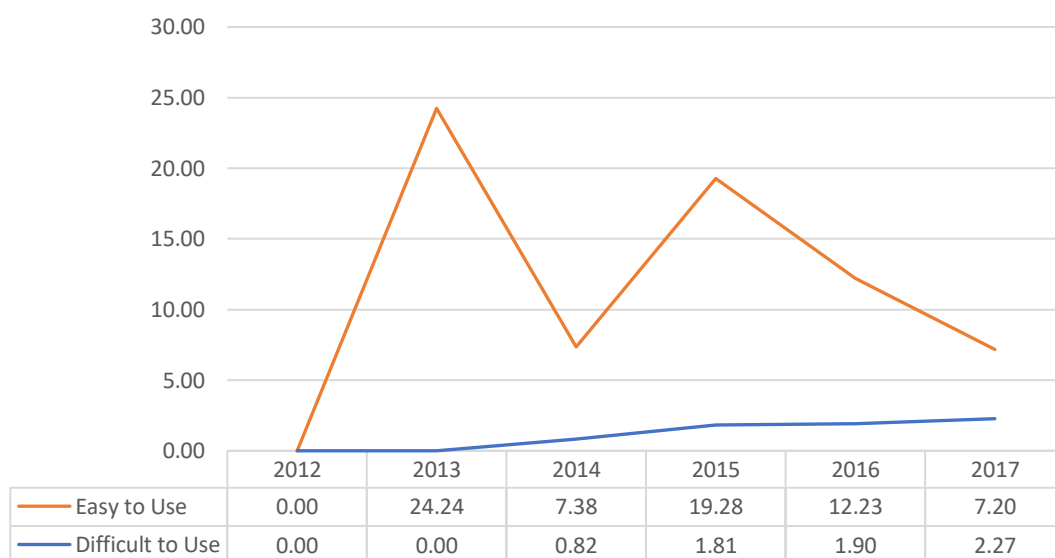
Table 8.4: Appearance of Terms in the “Difficult to Use” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>impractical*</i>	0	0.00	1	0.40	4	0.45	5	0.41
<i>complicated</i>	0	0.00	0	0.00	3	0.45	3	0.31
<i>difficult*</i>	1	1.64	1	0.40	1	0.15	3	0.31
<i>hard(est)</i>	0	0.00	5	1.21	0	0.00	5	0.31
<i>laborious*</i>	0	0.00	0	0.00	3	0.30	3	0.20
<i>unnatural*</i>	0	0.00	2	0.81	0	0.00	2	0.20
<i>counter(-) intuitive</i>	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	1	1.64	9	2.82	11	1.35	21	1.74

However, it should be noted that there were some important differences between the news outlets regarding the Easy to Use frame. While terms in the “easy to use” category appeared in *The Guardian* and *MailOnline* in a similar portion of articles (11.29 percent and 12.43 percent respectively) only two articles in *The Sun* (3.28 percent)

included these words. Furthermore, only one article in *The Sun* used a term from the “difficult to use” category. This shows that the topic of ease of use (whether easy or difficult) was very rarely mentioned in this outlet. Indeed, since frames are usually persistent (Gitlin, 1980), such few uses of words from the “easy to use” category in *The Sun* suggests that the Easy to Use frame was absent from this news outlet. As of yet, this is the only instance in which a frame has not appeared in all three news outlets to some extent. In this way, the media organisation factor (Shoemaker and Reese, 2014) appears to have affected the frame-building of XR quite strongly in regards to this particular frame.

Figure 8.2: Percentage of Articles per Year With at Least One Term From the “Easy to Use” and “Difficult to Use” Categories



To a lesser extent, examining the use of words in the “easy to use” category across the sample period shows that this frame somewhat varied in emphasis over the years (see Figure 8.2). The number of articles using terms from the “easy to use” category fluctuated across time, with two peaks in 2013 (24.24 percent) and 2015 (19.28 percent). Since 2016 was the major year for product releases (Steinicke, 2016), audiences would have been in the knowledge-building stage of Rogers’ (2003) innovation-decision process in 2013 and 2015. Therefore, framing XR as Easy to Use at this stage could have created an initially positive attitude towards the technology. However, the reduction in the appearance of “easy to use” words in 2016 and 2017 suggests that this frame became less common once several XR products had been released into the market. That is to say, the appearance of the Easy to Use frame differed depending on the development stage

of XR. Nevertheless, this reduction of “easy to use” words in the later years of the sample does not mean that XR was then framed as difficult to use. Words in the “easy to use” category appeared more than those from the “difficult to use” group in every year. Thus, although the strength of the Easy to Use frame varied, it was never overtaken by a counterframe. Combined with the other frames previously discussed, this highlights a lack of critical representations of XR. Since the news is the public’s main source of information about emerging technologies (Whitton and Maclure, 2015; Williams, 2003), this could lead readers to view it in a positive light.

As well as specific word choices, the qualitative analysis revealed that modifiers were used as rhetorical framing devices to emphasise the Easy to Use frame. In particular, it was the apparently natural feel of interacting with XR that was emphasised. As seen above in Table 8.3, the stem *natural** was the second most used term within the “easy to use” category. Describing interaction as natural implies there is no effort needed to understand how it works – it is easy and intuitive, thus highlighting the Easy to Use frame. Examining this word in context within the news articles demonstrates that the idea of being able to naturally interact with the XR environment was emphasised. For instance, a journalist in *The Guardian* writes about his experience of a PlayStation VR demo, claiming: “It all feels very natural and intuitive, holding the trigger button to grip the swords and then swinging them the way you would a real sword” (ID0090). Firstly, he enhances the apparently natural feel of the experience with the modifier “very”. The journalist then explains the controller can be used in the same way a real sword would be; again suggesting it offers a natural way to interact with the virtual environment.

Emphasising this idea even further, the following quotation appeared in three *MailOnline* articles: “Rory Abovitz, Magic Leap’s CEO, said his firm is working on ‘the most natural and human-friendly wearable computing interface in the world’” (ID0408; ID0411; ID0435). Instead of simply arguing the experience is “very” natural, the superlative “most” strengthens the Easy to Use frame even more. Additionally, since this quote was repeated in three articles, the salience of the message depicting the Easy to Use frame is increased. Therefore, as has been found with other frames, a frame advocate (relating to the social institutions factor [Shoemaker and Reese, 2014]) has again been given substantial power in portraying XR in a way that is desirable to them, due to the routine practice (Shoemaker and Reese, 2014) of the *MailOnline* to repeat sections of its articles. This is

likely caused by the wider social system (Shoemaker and Reese, 2014) leading news organisations to produce content quickly for commercial gain.

Regarding the relationship between XR news and marketing, it was found that the idea of natural interaction was also used in the promotional materials to create the Easy to Use frame. Firstly, since the above quotation came from the CEO of Magic Leap, it is not surprising that this idea was present in Magic Leap marketing. This can be seen on their website which explains that the interface of the device “provides the tools needed to break free from outdated conventions of point and click interfaces, delivering a more natural and intuitive way to interact with technology” (ML28). Similarly, a repeated phrase within HoloLens marketing is that it creates “[a] more natural way to interact” (HL04; HL20; HL22; HL34), in comparison to traditional ways of interacting with technology. In VR marketing, this idea of natural interaction was also present when referencing the controllers used. The Gear VR website notes that “[c]ontrol comes naturally” (GVR15). Additionally, the Oculus Rift website states: “Before you even pick up a pair of Touch controllers, you know how to use them. Intuitive actions in VR feel as natural as using your real hands” (OR27). In this example, the Easy to Use frame is highlighted by claiming no practise or effort is needed, since an individual will feel as if they are simply interacting with the virtual environment using their own hands. These excerpts from the marketing demonstrate that the Easy to Use frame is shared between the two discourses to the extent that the same framing device has been used to construct it, thus reinforcing the supposed facticity of the frame (Van Gorp, 2007).

Other framing devices were also uncovered. In a similar way to other frames, a quotation from Mark Zuckerberg was used as a technical framing device to portray XR as Easy to Use. The following quote first appeared in *The Guardian* and the *MailOnline* on the same date (25 March 2014):

Imagine enjoying a court side seat at a game, studying in a classroom of students and teachers all over the world or consulting with a doctor face-to-face – just by putting on goggles in your home (ID0083; ID0363).

The use of the modifier “just” in the last sentence of this quotation implies that each of these virtual experiences will be quickly and easily accessible. This quotation appeared in 11 different articles in *The Guardian* and eight *MailOnline* articles. As in other instances of repeated quotations, this finding suggests that a frame advocate (a social institutions

level influence [Shoemaker and Reese, 2014]) from an XR company has again been given the power to define XR in positive terms. Frame advocates “select and enhance” certain aspects of a topic “to promote their own interests” (Hallberg-Sramek, Bjärstig and Nordin, 2020: 200). Using frame advocates as sources legitimises their chosen frame (Geiß, Weber and Quiring, 2016), thus giving these sources significant power in defining an issue. Furthermore, while it has already been established that the *MailOnline* copies and pastes sections of its previous articles into new ones (thus sometimes resulting in the repetition of certain quotes), *The Guardian* does not do this. Therefore, the repetition of this statement is significant because it shows that *The Guardian* journalists have chosen to include this quotation in at least 11 different articles. With this in mind, it appears *The Guardian* specifically has put particular emphasis on the Easy to Use frame by reinforcing the views of an XR company owner.

In a different way, another rhetorical framing device used to construe the Easy to Use frame was emphasising the immediacy of certain processes. This was applied to XR hardware as well as software. Regarding the software, one of the earliest articles in the *MailOnline* about Google Glass notes that users “could be given information instantly on the buildings they are looking at, on nearby landmarks or friends who are in the area” (ID0312). The idea of instant information implies that using the device is easy and convenient. Similarly, a *MailOnline* article about an AR application that can translate foreign signs explains: “When a user looks at foreign writing, it is translated in real-time” (ID0347). The use of “real-time” suggests this translation happens immediately. Furthermore, this is said to happen by simply *looking* at foreign text, which appears much more convenient than typing the words into a translator or referencing a word in a dictionary. In a study of AR in e-commerce settings, Kannaiah and Shanthi (2015) found that the desire for instant information was one of the factors that attracted consumers to AR. Therefore, framing XR as Easy to Use in this way could also make the technology seem more appealing.

Regarding the hardware, this framing device was used in relation to smartphone-based VR headsets when describing how the products are set up. For instance, a *MailOnline* article about Google Daydream notes: “you open a hatch, pop the phone in, and suddenly you’re fishing or exploring the world in VR via Street View” (ID0956). The word “pop” has connotations that imply the process can be done with little effort. This is

emphasised by stating that, as soon as the phone is in the headset, the user is “suddenly” in the virtual world, insinuating the process is not only easy but can be done very quickly. Similarly, another article about Gear VR states that “users slip a Note 3 tablet into the \$200 headset to provide the screen” (ID0426). The use of “slip” has similar connotations to “pop”, suggesting the process is very easy.

Importantly, as the only smartphone-based device that was analysed in the sample of marketing materials, it was found that Gear VR promotional content also used this framing device. The Gear VR website states: “Just snap your phone into the Gear VR and you’re in virtual reality” (GVR06). Using the words “just” and “simply” implies it is easy and simple to do this. Additionally, a Facebook post about Gear VR from Samsung Global reads: “Click in, boot up and start exploring” (GVR20). Using four one syllable words (click, in, boot, up) to explain the set-up process reads quickly, creating the impression that the set up itself is quick and easy. This is further evidence to suggest the Easy to Use frame is shared between the news and marketing of XR.

As well as framing XR as Easy to Use by highlighting immediacy, the hands-free nature of some devices is highlighted to construe this frame. For example, a journalist writing about HoloLens gestures in *The Guardian* states: “I just have to lift my hand up in front of the device’s sensors, raise a finger then make a sort of clicking gesture, like pressing the button on a mouse” (ID0146). The use of “just”, combined with relating this process to an action many readers will be familiar with (clicking a mouse) enhances the idea that it is easy to do. Similarly, a *MailOnline* article about the Fove headset states in its opening line: “No more fiddling with remote-controller buttons or a mouse. Just look” (ID0608). The traditional way of interacting with technology (buttons/mouse) is classed as “fiddly”, whereas being able to use the eyes to interact is said to be as simple as “just looking”. The idea of using the eyes to interact with ease is also highlighted in a *MailOnline* article about the RideOn VR headset (which uses eye tracking technology):

Worn while skiing or snowboarding, RideOn wearers will be able to message friends **in the blink of an eye**, stream live skiing videos and ride through virtual slalom tracks chasing their favourite ski athletes down the mountain, **without pressing a single button**. [...] **No external devices, phone apps, or voice activation is necessary**. Instead, wearers look at icons fixed to the sky, their friends, or points of interest (ID0437).

Specifically, the sections highlighted in bold contribute to framing the device as Easy to Use. Actions can be carried out quickly and easily (“in the blink of an eye”) without the need for pressing any buttons or using additional software/hardware. In particular, this framing device highlights the relative advantage of XR by claiming it is better than already established technologies. The greater the perceived relative advantage, the more likely consumers are to adopt an innovation (Rogers, 2003). Thus, highlighting the Easy to Use frame in this way could support XR’s adoption.

Regarding the connection with XR promotional content, Google Glass marketing in particular highlights the hands-free features of the device to frame it as Easy to Use. It is emphasised that Google Glass can be used hands-free, such as for accessing information while carrying out fitness activities and viewing recipes while cooking (GG07). Similarly, in a video demonstrating one user’s experience of Google Glass (GG14), the user receives a call from his mother while cooking. He is able to answer the call without using his hands so that he can continue cooking whilst speaking. This highlights the convenience of being able to interact with the device hands-free. Furthermore, the same idea is emphasised in a tweet from the Google Glass Twitter account: “Catch all your phone notifications without having to pull that Android out of your pocket” (GG26). Again, the hands-free nature of the device is shown to make it easy to use, this time in comparison to a standard smartphone. The idea persists into the rebranding of Google Glass when the new website states: “Glass is a hands-free device, for hands-on workers” (GG25). The website continues by noting several examples of how the device can be used by workers without the need to interact with it using their hands. Therefore, in these instances, just as in the news coverage, the way interaction with XR products has been described has contributed to framing it as Easy to Use.

As has been considered with the other frames discussed throughout this thesis, it is important to acknowledge any attempts at countering the Easy to Use frame. The qualitative framing analysis uncovered that this frame was contested by arguing against the idea that interaction with XR products is natural (as discussed above). For example, one *MailOnline* article from 2013 states that “lunging forward with your head to move forward” (ID0327) is the way a user must interact with Oculus Rift. Having to “lunge forward” appears to be a very unnatural way of interacting with the virtual environment, portraying it as an experience that is difficult to control. Similarly, before the Gear VR

headset had its own controller, interaction was also explained negatively in this *MailOnline* article: "With the Gear VR, you have to move your head to point a cursor at something, then reach for a button on the headset – which is far from ideal" (ID0754). Moving the head to direct a cursor sounds difficult enough. This is combined with the statement that the user must "reach" for a button as well. The word "reach" implies it is not easily accessible and requires effort to do so. Finally, the journalist evaluates this process as "far from ideal", summarising the counterintuitive way of interacting with the device. Still, although it is significant that there were some instances of opposing the Easy to Use frame, it should be remembered that the stem *natural** was used 49 times within the news articles, whereas *unnatural** only appeared twice. Therefore, articles were much more likely to highlight ease of use than difficulty of use when reporting on XR. This is another example of the news discourse favouring positive frames over those that are negative.

The appearance of the Easy to Use frame in XR news and marketing is similar to the findings regarding other technologies. For instance, as discussed in Section 2.7, Kang, Lee and De La Cerda (2015) found that ease of use was one of the two most common frames used in US television news of the smartphone. In their study of Twitter news, Arceneaux and Weiss (2010) also found that articles often emphasised the near-instant dissemination of information using this platform, relating to one of the framing devices contributing to constructing the Easy to Use frame in XR news. Similarly, Therrien and Lefebvre uncovered an Accessibility frame in their study of videogame marketing which is "usually manifested textually through an emphasis on ergonomic controls, a lenient learning curve or the presence of adjustable/easy difficulty levels" (2017: 56). In the current study, the Easy to Use frame assumes its readers are potential consumers of the technology as ease of use is something that would only be of interest to those considering purchasing a device. This demonstrates another similarity between XR news and lifestyle journalism which treats the audience as consumers (Hanusch, 2012).

This frame not only presents XR positively, but also relates to the complexity attribute of an innovation. Rogers defines this attribute as "the degree to which an innovation is perceived as difficult to understand and use" (2003: 16). Furthermore, innovations "that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings" (2003: 16). Based on

Rogers' assessment, framing XR as Easy to Use could lead to it being adopted more quickly. In other words, in relation to RQ3, the news articles have again promoted the diffusion of XR by using this frame. Just like the other frames already discussed, the appearance of the Easy to Use frame in the news sample provides further evidence to suggest the news supports the commercial interests of XR companies.

8.3 Comfortable

The final section in this chapter discusses another way XR was framed relating to user experience of the hardware itself: Comfortable. This refers to physical comfort surrounding the design of the hardware, rather than psychological comfort. In what follows, the framing devices used to create this frame in XR news are closely examined, alongside a comparison with the marketing materials. Taking the same approach as the rest of this chapter, quantitative data is considered first to uncover how often words that frame XR as Comfortable were mentioned in the news articles. Quantitative data regarding the use of terms that could counter this frame (uncomfortable) is also analysed. Any variations between news outlet, year of the sample or XR type are discussed. The section then moves on to explore additional framing devices used to construct the Comfortable frame based on qualitative data. Qualitative data regarding the marketing materials is also investigated to provide insight into the relationship between XR news and promotional content. It is then considered how the Comfortable frame was contested within the news articles. Finally, the section ends by discussing how the appearance of the Comfortable frame could contribute to promoting XR adoption.

Firstly, the quantitative analysis uncovered that terms in the "comfortable" category appeared 208 times in 11.26 percent of articles overall (see Table 8.5). As with the Easy to Use frame, words that could counter the Comfortable frame rarely appeared. Terms in the "uncomfortable" category were used just 33 times in 2.87 percent of articles (see Table 8.6). This means that words relating to XR being comfortable were used 6.3 times more than those referring to it as uncomfortable. Moreover, both VR and AR/MR articles used "comfortable" words considerably more than "uncomfortable" words, with no notable differences between the portion of articles they appeared in (see Appendix J.6). Terms referring to the comfort of XR appeared in 10.49 percent of VR articles and 13.42 percent of AR/MR articles, whereas words in the "uncomfortable" category were

used in 3.13 percent of VR articles and 3.36 percent of AR/MR articles. Similarly, despite the use of words in the “comfortable” category fluctuating over the years of the sample, they were always used much more than those in the “uncomfortable” category (see Figure 8.3). Therefore, the Comfortable frame was consistent regardless of year or type of XR. This shows that the sample has, again, favoured a positive frame over a critical perspective.

Table 8.5: Appearance of Terms in the “Comfortable” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>light(weight)</i>	1	1.64	6	2.02	98	9.28	105	6.96
<i>comfortab*</i>	1	1.64	17	4.44	61	5.69	79	5.12
<i>ergonomic*</i>	0	0.00	0	0.00	11	1.50	11	1.02
<i>soft</i>	0	0.00	0	0.00	12	0.75	12	0.51
<i>cushion*</i>	0	0.00	0	0.00	1	0.15	1	0.10
TOTAL	2	1.64	23	5.65	183	14.22	208	11.26

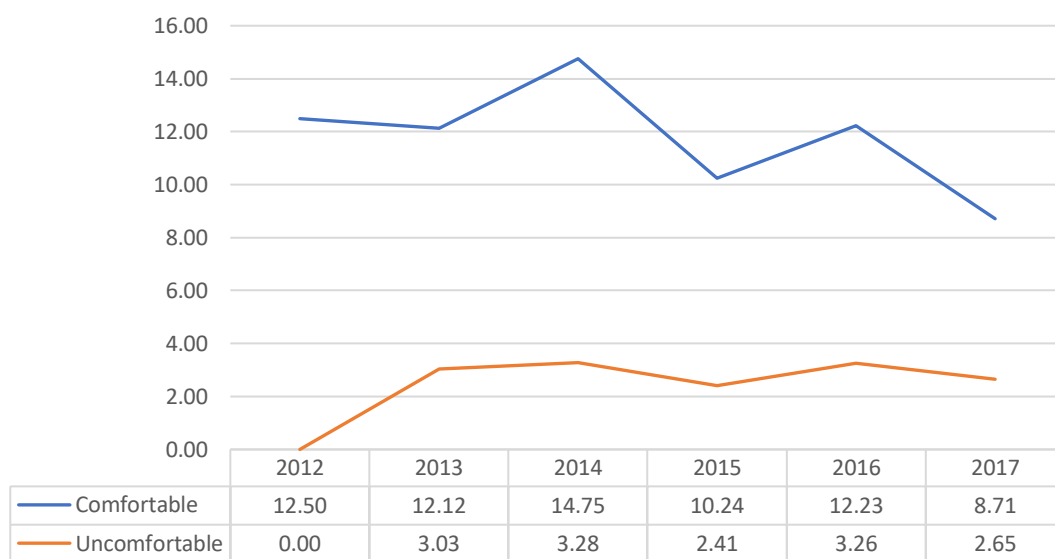
Table 8.6: Appearance of Terms in the “Uncomfortable” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>discomfort</i>	2	1.64	5	1.61	6	0.60	13	0.92
<i>uncomfortab*</i>	0	0.00	4	1.61	5	0.75	9	0.92
<i>cumbersome*</i>	0	0.00	3	1.21	4	0.60	7	0.72
<i>heavy</i>	0	0.00	2	0.81	1	0.15	3	0.31
<i>unwieldy</i>	0	0.00	1	0.40	0	0.00	1	0.10
TOTAL	2	1.64	15	5.24	16	2.10	33	2.87

However, it should be noted that the Comfortable frame does not appear to be prevalent in all news outlets. In fact, the *MailOnline* was the only news outlet to use words from the “comfortable” category in a substantial portion of articles (14.22 percent) and much more than words in the “uncomfortable” group (2.1 percent). On the other hand, *The Sun* very rarely mentioned words in either of these categories (two uses from each), meaning discussions of comfort, or indeed discomfort, were not common in *The Sun* articles. Similarly, the percentage of articles in *The Guardian* using words in the

“comfortable” and “uncomfortable” categories were near identical (5.65 percent and 5.24 percent respectively). Considering these figures, it seems that the *MailOnline* has been the main proponent of the Comfortable frame in comparison to the other news outlets. Furthermore, just as the Easy to Use frame was absent from *The Sun*, it appears this publication did not use the Comfortable frame either. In this way, the media organisation factor (Shoemaker and Reese, 2014) has again impacted whether a frame was present or not. While this perhaps means the Comfortable frame reaches a smaller audience, it is still significant that it appeared in the *MailOnline*. To specify, the *MailOnline* was the world’s most read online news source during the sample period of this study (Greenslade, 2012; Johnston, 2018; *This is Money*, 2016), meaning its individual readership was very large. For this frame to appear in the *MailOnline* means that it could still encourage a large group to view XR favourably.

Figure 8.3: Percentage of Articles per Year With at Least One Term From the “Comfortable” and “Uncomfortable” Categories



Considering the use of specific words, it was found that, in the “comfortable” category, the term *light(weight)* was the most common (see Table 8.5). Further to this, the qualitative framing analysis uncovered that this lightness was emphasised by some articles. For example, a *MailOnline* article claims: “The Playstation VR headset has been designed to be as light and as comfortable as possible” (ID0675). In other words, the headset could not be any more light or comfortable than it is, putting particular emphasis on the Comfortable frame. More extremely, it was found that the lightness of Gear VR was exaggerated in another *MailOnline* article: “At first glance the headset looks like it

will be really heavy, but it just feels like a pair of goggles you used to wear when doing science at school" (ID0421). While even the lightest version of the Gear VR headset is 345 grams (Samsung, n.d.), the journalist compares the headset to protective plastic goggles worn during science classes. Gear VR is significantly heavier than a pair of science glasses, making this an exaggeration. However, since the majority of generalist news readers "do not have technical knowledge or background" (Weiss-Blatt, 2016: 415), they may not be aware that this is exaggerated. This, then, creates the impression that Gear VR is extremely lightweight, thus framing it as Comfortable.

Similarly, other articles constructed the Comfortable frame by focusing on headset weight distribution. Regarding PlayStation VR, *The Guardian* states:

The new design places the device's weight on the top of the head so that there's little pressure on top of face [*sic*] – a mild dig at Oculus Rift's more intrusive goggle-style design. The headset is comparatively light, and the redesigned strap distributes the weight evenly for a comfortable fit (ID0134).

In this example, PlayStation VR is said to be more comfortable than Oculus Rift, due to its distribution of weight on the top of the head. While PlayStation VR marketing was not analysed in this study, it was found that the distribution of weight to improve comfort was highlighted on the HoloLens website:

Designed for comfort.

The headband is designed like a performance car with great weight distribution for a comfortable fit. Weight is distributed around the crown of your head, saving your ears or nose from undue pressure (HL18).

The comfort of this device is portrayed to be extremely high-quality by comparing it to a "performance car". The explanation of how the headset distributes weight further enhances this. Additionally, marketing of various XR devices describes them as "light" or "lightweight" (GVR18; GG01; HL04; ML28; OR01; OR04; OR08; OR10; OR11; OR30). Therefore, it is clear that this Comfortable frame is shared between the two samples.

However, as with the other frames discussed, it is important to examine any instances that opposed the Comfortable frame within the news articles. Firstly, in a report from *The Guardian*, a journalist highlights their discomfort while using the Google Cardboard headset: "I am intensely aware that the bridge of my nose is being assaulted

by the hard edges of the headset" (ID0100). The use of the modifier "intensely" puts great emphasis on their discomfort. Moreover, describing the edges of the headset as "hard" and using the metaphor "assaulted" implies a very uncomfortable experience. However, since the Cardboard headset is literally made of cardboard, it is not surprising that this product in particular has been singled out as being uncomfortable. Still, another journalist from *The Guardian* did highlight his discomfort when using an early version of Oculus Rift: "Wearing it felt like having uncomfortable ski goggles clamped to my face" (ID0170). Aside from the use of "uncomfortable", "clamped" suggests a very tight fit. Though this presents the device as highly uncomfortable, the statement is contrasted in the next paragraph with the journalist's recent experience of Oculus Rift. He claims "I finally saw what the fuss was about" (ID0170), with no further mention of discomfort. Therefore, the discomfort of XR was not emphasised to the extent that it would be classified as a frame. This is supported by the numerical data discussed above which shows that the Comfortable frame was favoured by the news outlets.

The preference for the Comfortable frame demonstrates another example of the news coverage focusing on positive over negative frames when it comes to XR. As previously noted, the news is the main source of information about emerging technologies for the general public (Whitton and Maclure, 2015; Williams, 2003). Thus, combined with the other positive frames already discussed, this is further evidence to suggest that the news fosters a positive attitude toward XR, which could lead readers to be more likely to purchase these products. While the Comfortable frame does not directly relate to any of Rogers' (2003) perceived attributes of innovations, it does coincide with one of Buenaflor and Kim's (2013) factors concerning the acceptability of wearable computers. According to the authors, "[p]hysical comfort and safety is an essential consideration" when it comes to the acceptance of wearable computers (2013: 109). They also insist that "a user's perception of a new technology significantly affects acceptance" (2013: 107). Therefore, as a wearable technology, the emphasis of the Comfortable frame in the news coverage could contribute to supporting the adoption of XR. Presenting XR in such a way is clearly of benefit to XR companies since this frame also appears in their marketing. Thus, the news acts as a promotional tool for XR by using this frame, supporting the capitalist ideologies of XR companies. Like the Easy to Use frame, the Comfortable frame treats the audience as consumers, as is the case in lifestyle journalism

(Hanusch, 2012), since the comfort of the device would not be of interest to someone unless they were considering purchasing it. Therefore, although these articles are presented as news, they include characteristics of lifestyle journalism.

8.4 Final Remarks

In this chapter, frames relating to the user experience of XR have been analysed. This involved discussing the framing devices used to present XR as Social, Easy to Use and Comfortable. Mirroring the findings from the previous two chapters, these three frames appeared in both the news and marketing samples and, in some cases, the same framing devices were used to construct them. In particular, all four of the rhetorical framing devices used to construct the Easy to Use frame were shared between the two samples. This included presenting XR interaction as natural, using modifiers to emphasise this supposed natural interaction, highlighting the fast speed of processes and mentioning the hands-free capabilities of some XR products. Furthermore, references to telepresence were used in the news and marketing samples to depict the Social frame. Regarding the Comfortable frame, both samples each positively evaluated the distribution of weight in the headsets.

The news articles also exaggerated the lightness of Samsung Gear VR by comparing it to school science glasses, though this framing device did not appear in the marketing materials. On the other hand, the marketing materials depicted the Social frame by emphasising the value of AR for collaborative working, and this idea was not present in the news articles. Regarding technical framing devices, some very similar findings were uncovered in relation to the previous chapters. Quotes from Mark Zuckerberg were used in the news articles to construct the Social and Easy to Use frames. Additionally, these quotes were repeated in multiple articles, emphasising the strength of the frames. This is further evidence to suggest that Zuckerberg has been instrumental in the news framing of XR.

Considering these results alongside those presented in Chapters 6 and 7 shows that eight frames present in the marketing of XR also appeared in the news coverage. These were: Immersive; Transcendent; Different and Unique; Revolutionary and Transformative; Advanced and High-Quality; Social; Easy to Use; and Comfortable.

However, it should also be noted that this study found some frames used in the marketing that did not appear in the news coverage. Firstly, a Personal frame appeared in the marketing of some products to present the technology as allowing a personal experience (e.g. HL03; HL04; HL08; GVR15). Secondly, a Boundless frame in the marketing implies there is a plethora of content available for XR (e.g. HL44; HL69; OR23; GVR09). Finally, a Magical frame was found in the marketing of (unsurprisingly) Magic Leap, with its tagline being to “bring magic back into the world”. This shows that there were some differences between the two samples. Nevertheless, the major finding here is that several more frames *were* shared between the two samples (eight), than those that were unique to the marketing (three).

This indicates that, within the social institutions level (Shoemaker and Reese, 2014), the marketing materials of XR have been instrumental in the framing process for XR news. Without analysing journalists in the newsroom, it cannot be certain whether they have been directly influenced by this marketing when creating XR news. However, the strong similarities in the way XR is framed in the two discourses certainly supports this claim. Furthermore, the prevalence of XR company owners and content creators as sources in the news articles (see Section 5.2.4), as well as the repetition of quotes from company owners such as Zuckerberg as framing devices, shows that these groups have been given significant power to frame XR. Whether the news has been influenced by these groups or not, when identical frames appear in different media, “[t]his enhances the persuasive power of the frames, because the media appear to address the audience with a single voice” (Van Gorp, 2007). That is to say, the discourses work to reinforce each other. Since the way XR is framed in its marketing is intended to sell the products, the fact that these same frames also exist in the news content suggests that the news is also acting as a promotional tool to support the diffusion of the technology. Although the journalistic norm of objectivity states that promotional content should be clearly separate from news content (Carlson, 2015), this does not seem to have happened in relation to XR. Instead, this hints at the marketization (Fairclough, 1993) of XR news and the blurring of news and promotional content, supporting Chyi and Lee’s (2018) argument that technology news is commercialised.

Moreover, each of the frames in this section emphasised a positive aspect of the XR experience, rather than taking a critical stance. The technology was framed as Social,

rather than isolating, despite the focus on videogame applications which have been presented as isolating in the news (Rogers, 2013). Additionally, despite the existence of the Advanced and High-Quality frame discussed in the previous chapter, XR was also framed as Easy to Use rather than difficult to use. Similarly, the hardware was more likely to be presented as Comfortable rather than uncomfortable. Each of these frames avoid moral panic type discourse about XR. Since the perception of an emerging technology has a significant impact on its acceptance (Buenaflor and Kim, 2013) and the news media are the general public's main source of information about an innovation (Whitton and Maclure, 2015; Williams, 2003), this indicates that the news coverage could support the diffusion of XR. This is even more likely to be the case considering that each frame highlights a characteristic of a technology that can make adoption more likely. To expand, the Social frame depicts the compatibility attribute (Rogers, 2003), the Easy to Use frame lowers the perceived complexity (Rogers, 2003) of XR and the Comfortable frame positively evaluates the physical comfort (Buenaflor and Kim, 2013) of the products. As each frame emphasises an aspect of an innovation or technology that can increase the chance of adoption, this indicates that the use of these frames promotes the diffusion of XR. This is also in line with the findings discussed in previous chapters.

This is concerning regarding the state of technology news (at least on XR) as it shows journalists are not performing their fourth estate role. Instead of providing the public with information about the potential benefits and risks of XR, they only focus on positively emphasising aspects of the technology that increase the likelihood of adoption. Added to this, these are the same frames that appear in XR marketing, meaning XR companies perceive these traits to be the key factors that will help them sell their products. As these frames are repeated in the news articles, the discourse that is supposed to critically inform the public (Fjæstad, 2007) instead promotes and persuades audiences to purchase these devices. In other words, the news prioritises the interests of XR companies rather than the general public.

Chapter 9: Evaluative Framing of Extended Reality

The previous three chapters have analysed the frames present within the news coverage of XR that also appeared in XR marketing. This final data analysis chapter provides further insight into the news framing of XR by exploring frames that were present in XR news coverage, though not in the marketing materials. The majority of this chapter follows the same format as the previous three by examining the specific frames used to evaluate XR. These are: Important; Successful; Affordable; and Much-Anticipated. Each section considers both quantitative and qualitative data to analyse the framing devices used to construct the frames. However, since these frames did not appear in XR marketing, the qualitative data discussed here is purely based on the news sample. This is followed by a section that considers the overall evaluative framing of XR to provide further insight into the general tone of XR news articles, regardless of specific frame. The use of positive and negative discourse is explored, as well as attention to concerns and ailments. These sections follow the same format as those that focus on specific frames (first analysing quantitative data and then qualitative data regarding framing devices), though relating to the overall tone of the discourse instead of a specific frame. In line with other chapters, the current chapter is underpinned by framing theory which is used to discuss the effectiveness of the framing devices and how four factors of the hierarchy of influences model (social systems, social institutions, media organisations and routine practices; Shoemaker and Reese, 2014) have impacted the frame-building process in XR news. This is supported by diffusion of innovations theory (Rogers, 2003) and models of technological acceptance (Buenafior and Kim, 2013; Davis, 1989; Kim, Chan and Gupta, 2007) which help to analyse whether the way XR is framed could support its diffusion.

9.1 Important

As discussed in Section 7.2, the Revolutionary and Transformative frame emphasised the importance of XR as able to create meaningful change. Section 5.1.3 also noted that the placement of XR news articles highlighted the importance of the technology. For instance, both *The Sun* and *The Guardian* deemed XR news important enough to have specific “virtual reality” categories that XR articles were assigned to. It is not surprising, then, that Important emerged as its own frame within the news discourse. This involved

presenting XR as a significant development with high importance. The current section discusses the framing devices used to construct the Important frame in the news articles. In the same way as the previous chapter, it first examines quantitative data that demonstrates how often words that frame XR as Important were used, as well as any that could counter this frame by presenting XR as trivial. Based on this quantitative data, any variations between XR type, news outlet or sample year are also considered. Next, qualitative data is examined which provides further insight into any other framing devices that were used to present XR as Important. Unlike the frames discussed in the previous chapter, no framing devices could be found during the qualitative analysis that countered the Important frame. The final paragraph considers why this might be, as well as the implications of this frame being used regarding the diffusion of XR.

As has been noted in other chapters, the use of specific words can indicate the appearance of a frame (Entman, 1993; Linström and Marais, 2012). Likewise, the use of certain terms could also work to counter a frame. This study found that terms in the “important” category were used 179 times in 12.69 percent of articles (see Table 9.1). In comparison, words that could counter this frame, in the “trivial” category, were only used 51 times in 4.09 percent of articles overall (see Table 9.2). This shows that words presenting XR in a favourable light have been used more often than those that would do the opposite. However, inspecting the use of these words across the sample period provides more nuanced insight into the use of this frame. At the start of the sample, the percentage of news articles using words in both categories (“important” and “trivial”) was the same: 8.33 percent (see Figure 9.1). Thus, in the first year of the sample, the Important frame did not dominate the coverage. Instead, there were a mixture of viewpoints on this issue in the early stages of XR development. Nevertheless, in every year after this, words in the “important” category were used in more articles than those in the “trivial” category. That is to say, from 2013 to 2017, the news outlets chose to use the Important frame to present XR favourably.

Indeed, every news outlet used words in the “important” category more than those in the “trivial” category, showing the dominance of the Important frame. *The Sun* articles did not use any words from the “trivial” category at all (see Table 9.2). Still, only 6.56 percent of its news items included words in the “important” group, showing that this was not a very common frame in *The Sun*. In the *MailOnline*, 12.28 percent of articles

included “important” words, whereas just 1.95 percent used terms from the “trivial” category. In other words, the *MailOnline* has placed particular emphasis on the Important frame over its potential counterpart. Alternatively, *The Guardian* used words in the “important” category the most (15.32 percent of articles) out of all news outlets. However, 10.89 percent of articles from this publication used terms from the “trivial” category. Thus, *The Guardian* appears to have taken a more balanced approach regarding the Important frame. Quality news outlets, such as *The Guardian*, are expected to adhere to the journalistic norms of objectivity and balance more than tabloids and middle-market publications (Bastos, 2019), which could explain this difference. Therefore, the variation between how often words were used in the three publications suggests that the media organisation (Shoemaker and Reese, 2014) reporting on XR has had an impact on the strength of the Important frame.

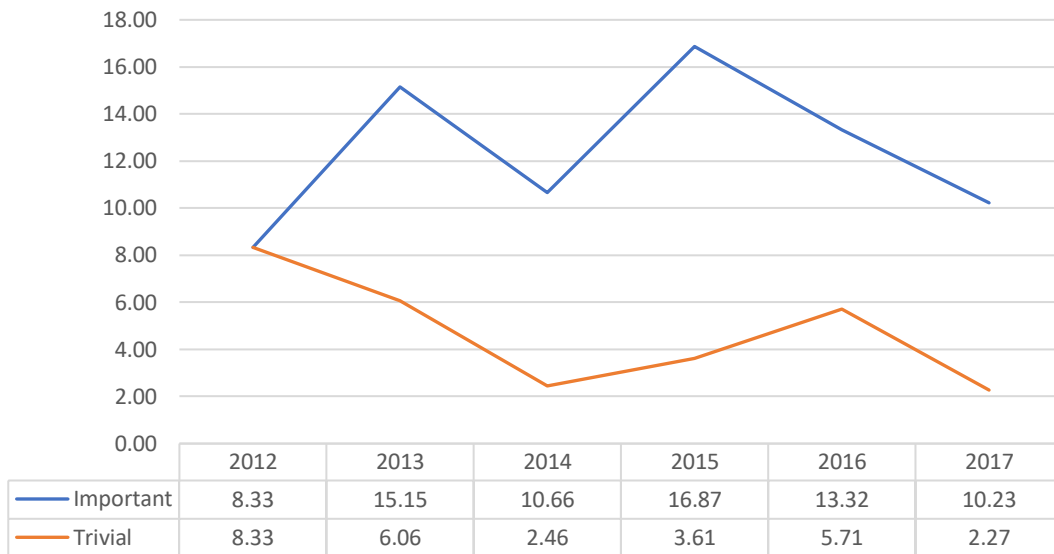
Table 9.1: Appearance of Terms in the “Important” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>special</i>	1	1.64	14	4.44	83	8.68	98	7.16
<i>important*</i>	0	0.00	12	4.03	17	1.95	29	2.35
<i>valuable*</i>	1	1.64	4	1.61	10	1.35	15	1.43
<i>significant*</i>	1	1.64	7	2.82	5	0.60	13	1.23
<i>ubiquitous</i>	1	1.64	7	2.42	2	0.30	10	0.92
<i>prominent*</i>	0	0.00	3	1.21	3	0.45	6	0.61
<i>big deal</i>	0	0.00	3	0.81	2	0.30	5	0.41
<i>meaningful*</i>	0	0.00	2	0.81	0	0.00	2	0.20
<i>seminal</i>	0	0.00	0	0.00	1	0.15	1	0.10
TOTAL	4	6.56	52	15.32	123	12.28	179	12.69

Table 9.2: Appearance of Terms in the “Trivial” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>gimmick*</i>	0	0	18	6.45	14	1.50	32	2.66
<i>novelt*</i>	0	0	13	4.44	1	0.15	14	1.23
<i>fad(s)</i>	0	0	3	1.21	2	0.30	5	0.51
<i>trivial</i>	0	0	0	0.00	0	0.00	0	0.00
TOTAL	0	0.00	34	10.89	17	1.95	51	4.09

Figure 9.1: Percentage of Articles per Year With at Least One Term From the “Important” and “Trivial” Categories



On the other hand, there was not a significant difference between the portion of VR articles using words in these categories in comparison with AR/MR articles (see Appendix J.6). Words from the “important” category appeared in 12.53 percent of VR articles and 11.41 percent of AR/MR articles. This is a very small difference, showing that the Important frame was not attributed to one type of XR more than another. Additionally, 4.22 percent of VR articles used words in the “trivial” category, compared to 2.68 percent of AR/MR articles. Although this is a larger difference, both figures are very low, showing that either type of XR was rarely described as trivial.

Looking more closely at how often specific terms were used within the news articles highlights another noteworthy finding regarding the Important frame. Out of all words in the “important” category, *special* was the one to be used the most (7.16 percent of articles; see Table 9.1), even more than *important** itself (2.35 percent). Bantimaroudis and Ban state that “[a] careful examination of word choices and the extent of their use in news coverage can reveal much about the organizing ideas, the framing choices, of the media” (2001: 177). Indeed, the frequent use of *special* does just this. Whereas the use of the stem *important** clearly denotes the Important frame, it is a less loaded term than a word such as *special*, which connotes importance while also implying that the way it is important is positive and perhaps different. Therefore, word choice has been used as a framing device not only to frame XR as Important, but to do this in a positive way. Because the news is the public’s main source of information about emerging

technologies (Whitton and Maclure, 2015; Williams, 2003) and the perception of an innovation is a key factor in its success (Buenaflor and Kim, 2013), this favourable evaluation of XR could promote its diffusion.

In addition to using specific words to frame XR as Important, the qualitative analysis uncovered further framing devices used to present XR this way. Firstly, quotations were used as technical framing devices to construct this frame. In continuity with the findings discussed in previous chapters, quotes from both Mark Zuckerberg and Apple CEO Tim Cook were used to highlight this frame. In particular, Zuckerberg's statement that "we believe that VR is going to be the next big computing platform" (ID0659) or the "next major computing platform" (ID0861) frames the technology as Important. Here, VR specifically is represented as highly significant as it is implied it will be a new way for people to interact with computers, rather than simply a gimmick. Variations of this quote were used in several news items: the phrase "next major computing platform" appeared in one article in *The Guardian* and five *MailOnline* articles. Similarly, the phrase "next big computing platform" appeared in five news articles; again with one from *The Guardian* and four in the *MailOnline*. Here, the *MailOnline's* routine practice (Shoemaker and Reese, 2014) of copying and pasting parts of its articles has contributed to enhancing the Important frame. As noted previously, repetition of quotes could be a result of pressures on journalists to create news content quickly, thus indicating that this routine practice has developed due to commercial pressures in the social system (Shoemaker and Reese, 2014).

Similarly, Tim Cook was also quoted to frame AR as Important. A *MailOnline* article states that: "Apple CEO Tim Cook has called augmented reality (AR) a 'big idea' and people will 'have AR experiences every day, almost like eating three meals a day'" (ID0962). Comparing AR to the integral and everyday act of eating meals suggests it will be a big part of life, which highlights its significance. Furthermore, as mentioned in previous chapters, this argument could be convincing to readers due to the credibility of Cook's position (Go, Jung and Wu, 2014). Since the inclusion of a source in an article contributes to enhancing the source's chosen frame (Van Gorp, 2007), this shows that two advocates of the Important frame (Zuckerberg and Cook) have, again, been successful in getting this frame into the news. This is further evidence to suggest frame

advocates within the social institutions factor (Shoemaker and Reese, 2014) played a significant role in the framing of XR.

Also showing similarities with the Advanced and High-Quality frame (see Section 7.3), associations were used as rhetorical framing devices in creating the Important frame. This involved associating XR with high-profile or well-known companies. For instance, one *MailOnline* article notes: "Big companies such as Apple, Facebook, Sony and Samsung have big stakes in the emerging sector" (ID0421) and another highlights that "HTC, Lenovo, Asus, and HP" are working with Microsoft on HoloLens (ID0667). For these successful and established companies to be mentioned in relation to XR suggests the technology is significant because they have deemed it worthy of investment. In a similar way, it is also mentioned that Google was one of the major investors in Magic Leap. One article in *The Guardian* states: "The investors are also of an unusually high calibre, including Google and the semiconductor magnate, Qualcomm" (ID0109). Again, the involvement of these well-known and successful companies is noted to highlight the significance of the technology. Moreover, by using the modifier "high calibre" when referring to the investors, even readers who are unaware of these companies will be assured that they are well-established in their industries, thus accentuating the same importance of Magic Leap.

Nordfors states that the reputation of an innovation depends greatly "on the reputation of the innovator, especially the innovator's reputation of innovating" (2009: 15). This includes the reputation of "related products, services and stakeholders" (2009: 15). Although Facebook does not have an overly positive reputation, particularly in relation to the privacy of its users (Johnson, Egelman and Bellovin, 2012), it certainly has a strong reputation as an innovator. Indeed, the social media platform grew from approximately one million monthly users in 2004 (Sedghi, 2014: n.p.) to approximately 2.5 billion by the end of 2019 (Facebook, 2020: 3), with an annual revenue of \$70.7 billion in 2019 (Facebook, 2019: 44). Therefore, highlighting Facebook's involvement with VR works towards improving the reputation of Oculus and the wider XR industry. The same can be said for the other successful technological innovators mentioned in the previous paragraph. Thus, these associations work to construct the Important frame in XR news.

Additionally, referencing the impact XR can have also contributed to creating the Important frame. For example, an article in *The Guardian* states that: "Many of these

filmmakers and journalists see VR as a way to cut through viewers' complacency about disaster or war stories" (ID0176). This relates to the idea that VR can be the "ultimate empathy machine" (Milk, 2015). As mentioned in Section 2.4, Milk argues that the immersive capabilities of VR mean users are able to feel more empathy for certain people or groups by experiencing the world from their perspective in VR. This news article implies that VR can encourage the public to act by increasing empathy. It further highlights this with a quotation from Milk himself: "What you're talking about at some point is more than a medium, but is fundamentally an alternative level of human consciousness" (ID0176). Here, the significance of VR is implied to be strong because it can alter human consciousness, thus appropriating the Important frame.

Zuckerberg is also quoted in another article highlighting empathy: "One of the most powerful features of VR is empathy" (ID0302). He continues on to explain the goal of demonstrating his new VR application: "My goal here was to show how VR can raise awareness and help us see what's happening in different parts of the world" (ID0302). Again, VR is represented as able to raise awareness of global issues in relation to empathy, which implies the technology has importance and significance beyond simply being an entertainment platform. This framing device, as well as being another example of frame advocates' input at the social institutions level (Shoemaker and Reese, 2014), highlights the observability of XR, or "the degree to which the results of an innovation are visible to others" (Rogers, 2003: 16). The greater this visibility is, the more likely consumers are to adopt an innovation (Rogers, 2003). Thus, emphasizing the impact of XR to construct the Important frame could aid the diffusion of this technology.

Aside from the limited number of uses of words that could counter the Important frame, no other framing devices were uncovered in the qualitative analysis to counter it. Bednarek and Caple state that "evaluations of Unimportance [...] are rare in news discourse, presumably because they decrease news value" (2012: 141). This certainly seems to be the case in news coverage of XR. Instead, it appears that the news values of prominence (Bednarek and Caple, 2012) and magnitude (Harcup and O'Neill, 2017) have caused journalists to frame XR as Important. The prominence news value can be observed in the emphasis on the large successful companies involved in XR, while the magnitude news value appears to have been considered because the impact of the technology is shown to be significant. Since news values are related to routine practices (Shoemaker

and Reese, 2014), it appears that this factor has impacted the creation of the Important frame.

In addition to improving the perception and observability of XR, the Important frame has significant consequences for XR diffusion. Maisch et al. argue that the uncertainty over the importance of an innovation “can lead to resentment and aversion” of that product (2011: 4). However, by highlighting the importance of XR technology, the news media have avoided creating resentment or aversion to the innovation and instead have reassured the public of its significant role in society. This could then lead to an increased likelihood of XR being adopted. In other words, the appearance of the Important frame is further evidence to indicate that the news coverage supports XR diffusion. Yet again, the Important frame contributes to the news acting as a promotional tool for XR and supporting the commercial interests of those selling the devices. Indeed, it shows that favourable framing persists even when the same frame did not appear in the XR marketing, further promoting this technology to the public. Just as lifestyle journalism has been described as an extension of marketing (English and Fleischman, 2019; Kristensen, Hellman and Riegert, 2019), the same seems to be the case in XR news.

9.2 Successful

When an innovation is in the early stages of the diffusion process (as XR was during the sample period of this study) it is not known whether it will be successful or not. Despite this, one frame that emerged from the qualitative analysis was Successful. This involved presenting XR as a technology that is, or will be, successful. The current section examines the framing devices used to represent XR as Successful, using the same format as the previous segment. Quantitative data is analysed first to discuss the prominence of the Successful frame based on how often words referring to this frame were used. This is compared with the use of any words that could counter the frame by presenting XR as unsuccessful. To investigate this frame further, any differences between news outlet, XR type or sample year are considered. Next, qualitative data is used to analyse the additional rhetorical and technical framing devices that portrayed XR as Successful. It is also noted that there were some attempts to counter the frame. Finally, the implications of this frame appearing in the news are explored based on theories of diffusion and technological acceptance.

Firstly, quantitative data from the frequency of terms analysis illustrates the prominence of the Successful frame. Across the whole sample, 17.09 percent of articles used words in the “successful” category (see Table 9.3). In comparison, just 5.12 percent of articles included terms from the “unsuccessful” category (see Table 9.4). Thus, words relating to the success of XR were used in 3.3 times more articles than those implying XR is unsuccessful. Moreover, every news outlet used words in the “successful” group in significantly larger portions of their articles than terms in the “unsuccessful” category (see Table 9.3 and Table 9.4). Similarly, terms in the “successful” group were used more than “unsuccessful” words in every year of the sample (see Figure 9.2). This shows that the news articles have consistently favoured a positive framing of XR over a critical one, regardless of news outlet or year. Since the news is the public’s main source of information about emerging technologies (Whitton and Maclure, 2015; Williams, 2003), this could lead to positive perceptions of XR in terms of its success.

Table 9.3: Appearance of Terms in the “Successful” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>mainstream</i>	2	3.28	50	14.52	42	5.24	94	7.47
<i>popular</i>	8	9.84	20	6.85	55	6.29	83	6.65
<i>successful</i>	1	1.64	17	5.65	11	1.65	29	2.66
<i>mass(-)market</i>	0	0.00	10	3.63	12	1.50	22	1.94
<i>lucrative</i>	0	0.00	0	0.00	2	0.30	2	0.20
TOTAL	11	13.11	97	25.40	122	14.37	230	17.09

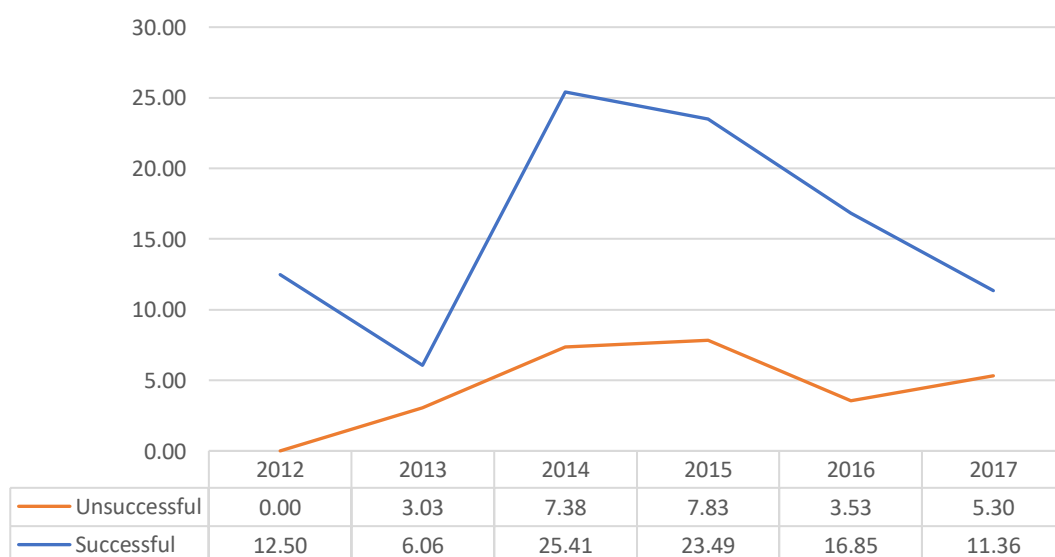
Table 9.4: Appearance of Terms in the “Unsuccessful” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>fail*</i>	3	3.28	20	6.85	15	1.95	38	3.28
<i>niche</i>	0	0.00	16	4.44	9	1.05	25	1.84
<i>unsuccessful</i>	0	0.00	1	0.40	0	0.00	1	0.10
TOTAL	3	3.28	37	11.29	24	2.99	64	5.12

Although words in the “successful” category always dominated, there were some variations in how much these words were used per news outlet. Terms in the “successful” category were mentioned in a similar portion of articles in *The Sun* and *MailOnline* (13.11

percent and 14.37 percent respectively). Likewise, both of these news outlets used words in the “unsuccessful” category in a similarly low portion of articles (3.28 percent in *The Sun* and 2.99 percent in the *MailOnline*). Therefore, these news outlets do not appear to differ in terms of how often they use the Successful frame in news coverage of XR. On the other hand, *The Guardian* had the highest portion of articles including words from both of these categories, with a relatively large 25.4 percent using terms from the “successful” category and 11.29 percent including words from the “unsuccessful” group. This shows that *The Guardian* has discussed the success (whether successful or unsuccessful) of XR more than the other news outlets. Moreover, words in the “successful” category were used over twice as often by *The Guardian* as those in the “unsuccessful” category and substantially more than the other news outlets. This suggests that *The Guardian* has used the Successful frame more often than *The Sun* and *MailOnline*. Since audiences typically assign more credibility to quality news outlets such as *The Guardian* than they do tabloids (Frewer, Scholderer and Bredahl, 2003), the potency of the Successful frame in *The Guardian* could have a meaningful impact on readers. Indeed, as shown in Appendix D, *The Guardian* news site had the second largest readership (out of all UK national news sites) in every year of the sample period for which data was available. Furthermore, this variation shows that the media organisation (Shoemaker and Reese, 2014) factor has impacted the strength of the Successful frame, although not to the extent that it is present in some outlets and not others.

Figure 9.2: Percentage of Articles per Year With at Least One Term From the “Unsuccessful” and “Successful” Categories



Additionally, while there were no substantial differences between VR and AR/MR articles' use of words in these categories (see Appendix J.6), examining this data across the years of the sample period provides a notable result. It has already been noted that words in the "successful" category were always used more than words in the "unsuccessful" group. However, the use of these words was not stable over time. In fact, there was a large increase in the use of words in the "successful" category from 2013 (6.06 percent) to 2014 (25.41 percent). As previously mentioned, 2014 was the year Mark Zuckerberg acquired Oculus, spurring much interest in XR. Therefore, this data indicates that Zuckerberg's involvement with XR contributed not only to increased media attention of XR (see Section 5.1.1), but an increase in positive framing of XR. This coincides with the findings in relation to the Social frame discussed in Section 8.1.

In more detail, the use of specific words in each of these categories indicates that the success of XR was highlighted most often by claiming it has a large audience. This can be seen in the fact that the words *mainstream* and *popular* were the most used in the "successful" category (see Table 9.3). In a similar way, portrayals of XR as mainstream were more common than describing it as niche. The term *niche* only appeared in 1.84 percent of articles, whereas *mainstream* appeared in 7.47 percent. Moreover, the qualitative analysis uncovered additional rhetorical framing devices used to argue XR will have a large audience. For instance, *The Guardian* writes the following about VR:

In the same way as the Nintendo Wii's motion-oriented gaming opened up the industry to new users, from children to grandparents and casual gamers everywhere, VR could have a similar impact. Ashforth says: "I've tried it with my kids, my mum, everyone loves it (ID0090).

Here, an analogy is used as a rhetorical framing device by relating VR to a previous technology. VR is said to have a potentially similar impact as the Nintendo Wii did in terms of attracting a wide audience. Frames work by "connecting the mental dots for the public" (Nisbet, 2010: 47). Thus, by relating VR to a device that is already known to be widely popular, readers would be more inclined to accept the Successful frame. To add to this, the statement is supported by a technical framing device in the form of a quote from a Sony employee (Ashforth) who states people of all different age groups have enjoyed VR. Again, this implies VR will appeal to a wide audience. Moreover, the source is defined by the journalist as a senior game designer. The labels (or designators) applied

to sources can indicate the level of authoritativeness of a statement (Bell, 1991; Pan and Kosicki, 1993). Referring to the source as a *senior* game designer presents him as established in the industry, thus giving his statement more credibility. As a result, the Successful frame is emphasised.

Aside from highlighting the audience size, the news articles also presented XR as established to construct the Successful frame. For instance, an article in *The Guardian* asks: "When your grandkids ask where you were [when] virtual reality took off, what will you say?" (ID0259). This question implies that it is certain VR will be successful and it will become such a major part of life that future generations ("grandkids") will want to know about the moment it became established. Additionally, a *MailOnline* article includes the following statements:

The world of virtual reality is hotting up [...] VR is one of the biggest trends in technology at the moment, with dozens of firms jumping on the bandwagon and developing VR headsets (ID0593).

Noting VR is "one of the biggest trends" and that many companies are developing headsets makes the industry appear very current and established. Additionally, this is not just mentioned in relation to VR. Another article from *The Guardian* argues that Google Glass is known by everyone apart from "those who have been vacationing on Mars" (ID0073); again suggesting this is an established product that is common knowledge. These depictions act as framing devices for the Successful frame. Presenting XR as established could reduce uncertainty about the technology, leading readers to be more accepting of it (Rogers, 2003) and thus increasing the likelihood of adoption.

Moreover, data regarding product sales and XR revenue are used as technical framing devices in the news articles to construct the Successful frame. This is often alongside rhetorical framing devices in the way that these statistics are evaluated by the journalist. One of the earliest examples of this appeared in an article about the Oculus Rift's Kickstarter campaign from *The Guardian*. It states: "Oculus raised \$2.4m for its Rift headset in September 2012, exceeding its initial fundraising goal by 10 times. It remains one of the largest ever Kickstarter campaigns" (ID0085). Highlighting that the campaign exceeded its goal by a very large amount creates the impression that the device is very popular, thus depicting the Successful frame. This is further emphasised by noting it is one of the largest Kickstarter campaigns.

Similar sentiments were also highlighted by sources. For instance, a *MailOnline* article states: "Goldman Sachs has predicted VR and augmented reality as a segment will be worth \$80 billion (£56 billion) by 2025, which is around the same size as the desktop computer market today" (ID0576). In this sentence, the VR/AR industry is predicted to be worth the same amount of money as a very established piece of technology (the desktop computer) by 2025. This comparison suggests VR and AR will be very financially successful. In a similar way to comparing VR to the Wii above, associating XR with the desktop computer allows readers to more easily make connections between new and existing information, which is important in making a frame salient (Nisbet, 2010). Additionally, *The Guardian* implies success with a quote from a device creator:

Mike Jazayeri, director of product management at Google VR, says he is pleasantly surprised by the success: 'We never imagined the momentum it has had. Immediately we got a lot of interest from content creators, brands, developers – and a year later more than a million Cardboards have shipped and there's hundreds of apps' (ID0144).

The success of Google Cardboard in particular is highlighted in this quote by mentioning the high volume of interest, content and sales of the device. Both of these examples also employ the technical framing device of an established source, which increases the persuasiveness of the frame (van Dijk, 1988; Go, Jung and Wu, 2014). Furthermore, the second example shows that the creator of a VR product has also acted as a frame advocate (relating to the social institutions factor [Shoemaker and Reese, 2014]) for the Successful frame, again emphasising the impact of such voices on the portrayal of XR.

In relation to actual product sales, several articles highlighted the fact that XR devices sold out quickly. Gear VR "sold out within hours of going on sale" (ID0535) and, more extremely, "the first wave [of Oculus Rifts] sold out on the firm's website in seconds" (ID0546). Moreover, the headline of one *MailOnline* article states: "HTC reveals it sold 15,000 Vive VR headsets in the first 10 MINUTES of going on sale" (ID0587). Each of these articles emphasise the popularity, and thus success, of the devices. Additionally, the fact that this final example appeared in the headline of the article highlights the prominence of the frame (Pan and Kosicki, 1993). It is emphasised further with the use of capitals ("10 MINUTES") to imply that it is extraordinary to sell 15,000 headsets in that amount of time. In all, the use of numbers in each of these examples act as "[s]ignals that indicate precision and exactness" which can increase the persuasiveness of statements (van Dijk,

1988: 84). Therefore, constructing the Successful frame in such a way gives it particular salience.

Lastly, an exemplar was used as a framing device in the form of comparing the current wave of XR to the first wave of XR. As mentioned in Section 2.1, the 1990s saw the first attempt at consumer VR, though it was not commercially successful (Dixon, 2016). The apparent success of the new generation of XR products was sometimes emphasised by comparing it to this historical failure of VR products. One article from *The Guardian* begins by stating:

The first wave of VR headsets flopped, but soon the Oculus Rift, HTC Vive and PlayStation VR will go on sale – and they're going to be much, much better (ID0170).

This introductory paragraph highlights the failure of the “first wave of VR”, but contrasts this with some of the new headsets being released in 2016. These new releases are classed as “much, much better”. Though this does not directly state that the new products will be successful, they are said to be of a much higher quality and therefore the chance of success is insinuated to be higher than it was previously.

Similarly, a *MailOnline* article cited Magic Leap CEO Rory Abovitz saying “virtual reality and augmented reality are old terms, with a largely disappointing history”, followed by the quote: “We have the term ‘cinematic reality’ because we are disassociated with those things” (ID0408). In other words, the Magic Leap product will be different to the historically “disappointing” attempts at XR. Including a statement from a source in a news article “makes a positive contribution in the evocation of a frame” (Van Gorp, 2010: 103). In other words, the journalist’s choice to include Rory Abovitz as a source contributes to framing XR the way Abovitz did – in this case, Successful. Again, an XR company owner has been used as a technical framing device for the Successful frame, showing the prominence of these sources as advocates at the social institutions level (Shoemaker and Reese, 2014).

While these examples demonstrate that various framing devices were used to construct the Successful frame, it is also important to acknowledge attempts within the news articles to counter this frame. The qualitative analysis uncovered that when XR was portrayed as unsuccessful, this usually occurred in relation to Google Glass. The device

was described as “an expensive flop” (ID0480) by the *MailOnline* and *The Guardian* noted “the company [Google] has given up on trying to sell them [Google Glass] as a mainstream idea” (ID0259). Indeed, an entire *MailOnline* article was dedicated to discussing the failure of the device, headlined: “Is Google Glass a flop? Developers – and customers – are ditching the smart spectacles in favour of Oculus Rift” (ID0417). The article notes that nine out of 16 developers who were working on Google Glass applications have cancelled their development. Moreover, the article states that “its prospects of becoming a consumer hit in the near future are slim” (ID0417). Altogether, Google Glass is portrayed as unlikely to be successful. This shows that the technological characteristics of the devices have had more impact on the frames used than was obvious from the quantitative data.

Nevertheless, the quantitative data above, combined with the multiple framing devices used to construct the Successful frame, show that the news articles favoured this positive representation of XR over a negative perspective. This is similar to the findings related to the frames discussed previously. Regarding RQ3, the presence of the Successful frame is significant because it reduces the uncertainty surrounding XR. During the innovation-decision process, individuals aim to reduce uncertainty about an innovation (Rogers, 2003). The Successful frame arguably reduces this uncertainty because it presents XR as something that has already been established and is of a high enough quality to achieve success. In this way, the Successful frame could promote the diffusion of XR. Moreover, the perception of a new technology has a significant impact on its acceptance (Buenaflor and Kim, 2013). Thus, for the news articles to present XR in a favourable light using the Successful frame could generate positive perceptions of XR. As a result, audiences may be more likely to adopt the technology. This shows that the news aids the promotion of XR by presenting it as Successful even when it was not yet known whether it would be. Such news coverage aligns with the commercial agendas of XR companies by supporting adoption and diffusion.

9.3 Affordable

While the current generation of XR products cost much less than they did during the first wave of XR (Fuchs et al., 2017; Steinicke, 2016), the different products still vary in price. For instance, a Google Cardboard VR headset costs approximately \$6, whereas the

Microsoft HoloLens MR device costs \$3,000 (Greengard, 2019). Valuing between these figures, the headset that was mentioned the most in the news articles (see Section 5.2.1), Oculus Rift, cost \$599 when it launched in 2016 (Morris, 2016). Despite these variations in price, it was found that one of the frames applied to XR in the news articles was Affordable. This involved presenting XR products as reasonably priced instead of overpriced or expensive. The current section analyses the framing devices used to construct the Affordable frame in XR news. To start, quantitative data is examined which shows how often words depicting the Affordable frame were used, as well as how many articles included words that presented XR as expensive. The section discusses any variations between news outlet, over time and by the type of XR being focused on. Following this, qualitative data is analysed that shows which other framing devices were used to create this frame. There were more attempts to counter the Affordable frame than there have been for any frames already discussed. Therefore, in this section, more attention is paid to how it was opposed than previous sections have done for their corresponding frames. Finally, the implications of the use of this frame are considered in terms of whether it could promote the adoption of XR products.

To begin, results from the frequency of terms analysis indicate how many articles used words that contribute to framing XR as Affordable. Across the entire sample, 15.46 percent of articles used words from the "affordable" category. The preference for portraying XR this way is highlighted by comparing this figure with the number of articles using words that would counter an Affordable frame. Terms in the "expensive" category appeared in 7.88 percent of articles. Additionally, every news outlet used "affordable" words in more articles than they did "expensive" words (see Table 9.5 and Table 9.6). However, there were some differences in the prevalence of these words depending on the news outlet. Mirroring the results regarding the Successful frame, *The Guardian* used words in the "affordable" category in the most articles (18.55 percent). The *MailOnline* used such words slightly less (15.12 percent). However, only 6.56 percent of articles in *The Sun* included terms from this category. Equally, *The Sun* also rarely used words in the "expensive" group (3.28 percent of articles). This suggests *The Sun* did not focus considerably on the price of XR products, although the outlet was still more likely to portray them as affordable rather than expensive. On the other hand, *The Guardian* and *MailOnline* used words in the "expensive" category in a similar portion of their articles

(8.47 percent and 8.08 percent respectively). These figures show that the two outlets used the Affordable frame more so than *The Sun*. Therefore, the media organisation (Shoemaker and Reese, 2014) reporting on XR has had an impact on the strength of this frame, as was found to be the case for most other frames.

	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
Term	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>cheap*</i>	4	4.92	40	10.08	79	8.53	123	8.70
<i>affordab*</i>	0	0.00	25	7.26	55	5.84	80	5.83
<i>low(-)cost</i>	0	0.00	4	1.61	22	2.54	26	2.15
<i>inexpensiv*</i>	0	0.00	4	1.21	16	2.10	20	1.74
<i>bargain*</i>	1	1.64	1	0.40	1	0.15	3	0.31
TOTAL	5	6.56	74	18.55	173	15.12	252	15.46

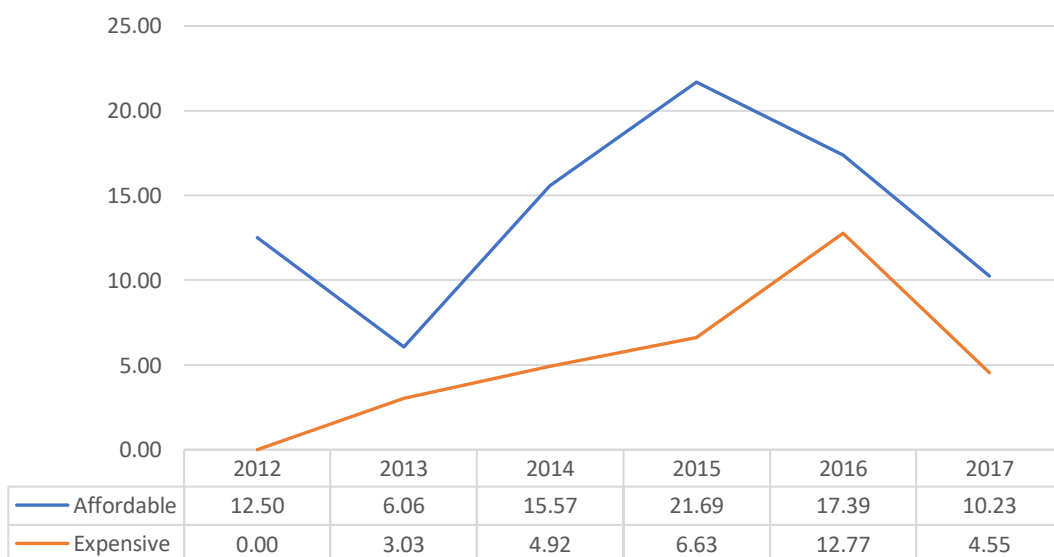
	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
Term	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>expensiv*</i>	2	3.28	25	8.06	75	7.49	102	7.37
<i>pricey/pricier /priciest</i>	0	0.00	1	0.40	3	0.45	4	0.41
<i>costly</i>	0	0.00	0	0.00	2	0.30	2	0.20
<i>high(-)cost</i>	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	2	3.28	26	8.47	80	8.08	108	7.88

Additionally, this is one of the few frames that appeared to differ significantly between VR and AR/MR products (see Appendix J.6). Words in the “affordable” category appeared in 16.21 percent of VR articles but only 3.36 percent of AR/MR articles. Moreover, words in the “expensive” category appeared in 7.9 percent of VR reports and 4.03 percent of articles about AR/MR. These figures suggest that evaluating the price of AR/MR products was much less common than it was for VR devices. Therefore, although the Affordable frame has been applied to VR articles, this does not seem to be the case in AR/MR coverage since these words were used so few times. Since the AR/MR devices this sample focused on cost substantially more than the VR products, this is not a surprising finding. For instance, of the devices mentioned in more than 10 articles, the lowest priced AR/MR product was Google Glass at \$1,500 (Greengard, 2019), whereas

the most expensive VR product (HTC Vive) cost \$799 (Burgess, 2016). However, it does show that, despite AR/MR products costing more than VR devices, the news outlets still have not portrayed them as expensive. Again, they have avoided critical representations of XR.

Furthermore, examining the use of these words across the sample period highlights an additional finding. The use of words in the “affordable” category varied over the years (see Figure 9.3). They were most common in 2015 (21.69 percent), indicating that the Affordable frame was most prominent in this year. However, in 2016 (the year that several major VR headsets were released to the public), the appearance of words in the “expensive” category peaked at 12.77 percent of articles. This suggests that there were the most attempts to counter the Affordable frame in this key year for the XR industry. According to Sääksjärvi and Morel (2010), one factor that could lead consumers to reject a technology is doubt over perceived value for money. Since 2016 was the year that many consumers would make their decision of whether to buy a dedicated VR device, the rise in words countering the Affordable frame could have increased their doubt about VR’s value for money and thus reduced their willingness to buy the product. Nevertheless, it should be remembered that words in the “affordable” category were used more than those in the “expensive” category in every year of the sample, showing that the Affordable frame was favoured by journalists overall.

Figure 9.3: Percentage of Articles per Year With at Least One Term From the “Affordable” and “Expensive” Categories



As the Affordable frame appears to have been contested more so than others, it is worth examining the framing devices used to both support and counter this frame. Aside from the use of specific words, the Affordable frame was observed in the news articles in the way they speculated about the price of the products. For example, before the price of Oculus Rift had been announced, a *MailOnline* article was published with the headline: "Facebook's Oculus Rift Virtual Reality headset to cost just \$200" (ID0398). Using the modifier "just" implies this is a low amount. However, this headline is misleading, as the article itself states that "it has been revealed it could cost as little as \$200" (ID0398). Though the headline implies it *will* "just" cost \$200, the body of the article states that it *could* cost that amount. Moreover, further in to the article, the journalist details that: "[Oculus Rift] will be offered for around \$200-\$400, according to Oculus VR co-founder Nate Mitchell" (ID0398). As the headline and lead of an article are the most powerful in creating a certain frame (Pan and Kosicki, 1993), this shows that the journalist chose to emphasise the lowest figure mentioned by the device creator, thus framing XR as Affordable.

In a different way, comparisons were also used as a rhetorical framing device to construct this frame. For example, a very early article about Google Glass published in 2012 stated that the device could cost "less than £380 – making it cheaper than Apple's iPhone" (ID0312). Whereas the journalist could have written "approximately £380", their use of the word "less" implies this is a low amount. This is emphasised by noting it is "cheaper" than a product bought by millions of consumers – the iPhone. Certainly, in the year this article was published (2012) Apple shipped 136.8 million iPhone units (*AppleInsider*, 2013). Since the iPhone is a product that is very popular, it seems many consumers consider this a reasonable price for a phone. For Google Glass to cost even less than this implies the price is just as reasonable, perhaps even more so since the device has also been framed as Advanced and High-Quality (see Section 7.3), thus depicting the Affordable frame.

However, whereas news articles used the Affordable frame when the prices of products were not yet known, it was also found that some articles exaggerated the price of Oculus Rift after it had been announced. For example, an article in *The Guardian* states: "Oculus will sell for about \$1,500 (although this includes a powerful PC to drive its graphics)" (ID0144). The *MailOnline* uses a very similar statement in one of its headlines:

“Facebook’s Oculus Rift headset will cost \$1500 (including the new computer you’ll probably need to power it)” (ID0485), making it even more salient by including it in the most powerful part of the news article (Pan and Kosicki, 1993). Although these articles mention that this price includes the new PC needed to use the headset, it is not specified how much of that figure is for the headset itself or the computer. Therefore, it creates the overall impression that the product is expensive, countering the Affordable frame.

Certainly, when attempts were made to counter the Affordable frame by suggesting XR was expensive, this usually focused on the external components needed for the experience; namely, the PCs already mentioned. Some examples of this are as follows:

The headset will also require an expensive, high-powered PC to run VR applications (ID0175)

you’ll probably need an expensive new PC to run it (ID0542)

headsets to view VR video can cost more than \$1,000 once you include a high-end personal computer with fast-enough graphics (ID0602)

Alternatively, some mentions of price are less specific, with one *MailOnline* article stating that the “main problem” with VR “is its price” (ID0374). There were also instances where the headsets themselves were represented as expensive, such as HoloLens’ price of £2,719 being described as “gargantuan” by *The Guardian* (ID0254). Therefore, it can be seen that there were some attempts to oppose the Affordable frame within the news coverage.

Relatedly, comparisons were used as framing devices to present certain products as more affordable than others. This was identified in relation to PlayStation VR. The headset is framed as Affordable because it does not need to be connected to a PC to work. For example, the headline of a *MailOnline* article states: “Sony’s PlayStation VR to undercut Oculus and HTC: Headset will cost \$399 and you WON’T need an expensive new PC to use it” (ID0599). Additionally, a journalist for *The Guardian* writes:

Sony’s virtual reality headset, the PSVR, will launch globally in October, for the comparatively low price of £349.

It’s unusual for a peripheral that costs more than its host game console to be considered a bargain, but virtual reality is proving to be a pricey

frontier for early adopters. HTC's Vive will retail for \$799/£689, while Facebook's Oculus Rift, which will launch in April, costs \$599/£499, a significant amount when you consider the additional cost of the formidable PCs required to run the hardware competently (ID0190).

Firstly, PlayStation VR is described as "comparatively low", which implies that, although it might not usually be considered cheap, it is reasonably priced when measured against the cost of other VR devices. This is emphasised in the beginning of the second paragraph when the article mentions the headset ("peripheral") costs more than the console needed to use it, though is still considered a bargain because of the prices of the other products. In this example, HTC Vive and Oculus Rift are presented as expensive in comparison to PlayStation VR. The high cost of HTC Vive and Oculus Rift is further highlighted by the mention of the "additional cost of the formidable PCs" needed to experience VR. In both of these examples, PlayStation VR is framed as Affordable, whereas HTC Vive and Oculus Rift are presented as expensive in comparison because of the PCs needed to use them. Therefore, it appears that the technological characteristics of specific products have impacted the strength of the Affordable frame.

In sum, although the Affordable frame was not as prominent as others due to there being more attempts to counter it, the news articles certainly did not favour a critical view when it came to the price of this technology. The perception of an innovation's value for money can have a significant impact on a consumer's decision of whether or not to adopt it (Sääksjärvi and Morel, 2010). Similarly, perceived fee is one of the two main sacrifices in Kim, Chan and Gupta's (2007) value-based adoption model (VAM). According to the authors, the higher the perceived fee, the less likely consumers are to adopt a technology. The fact that the Affordable frame has been the most salient (as opposed to a frame portraying XR as expensive) could lead readers to perceive the fee of XR products to be reasonable. Thus, the Affordable frame could promote the diffusion of XR.

Like the Comfortable and Easy to Use frames discussed in the previous chapter, any discussion of price indicates that journalists assume their readers to be interested in purchasing one of these products since the price would be irrelevant otherwise. Indeed, the mention of price was one of the factors considered by Arik and Çağlar (2005) in their analysis of consumption messages in Turkish lifestyle journalism. It is reassuring that the

Affordable frame was contested more than others, but it was still the most dominant in comparison to its counterpart (i.e. expensive). As in Arik and Çağlar's study, the discussion of price indicates a discourse of consumption in XR news. Since this price is positively evaluated in content that is presented as news, this benefits the companies aiming to sell these products.

9.4 Much-Anticipated

The final specific frame to be discussed that emerged from the qualitative framing analysis is Much-Anticipated. The use of this frame emphasised excitement for XR that could then generate hype. This section examines the appearance of the Much-Anticipated frame, including its prevalence and which framing devices were used to construct it. It starts with an analysis of quantitative data that highlights the prominence of this frame based on how often words relating to it were used. It also considers any variations between XR type, year and news outlet. Unlike the other frames discussed in the chapter, this section does not examine quantitative data regarding words that could counter this frame because it does not have a clearly articulated opposite. Additionally, no attempts at countering this frame could be found within the news articles through qualitative analysis either. Therefore, this section then discusses qualitative data that shows which additional framing devices have been used to present XR as Much-Anticipated. Lastly, it is considered how this frame relates to previous research and the significance of it being used in the news articles regarding the diffusion of XR.

Firstly, how often words relating to this frame were used highlights its strength. Terms in the "much-anticipated" category appeared 480 times in 26.71 percent of articles overall (see Table 9.7). That is to say, out of all the word categories for specific frames, "much-anticipated" terms were the third most common (see Table 6.3). Moreover, out of all individual search terms, the stem *excit** was used in the second largest portion of news articles, appearing in 18.32 percent (see Table 6.3). This indicates that the Much-Anticipated frame was particularly strong. Similarly, despite more VR products being commercially released during the sample period of this study than AR/MR devices, there was little difference in the use of these words depending on XR type (see Appendix J.6). It was found that 26.02 percent of VR articles included words from the "much-

anticipated” category, whereas such terms appeared in 21.48 percent of AR/MR articles. In other words, the news articles presented both types of XR as Much-Anticipated.

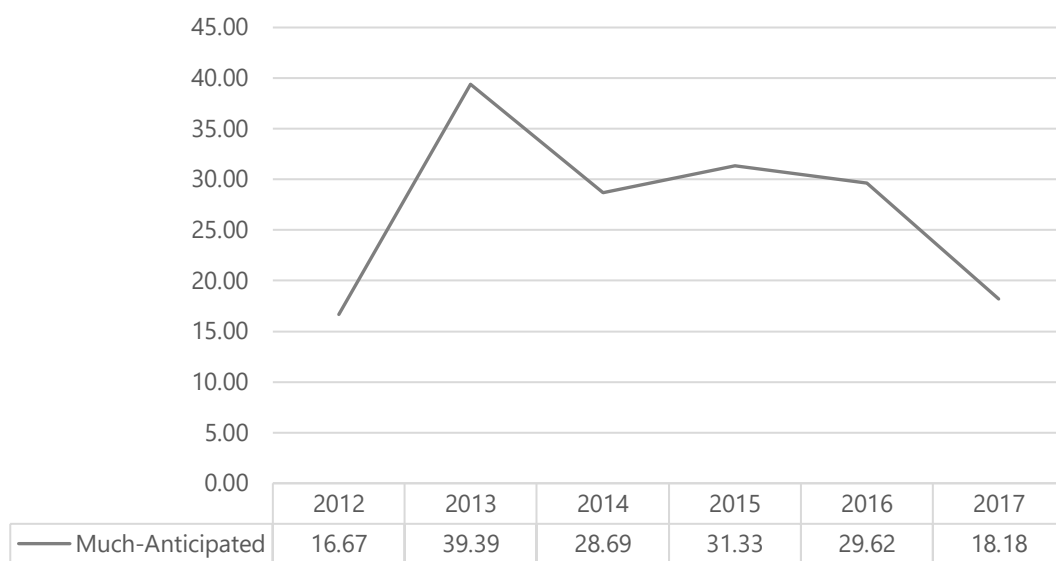
Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>excit*</i>	8	8.20	90	25.40	148	16.62	246	18.32
<i>finally</i>	2	3.28	20	6.05	94	9.28	116	8.09
<i>anticipat*</i>	0	0.00	7	2.82	42	5.09	49	4.20
<i>long(-)awaited</i>	0	0.00	1	0.40	24	3.44	25	2.46
<i>hyp*</i>	0	0.00	17	5.65	11	1.35	28	2.35
<i>buzz*</i>	0	0.00	3	1.21	6	0.90	9	0.92
<i>tantali(s/z)*</i>	0	0.00	3	0.81	4	0.45	7	0.51
TOTAL	10	11.48	141	32.66	329	25.90	480	26.71

However, there was some variation per news outlet in how often these words appeared. Out of all frame-based categories (see Table 6.3), *The Guardian* used “much-anticipated” words the second most and more than any other news outlet (32.66 percent). Slightly less than *The Guardian*, words in the “much-anticipated” category were the third most used in the *MailOnline* (25.9 percent). Alternatively, *The Sun* was the least likely to use words from the “much-anticipated” category, with them appearing in 11.48 percent of articles from this outlet. In fact, words relating to four other frame categories were used more in *The Sun* than those referring to the Much-Anticipated frame. This data indicates that the strength of the Much-Anticipated frame varied depending on media organisation (Shoemaker and Reese, 2014), although it was still present in every news outlet to some extent.

Additionally, there was some variation in the use of words in this category across the sample period (see Figure 9.4). Although words in the “much-anticipated” category were at their lowest point in 2012 (16.67 percent), this rose dramatically in 2013 to 39.39 percent where it reached its peak. In other words, the Much-Anticipated frame appears to have been the strongest the year after the second wave of XR began. From 2014 to 2016, terms in this category remained fairly consistent, ranging from 28.69 percent to 31.33 percent. However, this dropped to 18.18 percent in 2017, showing that mentioning

words to highlight the Much-Anticipated frame was not as common in the year after several major VR products were released to consumers. This data suggests that the news articles attempted to increase the hype and excitement for XR leading up to the release of these products. Previous studies have suggested that consumer anticipation increases the chance a new product will be successful (Lee and O'Connor, 2003; Schatzel and Calantone, 2006; Vichiengior, Ackerman and Palmer, 2019). Therefore, the fact that the Much-Anticipated frame was prevalent in the years leading up to the release of many XR products could have supported its adoption.

Figure 9.4: Percentage of Articles per Year With at Least One Term From the “Much-Anticipated” Category



In addition to the use of these specific words, the qualitative analysis uncovered that rhetorical framing devices were used to construct the Much-Anticipated frame. One technique involved using modifiers to emphasise the anticipation surrounding XR. Some examples of this are shown below:

Sony’s highly anticipated Project Morpheus (ID0104)

the highly-anticipated gaming gadget (ID0576)

the much anticipated Oculus Rift virtual reality headset (ID0428)

the eagerly awaited Touch controller (ID0737)

eagerly anticipated Vive virtual reality system (ID0581)

The use of the modifiers “highly”, “much” and “eagerly” in these sentences implies there is substantial excitement surrounding XR, thus framing it as Much-Anticipated. Similarly, an article from *The Guardian* claims “it’s VR that has everyone excited” (ID0142). For “everyone” to be excited about VR implies the technology must be worthy of this excitement, thus potentially generating more hype and anticipation for the technology. In another article, this is combined with an exemplar to further emphasise the excitement surrounding XR. The opening line of a *MailOnline* article describes Oculus Rift as “one of the most anticipated gadgets since the iPhone” (ID0472). Using the iPhone as an exemplar implies the same level of interest surrounds Oculus Rift as did the popular smartphone. Considering the strong success of the iPhone, this suggests that there is extreme excitement surrounding Oculus Rift. Emphasis and exclusion are major parts of framing an issue or topic (Gitlin, 1980; Hallahan, 1999; de Vreese, 2010). These examples demonstrate just how much the anticipation over XR was emphasised in the news articles, thus increasing the salience of the Much-Anticipated frame.

Furthermore, the use of the word “finally” works as a rhetorical framing device in the articles to emphasise anticipation for XR. This is combined with technical framing devices to add prominence to these points. For instance, a *MailOnline* article headline claims “Virtual reality is finally here” (ID0477). The use of the word “finally” suggests that much time has passed waiting for this technology. Thus, for VR to be “finally here” seems even more significant and worthy of excitement and hype. The fact that this point appeared in the headline of an article demonstrates the salience of this argument (Pan and Kosicki, 1993) and, in turn, the Much-Anticipated frame. Moreover, the *MailOnline* also wrote that “the Oculus Rift headset finally delivers on the long awaited promise of virtual reality” (ID0363). In this example, it is not just the device itself that is shown to be long-awaited, but VR in general; making it seem even more noteworthy. This rhetorical framing device works together with a technical framing device to increase the prominence of this point, since it appeared in the side-note of 16 *MailOnline* articles from 2014 to 2016. Again, *MailOnline*’s routine practice (Shoemaker and Reese, 2014) to repeat sections of its articles has worked to emphasise the Much-Anticipated frame. This is likely an effect of the capitalist social system (Shoemaker and Reese, 2014) causing journalists to be under pressure to create news content quickly for commercial gain.

According to Newman, “[t]he pages of the specialist gaming press brim over with anticipation, communicating palpable longing and desire for the next game” (2012: 60, quoted in Vollans et al., 2017: 1). The existence of the Much-Anticipated frame in XR news suggests that generalist news coverage of XR is similar to that of the specialist gaming press mentioned by Newman. However, whereas games journalists typically present their articles as reviews (Foxman and Nieborg, 2016), XR news was most commonly presented as traditional news. This means audiences would have different expectations when reading these different types of journalism, being under the impression that what is presented as “news” is based on research and unbiased facts (Pan and Kosicki, 1993). This could make these frames more persuasive, effectively disguising promotion as news. Again, it appears XR news has been marketized (Fairclough, 1993), blurring the distinction between news and promotional content.

Moreover, the combination of this frame with others that positively evaluate XR (as discussed above) could lead to considerable hype and excitement over the technology. On the one hand, hype leads to “high rising expectations about the potential of [an] innovation” (Ruef and Markard, 2010: 317), which could support its adoption (Hedman and Gimpel, 2010). On the other hand, hype is usually followed by disappointment. Ruef and Markard state that “[t]he subsequent drop of attention and a disappointment of the hyped expectations may have negative effects on the innovation process” (2010: 317-318). Therefore, although the Much-Anticipated frame could initially support the diffusion of XR, it may not have a positive long lasting effect. Nevertheless, at least in the initial stages, this frame works to support the promotion of XR, aligning with the goals of XR companies.

9.5 Positive Framing of Extended Reality

As of yet, this thesis has examined specific frames in the news coverage of XR, finding that frames which present XR in a positive light are favoured over any that might criticise the technology. This is a strong indication that coverage is more positive than negative. However, to better understand the overall framing of XR news coverage (and indeed whether this contributes to the diffusion of XR), it is useful to analyse the general tone of the articles regardless of which specific frame is being used. To investigate the overall tone, the current study recorded the use of positive and negative words within the

articles, as well as any words relating to concerns and ailments surrounding XR. The qualitative analysis also explored which framing devices had been used to present XR in a positive or negative light. Thus, instead of focusing on a specific frame, this section examines how the general tone of XR news coverage has contributed to the overall framing of the technology. It begins by discussing the use of positive and negative framing devices. It then considers how much attention was paid to concerns and ailments within the news coverage. Each of these sections first explore quantitative data and then analyse qualitative data regarding further framing devices that set the tone for the articles.

9.5.1 Positive and Negative Discourse

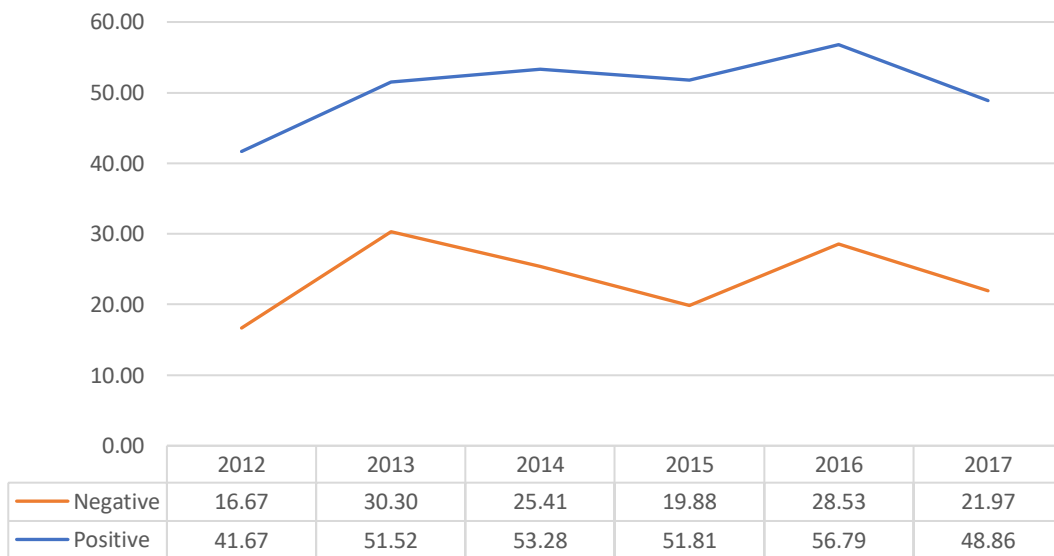
At a broad level, the use of positive and negative words within the news articles can indicate the overall tone of the coverage. This study found that words in the “positive” category were used in 52.81 percent of articles, whereas words in the “negative” category appeared in 28.56 percent of articles (see Table 9.8). Additionally, individual uses of “positive” words appeared 2.2 times more than individual uses of “negative” words (1,304 compared to 592). These figures indicate that articles were more likely to frame XR positively than negatively, though negative words were not completely absent. This remained consistent throughout the sample period, with every year seeing a substantially larger portion of articles using words in the “positive” category than in the “negative” category (see Figure 9.5). Examining the use of terms in both of these groups across time shows that the trajectories they followed were very similar. Therefore, rather than showing how coverage became more or less positive/negative over time, this data suggests that articles were simply more likely to evaluate XR in certain years than others. Furthermore, an important finding is that the use of “positive” words peaked in 2016, at 56.79 percent. This shows that the year several dedicated VR devices were released to consumers saw the most positive evaluations about XR. In this year, potential early adopters would have been in the decision stage of the innovation-decision process (Rogers, 2003). Therefore, the fact that “positive” words dominated could mean that the news has promoted XR diffusion by presenting the technology in a favourable light when this decision was being made.

Considering the differences between articles focusing on VR or AR/MR highlights a similar result (see Appendix J.6). Slightly more “positive” words were used in VR articles than AR/MR articles (54.63 percent compared to 42.28 percent). However, the same trend appeared regarding “negative” words, with these appearing in 24.11 percent of VR articles and 21.48 percent of AR/MR news reports. Therefore, the technological characteristics of XR do not seem to have impacted whether they would be framed more positively or negatively, but simply how often they were evaluated in the news.

Table 9.8: Appearance of Terms in the “Positive” and “Negative” Categories per News Outlet

	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
Category	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
Positive	60	54.10	459	63.31	785	48.80	1304	52.81
Negative	28	18.03	236	45.16	328	23.35	592	28.56

Figure 9.5: Percentage of Articles per Year With at Least One Term From the “Positive” and “Negative” Categories



On the other hand, there were some differences in the use of “positive” and “negative” words between the news outlets in the sample. Whereas every news outlet used “positive” terms more than “negative” terms, the difference between the two categories varied. The *MailOnline* was the only news outlet not to use “positive” words in at least half of its articles (48.8 percent). However, the publication used “positive” words in 2.1 times more articles than it did “negative” words, showing that a positive tone was still favoured. Additionally, *The Sun* was the least likely to use “negative” words, with them

appearing in 18.03 percent of articles. This outlet also had the largest difference between the number of articles using words in the “positive” and “negative” categories. In *The Sun*, three times more articles used “positive” words than “negative” words. Therefore, this news outlet in particular appears to have emphasised positive coverage of XR. On the other hand, *The Guardian* was most likely to use words in the “positive” category (63.31 percent), though it also used words in the “negative” group more than any other outlet (45.16 percent). This implies that *The Guardian* was most likely out of the three to use evaluative words, which is surprising considering the quality news outlet in this sample would be most expected to adhere to the journalistic norm of objectivity (Bastos, 2019). Nevertheless, *The Guardian* has been more balanced in its news coverage than the other outlets, with “positive” words appearing in 1.4 times more articles than “negative” words. This indicates the publication may have been more analytical about XR than the others, in line with the norms of quality news outlets. Still, “positive” words were used more by all publications, demonstrating that framing XR in a positive light was a trend shared across the sample. Since moral panics involve exaggerated fear and negativity (Cohen, 2002; Hall et al., 1978), this is further evidence to support the claim that a moral panic does not exist in XR news.

In addition to considering how often words in these categories appeared, examining which specific words were used the most within these groups sheds more light on the strength of positive and negative evaluations. Entman states that “content analysis informed by a theory of framing would avoid treating all negative or positive terms or utterances as equally salient and influential” (1993: 57). Indeed, Bednarek and Caple argue that “[e]valuations of Emotivity [or tone] are expressed by a range of linguistic items that vary enormously in their evaluative force and are situated on a cline ranging from more or less positive to more or less negative” (2012: 144). The current study found that several words with strongly positive connotations were used in XR news coverage (see Table 9.9). For instance, although *good* was common (appearing in 8.19 percent of articles), this word does not imply something is exceptionally positive, but is a rather more mediocre evaluation. On the other hand, the terms *great*, *amaz** (e.g. amazing) and *incredible* were also used substantially (see Table 9.9). These words have stronger positive connotations and thus present XR in an even more positive light than *good*. In addition, the terms *best* and *perfect** also appeared in the top 10 “positive” words. These terms are

highly positive since they imply that something could not possibly be any better than it already is.

Table 9.9: 10 Most Used Terms in the “Positive” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>enjoy*</i>	15	21.31	32	10.89	83	8.53	130	9.93
<i>good</i>	2	1.64	45	13.31	51	6.89	98	8.19
<i>great</i>	3	4.92	38	11.29	61	6.14	102	7.37
<i>fun</i>	3	3.28	28	8.06	67	7.19	98	7.16
<i>benefi*</i>	3	3.28	30	9.27	56	6.44	89	6.96
<i>amaz*</i>	2	3.28	16	6.05	56	6.74	74	6.35
<i>best</i>	1	1.64	23	7.66	30	4.19	54	4.91
<i>incredible</i>	7	8.20	10	3.63	34	4.19	51	4.30
<i>perfect*</i>	3	3.28	13	4.44	30	4.19	46	4.20
<i>cool(est)</i>	1	1.64	24	7.66	26	2.99	51	4.09

Table 9.10: 10 Most Used Terms in the “Negative” Category per News Outlet

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>limit*</i>	1	1.64	29	9.68	51	4.94	81	5.94
<i>bulk*</i>	1	1.64	5	2.02	54	5.09	60	4.09
<i>critic*</i>	1	1.64	20	6.85	16	1.35	37	2.76
<i>bad*</i>	1	1.64	17	5.24	2	0.30	20	1.64
<i>disappoint*</i>	1	1.64	5	2.02	11	1.50	17	1.64
<i>sceptic*</i>	0	0.00	13	4.84	4	0.45	17	1.54
<i>awkward*</i>	0	0.00	4	1.61	16	1.50	20	1.43
<i>clunky</i>	0	0.00	9	3.23	6	0.90	15	1.43
<i>frustrat*</i>	1	1.64	6	2.42	12	1.05	19	1.43
<i>controv*</i>	0	0.00	6	2.02	12	1.20	18	1.33

On the other hand, strongly negative words were rarely used in the news coverage (see Table 9.10). As the opposite to *good*, the term *bad* was used just 20 times in 1.64 percent of articles; less than any of the “positive” words mentioned in the previous paragraph. Additionally, strongly negative words were very rarely used. For instance, the term *awful* did not appear at all and *terrible* only appeared three times. This shows that

positive evaluations were much more salient in XR news coverage than negative evaluations. Furthermore, these results indicate that, as well as the use of specific frames presenting XR positively, the overall framing was also positive. Thus, instead of creating a moral panic around XR, this coverage encourages readers to develop a favourable view of XR. The perception of a new technology has a significant impact on its acceptance (Buenaflor and Kim, 2013). Therefore, the positive tone of the articles could support the diffusion of XR.

In addition to the use of certain words to indicate the tone of the news articles, the qualitative framing analysis also found that positive imagery was used to support this. This involved including pictures of XR users with looks of happiness or wonderment as they interacted with the devices. Firstly, Figures 9.6, 9.7 and 9.8 demonstrate examples of smiling users. The inclusion of such images creates the impression that these products offer enjoyable experiences able to generate positive emotions. In turn, this presents XR in a favourable light. Other articles depicted users with expressions of disbelief and wonder (see Figures 9.9; 9.10; 9.11). In these images, the open mouths of the users imply that they are impressed or awestruck by what they are seeing. While some articles used generic stock images to create this effect (e.g. Figure 9.10), Figure 9.9 shows an example of a well-known individual being shown to react in this way. This image depicts the UK's former Deputy Prime Minister Nick Clegg looking impressed at his experience of Google Glass. Although this article was published in 2017, the caption of the image notes that it was taken when Clegg was still Deputy Prime Minister. Whereas political figures are often appropriated by the media to generate a moral panic (Hall et al., 1978), including in Sørensen's (2012) study of the videogame moral panic, the opposite appears to have happened here. Showing previous or current world leaders to be engaging with an XR product implies it must have reached a high level of significance within the technology industry. Furthermore, Clegg's expression of shock and wonder, combined with his position as a political elite, endorses the product and further supports the idea that it is impressive. Indeed, "images exert a more powerful influence on memory and perceptions than text" (Coleman, 2010: 243). Thus, using these images could be highly effective in presenting XR in a favourable light.

Figure 9.6: Smiling Oculus Rift Wearer, Used in *The Guardian* (ID0114)



Figure 9.7: Smiling Google Glass Wearers, Used in *MailOnline* (ID0347)



Figure 9.8: Smiling Google Cardboard Wearer, Used in *MailOnline* (ID0654)



Figure 9.9: Nick Clegg Wearing Google Glass, Used in *The Sun* (ID0046)



Figure 9.10: Oculus Rift Wearer, Used in *The Guardian* (ID0089)



Figure 9.11: Oculus Rift Wearer, Used in *The Guardian* (ID0176)



9.5.2 Attention to Concerns and Ailments

Aside from positive and negative framing devices, examining how often concerns were mentioned provides further insight into the overall tone of XR news coverage. The frequency of terms analysis recorded the use of words relating to concerns and ailments. These results showed that 24.87 percent of articles mentioned words in the “concerns”

category and 14.02 percent used words from the “ailments” category (see Table 9.11 and Table 9.12). Comparable to what was found regarding the “positive” and “negative” groups, the use of words referring to concerns and ailments varied slightly per news outlet. Just as *The Guardian* was most likely to use words in the “negative” category, this publication also used words in the “ailments” and “concerns” categories the most (20.16 percent and 39.92 percent respectively). The *MailOnline* was the least likely to use words in the “concerns” category (19.31 percent) and used terms referring to “ailments” even less (12.13 percent). On the other hand, *The Sun* was least likely to use words in the “ailments” category (9.84 percent) but used words relating to “concerns” in 24.59 percent of articles. The differences in these figures suggest that the media organisation (Shoemaker and Reese, 2014) reporting on XR impacted how often ailments and concerns were noted.

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>problem*</i>	7	4.92	72	14.52	53	5.39	132	7.68
<i>concern*</i>	7	8.20	32	9.68	49	5.24	88	6.55
<i>warn*</i>	11	6.56	23	6.05	52	5.24	86	5.53
<i>scar*</i>	6	3.28	24	7.66	38	2.99	68	4.20
<i>terrify*/ies/ied)</i>	8	8.20	16	4.84	26	2.40	50	3.38
<i>fear*</i>	6	6.56	15	4.44	34	2.10	55	2.97
<i>worr*</i>	0	0.00	26	6.45	16	1.95	42	2.97
<i>isolat*</i>	0	0.00	12	4.03	19	1.05	31	1.74
<i>damag*</i>	2	1.64	9	3.23	1	0.15	12	1.02
<i>solitary</i>	0	0.00	7	2.82	1	0.15	8	0.82
<i>assault*</i>	2	1.64	8	1.21	14	0.45	24	0.72
<i>caution*</i>	0	0.00	5	2.02	4	0.30	9	0.72
<i>addict*</i>	2	1.64	2	0.40	6	0.60	10	0.61
<i>creepy</i>	1	1.64	3	1.21	2	0.30	6	0.61
<i>intrusive</i>	0	0.00	3	1.21	0	0.00	3	0.31
<i>invasive</i>	0	0.00	3	0.81	0	0.00	3	0.20
TOTAL	52	24.59	260	39.92	315	19.31	627	24.87

Further differences can be observed when examining the use of these words in articles about VR in comparison to those about AR/MR (see Appendix J.6). VR articles were much more likely to use words in the “ailments” category, with such terms appearing in 16.21 percent of VR articles and just 2.68 percent of AR/MR articles. Since the most used words in the “ailments” category focused on cybersickness and eyestrain (see Table 9.12), which is more associated with VR than AR/MR devices, this shows that the technological characteristics of XR have impacted how often ailments were mentioned. Alternatively, words in the “concerns” category were mentioned in a much similar portion of VR articles in comparison to AR/MR articles (24.39 percent and 21.48 percent respectively). Therefore, although ailments were mentioned more in VR articles, the type of XR being reported on does not appear to have impacted how often concerns were mentioned.

Term	<i>The Sun</i>		<i>The Guardian</i>		<i>MailOnline</i>		OVERALL	
	Uses	Percent	Uses	Percent	Uses	Percent	Uses	Percent
<i>sick*</i>	7	3.28	62	12.90	41	4.19	110	6.35
<i>naus*</i>	1	1.64	30	9.27	57	4.79	88	5.73
<i>disorient*</i>	1	1.64	10	3.63	26	2.10	37	2.46
<i>dizz*</i>	0	0.00	4	1.61	25	2.84	29	2.35
<i>headach*</i>	0	0.00	7	2.82	15	2.10	22	2.15
<i>eyestrain</i>	0	0.00	1	0.40	8	1.20	9	0.92
<i>queas*</i>	0	0.00	6	1.61	6	0.75	12	0.92
<i>hurt*</i>	0	0.00	0	0.00	9	1.05	9	0.72
<i>pain(ful)</i>	2	1.64	5	0.81	19	0.60	26	0.72
<i>harm*</i>	1	1.64	3	0.81	3	0.45	7	0.61
<i>vomit*</i>	1	1.64	3	0.81	3	0.45	7	0.61
<i>strain*</i>	0	0.00	2	0.81	3	0.30	5	0.41
<i>hazard*</i>	0	0.00	1	0.40	1	0.15	2	0.20
<i>ailment*</i>	0	0.00	0	0.00	1	0.15	1	0.10
<i>cybersickness</i>	0	0.00	0	0.00	4	0.15	4	0.10
TOTAL	13	9.84	134	20.16	221	12.13	368	14.02

Figure 9.12: Percentage of Articles per Year With at Least One Term From the “Concerns” Category

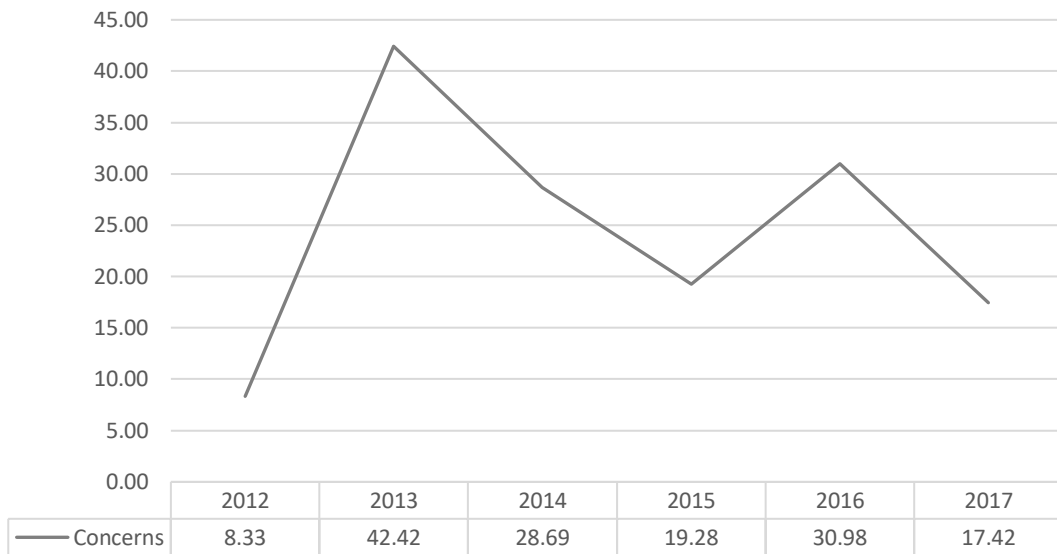
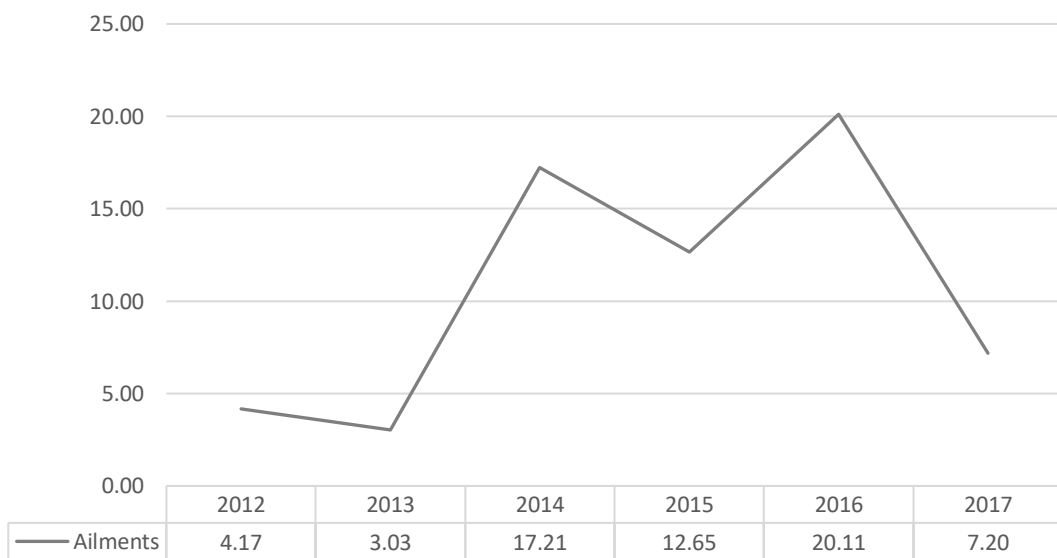


Figure 9.13: Percentage of Articles per Year With at Least One Term From the “Ailments” Category



Additionally, there are some notable points to be made about the use of these words across the years of the sample period. Words in the “concerns” category peaked in 2013 (42.42 percent) with a smaller peak in 2016 (30.98 percent; see Figure 9.12). This first peak shows that concerns about AR/MR were particularly frequent in 2013, since this technology was the focus in that year (see Section 5.2.1). Moreover, the smaller peak in 2016 is significant because this was the year that several VR products were released. This data also shows that words in the “ailments” category were used fairly frequently in the years leading up to these releases (2014-2016; see Figure 9.13). Maisch et al. state that

"[b]efore consumers are prepared to adopt an innovation, they have to be convinced that the use of the innovation will not entail negative effects or unacceptable risks" (2011: 3). Therefore, the high use of words in these categories during this period could hinder the diffusion of XR.

Although these figures might suggest that particular attention was paid to the concerns and ailments surrounding XR, this type of news coverage can be better put into perspective by referring back to the results discussed in Chapter 5. Regarding the main topics of articles, it was found that just 2.97 percent had Concerns as their main topic and only two articles (0.2 percent) had the main topic of Regulation (see Table 5.6). Therefore, although these words were mentioned, they were not salient enough to become the main focus of many articles.

Certainly, although some articles note these concerns and ailments, other articles actually mention the way XR can be used to overcome the same issues. For example, the stem *sick** (relating to cybersickness) was the most common ailment to be mentioned (see Table 9.12), appearing in 6.35 percent of articles overall. However, there were also some reports that mentioned an XR device created to *prevent* motion sickness while flying. One article headline claims: "The end of air sickness? Virtual reality headsets could prevent nausea on bumpy flights and even tackle jet lag" (ID0466). Similarly, 17 articles used the stem *isolat** to show concerns over the solitary XR experience. However, in other articles, it is said that XR can be used to help people escape isolation. This includes astronauts (ID0409), military personnel (ID0564) and hospital patients and the elderly (ID0722). Additionally, the idea of being isolated in a VR experience is not always portrayed as a negative. For example, an article in *The Guardian* describes being able to isolate a patient using VR during an operation as a great advantage (ID0101). Moreover, isolation is also mentioned in a positive way in a *MailOnline* article in terms of plane passengers being able to isolate themselves from the other goings on in the plane to have a more pleasant journey (ID0583). Therefore, it is clear that the news articles have not primarily focused on the negative effects of XR.

Considering this data, it is clear that, although concerns and ailments were mentioned, they were certainly not a major focus of the news articles. Additionally, positive words were used much more often in the news coverage than negative words, complemented by positive imagery of XR users. These findings coincide with the results

found by Allan, Anderson and Peterson (2010) on nanotechnologies, Cogan (2005) on the personal computer and Hetland (2012) on the internet, although differ from Whitton and Maclure's (2015) analysis of videogame news. Despite the focus on videogame applications, XR news coverage seems to have more similarities with these other emerging technologies (nanotechnology, computers and the internet) than videogames themselves. Furthermore, based on the definitions of moral panics discussed in Section 2.9, it appears that a moral panic surrounding XR has not been created by these three news outlets. Though words relating to concerns were mentioned, this was not a main focus of the articles. Thus, consensus (Goode and Ben-Yehuda, 1994) was not generated in relation to these negative aspects. Similarly, as opposed to technopanics that focus on regulation (Marwick, 2008), regulation was very rarely mentioned in news coverage of XR.

While moral panic coverage can be damaging for new technologies by resulting in unnecessarily strict legislation (Marwick, 2008), the news coverage of XR appears to have veered so far in the opposite direction that it is problematic in another way. The public depend on news media to make sense of new technologies and to generate public debate about their benefits, risks and social implications (Anderson, 2005; Dimopoulos and Koulaidis, 2002; Schäfer, 2017; Scheufele, 2013). The lack of critical coverage or attention to concerns mutes this discussion which could lead to the absence of regulation. Certainly, even in 2021, no XR-specific regulation exists (XR Safety Initiative, 2021). Instead of promoting discussion, the mostly positive tone of the articles could lead readers to form favourable views of the technology and, as a result, be more likely to adopt it (Buenaflor and Kim, 2013). Therefore, it appears that the news articles have supported the diffusion of XR in this way and, as a result, prioritised the interests of the companies aiming to sell these products.

9.6 Final Remarks

This chapter has examined the evaluative frames present in XR news coverage, as well as the overall positive or negative framing of the news articles. The rhetorical and technical framing devices used to construct the following frames were discussed: Important; Successful; Affordable; and Much-Anticipated. Different rhetorical framing devices were used for each frame, although there was some overlap. Each frame was constructed, in

part, using associations or comparisons. For instance, news articles highlighted the well-known and successful companies XR is associated with to depict the Important frame. Additionally, XR was compared to a previously successful technology (the Nintendo Wii console) to present XR itself as Successful. Journalists also portrayed XR as Affordable by relating the price to another product that is already extremely popular – the iPhone. Similarly, the level of excitement surrounding XR was said to be comparable to the launch of the iPhone, thus helping to construct the Much-Anticipated frame.

Furthermore, modifiers were used to build the Successful, Affordable and Much-Anticipated frames. For the Much-Anticipated frame, this involved using words such as “highly” to make the anticipation for XR seem strong. Alternatively, articles used modifiers alongside numerical figures to construct the Successful and Affordable frames. Other rhetorical framing devices were more specific to the frame being used. News articles referenced the idea of VR having a positive impact on empathy in users to highlight the Important frame. On the other hand, the Successful frame was constructed by depicting XR as having a large audience and being an established industry. Lastly, the word “finally” was used to present XR as Much-Anticipated.

Aside from including numerical data regarding sales, XR revenue and product prices, the technical framing devices used to construct these frames were the same as was found in previous chapters. Showing similarities with the Different and Unique, Revolutionary and Transformative and Advanced and High-Quality frames, the Affordable and Much-Anticipated frames both appeared in news article headlines. Additionally, the Much-Anticipated frame also appeared in a *MailOnline* side-note that was repeated in multiple articles, as was found to be the case for the Immersive frame. Lastly, quotes from credible sources were used to construe the Important and Successful frames. In particular, for the Important frame, statements from both Mark Zuckerberg and Tim Cook were included in the news articles to emphasise the importance of XR. Additionally, the quote from Zuckerberg was repeated in several articles, demonstrating the use of another technical framing device to increase the strength of the Important frame. Using (and repeating) quotes from these specific sources shows continuity with some of the frames already discussed in previous chapters (Transcendent; Revolutionary and Transformative; Advanced and High-Quality; Social; and Easy to Use). This is further

evidence to suggest that these individuals have had a strong impact on the framing of XR.

On the whole, this chapter has shown that the news framing of XR has been mostly positive overall. Positive words were used more than negative words and this favourable tone was supported by images depicting users with looks of happiness and wonder. Likewise, positive frames have been favoured over their potential negative counterparts (e.g. Successful as opposed to unsuccessful and Affordable instead of expensive). Unlike other new technologies (e.g. radio, TV [Markey and Ferguson, 2017], mobile phones [Goggin, 2006] and videogames [Rogers, 2013]), concerns were rarely the focus of XR news coverage, demonstrating that a moral panic does not seem to have been created in relation to XR. Since the perception of an emerging technology is key in its success (Buenaflor and Kim, 2013) and the news is the public's main source of information about such technologies (Williams, 2003; Whitton and Maclure, 2015), these positive frames could lead readers to view XR positively and thus be more likely to purchase a product. In this way, the positive evaluation of XR supports its diffusion, meaning the news has acted as a promotional tool for the technology.

Furthermore, news articles highlighted the significance of XR by framing it as Important and Much-Anticipated. If consumers are uncertain about the importance of an innovation, they are likely to avoid adopting it (Maisch et al., 2011). Therefore, by assuring the value of XR with the Important frame, its adoption is supported. The Much-Anticipated frame also works to generate hype for the technology, potentially aiding its diffusion. However, there is the risk that this could lead to disappointment in later stages of the XR lifecycle, due to unrealistic expectations (Ruef and Markard, 2010). Therefore, although this frame could support the adoption of XR initially, it may have negative long-term effects. Still, the fact that these frames exist shows the preference for positive, even promotional, representations of XR in the news.

As noted in Chapter 5, the majority of XR articles were presented as news and therefore would be expected to contain facts rather than biased opinions as would be expected in, for example, review coverage. Since each frame and the overall framing positively evaluates the technology, the news discourse serves as a promotional tool for XR. The coverage appears to share similarities with lifestyle journalism in this way (which is often seen as an extension of marketing [English and Fleischman, 2019; Kristensen,

Hellman and Riegert, 2019]) despite being presented as news. Therefore, XR news has the characteristics of evaluative journalism disguised as impartial news content, thus encouraging readers to accept such frames as factual. This coverage is now so far away from moral panic style discourse that it has the opposite problem – being overly positive with little attention paid to potential concerns or drawbacks that could spark public debate. With these results in mind, the final chapter in this thesis provides an overview of the findings of this study and considers the implications of these results.

Chapter 10: Conclusion

This thesis has presented a mixed methods framing analysis of XR news coverage and its relationship with XR marketing. It has been argued that XR news prioritises the interests of XR companies rather than their readers, compromising the traditional role of journalism. The current chapter concludes the thesis by summarising how the research presented here has addressed the aims of the thesis, with detail provided regarding each research question. Four key findings are then explored, each linked to the central argument of the thesis. This is followed by a discussion of what makes these findings problematic and why XR news might be this way. The limitations of the research are then addressed. Next, the contributions the study has made to the academic literature are highlighted. The chapter ends by considering areas for future research.

10.1 Addressing the Research Aims

The twofold aim of this thesis was to examine the news coverage of XR and the extent to which this news coverage acted as a promotional tool for XR. These aims were achieved by applying a multimodal, mixed methods approach to XR news articles and marketing materials. Informed by framing theory, this research utilised quantitative content analysis and qualitative framing analysis. The news articles from three UK national news sites were examined (*The Sun*, *The Guardian* and *MailOnline*). Additionally, the marketing materials of five XR devices (Oculus Rift, Samsung Gear VR, Google Glass, Microsoft HoloLens and Magic Leap) were analysed. Three research questions guided the study, as follows:

RQ1: What are the key patterns of XR news coverage and how does this contribute to the framing of the technology?

RQ2: What are the key frames through which the news represents XR and how do these compare to the frames present in XR marketing materials?

RQ3: To what extent does news coverage of XR promote the diffusion of the technology and what does this say about journalistic principles in a commercial context?

The results for each research question will now be summarised, before moving on to a critical discussion of the key findings in the next section.

The first research question in this study asked what the patterns in XR news coverage were and how this affected the framing of XR. Chapter 5 addressed this question with quantitative data from a content analysis coding sheet. Regarding these patterns, it was found that the news outlets started publishing substantially on XR in 2014 (the year Facebook purchased Oculus) and this peaked in 2016 (the year several VR products were released to consumers). Additionally, two topics dominated XR news coverage: applications and products. Moreover, entertainment uses were mentioned the most out of all application types, with videogames being a major focus. Lastly, the creators of XR products and applications were the most used source types, both for comments and multimedia.

The second research question of this study asked how the news framed XR and how this related to XR marketing. Twelve different frames emerged from the news articles, grouped into four broader categories. The first category consisted of frames conceptualising XR, which were: Immersive and Transcendent. The second set of frames were related to the newness of the technology. These were: Different and Unique; Revolutionary and Transformative; and Advanced and High-Quality. Thirdly, other frames referred to the user experience of XR: Social; Easy to Use; and Comfortable. Lastly, the fourth category included frames that evaluated XR: Important; Successful; Affordable; and Much-Anticipated. It was also found that the frames in the first three categories were shared between the news and marketing discourse, demonstrating much similarity between the two samples. Chapters 6-9 discussed the prevalence of these frames as well as the framing devices used to construct them. A summary of these framing devices is presented in Table 10.1. Any framing device highlighted in bold was used by both the news and marketing samples, while any framing device in italics was unique to the marketing. Framing devices with no emphasis only appeared in the news articles. This shows that, not only did eight of the same frames appear in the news and marketing samples, but that several of the same framing devices were used in both discourses.

These findings are closely linked to the third research question, which considered whether the news coverage of XR could support or hinder its diffusion. Since marketing includes strategic frames that aim to sell a product, the fact that there were many shared frames between the two samples indicates the news has promoted XR diffusion. Chapter 9 provided further insight into RQ3. Positive frames were favoured over negative in all

Table 10.1: Framing Devices Used to Construct Each Frame

Framing devices in bold appeared in the news and the marketing, framing devices in italics appeared only in the marketing, framing devices with no emphasis only appeared in the news articles.

Frame	Rhetorical Framing Devices	Technical Framing Devices
<u>Frames conceptualising XR</u>		
Immersive	Emphasising modifiers (e.g. “incredibly”); Transportation metaphor; Active verbs (e.g. “flying”).	Imagery of users; Repetition of side-notes.
Transcendent	XR can improve a wide range of areas (exemplars); Going beyond the traditional screen interface; Making the impossible possible.	Quotes from elite, credible sources (e.g. Tim Cook).
<u>Newness frames</u>		
Different and Unique	Describing devices as the first of their kind; Describing XR as unlike any other experience.	Prominent placement in headlines/leads.
Revolutionary and Transformative	Mentioning a wide range of areas XR can revolutionise/transform; The phrase “future of”; Superlative modifiers for Magic Leap’s revolutionary capabilities (e.g. “most”); <i>“Transform the world” tagline (HoloLens).</i>	Prominent placement in headlines/leads; Quotes from elite, credible sources (e.g. Mark Zuckerberg, Tim Cook); Repetition of quotes in multiple articles.
Advanced and High-Quality	Fiction metaphors; Fiction becoming reality; Descriptive modifiers for product specifications.	Prominent placement in headlines/leads; Imagery of fiction; Quotes from elite, credible sources (e.g. Mark Zuckerberg);

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Frame	Rhetorical Framing Devices	Technical Framing Devices
		Inclusion of product specifications.
<u>User experience frames</u>		
Social	References to telepresence; <i>Value for collaborative working.</i>	Quotes from elite, credible sources (e.g. Mark Zuckerberg); Repetition of quotes in multiple articles.
Easy to Use	Depicting interaction as natural; Modifiers (e.g. “very”) emphasise “natural” interaction; Highlighting fast speed of processes; Highlighting hands-free capabilities.	Quotes from elite, credible sources (e.g. Magic Leap CEO Rory Abovitz, Mark Zuckerberg); Repetition of quotes in multiple articles.
Comfortable	Exaggeration of device lightness; Positive evaluation of device weight distribution.	No notable technical framing devices used.
<u>Evaluative frames</u>		
Important	Associating XR with well-known companies; Referring to the impact of XR (e.g. “empathy machine”).	Quotes from elite, credible sources (e.g. Mark Zuckerberg, Tim Cook); Repetition of quotes in multiple articles.
Successful	Depicting XR audience as large; Using analogies of other successful technologies (e.g. Nintendo Wii); Emphasising credibility of sources using designators; Depicting XR as established;	Quotes from elite, credible sources (e.g. Sony employee); Numerical data referring to product sales and revenue.

Table 10.1: Framing Devices Used to Construct Each Frame

Framing devices in bold appeared in the news and the marketing, framing devices in italics appeared only in the marketing, framing devices with no emphasis only appeared in the news articles.

Frame	Rhetorical Framing Devices	Technical Framing Devices
	Modifiers applied to numerical data; Comparing first and second waves of XR (exemplars).	
Affordable	Modifiers (e.g. "just") regarding price; Comparisons between other popular devices (e.g. iPhone).	Prominent placement in headlines/leads; Numerical data referring to device pricing.
Much-Anticipated	Modifiers (e.g. "highly") emphasise anticipation; Related to iPhone; "Finally".	Prominent placement in headlines/leads; Repetition of side-notes.

cases (e.g. Successful rather than unsuccessful), although the Affordable frame was the most contested. It was also found that the tone of XR articles overall (regardless of frame) was more positive than negative. Additionally, although concerns and ailments were mentioned in several articles, they were very rarely the focus. In a different way, Chapter 5 noted that news articles sometimes included information about how or where to buy XR products, as well as links to retailers. As will be discussed below, these results suggest XR news has indeed promoted XR diffusion.

Furthermore, the second part of RQ3 considered what this says about journalistic principles in a commercial context. For the news to promote the diffusion of XR with very little critical comments or insight suggests that the journalistic principles of independence and impartiality have not been adhered to. Such news also benefits the interests of XR companies more so than the general public, which conflicts with the fourth estate ideal of journalism to prioritise the public and hold those in power to account. Additional findings, such as the frequent absence of attributions for multimedia, the copying and pasting of quotes (or whole sections) from one article to another and the reliance on easily accessible sources (including news agencies, press releases and XR companies) suggest that this news has indeed been impacted by the commercial pressures on journalists. This could explain why the news coverage has supported XR diffusion and neglected the principles that are intended to produce high-quality journalism that prioritises the public.

10.2 Key Findings

Based on these research questions, four key findings emerged throughout this study. Firstly, regarding RQ1 and RQ2, news coverage was predominantly positive; most often using terms and frames that presented XR favourably rather than negatively. Secondly, regarding RQ2 in particular, several frames appeared in both the news and marketing of XR, thus reinforcing each other. Thirdly, and also linking to RQ1 and RQ2, the creators of XR devices and applications were the most powerful frame advocates in the frame-building process for XR. Lastly, each of these three points combined, plus data regarding the encouragement to purchase XR products, indicates that XR news has promoted the diffusion of the technology. This directly addresses the first part of RQ3. As will be discussed in Section 10.3, these four findings each support the claim that XR news

prioritises the interests of XR companies over the interests of the general public. First, though, these four key findings will be explored in more depth.

10.2.1 Favourable Framing of XR

As noted above, there was a lack of critical news coverage of XR. Overall, positive terms were used more than negative terms in all news outlets. While concerns and ailments were mentioned in several articles, these were very rarely the focus of any articles. Moreover, the frames journalists applied to XR represented the technology in a positive light. Indeed, the most used frame in all news outlets was Immersive. Immersion is the main aim and unique selling point of VR (Evans, 2019). Therefore, by framing XR as Immersive, the news articles suggest that the technology is successful in achieving its main aim, thus presenting it positively. Furthermore, the Transcendent frame involved emphasising how XR could *improve* upon what was possible with previous technology. Relatedly, the Revolutionary and Transformative frame was used to portray XR as able to bring about meaningful and positive change, rather than disruption. The Different and Unique frame positively evaluated the supposed uniqueness of the technology, while the Advanced and High-Quality frame highlighted the superiority of XR. Moreover, the Much-Anticipated frame was used to generate excitement for XR products. In addition, when a positive frame had a clear opposite (e.g. comfortable versus uncomfortable), words that could counter such a frame were consistently used in smaller portions of articles than those that indicate the presence of the positive frame. Each of these points demonstrate the preference for positive news coverage of XR.

The news media are the public's main source of information about emerging technologies (Scheufele and Lewenstein, 2005; Whitton and Maclure, 2015; Williams, 2003). This means that they can have much influence on public opinion in the early stages of the diffusion process (Rogers, 2003; Scheufele and Lewenstein, 2005; Tidd, 2010). Therefore, these frames could have significant impact on how the technology is constructed in the minds of the public. Focusing on positive representations and paying little attention to the concerns, risks and social implications surrounding XR benefits the companies creating these products because it avoids critical public debate in favour of celebratory coverage.

This finding is in line with previous research on news coverage of other emerging technologies (Anderson et al., 2005; Brennen, Howard and Nielsen, 2020b; Chuan, Tsai and Cho, 2019; Cogan, 2005; Hetland, 2012; Lewenstein, Gorss and Radin, 2005; Rössler, 2001). However, it differs from news coverage of VR's main commercial application (videogames) (McKernan, 2013; Whitton and Maclure, 2015) and fictional representations of VR (Bailenson, 2018; Chan, 2014; Steinicke, 2016). Moreover, these findings show that, unlike for other technologies (Dwyer and Stockbridge, 1999; Goggin, 2010; Lemish, 2015; Marwick, 2008), there certainly has not been a moral panic created by the media surrounding XR. Despite the range of concerns that exist regarding this technology discussed in Section 2.3, very little attention has been paid to these areas. This coincides with De Keere, Thunnissen and Kuipers (2020) analysis of binge-watching in which they found that this activity that is clearly linked to addiction was legitimised in US news rather than made the subject of a moral panic. De Keere, Thunnissen and Kuipers note that, while a moral panic was created surrounding the television when it was first introduced, the same has not happened for binge-watching which appears more obviously worthy of a moral panic. Similarly, while a moral panic was created about videogames focused on concerns of social isolation and aggression, the same has not occurred for XR, despite VR's main application being videogames and it requiring the user to block out their view of the real world with a headset.

It is beyond the scope of the current thesis to hypothesise why some emerging technologies generate moral panics and some do not. However, what is significant here is that this news coverage has not only avoided creating a moral panic around XR but it has paid very little attention to critical issues surrounding XR at all. Although moral panics have been found to result in overregulation of technologies (Marwick, 2008), the lack of critical attention paid to XR appears to have had the opposite effect. Even in 2021, several years after these products were first released, no new policies or regulations have been developed specifically for XR technologies (XR Safety Initiative, 2021). That is not to say that moral panics are good. However, the near absence of critical coverage has meant that XR companies have significant control over how their products are used, with little impact from external regulators.

10.2.2 Reinforcing Promotional Frames

The second major finding in this study is that many of the frames present in XR news also appeared in XR marketing. Chapters 6-8 examined these frames in detail. The following frames were shared between the two discourses: Immersive; Transcendent; Different and Unique; Revolutionary and Transformative; Advanced and High-Quality; Social; Easy to Use; and Comfortable. Moreover, the news even used some of the same framing devices as the marketing to construct every one of these frames (see Table 10.1). For the Immersive frame, both samples used similar imagery to depict presence. Secondly, the concept of “going beyond” was shared for the Transcendent frame. Additionally, products were described as the first of their kind within both samples to construct the Different and Unique frame. The “future of” phrase was used to frame XR as Revolutionary and Transformative and both the news and marketing positively evaluated product specifications to construct the Advanced and High-Quality frame. For the Social frame, the news and marketing referenced the concept of telepresence. Furthermore, interaction was presented as “natural” in the two discourses when employing the Easy to Use frame. Finally, both samples mentioned the effective distribution of weight to depict the Comfortable frame.

This finding is significant for three main reasons. Firstly, it indicates that the news articles have been influenced by the marketing of XR, or at least the individuals creating this marketing. This is supported by the quantitative data which shows that the creators of XR applications and devices were the most used sources within the news articles. Secondly, regardless of whether the marketing has influenced the news or not, when frames are confirmed by further information (such as appearing in two types of media) or congruent framing devices, they become harder to contest (Van Gorp, 2007), thus enhancing their persuasive power. That is to say, because the same frames and framing devices have been used in both the news and marketing, the frames themselves become stronger. Therefore, the news reinforces the frames that are present in the marketing discourse – and vice versa – making them more likely to be accepted as fact. Thirdly, since the purpose of marketing is ultimately to sell a product or service, these texts will clearly aim to frame XR in a way that makes it more desirable to potential consumers. In that case, since these frames are also present in the news, this effectively aids the

promotion of XR. Indeed, further evidence of this is indicated by the preference for positive frames as discussed in the previous section.

This suggests that a discourse of consumerism exists in XR news, relating to Fairclough's (1993) concept of marketization discussed in Section 3.6.1. Several other studies uncovered a blurring between news and promotional content (Chyi and Lee, 2018; Erjavec, 2004; Harro-Loit and Saks, 2006; Lewis, Williams and Franklin, 2008; Pander Maat, 2007; Sissons, 2012) and Arik and Çağlar (2005) identified discourses encouraging consumption in Turkish lifestyle news. Lewis, Williams and Franklin (2008) argue that neglecting to distinguish between news and promotion compromises the independence of the press. Indeed, it is important to remember that this study purposely omitted news articles that were classed as reviews, meaning that readers would expect they are accessing news that presents facts rather than opinions (Pan and Kosicki, 1993). Therefore, this is a concerning result regarding the integrity of news coverage about emerging technologies. Such coverage, whilst misleading to readers, benefits XR companies by increasing the reach of their promotional frames in a context that disguises them as factual news.

10.2.3 XR Companies as Frame Advocates

The third main finding of this study is that the creators of XR devices and applications played a major role as advocates in the frame-building process. Content analysis revealed that application creators and device creators were used as sources in much larger portions of articles than any other source type. Additionally, the largest portion of multimedia were attributed to device creators. While multimedia attributed to news agencies were the second most common, application creators were the third most used. Therefore, it is clear that the news outlets have allowed these source types to be the primary definers (Hall et al., 1987; Critcher, 2003) of XR, both through the written word and visually. These two groups are invested in the success of XR and are therefore unlikely to be critical of the technology. Instead, they would be advocates of frames that represent XR positively. Being a news source allows social actors access to persuasive influence and gives them the power to define reality (Carlson and Franklin, 2011; Coleman and Ross, 2010). Indeed, the prevalence of positive frames, plus the shared frames between XR news and marketing (some of which is produced by these product creators) suggests

they have been successful in getting their favoured definitions of XR to dominate the news coverage.

In particular, the qualitative framing analysis uncovered that one individual was instrumental in the framing of XR: Mark Zuckerberg. Firstly, Zuckerberg appears to have been a driving force in the attention paid to XR by *The Guardian* and *MailOnline*, since these news outlets first started reporting substantially on the topic in 2014 – the year Facebook purchased Oculus. Indeed, the Oculus Rift VR headset was mentioned in, by far, the most articles in comparison with other devices. Moreover, statements from Zuckerberg were used as framing devices (see Table 10.1) to construct five different frames: Revolutionary and Transformative; Advanced and High-Quality; Social; Easy to Use; and Important. These quotes and citations were also usually repeated in multiple articles, which increased the strength of those frames. Such sourcing practices give Zuckerberg power. As Carlson states, “[f]or a news story to include an individual or an organization as a source is not a neutral act but one that bestows authority through granting the source the right to be listened to” (2017: 132). Thus, Zuckerberg has repeatedly been given the authority to define XR by these news outlets, highlighting his power as a frame advocate. Whereas journalists in the fourth estate role should hold those in power to account (McNair, 2009), these sourcing practices afford even greater power to elites (in this case, technology company owners; Zuckerberg in particular), benefitting them more so than the general public..

10.2.4 News Promotes the Diffusion of XR

The fourth major finding directly addresses the first part of RQ3. Much evidence was uncovered to suggest that the news promotes the diffusion of XR. Firstly, based on diffusion of innovations theory and models of technological acceptance, the majority of frames used in XR news positively emphasise an aspect of an innovation or new technology that makes it more likely to be adopted. In more detail, both the Transcendent and Advanced and High-Quality frames highlight the relative advantage (Rogers, 2003) of XR. The Easy to Use frame positively emphasises the ease of use (Buenaflor and Kim, 2013; Davis, 1989), complexity (Rogers, 2003) and technicality (Kim, Chan and Gupta, 2007) of XR. The Social frame supports the perceived compatibility (Rogers, 2003) of XR, while the Affordable frame assures that the perceived fee (Kim,

Chan and Gupta, 2007) of XR is acceptable. Additionally, the Comfortable frame positively evaluates the physical comfort (Buenaflor and Kim, 2013) of the devices. Uniqueness of an innovation has been shown to be another factor enhancing its adoption (Cooper, 1979; Flight et al., 2011), meaning the Different and Unique frame could also contribute to supporting the diffusion of XR. In addition to specific frames, the focus on entertainment applications emphasises the enjoyment benefit (Kim, Chan and Gupta, 2007) of the technology. Moreover, the focus on applications and devices as article topics improves the observability (Rogers, 2003) of XR. The lack of coverage about risks or concerns could also support diffusion because technologies that are perceived as posing risks are less likely to be adopted (Buenaflor and Kim, 2013).

In addition, while not a specific characteristic, Rogers (2003) argues that the higher the perceived importance of an innovation, the more likely it is to be adopted. The Revolutionary and Transformative and Important frames both emphasise this importance, thus promoting adoption. Similarly, the Successful frame helps to reduce the uncertainty about XR, which is a major part of the innovation-decision process (Rogers, 2003). Finally, the Much-Anticipated frame works to raise expectations about XR, which can support its adoption (Hedman and Gimpel, 2010), though this might lead to disappointment later on (Ruef and Markard, 2010). The Immersive frame is the only one that does not obviously link to diffusion or technological acceptance theories. However, as mentioned above, immersion is the main selling point of VR (Evans, 2019). Therefore, emphasising this could indeed support its adoption as well.

Furthermore, it was also found that some news articles included information about how or where to purchase XR products, even in the form of links to retailers. Such practices directly support the diffusion of the technology. In addition, this indicates that these news outlets may have some financial incentive for framing XR so positively. Indeed, *The Guardian* even noted that it could earn commission if the reader made a purchase after clicking on such a link. Although *The Guardian* claims that this does not compromise their journalistic independence, the favourable frames suggest otherwise. If these news outlets gain money when their readers purchase XR products, they would be more likely to frame the technology positively so as to encourage these purchases. This would explain the overall promotional tone of the news articles. Moreover, this finding aligns with Chyi and Lee's (2018) study of tablets and smartphones, which argued that

technology news is commercialised. It appears that, when it comes to news coverage of XR, the commercial agendas of the news outlets have caused them to frame the technology in a way that aligns with the interests of the industry rather than the general public.

10.3 From “Better Than Life” to News as a Promotional Tool

As stated in Section 1.4, my enquiry into news coverage of XR was initially spurred by an article encouraging escapism into virtual worlds by representing VR experiences as superior to reality. While this type of discourse was somewhat present in the news articles through the use of the Transcendent frame, presenting XR as better than real life was not a common trope. On the other hand, this thesis has uncovered another (related) concern in XR news coverage: these technologies are presented positively, in line with the way they are marketed, leading to the news acting as a promotional tool for these products. Although this is a different concern to the one I started out with, the lack of critical coverage still encourages escapism into these virtual worlds, even if it is not by claiming the experience is superior to being in the real world. Furthermore, this highlights that technology news, at least surrounding XR, does not maintain the journalistic independence required for its fourth estate role (Hampton, 2010). Instead, XR news has more in common with other genres of journalism, such as lifestyle journalism, which has been found to include messages that encourage consumption (Arik and Çağlar, 2005) and is seen by some as an extension of marketing (English and Fleischman, 2019; Kristensen, Hellman and Riegert, 2019).

News coverage of emerging technologies can shape public debate which, in turn, affects regulation and policy decisions (Marwick, 2008; Schäfer, 2017; Scheufele, 2013). However, this promotional XR coverage encourages audiences to adopt these technologies rather than consider the ethical and political concerns that surround XR. Therefore, this news does not prioritise the public as journalists should in the fourth estate model (Fjæstad, 2007), but instead benefits the large technology companies selling these products. Rather than giving power to the public by holding elite organisations to account (e.g. by challenging positive views of XR and highlighting potential concerns), the news media give power to those elite organisations by allowing

their voices to dominate the news and presenting the technology in a way that aligns with their promotional framing of the products.

As highlighted in Section 3.5.2, news organisations must make money to continue operating, meaning news content can be affected by their own commercial interests. Journalists are under increasing pressure to produce news content quickly and regularly, particularly for online platforms (Currah, 2009; Forde and Johnston, 2013; Lewis et al., 2008), sometimes resulting in a practice of “churnalism” (Davies, 2009). In the current study, such a practice was evident particularly in the *MailOnline* which was found to publish news wire copy verbatim and to copy and paste parts of its articles from one to another. *The Guardian* was also found to repeat the same quotes from Zuckerberg multiple times. Since *The Sun*, *The Guardian* and *MailOnline* are each subject to these same commercial pressures, this could explain the lack of variation between the news outlets in the way they frame XR. With the aim to create news content quickly and before their competitors, the resulting news coverage is uncritical and lacking in diversity, giving XR companies the power to define the technology in a way that benefits them.

Similarly, another commercial factor that can impact content in online news particularly is how much attention journalists expect to receive for certain types of stories. In their study of UK technology journalists, Brennen, Howard and Nielsen (2020a) found that traffic metrics were a key factor that influenced news content. They state that journalists “seemed to have an intuitive sense that *uncritical* stories of new tech products from well-known popular brands are reliable draws” of traffic (2020a: 12-13, original emphasis). More traffic means more readers, which translates into greater revenue from advertising and subscription models. Therefore, favourable frames support the commercial interest of the news outlets, which could explain the lack of critical coverage about XR in these online outlets, as well as the focus on XR devices created by large companies such as Facebook and Google.

Aside from being large companies that might attract traffic, online news outlets also have relationships with Facebook and Google that could explain why the news coverage is this way. As noted in Section 3.4.3, most traffic to online news sites comes from search engines and social media and the two companies with the biggest market shares in these areas respectively are Google and Facebook. As Watson (2016) states, if publications rely on such companies to reach audiences, it is unlikely they will be critical

about them or their products. Such influences appear to have played a role here since the three publications in this study each mentioned the Facebook-owned Oculus Rift device most and Zuckerberg played a major role as a frame advocate in the articles.

Furthermore, the findings presented in this thesis suggest that the news outlets certainly do have something to gain by presenting XR positively and promoting diffusion. Firstly, native advertising was found to be present within some articles in the form of links to XR retailers. These news outlets would benefit most from this native advertising if readers click the link and purchase a product. Thus, it is in their commercial interests to present this technology positively to encourage adoption. Additionally, XR companies were most frequently used as sources and a handful of articles in *The Guardian* and *MailOnline* were even written by the creators of XR applications. This indicates that relationships exist between these news outlets and these groups. Within both lifestyle and games journalism, industry officials have been known to pull advertising or stop providing the news outlet with free gifts (such as technological devices) and information if the content is unfavourable to their products (R. Carlson, 2009; Hanusch, Hanitzsch and Lauerer, 2017). Therefore, the news outlets in this study may have avoided critical portrayals of XR in order to maintain these relationships and their commercial benefits.

Overall, it appears that the capitalist social system news organisations operate within has led them to prioritise their own commercial interests rather than the interests of the general public. As an effect of this, the news also supports the agendas of XR companies trying to sell this technology to consumers. Readers are treated as commodities for the commercial gain of the newsrooms, compromising the fourth estate role of journalism to provide independent information to the public and to hold those in power to account.

10.4 Study Limitations

These findings provide valuable insight into the news framing of XR. Nevertheless, as with any research project, there are some limitations to this study which will now be discussed. One drawback is that quantitative analysis was only applied to the news articles and not the marketing materials. While quantitative data based on the promotional materials would have allowed further comparisons to be made between the

news and marketing, the variation in format and length of the marketing materials made this difficult. For instance, marketing materials ranged from press releases, to social media posts, to promotional videos. If the same frequency of terms analysis had been applied to these texts, it would have been very difficult to fairly compare the results with the news articles. In other words, comparing a 1,000 word news article to a 10 word social media post would not provide reliable data. This issue could have been overcome by using the sentence as the unit of analysis rather than the entire text. However, for a sample of 977 news articles, this simply would not have been possible within the time constraints of the study. Instead of reducing the sample size, which would weaken the overall reliability of the findings, it was decided to focus solely on qualitative analysis for the comparison between the news and marketing samples.

Another methodological limitation is that the results in this thesis are based on only three UK national news outlets. Due to the required labour of the research methods used in this study and the volume of news coverage about XR, the sample had to be limited either by publication or by selecting a portion of the total articles from the news outlets. It was decided to follow the first approach in order to collect comprehensive data about each publication without the risk of missing valuable data. While it is possible that different results may have occurred if other (or more) publications had been sampled, including a tabloid, middle-market and quality news outlet could still make these findings generalisable to the wider population of news discourse.

Finally, it is important to consider the implications of the qualitative news sample being limited in terms of analysing articles from *The Sun*. As mentioned in Section 4.3.4, only three articles from *The Sun* met the criteria to be included in the qualitative sample. Because of this, although some qualitative examples from *The Sun* were used in Chapters 6-9, the majority came from *The Guardian* and *MailOnline*. This means that most of the framing devices identified during this analysis were based on *The Guardian* and *MailOnline*. Nevertheless, the quantitative results discussed in those chapters showed that *The Sun* used the same frames as *The Guardian* and *MailOnline*, with the exception of the Easy to Use and Comfortable frames. This indicates that the lack of articles from *The Sun* in the qualitative news sample has likely not had a significant impact on the results.

10.5 Contribution of the Study

This study has contributed to the existing literature by providing quantitative and qualitative insights into the news framing of XR and its relationship with XR marketing. The research makes three main original contributions to knowledge. Firstly, it contributes to the existing literature on news coverage of emerging technologies by analysing a topic that had previously been unexplored – XR. Although one published study had examined news coverage of the Pokémon Go AR game, this thesis presents the first study that has looked at XR news more broadly. Additionally, while analysing the news coverage of any emerging technology would be beneficial, focusing on XR is particularly valuable due to it being considered not just a new technology, but a new *medium* (Evans, 2019; Li et al., 2020), thus bringing with it new concepts (such as technologically-induced immersion) and experiences.

Secondly, the thesis makes a contribution to research about the relationship between news and promotional content. However, the current study goes further than previous research by analysing not just press releases or native advertising but marketing in general. In line with those other studies (Chyi and Lee, 2018; Erjavec, 2004; Harro-Loit and Saks, 2006; Lewis, Williams and Franklin, 2008; Pander Maat, 2007; Sissons, 2012), this thesis found a blurring of the boundary between news and promotional content, pointing to the commercialisation of technology news. This compromises the journalistic principles of impartiality and maintaining the separation between news and promotion. In the current study, this is perhaps even more concerning because this has been observed not just by the copying and pasting of press release content, but through the use of the same frames as the marketing materials. This means that both discourses reinforce each other. In effect, the news becomes a promotional tool.

Thirdly, aside from these empirical contributions, the study makes both a theoretical and methodological contribution by developing a set of frames related to XR. Methodologically, future research could measure the appearance of these frames in other news or media content about XR. While analyses that identify unique frames are often criticised for being unable to compare these frames to other studies (Tankard, 2001), the current research avoided this issue by also developing frame categories. It was found that frames could be organised into four groups, defined as follows:

- (1) Conceptualisation – frames related to concepts specific to the technology under study.
- (2) Newness – frames highlighting what makes a technology new or different.
- (3) User Experience – frames related to the actual use of a technology.
- (4) Evaluation – more general frames emphasising either a positive or negative aspect of a technology.

This categorisation could be used as theoretical guidance in future research on other emerging technologies. That is to say, scholars might investigate which frames are applied to other emerging technologies relating to these four categories. This means that researchers can maintain the benefits of identifying frames unique to their context as well as the advantages of using generic frames, since the unique frames will come under categories that can be compared across studies.

10.6 Directions for Future Research

Based on the above discussion, there are several directions in which the research presented in this thesis could be built upon. Firstly, regarding XR specifically, future analyses could provide further insight into the news coverage of this technology in the following ways. Other studies could examine a larger sample of news outlets both within and outside the UK. It would also be worthwhile to make comparisons between national news outlets and technology specific news publications, as well as between online, print and broadcast news. Additionally, XR products have continued to be developed and released after the final year examined in this thesis (2017). It would be beneficial to analyse the news coverage of this technology *after* the initial release phase that this thesis focused on to see how and whether the discourse changes. Alternatively, other studies could also compare the historical coverage of XR during the first wave in the 1990s to the current second wave. This would reveal how news reporting differed between the two time periods.

Moreover, future research could build upon the textual analysis presented in this study by using ethnographic approaches. While this study used diffusion theories to examine whether news coverage promoted the adoption of XR, future research could

assess this by examining XR news coverage alongside framing effects (i.e. whether these frames made individuals more or less likely to purchase an XR product). In a different way, other researchers could analyse the news production process more closely by carrying out an ethnographic study of journalists as they create XR news. This would provide more accurate data as to the factors influencing the frame-building process when it comes to news about XR.

Lastly, extending beyond XR, the frame categories developed in this thesis could be applied to studies of other emerging technologies. This would allow comparisons to be made between the news coverage of different innovations while maintaining the benefit of identifying specific frames unique to each case study. Indeed, while this categorisation provides a starting point for analysing the framing of new technologies, future research could examine whether these categories are always relevant and even suggest further frame-based groupings.

10.7 Final Remarks

Informed by framing theory, this thesis has found that news coverage of XR is primarily positive and there are several frames shared between the news and marketing of XR. Thus, the two texts work to reinforce each other and the frames within them. This leads to an overall discourse of consumerism in XR news, which points to the commercialisation of this news. These results are similar to previous studies on other emerging technologies and investigations into the diminishing boundary between news and promotional content. However, it appears that news coverage of XR differs from its fictional representations as well as news portrayals of videogames. The study presented here has made an original contribution to the literature regarding news coverage of emerging technologies by focusing on a previously unexplored topic (XR). It also makes an original contribution to studies looking at the relationship between news and promotional content, extending such research by analysing the interplay between news and marketing in general rather than simply native advertising or public relations material. Furthermore, the thesis presents a theoretical and methodological contribution in the form of frames and frame categories that can be applied to future research on XR and emerging technologies. In all, this thesis has provided the first in-depth investigation into XR news,

as well as its connection to promotional materials, through the rigorous application of a mixed methods methodology.

The results presented here show that XR news prioritises commercial interests, both of their own media organisations as well as XR companies, rather than serving the general public. This highlights a problem with technology news because it compromises the fourth estate role of journalism. News about XR has been affected by the capitalist ideologies of media organisations to the extent that it acts as a promotional tool for XR companies, encouraging readers to escape to virtual worlds.

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Appendix A: Coding Sheet Guide

This appendix presents the definitions for each category and variable in the coding sheet, split into six sections: General Article Details, Topics, Multimedia, Sources, Applications and Devices. Some variables were split into sub-variables which are highlighted in grey.

A.1 General Article Details

Coding sheet category/variable	Definition
<u>ID</u>	The unique article identification number.
<u>Publication</u>	The publication the article is from (<i>The Sun, The Guardian, MailOnline</i>)
<u>Publication Date</u>	The date the article was first published.
<u>Last Updated</u>	The date the article was last updated.
<u>URL</u>	The website address for the article.
<u>Type</u>	<u>How is the article presented?</u>
News	A standard news article, including those labelled "news" and those without any label.
Feature	An article labelled as a feature.
Blog	An article from the blog section of the website.
Event Listing	Not in the traditional news article format, more of an event listing explaining when and where an event is and how to attend.
Interview	An interview with someone.
Opinion/Comment	An article labelled as opinion or comment.
<u>Section</u>	The section of the publication's website the article appears in. Sometimes these are tiered. For example, an article may be most broadly in the "News" section, but within that may then be in another sub-category named "Technology" within another named "Virtual Reality". Each tier should

Coding sheet category/variable	Definition
	be noted here. More than 3 can be added if necessary.
<u>Categories</u>	In addition to "sections", some publications also include multiple "categories" relevant to the article, found at the top or bottom of the article. Each category is noted here.
<u>Headline</u>	<p>The headline of the article (defined as the text in the largest font at the top of the article). For example, in the screenshot below, the headline would begin at "WE'VE" and end at the word "detail" in the larger font.</p> <p>'WE'VE BEEN GAMED' Mount & Blade: Bannerlord 2 revealed at E3 but gamers are going nuts over this one detail</p> <p><small>It was one of the most popular games on the line-up at this evening's PC Gaming Show... but fans got VERY heated during the trailer reveal</small></p>
<u>Byline</u>	<p><u>The author(s) of the article, selected out of the following options.</u></p> <p>This was determined by how the publication portrayed the writer in the byline. For example, if someone is listed in the byline and there is no information in the article about who they are, then they are treated as a journalist of the publication in question. This assumes the publication would make it clear if it was written by someone who was not one of their journalists.</p>
Journalist(s)	One or more journalist affiliated with the publication in question.
Agency	Any of the following news agencies.
Reuters	
Press Association (PA)	

Coding sheet category/variable	Definition
Associated Press (AP)	Includes any of the following agencies AND a journalist affiliated with the publication in question.
Agence France Presse (AFP)	
Agency & Journalist(s)	
Reuters	
Press Association (PA)	
Associated Press (AP)	
Agence France Presse (AFP)	
Unspecified Agency	Byline does not specify what agency the article was written by, but states something general such as simply "Agency".
Application Creator	A creator of an XR application.
Specialist	A specialist from any industry writing an article (who is not usually a journalist).
No Byline	The author is not specified.
Mention Where/How to Buy?	<u>Does the article explain where/how a product/application can be bought/used?</u>
Yes - Product	Yes, in relation to an XR headset, peripheral or accessory.
Yes - Application	Yes, in relation to an XR application.
Yes - Product & Application	Yes, in relation to both an XR headset, peripheral or accessory AND an application.
No	It does not mention how/where to buy/use XR-related products.

A.2 Topics

This section of the coding sheet recorded the topic that was the main focus of an article.

Coding sheet variable	Definition
History	The history of XR. This refers to pre-2012 history, such as products that existed before the current generation (e.g. Nintendo Boy). Articles overviewing the development of XR in this generation (2012 onwards) would be classed as having the "Development" topic instead. Articles detailing the development of XR from pre-2012 to now would be classed as "Development".
Application(s)	One or more application(s) of XR.
With XR Element	The article focuses on an application that involves XR but only briefly mentions that/how XR is involved.
XR Focus	The article focuses on the XR aspect of the application.
Product(s)	Details about one or more XR products, including specifications, release dates and so on.
Commercial Product	A product aimed towards general consumption, rather than industry use.
Industry Product	A product that is not available for the general public to buy but is either used in industry or a company uses it as part of their service (e.g. an aviation company making its own headset for passengers to use during flights).
Conceptual Product	A concept for an XR product that is either definitely not going to be developed or produced or the article states it is unsure whether it will ever be produced as an actual product.
Rumoured Product	Speculation over a products' existence, often regarding patents.
XR Overview	A general overview or comment about XR. This could be the state of the market, a criticism of XR or any

Coding sheet variable	Definition
	other article not focusing on a specific product, person, impact or application.
Business	Business news related to XR such as acquisitions of XR company or applications, financial reports (e.g. profits, job losses), development (e.g. new facilities) and so on.
Legal Disputes	Legal disputes relating to an XR company or product, such as Oculus stealing someone else's idea for Rift.
Crime	A crime related to an XR company or person involved in XR. Importantly, this does not involve carrying out crime using XR technologies - this would come under the Concerns topic.
Regulation	Details of how XR is or should be regulated.
Fiction	Works of fiction about XR, including plays, films, television shows and books.
Demo	About someone or a group of people trying/using an XR device.
Celebrity	The person experiencing the demo was a well-known person, such as a politician, sports person, member of the royal family, TV/film star.
Journalist	The author of the article writes about their own experience of XR.
General Public	The person experiencing the demo was not well-known but simply a member of the general public.
Concerns	Concerns of the effect(s) XR can have on society/individuals, including sickness, eye strain, isolation, online abuse, privacy and security and injuries.
Future	Details of XR or XR-related technology that could exist in the future or what it could be used for in the future.
Peripherals/Accessories	Details of XR peripherals and/or accessories, such as controllers, bodysuits, headphones.

Coding sheet variable	Definition
Figurehead	About one or more of the major figures in XR, such as creators/owners Mark Zuckerberg or Palmer Luckey.
Company	Details about a company creating XR products or applications, such as Oculus. If the company offers services/products other than XR (such as Facebook), this topic is only chosen if the focus is on the XR side of the company.
Development	How XR as a technology has developed over time during the second wave.
Other	Any other topic.

A.3 Multimedia

The multimedia section of the coding sheet recorded how many different types of visual media were used, who they were attributed to and what external links were present in the news articles.

Coding sheet category/variable	Definition
<u>Multimedia</u>	<u>Details about the multimedia (images, videos, etc.) that appear in the articles.</u> This counts media within the article itself, not adverts, byline pictures or pictures in the related articles sections. Note that this only includes images of tweets (e.g. article ID0003) or embedded tweets if the tweet is of an image. An image of a tweet or embedded tweet with just text is counted in the "Sources Referenced" section.
Image(s)	The number of images shown in the article.
Video(s)	The number of videos shown in the article.
GIF(s)	The number of GIFs shown in the article. GIFs differ from videos in that GIFs do not have sound and the reader cannot rewind/fast-forward them.

Coding sheet category/variable	Definition
Other	The number of other multimedia in the article.
<u>Media Attribution</u>	<u>Where did these media come from?</u>
Device Creator	A person or company creating any kind of XR hardware. This could be headsets, peripherals, robotic suits and so on. If it is a company, it could be a company that specialises in creating XR products, or a company that has made some XR technology even if that isn't its sole purpose (e.g. military creating XR tank).
Application Creator	The creator of an XR application or platform to create/view XR applications. Could be the company itself, an individual from that company or an individual involved in the creation of the application. If the medium is attributed to an application itself (e.g. a screenshot from the app), this is counted in this variable.
XR Facilitator	A person or company that facilitates the use of XR technology or applications rather than creating the applications/technology themselves. For example, a health specialist providing an XR treatment for patients or an event hosting XR demos/apps.
Social Media	A social media site generally (e.g. Twitter), not mentioning who/what person/company it was from. Includes YouTube.
Celebrity	Someone that is well-known in the public eye, including film stars, politicians, the royal family and reality TV stars.
General Public	A member of the public. Could be via social media, could be a user of XR, but is not part of an XR company/related company.

Coding sheet category/variable	Definition
Technology Industry Specialist	A specialist (either an individual or a company) of the technology industry.
Other Industry Specialist	A specialist (either an individual or a company) of an industry other than XR or technology.
Journalist	One of the publication's journalists.
Agency	A news agency or news image agency.
Publisher	From the publication itself (the one the article is from). Could be newly created for this article or from their database of media.
Stock Image	A stock image from companies such as Shutterstock.
Other News Outlet	A news outlet other than the one the article is published in. If an article is about another news outlet having an XR application, they are classed as Application Creator instead of this.
General Media	Media other than news media or social media (such as television shows/channels/film studios). Includes companies and specific media.
Unclear	Media is attributed but it is unclear who this person/company is.
No Attribution	No attribution is mentioned. Even if it is clear to the researcher where this content came from, if it isn't noted, it is marked in this category. The point is whether the news organisation has attributed the media or not and to whom. If a video is embedded from another video player (e.g. YouTube, Vimeo), the attribution is counted as the owner of the video even if the publisher hasn't explicitly said this (it is clear from viewing the video information).
Other	Any other attribution.
Multimedia Attributions Clarifications	

Coding sheet category/variable	Definition
	<p>If article mentions application and device:</p> <ul style="list-style-type: none"> • If image/video is of application (e.g. screenshot or someone using application) = application creator • If image/video is of device = device creator
<u>External Links</u>	<p><u>What kinds of websites does the article link to externally (not inside its own website)?</u> Links within tweets were not included. Links in the article information were not included (for example author disclosure - see article ID0062). Links that were repeated were counted as many times as they were included, not just once. If a link is to the news section of an official application creator or device creator, those two categories take priority over 'news source'.</p>
Retailer	A page/site that allows the user to buy an XR product or application. This includes retailers like Amazon as well as app stores (e.g. Google Play) and XR company's own stores. Can be individual retailer or a comparison site for different retailers.
Product Info	A page/site with information about an XR product or related product, including peripherals. It could be the official page, or it could be another page with product information on, such as the company's YouTube channel or video.
XR Event Info	A page/site about an event focusing on or featuring XR. Could be about the company running the event or details about the event itself.
Actual Application	A page/site where the reader/user can actually use an XR application. This is usually a 360-video experience as they can be viewed in web browsers.

Coding sheet category/variable	Definition
Application Info	A page/site with information about an XR application. It could be the official page, or it could be another page with application information on, such as the company's YouTube channel or video.
Application Creator	A page/site about the person/company that created an application rather than information about the application itself. Includes those who created some technology/software to create XR experiences, not just those who have created actual experiences.
XR Company	A page/site for a company or individual that makes XR products (e.g. headset, peripheral), but not directly linking to the product page (as that would be Product Information). This could be their official website, their social media pages, etc. If a link goes to the news section of one of these websites, it is classed as a Device Creator rather than Another News Source because it is most significant that it comes from the company rather than being 'news'.
Other XR-Related	A page/site with information about XR that does not fit into the above categories. This could be an XR community page, an academic article about XR, a video of someone using XR, research/stats about XR, pages about fiction featuring XR and so on.
Non-XR-Related	Any other pages or sites that are not related to XR.
Another News Website	A page/site for another news source online, including blogs.
Other	Any other kind of page/site.
Unclear	It is unclear what the link was for because the website/page no longer exists and the article itself does not make it clear.

A.4 Sources

The sources part of the coding sheet recorded who was quoted or cited in the articles. This includes direct quotes as well as paraphrased statements. Some clarifications should be made as to how quotes/citations were counted:

- Quotes were counted as one quote within opening and closing quotation marks. Sometimes a quote spanned multiple paragraphs, meaning there were multiple opening quotation marks. In this study, the closing quote defines the end of the quote. If there was no closing quote, the quote was seen to be continuing rather than a separate quote;
- Repeated quotes were only counted once;
- Quotes in captions were only counted if they were not repeated elsewhere in the article in the same words or paraphrased;
- In-app dialogue was not included;
- Quotes within headlines were not counted because these quotes are very rarely attributed and are normally repeated within the body;
- If the journalist paraphrased a quote before inserting the quote, the paraphrased statement was not counted;
- In interview-type articles where other people are speaking but not in quotation marks, each section (not paragraph) was counted as one instance of a quote/citation;
- If a source references another source, it was still counted as coming from the source that is currently speaking because the journalist has not chosen the source that the other person referenced.

Coding sheet variable	Definition
User (General)	Someone who has/is using XR technology for general purposes, including headsets, applications and peripherals. If source is a user AND something else (e.g. investor), the other variable takes precedence, with the exception of General Public and Celebrity.

Coding sheet variable	Definition
User (Professional)	Someone who has/is using XR technology for professional purposes, such as in the workplace or an artist creating artwork.
General Public	The general public, not speaking as a user of XR.
XR Industry Specialist	An industry specialist in the field of XR.
Technology Industry Specialist	Specialists from a technology industry, not specifically XR. If an article quotes a technology company talking about the XR side of their business, they are classed as an XR Industry Specialist. If a technology company became involved in XR at some point during the sample period, they were classed as a Technology Industry Specialist up until the point it was announced they were involved in XR, and at this point if they spoke about the XR side of their business they were classed as an XR Industry Specialist.
Game Industry Specialist	Someone working for a videogames company, who owns a videogames company or is a game analyst (but not a developer of XR games - this would be classed as Application Creator).
Other Industry, or General, Specialist	An industry specialist in a field other than XR or technology (such as a doctor) or an unspecified specialist (such as "expert").
Celebrity	A celebrity. If a celebrity is also a user, they are classed as a user when talking about their XR experience and a celebrity when talking about something else.
Politician	A political figure from any country.
Retailer	Sellers of XR and related products.
Researcher/Analyst	Individual researchers/analysts or research agencies (e.g. SuperData), or just broadly "research", "researchers", "analysts". Regarding academics, they were classed as Researchers/Analysts when the article

Coding sheet variable	Definition
	was about research they had carried out, but Other Industry Specialists otherwise.
Investor/Funder	People or companies that are considering to or have invested in XR software or hardware. Includes the general public funding through something like Kickstarter as well as venture capital firms and other corporations.
Fiction Creator	Creators of fictional works (usually XR based but does not have to be).
Device Creator	Owners of XR companies/products or creators of XR products. If an article mentions both a product and an application from the same company (e.g. Google), they will come under this heading, not Application Creators, because first and foremost they are a device creator. If a device creator's quote comes from their own official blog, it is classed as Device Creator, not Other News Source
Application Creator	People who have created or are creating XR applications, including actual developers as well as people who may be acting/presenting within an XR application. If a person/company makes a peripheral AND software to go with that peripheral, they are classed as Application Creators. If they only make peripheral (no software), they are classed as a Peripheral Creator.
XR Facilitator	Someone who uses XR in a professional role for others, but has not developed an application or device. For example, a doctor using XR for a patient to help them overcome a phobia or a theme park offering an XR experience.

Coding sheet variable	Definition
Marketing Materials	Words from an advert or promotional material for XR.
Other Article by Same Publisher	An article referencing another article published by the same organisation.
Other News Source	An article referencing another news source, could be national, specialist, broadcaster, blog, magazine.
External Journalist/Blogger	A journalist, reporter or blogger not from the publication in question.
Official Reports and Documentation	Text from documents or reports such as legal documents, complaints, product manuals, patents and so on.
XR Event Organiser	An organiser of an XR event.
Peripheral Creator	The creator of an XR peripheral, such as a controller, rather than an XR headset or application.
XR Job Advert	Text from an advertisement for a job in the XR industry.
Platform Creator	The creator of a platform to produce XR applications rather than a creator of the application itself.
Unclear	It is not clear who the quote/citation is from, either because the description is too broad, the way the sentence/paragraphs are organised doesn't make clear who was speaking or someone is mentioned but it is not made clear who they are and the researcher cannot find out elsewhere.
Not Specified	There is no mention of who is speaking, even in a broad sense.
Other	Any other kind of source.
Sources Clarifications If article mentions application and device: <ul style="list-style-type: none"> • If quote focuses on application or is from someone who specifically worked on the application = application creator 	

Coding sheet variable	Definition
	<ul style="list-style-type: none"> If quote focuses on device or is from someone who specifically worked on the device = device creator

A.5 Applications

The applications section of the coding sheet recorded which types of XR uses were mentioned. Whether a specific application or an area was mentioned, each of these instances were recorded under the following variables.

Coding sheet variable	Definition
Accessibility	XR used to improve accessibility. This could be applications to help blind people see, translation applications and so on.
Architecture/Planning	XR used to design buildings and/or demonstrate how they will look in the geographical area.
Art/Design	Art created with, experienced with or about XR or XR used for design such as interior design (not product design, this comes under Product Development). There could be overlap between Art and Design and Architecture and Planning: if design is focused on the creative aspect, classed as Art and Design; if focused on designing something that is going to be created (e.g. building, town), classed as Architecture and Planning; if design is mentioned broadly (e.g. "design"), classed as Art and Design.
Automotive Support	Support with automotive vehicles, both for the driver and professional (e.g. mechanic). This includes how to build the engine, how to park and how to repair a vehicle.
Children's Toys/Interactive Stories	Books, stories or toys for children that can either be experienced in a virtual world or XR can be used to enhance the physical toy. This includes allowing

Coding sheet variable	Definition
	parents to read their child bedtime stories in XR while physically apart and stickers coming to life using AR.
Cosmetics	XR used to test appearance (such as make-up, breast enlargements).
Crime Prevention and Justice	Applications to prevent crime or to aid in criminal investigations, such as recreating crime scenes and assessing past/potential criminals.
Documentary	XR used to watch film, TV or 360-degree videos that are documentaries, rather than created for entertainment.
Drones	XR used to control drones.
Education	XR used in education, including in school/college/university and at home.
Emergency Services	XR used to support the emergency services.
Film/TV/Video	XR films, television shows or videos, including 360-degree videos, for entertainment.
Fitness	Fitness applications involving XR, such as fitness classes with XR element or using XR to stimulate exercise.
Food and Drink	Applications used while eating, drinking or cooking. This could be to improve the eating/drinking experience or for dieting.
Health	XR used in health care.
Industrial and Workplace Management	XR applications in industrial settings, such as warehouses, factories, manufacturing, construction, oil and gas, engineering, mining, logistics, or for workplace management such as scheduling and recruitment.
Journalism	XR used to create or view news stories.

Coding sheet variable	Definition
Marketing and Advertising	Marketing campaigns or advertisements involving and/or created in/with XR.
Military and Defence	XR used by the military.
Museum/Exhibition/Archive Viewing	An XR experience in a museum or exhibition or used to access archives/exhibitions virtually.
Music	XR uses in the music industry, such as attending concerts and 360-degree music videos.
Organisation	Applications to help users with their organisation, such as a calendar, diary, checking the weather.
Photography/Video Recording	Using XR to take photos or videos (usually related to AR).
Pornography, Teledildonics and Sex	XR used to view pornography, improve sex or XR accessories (teledildonics) used for pleasure.
Product Development and Testing	XR used to create and/or test products (e.g. cars).
Real Estate	XR used to sell properties.
Research	XR used in an academic or scientific study.
Retail	XR used either to shop remotely (e.g. at home using a device) or in a physical shop.
Simulation	XR used to simulate an environment for pleasure rather than serious purposes such as training.
Social Change and Awareness	XR used to raise awareness of something or bring about social change by, for example, encouraging recycling, body swapping, simulating migraines, simulating a car crash to discourage drink driving or experiencing life through the eyes of a refugee to encourage people to make a change for them.
Social Media and Communication	XR used in social applications such as Facebook Spaces, or simply to communicate (e.g. email).
Space and Science	Applications used by astronauts and scientists, as well as allowing users to virtually visit space for fun.

Coding sheet variable	Definition
Sport	XR used to watch sports or experiences involving sports people (behind the scenes type experiences).
Theatre	XR used to watch a theatre production or behind-the-scenes details about theatre production.
Theme Park and Rides	XR used in a theme park, such as on a rollercoaster ride.
Tourism/Travel	XR used to allow users to virtually visit tourist locations or to aid navigation.
Training	XR used to train people in a variety of situations (from flight simulators to operations).
Videogames	XR used to play videogames.
Web Browsing	XR used to browse webpages.
Wellness	XR used for wellness such as meditation and massage.
Other	Any other type of application.

A.6 Devices

This section of the coding sheet recorded which devices were mentioned or pictured. This includes written mentions, references of a specific company's device without the name (e.g. "Sony's VR device") and images/videos of devices. Only general consumer (rather than industrial) devices were recorded. When devices are shown in pictures/videos, these are only recorded if the logo is clearly visible on the product, so that it is obvious to general readers (including people unfamiliar with XR) which device it is. This decision was made because some devices are more easily recognisable than others (e.g. HTC Vive and Google Glass have easily-recognisable design, can even be picked out from a silhouette, but many other devices cannot). It would not make comparisons fair if easily recognisable devices were always coded and others were not. The following 61 devices were found to be mentioned and were thus recorded if appearing in any article:

- AirVR(+)
- Alcatel Vision
- Altergaze
- ANTVR

- Archos VR
- AuraVisor
- castAR
- Cmoar
- Empire EVS
- Epson Moverio B200
- eSight
- Fove
- Freefly
- GlassUp
- Google Cardboard
- Google Daydream View
- Google Glass
- HoloSeer
- Homido
- HTC Vive
- HTC Vive Focus
- Immerse
- Impression Pi
- IonVR
- Lenovo Theatremax
- LG 360 VR
- Magic Leap
- Memo
- Meta 2
- Meta Space Glasses
- Microsoft HoloLens
- MindLeap
- Mirage Solo
- Nautilus VR
- Oculus Rift
- Oculus Go/Pacific
- Oculus Quest/Santa Cruz
- Opto
- Pinć
- PlayStation VR/Project Morpheus
- Project Alloy
- Razer OSVR
- Recon Jet
- RideOn
- Samsung Gear VR
- Smart Eyeglass
- Smartspecs
- Sony HMZ-T2
- Sulon Cortex
- Telepathy One
- Totem VR
- Veeso
- View-Master
- VR for G3
- VR One
- Vrana Totem
- Vrase
- Vrizzmo
- Vuzix 920 Eyewear
- Windows Mixed Reality
- ZEISS cinemizer

Appendix B: Sections Versus Categories

Both the section an article appeared in and the categories associated with it were recorded. The following examples clearly define what was considered a section and what was considered a category in *The Sun* and *The Guardian*. Since the *MailOnline* did not use categories, an example from this outlet does not appear here. Both *The Sun* and *The Guardian* classified categories as “topics”. However, due to another part of the coding sheet recording the main topic of an article, the term “category” was used in this study to avoid confusion.

B.1 The Sun



THE SUN, A NEWS UK COMPANY

Sign in

UK Edition | Search

< BIZ | NEWS | FABULOUS | MONEY | MOTORS | TRAVEL | TECH | DEAR DEID

All News | UK News | World News | Brexit | Politics | Opinion

VIRTUAL INSANITY Oculus Rift virtual reality headset will go on sale in the UK next month

Incredible device will allow British gamers to enjoy the future of immersive entertainment

by NILIMA MARSHALL
16th August 2016, 2:16 pm | Updated: 25th January 2017, 10:42 am

COMMENT NOW

Oculus, which is owned by Facebook, said the device will launch in the UK on September 20 and will be sold at a retail price of £549.

The headset is already available to pre-order at Amazon, John Lewis, PC World, GAME and Harrods and demonstration experiences will be rolled out across the country in the coming weeks - giving consumers the opportunity to try the Rift before buying.

The section the news article appeared in was determined by the highlighted menu items circled in red in the above screenshot. In this example, the article would be classed as having the following section string: News > Tech > All News.

Minecraft, Mojang's world-building game, is already playable on the Samsung Gear VR, and anyone who owns the Windows 10 Beta Edition of the game can now play it on their Rift headset at no extra cost.

We pay for your stories! Do you have a story for The Sun Online news team? Email us at tips@the-sun.co.uk or call 0207 782 4368

0 COMMENTS

Be the first to comment...

TOPICS

VIRTUAL REALITY

Alternatively, *The Sun's* categories were shown at the end of the article under the heading of "topics", again circled in red in the above image. The category applied to this example was virtual reality.

B.2 The Guardian

Support The Guardian
Available for everyone, funded by readers
Contribute → Subscribe →

Search jobs Dating Sign in Search UK edition

The Guardian

News Opinion Sport Culture Lifestyle More

UK World Business Football UK politics Environment Education Society Science **Tech** Global development Cities Obituaries

Google

Sergey Brin tests Google Glass on New York subway

Co-founder of search giant spotted while wearing glasses that show small screen at edge of vision which provides data

Charles Arthur
@charlesarthur
Mon 21 Jan 2013
14:08 GMT

15 235
This article is over 6 years old

▲ Sergey Brin, co-founder of Google, was spotted on the New York subway wearing Google Glass - augmented reality glasses. Photograph: Noah Zerkin

You don't expect to find one of the world's richest men riding the New York subway looking a little like a hobo. But last week, Sergey Brin, the co-founder

most viewed

- Grayling reaches £33m settlement over Brexit ferry fiasco court case
- Live Brexit: US drug firms would be able to charge NHS more under Trump trade plan, campaigners claim - Politics live
- Ole Gunnar Solskjær hints Antonio Valencia's time up at Manchester United
- Concern over food safety as

Similarly, the section an article from *The Guardian* appeared in was identified by the highlighted menu items at the top of the webpage. In the above example, "News" is highlighted with a stronger line in comparison to the other sections and "Tech" is in bold. Thus, the above article would be classed as having the following section string: News > Tech.

Topics

Google

Sergey Brin / Computing / Augmented reality / Gadgets / Google Glass / Wearable technology / news

f t e in p Reuse this content

Also following a similar format as *The Sun*, the categories associated with articles in *The Guardian* were shown at the end of the report (as circled in red above). This means that the example depicted here would be recorded as having the following categories:

Google, Sergey Brin, Computing, Augmented reality, Gadgets, Google Glass, Wearable technology and news.

Appendix C: Dictionary of Search Terms

C.1 Frame-Based Categories

- **Advanced and High-quality**
 - **accurate**
 - accurate*
 - **advanced**
 - advanced
 - **bleeding edge**
 - bleeding edge
 - bleeding-edge
 - **clever**
 - clever*
 - **complex**
 - complex
 - **cutting edge**
 - cutting edge
 - cutting-edge
 - **futuristic**
 - futuristic
 - **high end**
 - high end
 - high-end
 - **high quality**
 - high quality
 - high-quality
 - **high tech**
 - high tech
 - high-tech
 - **masterpiece**
 - masterpiece*
 - **mind boggling**
 - mind boggling
 - mind-boggling
 - **next generation**
 - next gen*
 - next-gen*
 - **precise**
 - precise
 - **seamlessly**
 - seamless*

- **sophisticated**
 - sophisticat*
- **state of the art**
 - state of the art
 - state-of-the-art
- **superior**
 - superior
- **Affordable**
 - **affordable**
 - affordab*
 - **bargain**
 - bargain*
 - **cheap**
 - cheap*
 - **inexpensive**
 - inexpensiv*
 - **low cost**
 - low cost
 - low-cost
- **Comfortable**
 - **comfort**
 - comfortab*
 - **cushion**
 - cushion*
 - **ergonomic**
 - ergonomic*
 - **light**
 - light
 - lightweight
 - **soft**
 - soft
- **Different and Unique**
 - **different** *different to other technology/media, not differences between VR, AR, MR or specific devices*
 - different
 - **unique**
 - unique*
 - **unprecedented**
 - unprecedented
 - **weird**
 - weird*
- **Easy to Use**
 - **convenient**
 - convenien*
 - **easy**

- easiest
 - easily
 - easy
- **effortless**
 - effortless*
- **intuitive**
 - intuitive*
- **natural**
 - natural*
- **Immersive**
 - **absorbing**
 - absorb*
 - **believable**
 - believ*
 - **captivating**
 - captivat*
 - **convincing**
 - convinc*
 - **engaging**
 - engaging
 - **engrossing**
 - engross*
 - **engulf**
 - engulf*
 - **immersive**
 - immers*
 - **mesmerising**
 - mesmeris*
 - mesmeriz*
 - **portal**
 - portal*
 - **presence**
 - presence
 - **present** *feeling present*
 - present
 - **really there**
 - really there
 - **teleport**
 - teleport*
 - **transport** *feeling of being transported*
 - transport*
 - **trick** *fooled*
 - trick*
 - **whisked** *as in whisked away*
 - whisk*

- **Important**
 - **big deal**
 - big deal
 - **important**
 - importan*
 - **meaningful**
 - meaningful*
 - **prominent**
 - prominen*
 - **seminal**
 - seminal
 - **significant**
 - significan*
 - **special**
 - special
 - **ubiquitous**
 - ubiquitous
 - **valuable**
 - valuab*
- **Much-Anticipated**
 - **anticipation**
 - anticipat*
 - **buzz**
 - buzz*
 - **exciting**
 - excit*
 - **finally** *e.g. XR has finally arrived*
 - finally
 - **hype**
 - hyp*
 - **long awaited**
 - long awaited
 - long-awaited
 - **tantalising**
 - tantalis*
 - tantaliz*
- **Revolutionary**
 - **disruptive**
 - disruptive
 - **game changing**
 - game chang*
 - game-chang*
 - gamechang*
 - **reinvent**
 - reinvent*

- **revolutionary**
 - revolution*
- **transformative**
 - transform*
- **Social**
 - **collaborate**
 - collaborat*
 - **share**
 - share*
 - sharing
 - **social** *described as social, not "social media" or "social network"*
 - social
 - **telepresence**
 - tele-presence
 - telepresence
 - **together**
 - together*
- **Successful**
 - **lucrative**
 - lucrative
 - **mainstream**
 - mainstream
 - **mass market**
 - mass market
 - mass-market
 - **popular**
 - popular
 - **successful**
 - successful
- **Transcendent**
 - **beyond** *going beyond what is already possible*
 - beyond
 - **empower**
 - empower*
 - **enhance**
 - enhanc*
 - **extend**
 - exten*
 - **improve**
 - improv*
 - **liberating**
 - liberat*
 - **transcend**
 - transcend*

C.2 Counterframe Categories

- **Difficult to Use**
 - **complicated**
 - complicated
 - **counterintuitive**
 - counterintuitive
 - **difficult** *in terms of usability*
 - difficult*
 - **hard** *in terms of usability*
 - hard
 - hardest
 - **impractical**
 - impractical*
 - **laborious**
 - laborious*
 - **unnatural**
 - unnatural*
- **Expensive**
 - **costly**
 - costly
 - **expensive**
 - expensiv*
 - **high cost**
 - high cost
 - high-cost
 - **pricey**
 - pricey
 - pricier
 - priciest
- **Trivial**
 - **fad**
 - fad
 - fads
 - **gimmick**
 - gimmick*
 - **novelty**
 - novelt*
 - **trivial**
 - trivial
- **Uncomfortable**
 - **cumbersome**
 - cumbersome*
 - **discomfort**

- discomfort
- **heavy** *weight of device*
 - heavy
- **uncomfortable**
 - uncomfortab*
- **unwieldy**
 - unwieldy
- **Unsuccessful**
 - **fail**
 - fail*
 - **niche**
 - niche
 - **unsuccessful**
 - unsuccessful

C.3 Tone Categories

- **Ailments**
 - **ailments**
 - ailment*
 - **cybersickness**
 - cybersickness
 - **disoriented**
 - disorient*
 - **dizzy**
 - dizz*
 - **eyestrain**
 - eyestrain
 - **harm**
 - harm*
 - **hazard**
 - hazard*
 - **headache**
 - headach*
 - **hurt**
 - hurt*
 - **nausea**
 - naus*
 - **pain**
 - pain
 - painful
 - **queasy**
 - queas*
 - **sick**

- sick*
 - **strain**
 - strain*
 - **vomit**
 - vomit*
- **Concerns**
 - **addictive**
 - addict*
 - **assaulted**
 - assault*
 - **caution**
 - caution*
 - **concerns**
 - concern*
 - **creepy**
 - creepy
 - **damaging**
 - damag*
 - **fear**
 - fear*
 - **intrusive**
 - intrusive
 - **invasive**
 - invasive
 - **isolating**
 - isolat*
 - **problem**
 - problem*
 - **scary**
 - scar*
 - **solitary**
 - solitary
 - **terrifying**
 - terrified
 - terrifies
 - terrify*
 - **warning**
 - warn*
 - **worried**
 - worr*
- **Negative**
 - **abysmal**
 - abysmal*
 - **alienated**
 - alienat*

- **anger**
 - anger*
 - angry
- **annoying**
 - annoy*
- **appalling**
 - appall*
- **apprehensive**
 - apprehensive
- **awful**
 - awful
- **awkward**
 - awkward*
- **backlash**
 - back lash
 - back-lash
 - backlash
- **bad**
 - bad*
- **betray**
 - betray*
- **boring**
 - bor*
- **bulky**
 - bulk*
- **burden**
 - burden*
- **clunky**
 - clunky
- **complain**
 - complain*
- **controversial**
 - controv*
- **cringe**
 - cring*
- **critical** *as in negative, not vital*
 - critic*
- **cynical**
 - cynic*
- **demise**
 - demise
- **disadvantage**
 - disadvantag*
- **disappointing**
 - disappoint*

- **disgrace**
 - disgrac*
- **disgusting**
 - disgust*
- **downside**
 - down side
 - down-side
 - downside
- **drab**
 - drab
- **dread**
 - dread*
- **dystopia**
 - dystop*
- **frustrating**
 - frustrat*
- **fury**
 - furious*
 - fury
- **hostility**
 - hostil*
- **incompetent**
 - incompeten*
- **intolerable**
 - intolerab*
- **irritating**
 - irritat*
- **limitations**
 - limit*
- **lousy**
 - lousy
- **nightmare**
 - nightmar*
- **peril**
 - peril*
- **pessimistic**
 - pessimis*
- **pointless**
 - pointless*
- **ridiculous**
 - ridiculous*
- **sceptic**
 - sceptic*
- **scrutiny**
 - scrutin*

- **shoddy**
 - shoddy
- **silly**
 - silly
- **terrible**
 - terrible
- **trepidation**
 - trepidation
- **ugly**
 - ugly
- **unappealing**
 - unappeal*
- **underwhelming**
 - underwhelm*
- **unhappy**
 - unhappy
- **unimpressed**
 - unimpress*
- **unnerving**
 - unnerv*
- **useless**
 - useless*
- **weakness**
 - weak*
- **Positive**
 - **advantages**
 - advantag*
 - **amazing**
 - amaz*
 - **appealing**
 - appealing
 - **awesome**
 - awesome*
 - **beautiful**
 - beaut*
 - **benefit**
 - benefi*
 - **best**
 - best
 - **boon**
 - boon
 - **breath taking**
 - breath taking
 - breath-taking
 - breathtaking

- **brilliant**
 - brillian*
- **charming**
 - charming
- **compelling**
 - compelling
- **cool** *evaluation not temperature*
 - cool
 - coolest
- **dazzling** *impressive, not blinding*
 - dazzling
- **delight**
 - delight*
- **desirable**
 - desirable
- **enjoy**
 - enjoy*
- **enticing**
 - enticing*
- **epic**
 - epic*
- **excel** *doing extremely well, not the spreadsheet*
 - excel
 - excelled
 - excelling
 - excels
- **excellent**
 - excellent*
- **extraordinary**
 - extraordinar*
- **fantastic**
 - fantastic*
- **fun**
 - fun
- **glorious**
 - glorious*
- **good**
 - good
- **gorgeous**
 - gorgeous*
- **grand** *as in luxurious, not money*
 - grand
- **great**
 - great
- **happy**

- happi*
- happy
- **helpful**
 - helpful*
- **impressive**
 - impress*
- **incredible**
 - incredible
- **joy**
 - joy*
- **marvel**
 - marvel
 - marvelled
 - marvelling
 - marvels
- **marvellous**
 - marvellous*
- **nice**
 - nice
 - nicely
- **nifty**
 - nifty
- **optimistic**
 - optimis*
- **perfect**
 - perfect*
- **remarkable**
 - remarkab*
- **satisfying**
 - satisf*
- **sleek**
 - sleek*
- **slick**
 - slick*
- **spectacular**
 - spectacular*
- **stunning** *evaluation, not incapacitating*
 - stunning*
- **super**
 - super
- **superb**
 - superb*
- **supreme**
 - suprem*
- **ultimate** *best*

- ultimate
- **useful**
 - useful*
- **wondrous**
 - wonderful*
 - wondrous*
- **wow**
 - wow*

Appendix D: Desktop and Mobile Readership of UK National News Sites

This table presents the desktop and mobile readership of UK national news sites from three sources: the Audit Bureau of Circulations (ABC), the National Readership Survey (NRS; which became PAMCo in 2017) and Ofcom. Three sources have been used to compensate for the gaps present in each source. In the table below, a gap is represented by a dash. For every year, the quality, mid-market and tabloid news outlet with the highest circulation according to each source is highlighted in yellow. This is with the exception of when data only existed for one news outlet in a category (e.g. the *MailOnline* was the only news outlet with data from ABC in the mid-market category). Some notes should be made about the ABC data presented below. First, the ABC data platform includes figures per month but this table shows an average number for the year based on these figures. Second, the ABC only held data regarding the readership of *The Times* mobile application so this has not been included as it would not make a fair comparison with the other news outlets. Third, there were some months missing for certain news outlets in the ABC data. These were:

- *The Sun*
 - August – December 2013
 - January – June 2015
- *The Express*
 - January 2014
 - September – December 2017
- *The Star*
 - January 2014
- *The Guardian*
 - October – December 2016
- *The Independent*
 - February – December 2018

	QUALITY				MID-MARKET		TABLOID		
	<i>The Telegraph</i>	<i>The Guardian</i>	<i>The Independent</i>	<i>The Times</i>	<i>MailOnline</i>	<i>The Express</i>	<i>The Sun</i>	<i>The Mirror</i>	<i>The Star</i>
2012									
Daily average unique browsers (ABC)	2,610,262	3,706,132	746,212	-	6,163,558	-	1,544,214	762,493	-
Monthly audience estimates (NRS)	-	-	-	-	-	-	-	-	-
Percentage of respondents using source (Ofcom)	-	-	-	-	-	-	-	-	-
2013									
Daily average unique browsers (ABC)	2,987,067	4,588,566	1,242,184	-	8,674,253	-	1,777,817	1,412,017	-
Monthly audience estimates (NRS)	-	-	-	-	-	-	-	-	-
Percentage of respondents using source (Ofcom)	2	6	2	2	8	-	5	1	-
2014									
Daily average unique browsers (ABC)	3,524,970	5,760,951	1,921,352	-	11,510,215	669,530	-	3,084,621	497,879
Monthly audience estimates (NRS)	6,451,000	7,071,000	4,266,000	348,000	5,609,000	1,808,000	659,000	3,971,000	-
Percentage of respondents using source (Ofcom)	3	7	2	1	8	-	2	1	-
2015									
Daily average unique browsers (ABC)	4,335,053	7,774,890	2,613,765	-	13,842,720	1,043,793	1,270,125	4,152,991	672,955
Monthly audience estimates (NRS)	11,736,000	11,341,000	8,898,000	493,000	10,819,000	4,620,000	1,809,000	10,355,000	2,599,000
Percentage of respondents using source (Ofcom)	3	9	3	2	9	-	2	1	-
2016									

	QUALITY				MID-MARKET		TABLOID		
	<i>The Telegraph</i>	<i>The Guardian</i>	<i>The Independent</i>	<i>The Times</i>	<i>MailOnline</i>	<i>The Express</i>	<i>The Sun</i>	<i>The Mirror</i>	<i>The Star</i>
Daily average unique browsers (ABC)	4,496,986	8,988,283	3,566,526	-	14,542,474	1,492,329	2,686,648	4,894,331	798,626
Monthly audience estimates (NRS)	19,440,000	21,435,000	16,853,000	2,185,000	24,193,000	8,370,000	20,502,000	22,733,000	4,077,000
Percentage of respondents using source (Ofcom)	4	9	4	2	10	-	2	2	-
2017									
Daily average unique browsers (ABC)	4,383,802	-	5,631,744	-	14,742,724	2,027,316	4,969,101	5,191,493	963,893
Monthly audience estimates (PAMCo)	-	-	-	-	-	-	-	-	-
Percentage of respondents using source (Ofcom)	-	-	-	-	-	-	-	-	-
2018									
Daily average unique browsers (ABC)	-	-	5,026,018	-	12,510,276	-	5,122,621	-	-
Monthly audience estimates (PAMCo)	23,772,000	27,959,000	24,272,000	4,417,000	28,098,000	18,440,000	27,052,000	23,172,000	6,476,000
Percentage of respondents using source (Ofcom)	9	17	8	5	17	-	6	5	-

Sources: ABC Data hub for Digital Publications, Web, Email, Events & Social Media: filtered for national platforms, 2012-2018; NRS (2014; 2015; 2016); PAMCo (2018); Ofcom (2013; 2014; 2015; 2017; 2018).

Appendix E: List of Sampled Articles

The unique ID, date and byline of every sampled news article is shown here. In the Outlet column, S refers to articles from *The Sun*, G refers to articles from *The Guardian* and M refers to articles from *MailOnline*.

ID	Outlet	Date	Byline
1	S	28/12/15	Alison Maloney
2	S	12/01/16	Jacob Lewis
3	S	22/02/16	John Hall
4	S	24/02/16	Lila Randall
5	S	29/02/16	Rose Willis
6	S	15/05/16	The Sun
7	S	22/06/16	Hayley Richardson
8	S	05/07/16	Will Grice
9	S	30/07/16	Pokématt
10	S	03/08/16	Jasper Hamill
11	S	16/08/16	Nilima Marshall
12	S	15/09/16	Rachel Moore
13	S	19/09/16	Corey Charlton
14	S	20/09/16	Tom Towers
15	S	28/09/16	Wally Downes Jr
16	S	07/10/16	Hannah Crouch
17	S	11/10/16	Jasper Hamill
18	S	13/10/16	Will Grice
19	S	13/10/16	Alana Moorhead
20	S	25/10/16	Jasper Hamill
21	S	25/10/16	Will Grice
22	S	07/11/16	Nik O'Flynn
23	S	15/11/16	Jasper Hamill
24	S	21/11/16	Ellie Cambridge
25	S	07/12/16	Jasper Hamill
26	S	11/01/17	Samantha Loveridge
27	S	17/01/17	Margi Murphy
28	S	24/01/17	Margi Murphy
29	S	28/01/17	Alison Maloney
30	S	04/02/17	Sam Morgan
31	S	23/02/17	Margi Murphy
32	S	16/03/17	Brittany Vonow
33	S	13/04/17	Margi Murphy

ID	Outlet	Date	Byline
34	S	13/04/17	Margi Murphy
35	S	19/04/17	Tara Evans
36	S	21/04/17	Rod Chester
37	S	03/05/17	Margi Murphy
38	S	11/05/17	Jasper Hamill
39	S	18/05/17	Margi Murphy
40	S	18/05/17	Jasper Hamill
41	S	19/05/17	Andrea Downey
42	S	02/06/17	Neal Baker
43	S	05/06/17	Margi Murphy
44	S	19/06/17	Jacob Lewis
45	S	21/06/17	Holly Christodoulou
46	S	22/06/17	Martyn Landi
47	S	24/06/17	Steve Corbett
48	S	29/06/17	Margi Murphy
49	S	13/07/17	Jacob Lewis
50	S	13/07/17	Jasper Hamill
51	S	16/07/17	Laura Burnip
52	S	25/07/17	Aletha Adu
53	S	26/07/17	Fay Strang
54	S	08/08/17	Dan Cain
55	S	18/08/17	Margi Murphy
56	S	27/09/17	Dan Elsom
57	S	27/09/17	Andrea Downey
58	S	11/10/17	Daniel Jones
59	S	17/10/17	Joe Finnerty
60	S	19/10/17	Livvi Sefton
977	S	17/03/17	Dan Elsom
61	G	10/01/12	Keith Stuart
62	G	13/01/12	Nick Dunn
63	G	05/04/12	Brian Braiker
64	G	18/05/12	Duncan Jefferies
65	G	19/07/12	William Perrin
66	G	26/08/12	Mo Costandi

ID	Outlet	Date	Byline
67	G	21/01/13	Charles Arthur
68	G	11/02/13	Judy Bloxham
69	G	24/02/13	John Naughton
70	G	26/02/13	Stuart Dredge
71	G	28/02/13	Charles Arthur
72	G	01/05/13	Charles Arthur
73	G	05/05/13	John Naughton
74	G	24/05/13	Oliver Wainwright
75	G	14/10/13	Carole Cadwalladr
76	G	13/11/13	Bijan White
77	G	15/01/14	Fred Mcconnell
78	G	22/01/14	Tom Meltzer
79	G	23/01/14	Keith Stuart
80	G	29/01/14	Ian Sample
81	G	29/01/14	Daniel Freeman and Jason Freeman
82	G	10/03/14	Will Freeman
83	G	25/03/14	Jemima Kiss
84	G	26/03/14	Keith Stuart
85	G	26/03/14	Alex Hern
86	G	26/03/14	Matthew Yeomans
87	G	26/03/14	Leo Benedictus
88	G	27/03/14	Steven Poole
89	G	31/03/14	Stuart Dredge
90	G	12/05/14	Samuel Gibbs
91	G	13/05/14	Karl Woolley
92	G	22/05/14	Keith Stuart
93	G	28/05/14	Darryl Adie
94	G	02/06/14	Samuel Gibbs
95	G	19/06/14	Stuart Dredge
96	G	24/06/14	Nick Cowen
97	G	24/06/14	Stuart Dredge
98	G	22/07/14	Stuart Dredge

ID	Outlet	Date	Byline
99	G	28/07/14	Oliver Wainwright
100	G	02/08/14	Kadhim Shubber
101	G	07/08/14	Simon Parkin
102	G	28/08/14	Mike Mcgee
103	G	01/09/14	Christopher Hack
104	G	03/09/14	Alex Hern and Samuel Gibbs
105	G	04/09/14	Samuel Gibbs
106	G	23/09/14	Alex Hern
107	G	28/09/14	Shane Hickey
108	G	06/10/14	Oliver Balch
109	G	25/10/14	Ed Cumming
110	G	25/10/14	Will Coldwell
111	G	27/10/14	Anne Cassidy
112	G	29/10/14	Stuart Dredge
113	G	30/10/14	Jonathan Jones
114	G	04/11/14	Stuart Dredge
115	G	20/11/14	Keith Stuart
116	G	21/11/14	Samuel Gibbs
117	G	11/12/14	Jordan Erica Webber
118	G	24/12/14	Stuart Dredge
119	G	07/01/15	Samuel Gibbs
120	G	07/01/15	Nicola Davis
121	G	14/01/15	Stuart Dredge
122	G	15/01/15	Stuart Dredge
123	G	21/01/15	Dominic Rushe
124	G	23/01/15	Stuart Dredge
125	G	26/01/15	Keith Stuart
126	G	27/01/15	Stuart Dredge
127	G	29/01/15	Stuart Dredge
128	G	30/01/15	Dan Page
129	G	09/02/15	Stuart Dredge
130	G	18/02/15	Stuart Dredge
131	G	22/02/15	Kit Buchan
132	G	02/03/15	Keith Stuart
133	G	02/03/15	Jordan Hoffman
134	G	04/03/15	Simon Parkin
135	G	11/03/15	Edward Helmore
136	G	20/03/15	Stuart Dredge
137	G	24/03/15	Juliette Garside
138	G	24/03/15	Emily Mackay

ID	Outlet	Date	Byline
139	G	13/04/15	Keith Stuart
140	G	23/04/15	Ian Sample
141	G	27/05/15	Chris Johnston
142	G	28/05/15	Charles Arthur
143	G	11/06/15	Nicola Davis
144	G	12/06/15	Ian Tucker
145	G	19/06/15	Patrick Walker
146	G	24/06/15	Keith Stuart
147	G	03/07/15	Keith Stuart
148	G	05/07/15	Maggie Brown
149	G	09/07/15	Nicola Davis
150	G	09/07/15	Stuart Heritage
151	G	28/07/15	David Nield
152	G	04/08/15	Maev Kennedy
153	G	08/08/15	Alex Hern
154	G	13/08/15	Stuart Dredge
155	G	18/08/15	Stuart Dredge
156	G	09/09/15	Jason Kingsley Obe
157	G	24/09/15	Stuart Dredge
158	G	08/10/15	Jonathan Jones
159	G	11/10/15	Elizabeth Day
160	G	16/10/15	Stuart Dredge
161	G	20/10/15	Jasper Jackson
162	G	03/11/15	Stuart Dredge
163	G	18/11/15	Emine Saner
164	G	22/11/15	Ben Cardew
165	G	29/11/15	No Byline
166	G	03/12/15	Stuart Dredge
167	G	03/12/15	Anne Cassidy
168	G	12/12/15	Barbara Casassus
169	G	24/12/15	Keith Stuart
170	G	28/12/15	Alex Hern
171	G	31/12/15	Mark Anderson
172	G	06/01/16	Samuel Gibbs
173	G	06/01/16	Alex Hern
174	G	06/01/16	Samuel Gibbs
175	G	07/01/16	Julia Carrie Wong
176	G	07/01/16	Stuart Dredge
177	G	12/01/16	Rebecca Smithers
178	G	20/01/16	Caroline Davies
179	G	28/01/16	Lanre Bakare

ID	Outlet	Date	Byline
180	G	03/02/16	Edward Hutchinson
181	G	16/02/16	Nick Van Mead
182	G	22/02/16	Stuart Dredge
183	G	29/02/16	Alex Hern
184	G	02/03/16	Keith Stuart
185	G	02/03/16	Keith Stuart
186	G	04/03/16	Tim Lott
187	G	04/03/16	Alex Hern
188	G	06/03/16	Simon Parkin
189	G	15/03/16	Keith Stuart
190	G	16/03/16	Simon Parkin
191	G	17/03/16	Samuel Gibbs
192	G	18/03/16	Alex Needham
193	G	18/03/16	Luke Buckmaster
194	G	19/03/16	Alex Hern
195	G	19/03/16	Nicola Davis
196	G	20/03/16	James Witts
197	G	24/03/16	Keith Stuart
198	G	24/03/16	Alex Hern
199	G	25/03/16	Ben Quinn
200	G	06/04/16	Danny Yadron
201	G	07/04/16	Alex Hern
202	G	08/04/16	Olga Oksman
203	G	13/04/16	Alex Hern
204	G	14/04/16	Nicola Davis
205	G	20/04/16	Nellie Bowles
206	G	27/04/16	Caroline Davies
207	G	29/04/16	Stuart Dredge
208	G	01/05/16	Simon Parkin
209	G	05/05/16	Daniel Freeman and Jason Freeman
210	G	06/05/16	Rebecca Smithers
211	G	13/05/16	David Ingham
212	G	19/05/16	Danny Yadron
213	G	03/06/16	Brian Moylan
214	G	08/06/16	Danny Yadron
215	G	10/06/16	Alex Hern
216	G	13/06/16	Stuart Dredge
217	G	24/06/16	Kirsty Marrins
218	G	28/06/16	Heather Millar
219	G	29/06/16	Brian Moylan

ID	Outlet	Date	Byline
220	G	07/07/16	John Thorp
221	G	09/07/16	Clem Bastow
222	G	19/07/16	Hannah Ellis
223	G	19/07/16	Leigh Alexander
224	G	19/07/16	Joanna Goodman
225	G	22/07/16	Keith Stuart
226	G	24/07/16	Hannah Jane Parkinson
227	G	28/07/16	Jenny Judge
228	G	01/08/16	Olivia Solon
229	G	02/08/16	Mark Brown
230	G	04/08/16	Brian Moylan
231	G	08/08/16	Brian Wise
232	G	17/08/16	Rory Carroll
233	G	17/08/16	Samuel Gibbs
234	G	21/08/16	Olga Oksman
235	G	23/08/16	Claire Evans
236	G	24/08/16	Jessica Murphy
237	G	27/08/16	Vanessa Thorpe
238	G	31/08/16	Hannah Ellis
239	G	08/09/16	Joanna Goodman
240	G	19/09/16	Sam Thielman
241	G	23/09/16	Alex Hern
242	G	23/09/16	Julia Carrie Wong
243	G	27/09/16	Jon Card
244	G	29/09/16	Alfred Hickling
245	G	02/10/16	Simon Parkin
246	G	02/10/16	Agence France Presse
247	G	03/10/16	Samuel Gibbs
248	G	03/10/16	David Matthews
249	G	04/10/16	Francesca Panetta
250	G	07/10/16	Jose Feroso
251	G	07/10/16	Alex Hern
252	G	14/10/16	Keith Stuart and Will Freeman
253	G	21/10/16	Max Whittle
254	G	23/10/16	Simon Parkin
255	G	26/10/16	Nick Gillett
256	G	28/10/16	Rich Mceachran
257	G	02/11/16	Arwa Mahdawi
258	G	02/11/16	No Byline

ID	Outlet	Date	Byline
259	G	10/11/16	Stuart Dredge
260	G	11/11/16	Nicky Woolf
261	G	12/11/16	Dan Raile
262	G	14/11/16	Will Freeman
263	G	17/11/16	Nicola Davis
264	G	30/11/16	Hal 90210
265	G	09/12/16	Tina Amirtha
266	G	12/12/16	Chris Wilk
267	G	16/12/16	Guy Bradbury
268	G	20/12/16	Jack De Quidt
269	G	27/12/16	Alex Hern
270	G	29/12/16	Samuel Gibbs
271	G	05/01/17	Alex Hern
272	G	11/01/17	Joshua Robertson
273	G	17/01/17	Sam Thielman
274	G	01/02/17	Olivia Solon
275	G	11/02/17	Simon Parkin
276	G	14/02/17	Alex Hern
277	G	01/03/17	Jules Howard
278	G	10/03/17	Emma Sheppard
279	G	15/03/17	Mark Brown
280	G	22/03/17	Daniel Freeman and Jason Freeman
281	G	31/03/17	Alex Hern
282	G	02/04/17	Lucy Siegle
283	G	04/04/17	Oliver Holmes
284	G	09/04/17	Stuart Dredge
285	G	14/04/17	Hannah Ellis
286	G	18/04/17	Olivia Solon
287	G	21/04/17	Mark Sweney
288	G	22/04/17	Andrew Anthony
289	G	23/04/17	Associated Press
290	G	17/05/17	Dalya Alberge
291	G	26/05/17	Aliide Naylor
292	G	07/06/17	Olivia Solon
293	G	23/06/17	Naaman Zhou
294	G	27/06/17	No Byline
295	G	14/08/17	Sabrina Faramarzi
296	G	08/09/17	Xan Brooks
297	G	24/09/17	Charlie Brinkhurst

ID	Outlet	Date	Byline
298	G	06/10/17	Luke Buckmaster
299	G	07/10/17	Simon Hattenstone
300	G	08/10/17	Paul Chadwick
301	G	10/10/17	Olivia Solon
302	G	12/10/17	Olivia Solon and Agencies
303	G	25/10/17	Ben Tarnoff
304	G	28/10/17	Robin Mckie
305	G	12/11/17	Tim Adams
306	G	20/11/17	Giulia Rhodes
307	G	11/12/17	Helen Lock
308	G	13/12/17	Tim Wigmore
309	M	19/01/12	Amy Oliver
310	M	03/02/12	Rob Waugh
311	M	22/02/12	Rob Waugh
312	M	24/02/12	Jaya Narain
313	M	05/03/12	Damien Gayle
314	M	13/03/12	Eddie Wrenn
315	M	04/04/12	Tamara Cohen
316	M	06/04/12	Tamara Cohen
317	M	14/04/12	Rob Waugh
318	M	19/04/12	Rob Waugh
319	M	28/06/12	Eddie Wrenn
320	M	09/07/12	Eddie Wrenn
321	M	17/07/12	Michael Zennie
322	M	27/08/12	Daniel Bates
323	M	28/08/12	Daniel Bates
324	M	01/10/12	Daniel Bates
325	M	20/10/12	No Byline
326	M	21/11/12	Damien Gayle
327	M	19/01/13	No Byline
328	M	21/01/13	Tara Brady
329	M	30/01/13	Daily Mail Reporter
330	M	19/02/13	Mark Prigg
331	M	28/02/13	Damien Gayle
332	M	28/02/13	No Byline
333	M	18/03/13	Tom Leonard
334	M	22/03/13	James Nye
335	M	25/03/13	Fiona Keating
336	M	09/04/13	Mark Prigg
337	M	16/04/13	Mark Prigg
338	M	17/04/13	Mark Prigg

ID	Outlet	Date	Byline
339	M	18/04/13	Mark Prigg
340	M	24/04/13	Mark Prigg
341	M	24/05/13	Victoria Woollaston
342	M	01/06/13	Daily Mail Reporter
343	M	02/06/13	Daily Mail Reporter
344	M	19/06/13	Victoria Woollaston
345	M	05/07/13	Talal Musa
346	M	06/09/13	Sarah Griffiths
347	M	30/09/13	Victoria Woollaston
348	M	15/10/13	Victoria Woollaston
349	M	14/11/13	Daily Mail Reporter
350	M	03/01/14	Ellie Zolfagharifard
351	M	07/01/14	Victoria Woollaston
352	M	21/01/14	Victoria Woollaston
353	M	22/01/14	Victoria Woollaston
354	M	24/01/14	Mark Prigg
355	M	10/02/14	Victoria Woollaston
356	M	21/02/14	Mark Prigg
357	M	26/02/14	Victoria Woollaston
358	M	07/03/14	Victoria Woollaston
359	M	09/03/14	Nik Simon
360	M	10/03/14	Ellie Zolfagharifard
361	M	19/03/14	Victoria Woollaston
362	M	20/03/14	Associated Press
363	M	25/03/14	Mark Prigg
364	M	26/03/14	Victoria Woollaston
365	M	27/03/14	Associated Press
366	M	03/04/14	Mark Prigg
367	M	19/04/14	Jonathan Block
368	M	23/04/14	Mark Prigg
369	M	29/04/14	Jonathan O'Callaghan
370	M	01/05/14	Victoria Woollaston
371	M	06/05/14	Victoria Woollaston

ID	Outlet	Date	Byline
372	M	08/05/14	Ellie Zolfagharifard
373	M	15/05/14	Mark Prigg
374	M	21/05/14	Victoria Woollaston
375	M	23/05/14	Victoria Woollaston
376	M	27/05/14	Mark Prigg
377	M	27/05/14	Mark Prigg
378	M	27/05/14	Australian Associated Press
379	M	29/05/14	Mark Prigg
380	M	03/06/14	Ellie Zolfagharifard
381	M	04/06/14	Victoria Woollaston
382	M	04/06/14	Sarah Griffiths
383	M	12/06/14	Associated Press
384	M	12/06/14	Sarah Griffiths
385	M	25/06/14	No Byline
386	M	02/07/14	Sarah Griffiths
387	M	09/07/14	Mark Prigg
388	M	17/07/14	Mark Prigg
389	M	21/07/14	Jonathan O'Callaghan
390	M	22/07/14	Associated Press
391	M	03/08/14	Sam Webb
392	M	05/08/14	Jonathan O'Callaghan
393	M	05/08/14	Victoria Woollaston
394	M	09/08/14	Paul Donnelley
395	M	26/08/14	Sarah Griffiths
396	M	02/09/14	Anucyia Victor
397	M	03/09/14	Mark Prigg
398	M	05/09/14	Mark Prigg
399	M	12/09/14	Victoria Woollaston
400	M	13/09/14	India Sturgis
401	M	17/09/14	Jonathan O'Callaghan
402	M	17/09/14	Jonathan O'Callaghan
403	M	19/09/14	India Sturgis
404	M	22/09/14	Victoria Woollaston
405	M	23/09/14	Reuters
406	M	02/10/14	Katie Amey

ID	Outlet	Date	Byline
407	M	14/10/14	Associated Press
408	M	14/10/14	Sarah Griffiths
409	M	15/10/14	Ellie Zolfagharifard
410	M	17/10/14	Jonathan O'Callaghan
411	M	21/10/14	Sarah Griffiths and Mark Prigg
412	M	22/10/14	Mark Prigg
413	M	27/10/14	Sarah Griffiths
414	M	03/11/14	Mark Prigg
415	M	05/11/14	Mark Prigg
416	M	13/11/14	Mark Prigg
417	M	17/11/14	Sarah Griffiths
418	M	19/11/14	Sarah Griffiths
419	M	20/11/14	Victoria Woollaston
420	M	20/11/14	Sarah Griffiths
421	M	21/11/14	Marc Shoffman
422	M	25/11/14	Victoria Woollaston
423	M	26/11/14	Victoria Woollaston
424	M	28/11/14	Victoria Woollaston
425	M	08/12/14	Olivia Foster
426	M	08/12/14	Mark Prigg
427	M	22/12/14	Mark Prigg
428	M	26/12/14	Mark Prigg
429	M	31/12/14	Rachel Reilly and Mark Prigg
430	M	02/01/15	Jonathan O'Callaghan
431	M	08/01/15	Anucyia Victor
432	M	09/01/15	Agence France Presse
433	M	10/01/15	Associated Press
434	M	16/01/15	Victoria Woollaston
435	M	19/01/15	Sarah Griffiths and Mark Prigg
436	M	20/01/15	Naomi Greenaway
437	M	21/01/15	India Sturgis
438	M	22/01/15	Sarah Griffiths
439	M	23/01/15	Reuters
440	M	23/01/15	Associated Press
441	M	25/01/15	Agence France Presse

ID	Outlet	Date	Byline
442	M	26/01/15	Reuters and Mark Prigg
443	M	29/01/15	Sarah Griffiths
444	M	29/01/15	Mark Prigg
445	M	06/02/15	Sarah Griffiths
446	M	07/02/15	Laurie Hanna
447	M	13/02/15	Sarah Griffiths
448	M	17/02/15	Mark Prigg
449	M	17/02/15	Victoria Woollaston
450	M	19/02/15	Victoria Woollaston
451	M	21/02/15	Mark Prigg
452	M	21/02/15	Ellie Zolfagharifard, Mark Prigg and Sarah Griffiths
453	M	26/02/15	Victoria Woollaston
454	M	01/03/15	Victoria Woollaston
455	M	04/03/15	Associated Press
456	M	05/03/15	Agence France Presse
457	M	12/03/15	Victoria Woollaston
458	M	13/03/15	Sarah Griffiths
459	M	14/03/15	Sarah Carty
460	M	19/03/15	Ellie Zolfagharifard
461	M	20/03/15	Australian Associated Press
462	M	08/04/15	Mark Prigg
463	M	10/04/15	Sarah Griffiths
464	M	16/04/15	Victoria Woollaston
465	M	20/04/15	Katie Amey
466	M	21/04/15	Richard Gray
467	M	22/04/15	John Hutchinson
468	M	23/04/15	Victoria Woollaston
469	M	24/04/15	Ellie Zolfagharifard
470	M	01/05/15	Richard Gray
471	M	01/05/15	Lucy-Mae Beers
472	M	06/05/15	Mark Prigg
473	M	07/05/15	Jonathan O'Callaghan
474	M	07/05/15	Mark Prigg
475	M	08/05/15	Reuters

ID	Outlet	Date	Byline
476	M	10/05/15	Thomas Burrows and Press Association
477	M	12/05/15	Javed Anwer
478	M	14/05/15	Victoria Woollaston
479	M	15/05/15	Victoria Woollaston
480	M	15/05/15	Victoria Woollaston
481	M	19/05/15	Sean Williams
482	M	19/05/15	Richard Gray
483	M	19/05/15	Associated Press
484	M	25/05/15	Daily Mail Reporter
485	M	27/05/15	Mark Prigg
486	M	28/05/15	Mark Prigg
487	M	29/05/15	Reuters
488	M	05/06/15	Becky Pemberton
489	M	09/06/15	Reuters
490	M	10/06/15	Sarah Griffiths
491	M	11/06/15	Mark Prigg
492	M	12/06/15	Imogen Calderwood
493	M	12/06/15	Mark Prigg
494	M	12/06/15	Sarah Griffiths
495	M	15/06/15	Dan Bates
496	M	15/06/15	Mark Prigg
497	M	17/06/15	Agence France Presse
498	M	17/06/15	Reuters
499	M	19/06/15	Sam Creighton and Sarah Griffiths
500	M	25/06/15	Mark Prigg
501	M	29/06/15	Reuters
502	M	30/06/15	Mark Prigg
503	M	02/07/15	Victoria Woollaston
504	M	02/07/15	Erin Van Der Meer
505	M	10/07/15	Victoria Woollaston
506	M	24/07/15	Jack Millner
507	M	29/07/15	Mark Prigg
508	M	31/07/15	Reuters
509	M	12/08/15	Richard Gray
510	M	27/08/15	Associated Press

ID	Outlet	Date	Byline
511	M	31/08/15	Victoria Woollaston
512	M	31/08/15	Mark Prigg
513	M	06/09/15	Christopher Brennan
514	M	11/09/15	Reuters
515	M	18/09/15	Victoria Woollaston
516	M	23/09/15	Mark Prigg
517	M	23/09/15	Sarah Griffiths
518	M	24/09/15	Agence France Presse
519	M	25/09/15	Mark Prigg
520	M	27/09/15	Alexandra Klausner
521	M	05/10/15	Myriah Towner
522	M	05/10/15	Sarah Griffiths
523	M	08/10/15	Reuters
524	M	09/10/15	Jake Polden
525	M	21/10/15	Victoria Woollaston
526	M	28/10/15	Sam Spettigue
527	M	04/11/15	Gian Volpicelli
528	M	05/11/15	Reuters
529	M	12/11/15	Sarah Griffiths
530	M	13/11/15	Anna-Lou Weatherley
531	M	18/11/15	Associated Press
532	M	20/11/15	Richard Gray
533	M	20/11/15	Associated Press
534	M	23/11/15	Agence France Presse
535	M	25/11/15	Gian Volpicelli
536	M	03/12/15	Mark Prigg
537	M	05/12/15	Associated Press
538	M	11/12/15	Belinda Cleary
539	M	15/12/15	Hannah Parry
540	M	23/12/15	Associated Press
541	M	27/12/15	Daily Mail Reporter
542	M	04/01/16	Mark Prigg
543	M	04/01/16	Sean Poulter
544	M	05/01/16	Ellie Zolfagharifard
545	M	06/01/16	Mark Prigg
546	M	06/01/16	Mark Prigg
547	M	06/01/16	Francis Scott

ID	Outlet	Date	Byline
548	M	06/01/16	Stacy Liberatore
549	M	07/01/16	Regina F. Graham
550	M	07/01/16	Ellie Zolfagharifard
551	M	08/01/16	Victoria Woollaston
552	M	08/01/16	Agence France Presse
553	M	08/01/16	Eleanor Lawrie
554	M	11/01/16	Victoria Woollaston
555	M	12/01/16	Victoria Woollaston
556	M	13/01/16	Victoria Woollaston
557	M	15/01/16	Ryan O'Hare
558	M	15/01/16	Mark Prigg
559	M	20/01/16	Rebecca English and Katie Louise Davies
560	M	21/01/16	Agence France Presse
561	M	21/01/16	Stacy Liberatore
562	M	22/01/16	Ryan O'Hare
563	M	22/01/16	Mark Prigg
564	M	22/01/16	Cheyenne Macdonald
565	M	26/01/16	Stacy Liberatore
566	M	26/01/16	Mark Prigg
567	M	29/01/16	Mark Prigg
568	M	03/02/16	Stacy Liberatore
569	M	08/02/16	Ryan O'Hare
570	M	10/02/16	Associated Press
571	M	12/02/16	Mark Prigg
572	M	12/02/16	Harriet Mallinson
573	M	15/02/16	Bobbie Whiteman
574	M	15/02/16	Victoria Woollaston
575	M	17/02/16	Reuters
576	M	17/02/16	Sarah Griffiths
577	M	18/02/16	Victoria Woollaston
578	M	18/02/16	Agence France Presse
579	M	19/02/16	Stacy Liberatore
580	M	20/02/16	Mark Duell
581	M	21/02/16	Sarah Griffiths and Victoria Woollaston

ID	Outlet	Date	Byline
582	M	22/02/16	Ellie Zolfagharifard and James Smith
583	M	24/02/16	Chris Kitching
584	M	29/02/16	Stacy Liberatore
585	M	29/02/16	Stacy Liberatore
586	M	29/02/16	Victoria Woollaston
587	M	02/03/16	Victoria Woollaston
588	M	02/03/16	Abigail Beall
589	M	02/03/16	Stacy Liberatore
590	M	03/03/16	Cheyenne Macdonald
591	M	03/03/16	Abigail Beall
592	M	04/03/16	Lydia Willgress
593	M	07/03/16	Lee Bell
594	M	10/03/16	Associated Press
595	M	11/03/16	Associated Press
596	M	11/03/16	Associated Press
597	M	14/03/16	Tom Wyke
598	M	14/03/16	Associated Press
599	M	15/03/16	Mark Prigg
600	M	15/03/16	Associated Press
601	M	15/03/16	Associated Press
602	M	15/03/16	Associated Press
603	M	15/03/16	Sarah Griffiths
604	M	16/03/16	Mark Prigg
605	M	16/03/16	Ryan O'Hare
606	M	17/03/16	Cheyenne Macdonald
607	M	17/03/16	Agence France Presse
608	M	17/03/16	Associated Press
609	M	18/03/16	Associated Press
610	M	24/03/16	Sarah Griffiths
611	M	24/03/16	Associated Press
612	M	24/03/16	Associated Press
613	M	24/03/16	Stacy Liberatore and Agence France Presse
614	M	25/03/16	Kate Pickles

ID	Outlet	Date	Byline
615	M	25/03/16	Mark Prigg
616	M	28/03/16	Cheyenne Macdonald
617	M	28/03/16	Victoria Woollaston
618	M	29/03/16	Harriet Mallinson
619	M	30/03/16	Agence France Presse
620	M	30/03/16	Ellie Zolfagharifard
621	M	31/03/16	Sarah Griffiths
622	M	31/03/16	Harriet Mallinson
623	M	31/03/16	Associated Press
624	M	01/04/16	Associated Press
625	M	04/04/16	Ryan O'Hare
626	M	05/04/16	Stacy Liberatore
627	M	05/04/16	Stacy Liberatore
628	M	06/04/16	Ellie Zolfagharifard
629	M	13/04/16	Victoria Woollaston
630	M	14/04/16	Sarah Pusateri and Stacy Liberatore
631	M	14/04/16	Associated Press
632	M	15/04/16	Victoria Woollaston
633	M	15/04/16	Associated Press
634	M	18/04/16	Associated Press
635	M	19/04/16	Cheyenne Macdonald
636	M	19/04/16	Ollie Gillman
637	M	19/04/16	Sarah Griffiths
638	M	20/04/16	Victoria Woollaston
639	M	21/04/16	Ryan O'Hare
640	M	22/04/16	Alexander Robertson
641	M	22/04/16	Millie Thwaites
642	M	23/04/16	Associated Press
643	M	29/04/16	Cheyenne Macdonald
644	M	29/04/16	Associated Press
645	M	02/05/16	Joseph Curtis and Emma Glanfield
646	M	03/05/16	Ryan O'Hare

ID	Outlet	Date	Byline
647	M	03/05/16	Jinan Harb
648	M	04/05/16	Simon Tomlinson
649	M	04/05/16	Stacy Liberatore
650	M	05/05/16	Associated Press
651	M	05/05/16	Sarah Griffiths
652	M	05/05/16	Abigail Beall
653	M	10/05/16	Javed Anwer
654	M	11/05/16	Victoria Woollaston
655	M	11/05/16	Ryan O'Hare
656	M	11/05/16	Associated Press
657	M	13/05/16	Mark Prigg
658	M	17/05/16	Mark Prigg
659	M	17/05/16	Reuters
660	M	18/05/16	Mark Prigg
661	M	18/05/16	Reuters
662	M	19/05/16	Associated Press
663	M	19/05/16	Associated Press
664	M	20/05/16	Shivali Best
665	M	23/05/16	Reuters
666	M	27/05/16	Associated Press
667	M	01/06/16	Abigail Beall
668	M	03/06/16	Mark Prigg
669	M	06/06/16	Richard Gray
670	M	06/06/16	James Gordon
671	M	08/06/16	Harriet Mallinson
672	M	08/06/16	Ryan O'Hare
673	M	10/06/16	Chris Kitching
674	M	11/06/16	Associated Press
675	M	14/06/16	Shivali Best
676	M	15/06/16	Reuters
677	M	15/06/16	Jake Polden
678	M	16/06/16	Cheyenne Macdonald
679	M	16/06/16	Agence France Presse
680	M	19/06/16	Associated Press
681	M	27/06/16	Siofra Brennan
682	M	29/06/16	Stacy Liberatore
683	M	29/06/16	Associated Press

ID	Outlet	Date	Byline
684	M	30/06/16	Associated Press
685	M	01/07/16	Stacy Liberatore
686	M	04/07/16	Gareth Davies
687	M	05/07/16	John Carney
688	M	08/07/16	Kristy Johnson
689	M	08/07/16	Stacy Liberatore
690	M	12/07/16	Agence France Presse
691	M	12/07/16	Reuters
692	M	13/07/16	Associated Press
693	M	17/07/16	Daily Mail Reporter
694	M	18/07/16	Lucy Morris
695	M	18/07/16	Ryan O'Hare
696	M	21/07/16	Associated Press
697	M	21/07/16	Mailonline Reporter
698	M	23/07/16	Marc Shoffman
699	M	25/07/16	Richard Gray
700	M	27/07/16	Shivali Best
701	M	27/07/16	Stacy Liberatore
702	M	29/07/16	Agence France Presse
703	M	03/08/16	Sarah Griffiths
704	M	04/08/16	Shivali Best
705	M	04/08/16	Shivali Best
706	M	08/08/16	Richard Gray
707	M	09/08/16	Associated Press
708	M	09/08/16	Roger Dobson
709	M	11/08/16	Associated Press
710	M	11/08/16	Emily Chan
711	M	13/08/16	Ned Donovan
712	M	16/08/16	Ryan O'Hare
713	M	17/08/16	Mark Prigg
714	M	17/08/16	Ryan O'Hare
715	M	18/08/16	Reuters
716	M	25/08/16	Associated Press
717	M	26/08/16	Associated Press and Stacy Liberatore
718	M	26/08/16	Mehzeb Chowdhury
719	M	05/09/16	Associated Press

ID	Outlet	Date	Byline
720	M	06/09/16	Libby Plummer
721	M	06/09/16	Libby Plummer
722	M	09/09/16	Jeffrey Ferguson
723	M	13/09/16	Associated Press
724	M	15/09/16	Libby Plummer
725	M	15/09/16	Reuters
726	M	16/09/16	Associated Press
727	M	19/09/16	Abigail Beall
728	M	20/09/16	Libby Plummer
729	M	21/09/16	Rachael Burford
730	M	28/09/16	Jack Gaughan
731	M	29/09/16	Associated Press
732	M	29/09/16	Associated Press
733	M	30/09/16	Francis Scott
734	M	02/10/16	Allan Hall
735	M	03/10/16	Shivali Best
736	M	05/10/16	Associated Press
737	M	06/10/16	Mark Prigg
738	M	11/10/16	Stacy Liberatore
739	M	12/10/16	Colin Fernandez
740	M	12/10/16	Reuters
741	M	12/10/16	Shivali Best
742	M	12/10/16	Libby Plummer and Ryan O'Hare
743	M	12/10/16	Ryan O'Hare
744	M	14/10/16	Cheyenne Macdonald and Reuters
745	M	19/10/16	Agence France Presse
746	M	20/10/16	Tom Bassam
747	M	25/10/16	Abigail Beall
748	M	26/10/16	Daily Mail Reporter
749	M	27/10/16	Ryan O'Hare
750	M	28/10/16	Daily Mail Reporter
751	M	28/10/16	Associated Press
752	M	04/11/16	Ryan O'Hare
753	M	09/11/16	Richard Gray
754	M	10/11/16	Mark Prigg
755	M	11/11/16	Jessica Duncan

ID	Outlet	Date	Byline
756	M	13/11/16	Emily Chan
757	M	15/11/16	Reuters and Shivali Best
758	M	15/11/16	Shivali Best
759	M	18/11/16	Harry Pettit
760	M	18/11/16	Associated Press
761	M	18/11/16	Abigail Beall
762	M	21/11/16	Reuters
763	M	21/11/16	Charlie Moore
764	M	21/11/16	Stephen Matthews
765	M	22/11/16	Cheyenne Macdonald
766	M	22/11/16	Ryan O'Hare
767	M	23/11/16	Mark Prigg
768	M	25/11/16	Ryan O'Hare
769	M	25/11/16	Ted Thornhill
770	M	27/11/16	Jonathan Petre
771	M	28/11/16	Ryan O'Hare and Press Association
772	M	05/12/16	Ollie Gillman
773	M	06/12/16	Libby Plummer
774	M	06/12/16	MailOnline Reporter
775	M	07/12/16	Abigail Beall and Harry Pettit
776	M	07/12/16	Ryan O'Hare
777	M	08/12/16	Libby Plummer
778	M	13/12/16	Reuters
779	M	13/12/16	Libby Plummer
780	M	13/12/16	Reuters
781	M	19/12/16	Shivali Best
782	M	19/12/16	Daily Mail Australia Reporter
783	M	21/12/16	Matthew Smith
784	M	26/12/16	Daily Mail Reporter
785	M	27/12/16	Daily Mail Reporter
786	M	30/12/16	Stacy Liberatore and Shivali Best
787	M	04/01/17	Cheyenne Macdonald
788	M	05/01/17	Harry Pettit
789	M	06/01/17	Reuters
790	M	06/01/17	Cheyenne Macdonald

ID	Outlet	Date	Byline
791	M	07/01/17	Agence France Presse
792	M	08/01/17	Ben Ellery
793	M	10/01/17	Mark Prigg
794	M	10/01/17	Stacy Liberatore
795	M	10/01/17	Shivali Best
796	M	12/01/17	Associated Press
797	M	17/01/17	Hannah Parry
798	M	18/01/17	Shivali Best
799	M	19/01/17	Vanessa Chalmers
800	M	19/01/17	Shivali Best
801	M	23/01/17	Harriet Mallinson
802	M	23/01/17	Press Association
803	M	23/01/17	Reuters
804	M	24/01/17	Agence France Presse
805	M	24/01/17	Mark Prigg
806	M	31/01/17	Cheyenne Roundtree
807	M	01/02/17	Reuters
808	M	01/02/17	Reuters
809	M	02/02/17	Stacy Liberatore
810	M	02/02/17	Cheyenne Macdonald
811	M	06/02/17	Mark Prigg
812	M	10/02/17	Harry Pettit
813	M	13/02/17	Mark Prigg and Phoebe Weston
814	M	14/02/17	Phoebe Weston
815	M	15/02/17	Annabel Fenwick Elliott
816	M	20/02/17	Reuters
817	M	20/02/17	Associated Press
818	M	20/02/17	Shivali Best
819	M	24/02/17	Mark Prigg and Reuters
820	M	27/02/17	Trudy Barber
821	M	27/02/17	Daisy Dunne
822	M	28/02/17	Stacy Liberatore
823	M	01/03/17	Mark Prigg
824	M	06/03/17	Phoebe Weston
825	M	07/03/17	Harry Pettit
826	M	10/03/17	Amitai Winehouse
827	M	16/03/17	Mark Duell

ID	Outlet	Date	Byline
828	M	17/03/17	Associated Press
829	M	19/03/17	Associated Press
830	M	20/03/17	Phoebe Weston
831	M	20/03/17	Stacy Liberatore
832	M	21/03/17	Tim Collins
833	M	21/03/17	Reuters
834	M	24/03/17	Cheyenne Macdonald
835	M	29/03/17	Harry Pettit
836	M	30/03/17	Will Griffiee
837	M	31/03/17	Agence France Presse and Tim Collins
838	M	31/03/17	Stacy Liberatore
839	M	06/04/17	Phoebe Weston
840	M	13/04/17	Shivali Best
841	M	13/04/17	Tim Collins
842	M	13/04/17	Harry Pettit
843	M	17/04/17	Cecile Borkhataria
844	M	18/04/17	Sian Boyle
845	M	18/04/17	Mark Prigg
846	M	19/04/17	Daisy Dunne
847	M	19/04/17	Alex Matthews
848	M	20/04/17	Phoebe Weston
849	M	20/04/17	Daisy Dunne
850	M	21/04/17	Reuters and Stacy Liberatore
851	M	21/04/17	Daisy Dunne
852	M	23/04/17	Associated Press
853	M	25/04/17	Associated Press
854	M	25/04/17	Stacy Liberatore
855	M	27/04/17	Associated Press
856	M	28/04/17	Agence France Presse
857	M	28/04/17	Mary Kekatos
858	M	05/05/17	Stacy Liberatore
859	M	09/05/17	Cecile Borkhataria
860	M	11/05/17	Phoebe Weston
861	M	11/05/17	Agence France Presse
862	M	12/05/17	Mark Prigg
863	M	16/05/17	Reuters and Tim Collins

ID	Outlet	Date	Byline
864	M	16/05/17	Stacy Liberatore
865	M	16/05/17	Phoebe Weston
866	M	16/05/17	Shivali Best
867	M	18/05/17	Harry Pettit
868	M	18/05/17	Tim Collins
869	M	19/05/17	Colin Fernandez and Phoebe Weston
870	M	19/05/17	Associated Press
871	M	22/05/17	Associated Press
872	M	22/05/17	Stacy Liberatore
873	M	22/05/17	Agence France Presse
874	M	24/05/17	Cecile Borkhataria
875	M	26/05/17	Mark Prigg
876	M	26/05/17	Agence France Presse and Tim Collins
877	M	01/06/17	Daily Mail Reporter
878	M	04/06/17	Naomi Ackerman
879	M	06/06/17	Reuters
880	M	07/06/17	Reuters
881	M	09/06/17	Stacy Liberatore
882	M	12/06/17	Stacy Liberatore
883	M	14/06/17	Stephen Matthews
884	M	15/06/17	Agence France Presse
885	M	16/06/17	Mark Prigg
886	M	16/06/17	Stephanie Linning
887	M	18/06/17	Alice Hart-Davis
888	M	22/06/17	Cheyenne Macdonald
889	M	22/06/17	City & Finance Reporter
890	M	22/06/17	Tim Collins
891	M	23/06/17	April Glover
892	M	27/06/17	Daisy Dunne
893	M	27/06/17	Lee Boyce
894	M	29/06/17	Agence France Presse
895	M	30/06/17	Joe Sheppard
896	M	08/07/17	Anthea Gerrie
897	M	10/07/17	Reuters
898	M	10/07/17	Associated Press

ID	Outlet	Date	Byline
899	M	13/07/17	Mark Prigg
900	M	13/07/17	Daily Mail Reporter
901	M	14/07/17	Katie Amey
902	M	16/07/17	Luke Barnes
903	M	17/07/17	Tim Collins
904	M	18/07/17	Agence France Presse
905	M	18/07/17	Agence France Presse
906	M	22/07/17	Agence France Presse
907	M	22/07/17	Susan and Simon Veness
908	M	24/07/17	Sage Lazzaro
909	M	26/07/17	Tim Collins
910	M	27/07/17	Annabel Fenwick Elliott
911	M	28/07/17	Agence France Presse and Shivali Best
912	M	28/07/17	Sage Lazzaro
913	M	31/07/17	Matthew Wright
914	M	03/08/17	Sage Lazzaro
915	M	05/08/17	Joanne Hart
916	M	09/08/17	Sage Lazzaro
917	M	15/08/17	Sage Lazzaro
918	M	18/08/17	City & Finance Reporter
919	M	21/08/17	Sage Lazzaro
920	M	23/08/17	Sage Lazzaro
921	M	23/08/17	MailOnline India and Agence France Presse
922	M	29/08/17	Mark Prigg
923	M	29/08/17	Mark Prigg
924	M	29/08/17	Rosie Taylor
925	M	29/08/17	Rosie Taylor
926	M	31/08/17	Sage Lazzaro
927	M	01/09/17	Reuters
928	M	06/09/17	Stephen Matthews
929	M	07/09/17	Reuters
930	M	14/09/17	Associated Press
931	M	15/09/17	Charlie Lankston
932	M	15/09/17	Reuters
933	M	21/09/17	Laura House
934	M	22/09/17	Reuters

ID	Outlet	Date	Byline
935	M	22/09/17	Reuters
936	M	26/09/17	Phoebe Weston
937	M	26/09/17	Tim Collins
938	M	01/10/17	Associated Press
939	M	03/10/17	Associated Press
940	M	05/10/17	City & Finance Reporter
941	M	10/10/17	Tim Collins
942	M	10/10/17	Reuters
943	M	11/10/17	Mark Prigg
944	M	12/10/17	Reuters
945	M	12/10/17	Shivali Best
946	M	13/10/17	Harry Pettit
947	M	16/10/17	Phoebe Weston
948	M	17/10/17	Associated Press
949	M	17/10/17	Reuters
950	M	17/10/17	Reuters
951	M	23/10/17	Mark Prigg
952	M	24/10/17	Claudia Tanner
953	M	24/10/17	Alexandra Thompson
954	M	27/10/17	Agence France Presse
955	M	27/10/17	Claire Heffron
956	M	28/10/17	Rob Waugh
957	M	03/11/17	Jessa Schroeder
958	M	07/11/17	Cecile Borkhataria
959	M	07/11/17	Reuters
960	M	08/11/17	Mark Prigg
961	M	08/11/17	Mark Prigg
962	M	15/11/17	Mark Prigg
963	M	21/11/17	Cheyenne Macdonald
964	M	23/11/17	Mark Prigg
965	M	24/11/17	Mark Prigg
966	M	24/11/17	Tim Collins
967	M	24/11/17	Reuters
968	M	24/11/17	Reuters
969	M	28/11/17	Harry Pettit
970	M	30/11/17	Press Association
971	M	10/12/17	Anna Maxted
972	M	12/12/17	Joe Pinkstone
973	M	13/12/17	Reuters

ID	Outlet	Date	Byline
974	M	20/12/17	Cheyenne Macdonald
975	M	22/12/17	Sebastian Murphy-Bates
976	M	30/12/17	Jamie Nimmo

Appendix F: List of Marketing Materials

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
GVR01	Gear VR	Website	Video	Gear VR Samsung website 1st 07-09-2014	Video of entire website v1	07/09/2014	Link
GVR02	Gear VR	Website	Ncapture	Oculus Gear VR 10-12-2014	Page for Gear VR on Oculus' website v1	10/12/2014	Link
GVR03	Gear VR	Video	Ncapture	Gear VR Demonstration - YouTube 2015-01-22	Video advert	22/01/2015	Link
GVR04	Gear VR	Video	Ncapture	Gear VR -- First Look - YouTube 2015-01-28	Video advert	28/01/2015	Link
GVR05	Gear VR	Website	Ncapture	Oculus Gear VR 06-09-15	Page for Gear VR on Oculus' website v2	06/09/2015	Link
GVR06	Gear VR	Website	Ncapture	Gear VR 27-11-15 Powered by Oculus ~ Oculus	Page for Gear VR on Oculus' website v2 (updated)	27/11/2015	Link
GVR09	Gear VR	TV Ad	Ncapture	Samsung Gear VR Commercial #3 - YouTube 2016-01-25	Video advert	25/01/2016	Link
GVR08	Gear VR	TV Ad	Ncapture	Samsung Gear VR Commercial #2 - YouTube 2016-01-25	Video advert	25/01/2016	Link
GVR07	Gear VR	TV Ad	Ncapture	Samsung Gear VR Commercial #1 - YouTube 2016-01-25	Video advert	25/01/2016	Link
GVR10a	Gear VR	Website	Ncapture	2nd site first version 2016-08-04	Second version of Gear VR website (Samsung)	04/08/2016	Link
GVR10b	Gear VR	Website	Video	Gear VR Samsung website 2nd 04-08-16	Second version of Gear VR website (Samsung)	04/08/2016	Link
GVR11	Gear VR	Video	Ncapture	Samsung Galaxy~ All the Feels - YouTube 2016-09-08	Video advert	08/09/2016	Link
GVR12	Gear VR	Video	Ncapture	Samsung Galaxy~ Unwrap The Feels - YouTube 2016-11-22	Video advert	22/11/2016	Link
GVR13	Gear VR	Website	Video	Oculus website Gear VR 14-02-17	Page for Gear VR on Oculus' website v3	14/02/2017	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
GVR14	Gear VR	Video	Ncapture	Samsung Official TVC - Ostrich - YouTube 29-03-17 2019-09-26 10_53_03Z	Video advert	29/03/2017	Link
GVR15a	Gear VR	Website	Ncapture	Samsung Gear VR with Controller - The Official Samsung Galaxy Site 30-03-17	Second version of Gear VR website (Samsung, updated)	30/03/2017	Link
GVR15b	Gear VR	Website	Video	2nd website v2 30-03-17	Second version of Gear VR website (Samsung, updated)	30/03/2017	Link
GVR16	Gear VR	Website	Ncapture	Gear VR 15-04-17 Powered by Oculus ~ Oculus	Updated version of Gear VR page on Oculus' website	15/04/2017	Link
GVR17	Gear VR	Website	Image	Changed picture 2nd site 19-04-17	New picture on Samsung Gear VR website	19/04/2017	N/A
GVR18a	Gear VR	Website	Ncapture	2nd website v3 2017-08-24	Latest version of Gear VR website	24/08/2017	Link
GVR18b	Gear VR	Website	Video	GearVR Website 2nd v3 24-08-17	Latest version of Gear VR website	24/08/2017	Link
GVR19	Gear VR	Video	Ncapture	The All New Samsung Gear VR Headset ~ Mobile Virtual Reality Headset - Samsung Commercial Ad - YouTube 2017-12-03	Video advert	03/12/2017	Link
GVR20	Gear VR	Facebook	PDF	#gearvr – Facebook Search 2014-2017	Facebook search results for #GearVR (the hashtag used by Samsung) from Samsung Global (the page linked to by the Gear VR site)	2014-2017	N/A
GVR21	Gear VR	Facebook	PDF	Search for Gear VR on Oculus FB - Posts	Search results on Oculus' page for "Gear VR"	2014-2017	N/A
GVR23	Gear VR	Twitter	PDF	#GearVR from_SamsungMobile since_2012-01-01 until_2017-12-31 (-filter_replies) - Twitter Search	All tweets from Samsung Mobile Twitter page with #GearVR hashtag	2014-2017	N/A

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
GVR25	Gear VR	Video	Video	Video from Twitter post 14-12-15	Video from Twitter post 14-12-15	14/12/2015	Link
GG01	Google Glass	Website	PDF	Google What It Does 23-02-13	Screenshot of What It Does page	23/02/2013	Link
GG02	Google Glass	Video	Ncapture	Explorer Story~ Andrew Vanden Heuvel [through Google Glass] - YouTube	Explorer Story video shown on How it Feels page	03/05/2013	Link
GG03	Google Glass	Video	Ncapture	Explorer Story~ Bethanie Mattek-Sands [through Google Glass] - YouTube	Explorer Story video shown on How it Feels page	24/06/2013	Link
GG04	Google Glass	Video	Ncapture	Explorer Story~ Alex Blaszcuk [through Google Glass] - YouTube	Explorer Story video shown on How it Feels page	07/08/2013	Link
GG05	Google Glass	Video	Ncapture	Explorer Story~ Young Guru [through Google Glass] - YouTube	Explorer Story video shown on How it Feels page	11/11/2013	Link
GG06a	Google Glass	Website	Image	Glass homepage 13-11-13a	1 of 3 screenshots of first version of homepage	13/11/2013	Link
GG06b	Google Glass	Website	Image	Glass homepage 13-11-13b	2 of 3 screenshots of first version of homepage	13/11/2013	Link
GG06c	Google Glass	Website	Image	Glass homepage 13-11-13c	3 of 3 screenshots of first version of homepage	13/11/2013	Link
GG07a	Google Glass	Website	Image	Glass homepage 20-11-13a	1 of 5 screenshots of updated homepage	20/11/2013	Link
GG07b	Google Glass	Website	Image	Glass homepage 20-11-13b	2 of 5 screenshots of updated homepage	20/11/2013	Link
GG07c	Google Glass	Website	Image	Glass homepage 20-11-13c	3 of 5 screenshots of updated homepage	20/11/2013	Link
GG07d	Google Glass	Website	Image	Glass homepage 20-11-13d	4 of 5 screenshots of updated homepage	20/11/2013	Link
GG07e	Google Glass	Website	Image	Glass homepage 20-11-13e	5 of 5 screenshots of updated homepage	20/11/2013	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
GG08	Google Glass	Website	Image	Glass how it feels 25-11-13	Screenshot of How it Feels page	25/11/2013	Link
GG09	Google Glass	Video	Ncapture	How it Feels through Google Glass - YouTube	Video shown as main content on homepage	25/11/2013	Link
GG10	Google Glass	Video	Ncapture	Explorer Story~ Patrick Jackson [through Google Glass] - YouTube	Explorer Story video shown on How it Feels page	20/01/2014	Link
GG11	Google Glass	Website	Image	Glass homepage 21-01-14	Screenshot of 1 picture added to homepage	21/01/2014	Link
GG12	Google Glass	Website	PDF	Glass homepage 28-01-14	Updated homepage	28/01/2014	Link
GG13	Google Glass	Website	PDF	Glass homepage 19-02-14 text	PDF of plain text homepage	19/02/2014	Link
GG14	Google Glass	Video	Ncapture	Google Glass Explorer Story~ Roy Choi - YouTube	Explorer Story video shown on How it Feels page	13/03/2014	Link
GG15	Google Glass	Website	Image	Glass homepage 15-03-14	Screenshot of new picture added to homepage	15/03/2014	Link
GG16	Google Glass	Website	Image	Glass how it feels 20-03-14	Screenshot of added stories	20/03/2014	Link
GG17	Google Glass	Website	Image	Glass homepage 10-04-14	Screenshot of new picture added to homepage	10/04/2014	Link
GG18	Google Glass	Website	Video	Glass What It Does v2 10-04-14	Video of What It Does page	10/04/2014	Link
GG19	Google Glass	Video	Ncapture	Google Glass Explorer Story~ WWF's Sabita Malla - YouTube	Explorer Story video shown on How it Feels page	22/04/2014	Link
GG20	Google Glass	Website	PDF	Glass explorer stories 27-04-14	Explorer Stories page	27/04/2014	Link
GG21	Google Glass	Website	PDF	Glass homepage 14-05-14 text	PDF of some of homepage that changed (text only)	14/05/2014	Link
GG22	Google Glass	Website	Image	Glass homepage 04-06-14	Screenshot of new picture added to homepage	04/06/2014	Link
GG23	Google Glass	Website	Image	Glass homepage 23-06-14	Screenshot of new picture added to homepage	23/06/2014	Link
GG24	Google Glass	Website	Image	Glass homepage 22-01-15	Screenshot of homepage v2	22/01/2015	Link
GG25a	Google Glass	Website	PDF	Glass homepage v3 18-07-17a	PDF of homepage v3 section A	18/07/2017	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
GG25b	Google Glass	Website	PDF	Glass homepage v3 18-07-17b	PDF of homepage v3 section B	18/07/2017	Link
GG25c	Google Glass	Website	PDF	Glass homepage v3 18-07-17c	PDF of homepage v3 section C	18/07/2017	Link
GG25d	Google Glass	Website	PDF	Glass homepage v3 18-07-17d	PDF of homepage v3 section D	18/07/2017	Link
GG26	Google Glass	Twitter	PDF	Google Glass WBM Twitter 2013-2014	PDF of Google Glass twitter from WBM before it was removed in January 2016	02/07/13-01-01-16	Link
GG27	Google Glass	Facebook	PDF	Google Glass _ Facebook 04-03-14 to 20-03-14	PDF of Glass Facebook page	04/03/14-20/03/14	Link
GG28	Google Glass	Video	Ncapture	Google Glass Project - One day - YouTube	Glass' first promotional video	04/04/2012	Link
HL01	HoloLens	Video	Link	[EXCLUSIVE] Microsoft HoloLens - Possibilities _ Microsoft - HoloLens Official Review - video dailymotion - Google Chrome 2019-10-02 12-11-17	Possibilities video from homepage	21/01/2015	Link
HL02	HoloLens	Video	Link	Microsoft HoloLens - Transform your world with holograms - YouTube - Google Chrome 2019-10-02 12-34-07	Transform your world video from Presskit Page	21/01/2015	Link
HL03	HoloLens	Website	PDF	HoloLens Get Ready page 24-01-15	Get Ready page	24/01/2015	Link
HL04	HoloLens	Website	Video	HoloLens homepage 24-01-15	Homepage	24/01/2015	Link
HL05	HoloLens	Website	PDF	HoloLens press kit page 24-01-15	Press Kit page	24/01/2015	Link
HL06	HoloLens	Video	Ncapture	Microsoft Aspen OnSight - YouTube	Aspen OnSight video from homepage	27/01/2015	Link
HL07	HoloLens	Website	PDF	HoloLens Developer page 01-05-15	Get Ready/Developers page	01/05/2015	Link
HL08	HoloLens	Website	Video	HoloLens Experience HoloLens page 01-05-15	Experience Holograms/Why HoloLens page	01/05/2015	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
HL09	HoloLens	Website	PDF	HoloLens homepage v2 01-05-15	Homepage v2	01/05/2015	Link
HL10	HoloLens	Website	PDF	HoloLens Commercial page 02-05-15	Commercial page	02/05/2015	Link
HL11	HoloLens	Video	Ncapture	Microsoft HoloLens - Breaking Down Barriers - YouTube	Video from Get Ready/Developers page	05/05/2015	Link
HL12	HoloLens	Video	Ncapture	Microsoft HoloLens - Simple-to-Use Tools - YouTube	Video from Get Ready/Developers page	05/05/2015	Link
HL13	HoloLens	Video	Ncapture	Microsoft HoloLens - A Close Look at the Hardware - YouTube	Video from Get Ready/Developers page	06/05/2015	Link
HL14	HoloLens	Video	Ncapture	Microsoft HoloLens - Developers Imagine the Future of Holographic Computing - YouTube	Video from Get Ready/Developers page	06/05/2015	Link
HL15	HoloLens	Video	Ncapture	Microsoft HoloLens - Exciting Features - YouTube	Video from Get Ready/Developers page	06/05/2015	Link
HL16	HoloLens	Video	Ncapture	Microsoft HoloLens - Ideas Become Reality at Holographic Academy - YouTube	Video from Get Ready/Developers page	06/05/2015	Link
HL17	HoloLens	Video	Ncapture	Microsoft HoloLens - Jump In and Start Creating - YouTube	Video from Get Ready/Developers page	06/05/2015	Link
HL18	HoloLens	Website	Video	HoloLens Hardware page 28-07-15	Hardware page	28/07/2015	Link
HL19	HoloLens	Website	PDF	HoloLens Development Edition page 06-10-2015	Development Edition page	06/10/2015	Link
HL20	HoloLens	Website	Video	HoloLens homepage v3 07-10-15	Homepage v3	07/10/2015	Link
HL21	HoloLens	Website	PDF	HoloLens Developer page v2 09-12-15	Developers page v2	09/12/2015	Link
HL22	HoloLens	Website	PDF	Why HoloLens page 01-03-16	Experience Holograms/Why HoloLens page	01/03/2016	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
HL23	HoloLens	Website	Image	HoloLens Development Edition hidden image 04-03-16	Hidden image from Development Edition page	04/03/2016	Link
HL24	HoloLens	Website	PDF	HoloLens Development Edition page 04-03-16	Development Edition page	04/03/2016	Link
HL25	HoloLens	Website	PDF	HoloLens Commercial page 15-03-16	Commercial page	15/03/2016	Link
HL26	HoloLens	Website	PDF	HoloLens Apps page 11-04-16	Apps page	11/04/2016	Link
HL27	HoloLens	Website	Image	HoloLens Apps page hidden image 11-04-16	Image that was hidden in PDF on same date	11/04/2016	Link
HL28	HoloLens	Website	PDF	HoloLens Commercial Suite page 12-08-16	Commercial Suite page	12/08/2016	Link
HL30	HoloLens	Website	PDF	HoloLens Development Edition page 30-10-16	Development Edition page	30/10/2016	Link
HL31	HoloLens	Website	Video	HoloLens homepage v4 31-10-16	Homepage v4	31/10/2016	Link
HL32	HoloLens	Website	PDF	HoloLens Apps page 08-11-16	Apps page	08/11/2016	Link
HL33	HoloLens	Website	Video	HoloLens Developers page v3 15-11-2016	Developers page v3	15/11/2016	Link
HL34	HoloLens	Website	PDF	Why HoloLens page 11-12-16	Why HoloLens page	11/12/2016	Link
HL35	HoloLens	Website	PDF	HoloLens Buy page 10-03-17	Buy page	10/03/2017	Link
HL38	HoloLens	Website	Video	HoloLens Commercial page 12-04-17	Opening different sections on Commercial page	12/04/2017	Link
HL39	HoloLens	Website	PDF	HoloLens Commercial page 09-12-15	Commercial page	09/12/2017	Link
HL40	HoloLens	Website	PDF	HoloLens Commercial page 28-12-17	Commercial page	28/12/2017	Link
HL41	HoloLens	Website	Video	HoloLens Why HoloLens 360 28-12-17	360-esque section added to Why HoloLens page	28/12/2017	Link
HL42	HoloLens	Twitter	PDF	(from_HoloLens) until_2017-12-31 since_2012-01-01 - filter_replies - Twitter Search	HoloLens twitter posts	2012-2017	N/A
HL44	HoloLens	Facebook	PDF	Microsoft HoloLens - Posts	HoloLens Facebook posts	2015-2017	N/A

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
HL45	HoloLens	Video	Ncapture	Microsoft HoloLens~ Mixed Reality Blends Holograms with the Real World - YouTube	Video from Developers page	29/02/2016	Link
HL46	HoloLens	Video	Ncapture	Microsoft HoloLens~ Share Your Idea - YouTube	Video from Developers page	01/12/2015	Link
HL49	HoloLens	Video	Video	Microsoft HoloLens_ Holographic Academy and Project Origami - video dailymotion - Google Chrome 2019-10-24 12-36-27	Video from Developers page	23/06/2015	Link
HL52	HoloLens	Video	Ncapture	DigiGirlz try out HoloLens at developer education session - YouTube	Video from Developers page	13/10/2015	Link
HL61	HoloLens	Video	Ncapture	Introducing the Microsoft HoloLens Commercial Suite - YouTube	Video from Commercial Suite page	02/08/2016	Link
HL63	HoloLens	Video	Ncapture	Microsoft HoloLens: Partners make it real - YouTube	Video from Developers page v3	30/03/2016	Link
HL68	HoloLens	Video	Ncapture	Mixed Reality Blends the Physical and Virtual Worlds - YouTube	Video from Why HoloLens page	07/12/2016	Link
HL69	HoloLens	Video	Video	Video from Commercial page	Video from Commercial page	Exact Unknown	Link
ML01	Magic Leap	Press Release	PDF	Press Release 2014-02-05 Magic Leap Raises More Than \$50 million _ Magic Leap	Press release "Magic Leap Raises More Than \$50 million"	05/02/2014	Link
ML03	Magic Leap	Website	Video	Magic Leap homepage v1a 23-07-14	Video of homepage v1a	23/07/2014	Link
ML04	Magic Leap	Press Release	PDF	Press Release 2014-10-21 Magic Leap Raises \$542 Million in Series B Funding _ Magic Leap	Press release "Magic Leap Raises \$542 Million in Series B Funding"	21/10/2014	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
ML05	Magic Leap	Press Release	PDF	Press Release 2014-12-08 Scott Henry Joins Magic Leap as Chief Financial Officer _ Magic Leap	Press release "Scott Henry Joins Magic Leap as Chief Financial Officer"	08/12/2014	Link
ML06	Magic Leap	Press Release	PDF	Press Release 2014-12-16 Magic Leap Appoints Author Neal Stephenson as 'Chief Futurist' _ Magic Leap	Press release "Magic Leap Appoints Author Neal Stephenson as 'Chief Futurist'"	16/12/2014	Link
ML07	Magic Leap	Website	Video	Magic Leap homepage v1b 25-02-15	Video of homepage v1b	25/02/2015	Link
ML08	Magic Leap	Website	PDF	Magic Leap About Us Company 25-02-15	About – Company section	25/02/2015	Link
ML09	Magic Leap	Website	PDF	Magic Leap About Us Team 25-02-15	About – Team section	25/02/2015	Link
ML10	Magic Leap	Website	PDF	Magic Leap Developers 25-02- 15	Developers section	25/02/2015	Link
ML11	Magic Leap	Website	PDF	Magic Leap Blog 25-02-15	Blog section	25/02/2015	Link
ML12	Magic Leap	Website	PDF	Magic Leap Wizards Wanted (jobs) 25-02-15	Wizards Wanted section (jobs)	25/02/2015	Link
ML13	Magic Leap	Video	Ncapture	Magic Leap ~ Original Concept Video - YouTube	YouTube video "Original Concept Video"	19/03/2015	Link
ML14	Magic Leap	Press Release	PDF	Press Release 2015-04-06 Yannick Pellet Joins Magic Leap as SVP, Software Engineering _ Magic Leap	Press release "Yannick Pellet Joins Magic Leap as SVP, Software Engineering"	06/04/2015	Link
ML15	Magic Leap	Video	Ncapture	Magic Leap ~ Demos~ Everyday Magic with Mixed Reality - YouTube	YouTube video "Demos: Everyday Magic with Mixed Reality"	20/10/2015	Link
ML16	Magic Leap	Website	Video	Magic Leap homepage v2 29- 10-15	Video of homepage v2	29/10/2015	Link
ML17	Magic Leap	Press Release	PDF	Press Release 2016-02-02 Magic Leap Announces \$793.5	Press release "Magic Leap Announces \$793.5 Million in New Funding"	02/02/2016	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
				Million in New Funding _ Magic Leap			
ML18	Magic Leap	Press Release	PDF	Press Release 2016-02-02 Magic Leap Announces Expanded Role for Weta Workshop's Sir Richard Taylor _ Magic Leap	Press release "Magic Leap Announces Expanded Role for Weta Workshop's Sir Richard Taylor"	02/02/2016	Link
ML19	Magic Leap	Video	Ncapture	Magic Leap ~ Office Life~ The View From Here at Magic Leap - YouTube	YouTube video "Office Life: The View From Here at Magic Leap"	11/04/2016	Link
ML20	Magic Leap	Video	Ncapture	Magic Leap ~ Demos~ Waking Up with Mixed Reality - YouTube	YouTube video "Demos: Waking Up with Mixed Reality"	19/04/2016	Link
ML21	Magic Leap	Video	Ncapture	Magic Leap ~ News~ Joining Forces with Lucasfilm - YouTube	YouTube video "News: Joining Forces with Lucasfilm"	23/06/2016	Link
ML22	Magic Leap	Press Release	PDF	Press Release 2016-07-01 Rio Caraeff Joins Magic Leap as Chief Content Officer _ Magic Leap	Press release "Rio Caraeff Joins Magic Leap as Chief Content Officer"	01/07/2016	Link
ML23	Magic Leap	Press Release	PDF	Press Release 2016-10-05 Rachna Bhasin Joins Magic Leap as Chief Business Officer _ Magic Leap	Press release "Rachna Bhasin Joins Magic Leap as Chief Business Officer"	05/10/2016	Link
ML24	Magic Leap	Press Release	PDF	Press Release 2016-12-06 Brenda Freeman Joins Magic Leap as Chief Marketing Officer _ Magic Leap	Press release "Brenda Freeman Joins Magic Leap as Chief Marketing Officer"	06/12/2016	Link
ML26	Magic Leap	Video	Ncapture	Magic Leap ~ How It All Began - YouTube	YouTube video "How It All Began"	05/10/2017	Link
ML27	Magic Leap	Press Release	PDF	Press Release 2017-10-17 Magic Leap Announces \$502	Press release "Magic Leap Announces \$502 Million in Series D Funding"	17/10/2017	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
				Million in Series D Funding _ Magic Leap			
ML28	Magic Leap	Website	Video	Magic Leap homepage v3 31- 12-17	Video of homepage v3	31/12/2017	Link
ML29	Magic Leap	Twitter	PDF	from_magicleap since_2012- 01-01 until_2017-12-31 - filter_replies - Twitter Search	Twitter posts	2012-2017	N/A
ML30	Magic Leap	Facebook	PDF	Magic Leap - Posts 2012-2017	Facebook posts	2012-2017	N/A
OR01	Oculus Rift	Website	Ncapture	About ~ OculusVR.com 09-06- 12	Website v1 About page	09/06/2012	Link
OR02	Oculus Rift	Website	Ncapture	OculusVR.com 09-06-12	First archived version of website homepage	09/06/2012	Link
OR03	Oculus Rift	Website	Ncapture	Coverage ~ OculusVR.com 10~06~12	Website v1 Coverage page	10/06/2012	Link
OR04	Oculus Rift	Website	Ncapture	Oculus RIFT ~ OculusVR.com 10-06-12	Website v1 Rift page	10/06/2012	Link
OR05	Oculus Rift	Press Release	PDF	1st Press Release about Kickstarter campaign	First press release about Rift and Kickstarter	01/08/2012	Link
OR06	Oculus Rift	Website	Ncapture	Oculus Rift~ Step Into the Game by Oculus — Kickstarter	Oculus Rift Kickstarter page	01/08/2012	Link
OR07	Oculus Rift	Website	Ncapture	Oculus website v2 09~08~12	Homepage v2	09/08/2012	Link
OR08	Oculus Rift	Video	Ncapture	OR 1st Kickstarter video	Kickstarter video	06/10/2012	Link
OR09	Oculus Rift	Website	Image	As of 12-01-13 style changed a bit but content pretty much the same	Updated style on website v2	12/01/2013	N/A
OR10	Oculus Rift	Website	Ncapture	Oculus website v2b 07-06-13	Homepage v2b	07/06/2013	Link
OR11	Oculus Rift	Website	Ncapture	07-11-13 Oculus Rift - Virtual Reality Headset for Immersive 3D Gaming ~ Oculus VR ~ Oculus Rift - Virtual Reality Headset for 3D Gaming	First Rift page on v2	07/11/2013	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
OR12	Oculus Rift	Website	Ncapture	20-03-14 The All New Oculus Rift Development Kit 2 (DK2) Virtual Reality Headset ~ Oculus Rift - Virtual Reality Headset for 3D Gaming	First DK2 page	20/03/2014	Link
OR13	Oculus Rift	Press Release	PDF	Facebook to Acquire Oculus _ Facebook Newsroom	Press Release: Facebook to Acquire Oculus	25/03/2014	Link
OR14	Oculus Rift	Press Release	PDF	F8 2015_ Updates on Connectivity Lab, Facebook AI Research and Oculus _ Facebook Newsroom	Press Release: F8 2015: Updates on Connectivity Lab, Facebook AI Research and Oculus	26/03/2015	Link
OR15	Oculus Rift	Website	Image	Oculus website v2 updated pic first consumer Rift pic	Updated main picture with first picture of consumer Rift product homepage v3	06/05/2015	N/A
OR17	Oculus Rift	Video	Ncapture	Oculus Rift Reveal - Step Into Rift - YouTube	First video advert for Rift with images of the product	11/06/2015	Link
OR18	Oculus Rift	Website	Video	Rift v3 website 11-06-15	First Rift page on v3 website	11/06/2015	Link
OR19	Oculus Rift	Press Release	PDF	Introducing the Oculus Rift _ Facebook Newsroom	Press Release: Introducing the Oculus Rift	11/06/2015	Link
OR20	Oculus Rift	Website	Ncapture	Oculus - Oculus VR	Homepage v3 updated pics	09/07/2015	Link
OR21	Oculus Rift	Website	Image	Slider pic 2 website v3	Second slider picture from homepage v3	09/07/2015	N/A
OR22	Oculus Rift	Press Release	PDF	Oculus Connect 2_ Announcing Consumer Gear VR, Minecraft in VR and More _ Facebook Newsroom	Press Release: Oculus Connect 2: Announcing Consumer Gear VR, Minecraft in VR and More	24/09/2015	Link
OR23	Oculus Rift	Video	Ncapture	Oculus Rift Kickstarter Update - YouTube	Video from Kickstarter page	05/01/2016	Link
OR24	Oculus Rift	Video	Ncapture	Step Into Rift - YouTube	Video advert of first version of Rift	28/03/2016	Link

ID	Device	Type	Format	File Name (NVivo)	Description	Date	URL
OR25	Oculus Rift	Press Release	PDF	Oculus Rift Launches at Retail in Europe and Canada September 20 — Pre-Order Now _ Facebook Newsroom	Press Release: Oculus Rift Launches at Retail in Europe and Canada September 20 — Pre-Order Now	16/08/2016	Link
OR26	Oculus Rift	Video	Ncapture	Oculus Rift Development Kit 2 - YouTube	Video from DK2 page (OR12)	19/03/2014	Link
OR27	Oculus Rift	Website	Video	Rift website v3b	Rift page on v3b website	08/10/2016	Link
OR28	Oculus Rift	Video	Ncapture	Oculus Rift ~ Step into Rift – now only \$399 - YouTube	Rift advert when price was lowered	11/10/2017	Link
OR29	Oculus Rift	Video	Ncapture	Oculus Rift Development Kit Unboxing - YouTube	Video from Rift page website v2 (OR11)	21/03/2013	Link
OR30	Oculus Rift	Website	Video	Rift page website v3c 28-12-17	Rift page on v3c website	28/12/2017	Link
OR31	Oculus Rift	Facebook	PDF	Oculus UK Facebook 11-04-17 onwards	Posts from UK version of Oculus' Facebook page	11/04/17-31/12/17	N/A
OR32	Oculus Rift	Twitter	PDF	(from_oculus) until_2017-12-31 since_2012-01-01 - filter_replies - Twitter Search	Oculus' Twitter posts	2012-2017	N/A
OR33	Oculus Rift	Facebook	PDF	Oculus US FB 2012-2017	PDFs of Facebook search results for Oculus' page	2012-2017	N/A

Appendix G: Sections News Articles Appeared In

G.1 The Sun

Number of Articles with Each String in <i>The Sun</i>		
Section String	No.	Percent
News > Tech > All News	12	19.67
News > All News	7	11.48
Tech > All Tech	7	11.48
Tech > Phones & Gadgets	6	9.84
News > World News	4	6.56
Sport > Football > Premier League	3	4.92
News > UK News	3	4.92
Living > Virals	2	3.28
Living > Sex	2	3.28
Tech > Science	2	3.28
Travel > Family	2	3.28
Travel > News	2	3.28
TV & Showbiz > TV	2	3.28
Motors > News	2	3.28
Living > Realife	1	1.64
News > Tech > UK News	1	1.64
Money > Shopping	1	1.64
Living > Health	1	1.64
Fabulous > Health & Fitness	1	1.64

G.2 The Guardian

Number of Articles with Each String in <i>The Guardian</i>		
Section String	No.	Percent
News > Tech	123	49.60
No Specific Section	24	9.68
Culture > Games	20	8.06
News > Science	7	2.82
Culture > Music	6	2.42
News > Education	5	2.02
Culture > Art & design	5	2.02
Culture > Film	5	2.02
Opinion	4	1.61
News > Business	4	1.61

Number of Articles with Each String in <i>The Guardian</i>		
Section String	No.	Percent
Culture	4	1.61
News > Cities	3	1.21
News > UK > Media	3	1.21
Lifestyle	3	1.21
Lifestyle > Health & Fitness	3	1.21
News > Society	2	0.81
News > World	2	0.81
News > Environment	2	0.81
News > Environment > Wildlife	2	0.81
News > World > Australia	2	0.81
Culture professionals network	1	0.40
News > World > US	1	0.40
Local Government Network	1	0.40
Media network	1	0.40
News > Travel	1	0.40
Lifestyle > Cars	1	0.40
News > World > Middle East	1	0.40
Lifestyle > Travel > Europe	1	0.40
News > Global development	1	0.40
Lifestyle > Travel	1	0.40
Lifestyle > Family	1	0.40
News > Indigenous Australia	1	0.40
Culture > Stage	1	0.40
News > World > Europe	1	0.40
Sport > Cycling	1	0.40
Sport > NFL	1	0.40
News > UK politics	1	0.40
News > Business > B2B	1	0.40
Sport > Cricket	1	0.40

G.3 MailOnline

Number of Articles with Each String in <i>MailOnline</i>		
Section String	No.	Percent
Science > Science	401	60.03
Wires	127	19.01
News > News	66	9.88
Health > Health	17	2.54
Travel	16	2.40

Number of Articles with Each String in <i>MailOnline</i>		
Section String	No.	Percent
Femail > Femail	12	1.80
No Specific Section	4	0.60
Money > Investing	4	0.60
Sport > Football	4	0.60
TV&Showbiz > TV&Showbiz	3	0.45
Travel > Travel	2	0.30
Money > Markets	2	0.30
Sport > Rugby	1	0.15
India > News	1	0.15
Money	1	0.15
U.S.	1	0.15
TV&Showbiz > U.S. Showbiz	1	0.15
Money > Mortgages & home	1	0.15
Sport	1	0.15
Money > Holidays	1	0.15
News	1	0.15
Event	1	0.15

Appendix H: Categories Applied to News Articles

H.1 The Sun

Articles with each Category in <i>The Sun</i>		
Category	No.	Percent
Virtual reality	26	42.62
None	11	18.03
Porn	6	9.84
Google	4	6.56
Sex	4	6.56
Apple	3	4.92
PlayStation	3	4.92
video games	3	4.92
Explainers	2	3.28
Facebook	2	3.28
US	2	3.28
Alton Towers	1	1.64
Apple rumours	1	1.64
Army	1	1.64
Arsenal	1	1.64
Brussels	1	1.64
Celebrity sex tape scandals	1	1.64
Chelsea	1	1.64
China	1	1.64
Cosmetic surgery	1	1.64
Disney movies and merchandise	1	1.64
Eamonn Holmes	1	1.64
Eurostar	1	1.64
Florida	1	1.64
Good Morning Britain	1	1.64
Google Maps	1	1.64
Google Street View	1	1.64
Japan	1	1.64
John Terry	1	1.64
Kim Kardashian	1	1.64
London	1	1.64
Louis van Gaal	1	1.64

Articles with each Category in <i>The Sun</i>		
Category	No.	Percent
Madrid	1	1.64
Manchester United	1	1.64
Microsoft	1	1.64
Orlando	1	1.64
Paris	1	1.64
plastic surgery	1	1.64
Pokemon	1	1.64
Pokemon Go	1	1.64
porn stars	1	1.64
revenge porn	1	1.64
Richard Arnold	1	1.64
Ruth Langsford	1	1.64
Space and astronomy	1	1.64
Theme parks	1	1.64
This Morning	1	1.64
Tokyo	1	1.64
UK	1	1.64
Volkswagen	1	1.64
weird science	1	1.64
World War 2	1	1.64

H.2 The Guardian

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Virtual reality	180	72.58
news	104	41.94
features	85	34.27
Games	67	27.02
Facebook	45	18.15
art	38	15.32
Google	36	14.52
Virtual worlds	36	14.52
Technology	33	13.31
blog	32	12.90
blogposts	28	11.29
TED	27	10.89
Augmented reality	25	10.08
computing	21	8.47
social networking	21	8.47
The Observer	21	8.47
Oculus	20	8.06
Google Glass	18	7.26
digital	17	6.85
PlayStation	16	6.45
health	15	6.05
internet	14	5.65
Media & Tech Network	14	5.65
smartphones	14	5.65
PlayStation 4	13	5.24
Sony	13	5.24
Culture	12	4.84
Wearable technology	12	4.84
apps	11	4.44
comment	11	4.44
Digital media	11	4.44
Film	11	4.44
PC	11	4.44
game culture	10	4.03
mobile	10	4.03

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Samsung	10	4.03
Business	9	3.63
gadgets	8	3.23
HTC	8	3.23
Mark Zuckerberg	8	3.23
Microsoft	8	3.23
Psychology	8	3.23
technology startups	8	3.23
3D	7	2.82
CES	7	2.82
mobile phones	7	2.82
social media	7	2.82
television	7	2.82
Medical research	6	2.42
Science	6	2.42
analysis	5	2.02
Apple	5	2.02
Design	5	2.02
marketing & PR	5	2.02
Mental health	5	2.02
Pokemon	5	2.02
Pokemon Go	5	2.02
Pornography	5	2.02
Silicon Valley	5	2.02
Technology sector	5	2.02
Television industry	5	2.02
Architecture	4	1.61
Cities	4	1.61
digital business	4	1.61
Donald Trump	4	1.61
Exhibitions	4	1.61
film industry	4	1.61
Kickstarter	4	1.61
London	4	1.61
media network blog	4	1.61

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
New York	4	1.61
newspapers	4	1.61
Nintendo	4	1.61
opinion	4	1.61
philosophy	4	1.61
sex	4	1.61
small business	4	1.61
theatre	4	1.61
advertising	3	1.21
Android	3	1.21
animals	3	1.21
Art and design	3	1.21
Bjork	3	1.21
children	3	1.21
Doctors	3	1.21
farming	3	1.21
Health & wellbeing	3	1.21
Intel	3	1.21
Neuroscience	3	1.21
next-gen tech	3	1.21
notes & theories	3	1.21
Planning	3	1.21
planning policy	3	1.21
shortcuts	3	1.21
Sky plc	3	1.21
sponsored features	3	1.21
television (technology)	3	1.21
television (television & radio)	3	1.21
Theme parks	3	1.21
travel & leisure	3	1.21
US politics	3	1.21
wildlife	3	1.21
Xbox	3	1.21
Audiences	2	0.81
biology	2	0.81
California	2	0.81

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Children's tech	2	0.81
Classical music	2	0.81
communications	2	0.81
consciousness	2	0.81
Conservation	2	0.81
David Attenborough	2	0.81
entrepreneurs	2	0.81
Europe	2	0.81
festivals	2	0.81
Games blog	2	0.81
gender	2	0.81
Google+	2	0.81
Guardian Small Business Network	2	0.81
history	2	0.81
indie games	2	0.81
Jonathan Jones on art	2	0.81
Merlin Entertainments	2	0.81
Museums	2	0.81
National Theatre	2	0.81
New York Times	2	0.81
newspapers & magazines	2	0.81
online TV	2	0.81
Paul McCartney	2	0.81
Peter Thiel	2	0.81
photography	2	0.81
Reddit	2	0.81
schools	2	0.81
Sergey Brin	2	0.81
teaching	2	0.81
The Guardian	2	0.81
the networker	2	0.81
US press and publishing	2	0.81
Venice film festival	2	0.81
voluntary sector	2	0.81
volunteering	2	0.81

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
wearable technology	2	0.81
Women	2	0.81
Xbox One	2	0.81
YouTube	2	0.81
20 innovations for 2015	1	0.40
3D printing	1	0.40
6x9: a virtual experience of solitary confinement	1	0.40
academic experts	1	0.40
Activision Blizzard	1	0.40
Adventures in Business	1	0.40
advertisement features	1	0.40
Ageing	1	0.40
Alphabet	1	0.40
an apple a day	1	0.40
animation (film)	1	0.40
apps blog	1	0.40
Arcade games	1	0.40
architecture and design blog	1	0.40
artificial intelligence (AI)	1	0.40
Ashes 2017-18	1	0.40
Asia Pacific	1	0.40
astronomy	1	0.40
Australia sport	1	0.40
Australian film	1	0.40
autobiography and memoir	1	0.40
automotive industry	1	0.40
BBC	1	0.40
best iPhone and iPad apps	1	0.40
Break into tech	1	0.40
British Museum	1	0.40
business to business	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Canada	1	0.40
cancer	1	0.40
catholicism	1	0.40
CES 2015	1	0.40
CES 2016	1	0.40
charitable giving	1	0.40
charities	1	0.40
childbirth	1	0.40
Christianity	1	0.40
communities	1	0.40
computing and the net books	1	0.40
coral	1	0.40
cricket	1	0.40
crowdfunding	1	0.40
cultural trips	1	0.40
Culture professionals network	1	0.40
cycling	1	0.40
David Beckham	1	0.40
dementia	1	0.40
democrats	1	0.40
depression	1	0.40
Derren Brown	1	0.40
design futures	1	0.40
digital blog	1	0.40
disability	1	0.40
Divergent	1	0.40
documentary films	1	0.40
Drones (non-military)	1	0.40
Dyson Ltd	1	0.40
Elon Musk	1	0.40
Esa-Pekka Salonen	1	0.40
Ethical and green living	1	0.40
ethical and green living with Lucy Siegle	1	0.40
Europe holidays	1	0.40
Eurovision	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
event descriptions	1	0.40
events	1	0.40
experimental music	1	0.40
Family	1	0.40
food & drink industry	1	0.40
France holidays	1	0.40
future of advertising	1	0.40
FutureFest	1	0.40
Game of Thrones	1	0.40
games consoles	1	0.40
Germany	1	0.40
Gold Cost	1	0.40
Google Home	1	0.40
Google virtual reality	1	0.40
Guardian Environment Network	1	0.40
Guardian Labs blog	1	0.40
hacking	1	0.40
HBO	1	0.40
heritage	1	0.40
Higher education network	1	0.40
Hillary Clinton	1	0.40
Holocaust	1	0.40
homelessness	1	0.40
hospitals	1	0.40
hotels	1	0.40
House of Commons	1	0.40
House of Lords	1	0.40
human biology	1	0.40
Humanitarian response	1	0.40
hurricane Maria	1	0.40
Iceland	1	0.40
Imperial College London	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Indigenous Australia	1	0.40
innovations in development	1	0.40
Inside the Guardian blog	1	0.40
internet of things	1	0.40
interviews	1	0.40
iOS	1	0.40
iPhone	1	0.40
Italy	1	0.40
Japan	1	0.40
Jaron Lanier	1	0.40
Kate Winslet	1	0.40
Kinect	1	0.40
Las Vegas	1	0.40
Laurie Anderson	1	0.40
learning and teaching	1	0.40
local government (public leaders network)	1	0.40
local government (society)	1	0.40
local politics	1	0.40
marketing & PE	1	0.40
Mat Callinshaw	1	0.40
McDonald's	1	0.40
medicine	1	0.40
meditation	1	0.40
Miami	1	0.40
Michelangelo	1	0.40
Middle East and North Africa	1	0.40
Minecraft	1	0.40
Minority Report	1	0.40
MIPTV	1	0.40
mixed-reality games	1	0.40
MMORPG	1	0.40
mobile games	1	0.40
Mobile World Congress	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Monarchy	1	0.40
motoring	1	0.40
music blog	1	0.40
Nasa	1	0.40
national newspapers	1	0.40
Natural History Museum	1	0.40
Nazism	1	0.40
nbn: Bringing Big Tech to Small Business	1	0.40
neurophilosophy	1	0.40
NFL	1	0.40
on the radar	1	0.40
open door	1	0.40
organic marketing	1	0.40
Paris holidays	1	0.40
performance art	1	0.40
phablets	1	0.40
photography (art and design)	1	0.40
photography (technology)	1	0.40
Pixar	1	0.40
Poland	1	0.40
post-traumatic stress disorder	1	0.40
primary schools	1	0.40
prisons and probation	1	0.40
privacy	1	0.40
professional supplements	1	0.40
prostitution	1	0.40
publishing and platforms	1	0.40
Puerto Rico	1	0.40
Qualcomm	1	0.40
Queensland	1	0.40
race	1	0.40
racing games	1	0.40
real estate	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
refugees	1	0.40
regional & local newspapers	1	0.40
religion	1	0.40
republicans	1	0.40
research and development	1	0.40
retail industry	1	0.40
road safety	1	0.40
role playing games	1	0.40
rugby union	1	0.40
run the jewels	1	0.40
schools of the future	1	0.40
science fiction and fantasy films	1	0.40
science fiction books	1	0.40
search engines	1	0.40
Second Life	1	0.40
second world war	1	0.40
secondary schools	1	0.40
self and wellbeing	1	0.40
sexual harrassment	1	0.40
shooting games (games genre)	1	0.40
simulation games	1	0.40
small businesses	1	0.40
smartwatches	1	0.40
software	1	0.40
solitary confinement	1	0.40
Southbank Centre	1	0.40
space	1	0.40
spam filter	1	0.40
Star Wars	1	0.40
Star Wars: The Force Awakens	1	0.40
Steam	1	0.40
Sundance 2016	1	0.40
sustainability	1	0.40
SXSW 2016	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
Sydney	1	0.40
Syria	1	0.40
tablet computers	1	0.40
Teacher Network	1	0.40
teaching tips	1	0.40
Team Sky	1	0.40
tech and the city	1	0.40
technology and innovation	1	0.40
Thailand	1	0.40
The Ashes	1	0.40
The Beatles	1	0.40
the guide Australia art and design listings	1	0.40
the innovators	1	0.40
The Matrix	1	0.40
the month in games	1	0.40
The Philharmonia Orchestra	1	0.40
The Queen	1	0.40
Tim Cook	1	0.40
Tim Lott's family column	1	0.40
Tom Cruise	1	0.40
Toyota	1	0.40
travel and transport	1	0.40
Travel websites	1	0.40
Tribeca film festival	1	0.40
TV and radio blog	1	0.40
Ulster rugby	1	0.40

Articles with each Category in <i>The Guardian</i>		
Category	No.	Percent
United Nations	1	0.40
University of Sheffield	1	0.40
urban eye	1	0.40
US elections 2016	1	0.40
US news blog	1	0.40
US prisons	1	0.40
US sports	1	0.40
US television	1	0.40
Vatican	1	0.40
Venice film festival 2016	1	0.40
Venice film festival 2017	1	0.40
Vice Media	1	0.40
Vital signs	1	0.40
Voluntary Sector Network	1	0.40
volunteering holidays	1	0.40
weddings	1	0.40
weekend magazine technology special	1	0.40
wellness at work	1	0.40
Yorkshire	1	0.40
zoology	1	0.40
Zoos	1	0.40

Appendix I: Comparing Changes Over Time

I.1 Topics

Percentage of Articles Each Year With Topic						
Topic/Year	2012	2013	2014	2015	2016	2017
Application(s) (ALL)	45.83	24.24	41.80	52.41	48.91	54.92
Application(s) > With XR Element	12.50	6.06	3.28	1.81	2.17	4.55
Application(s) > XR Focus	33.33	18.18	38.52	50.60	46.74	50.38
Business	0.00	0.00	13.11	3.61	1.90	3.41
Company	0.00	0.00	0.82	0.00	0.27	1.14
Concerns	0.00	9.09	1.64	1.20	5.16	1.14
Crime	4.17	3.03	0.00	0.00	0.27	0.00
Demo (ALL)	0.00	0.00	3.28	4.22	7.61	6.82
Demo > Celebrity	0.00	0.00	0.00	0.60	0.82	1.89
Demo > General Public	0.00	0.00	2.46	3.01	5.16	4.17
Demo > Journalist	0.00	0.00	0.82	0.60	1.63	0.76
Development	0.00	3.03	1.64	1.20	0.54	0.38
Fiction	4.17	0.00	0.00	0.00	0.27	0.38
Figurehead	0.00	12.12	0.00	0.00	1.36	1.52
Future	0.00	3.03	1.64	0.00	2.45	1.52
History	0.00	0.00	1.64	0.00	0.54	0.00
Legal Disputes	0.00	0.00	0.82	0.00	0.27	2.65
Peripherals/Accessories	0.00	0.00	5.74	3.01	2.45	2.27
Product(s) (ALL)	45.83	45.45	26.23	28.92	22.83	19.70
Product(s) > Commercial Product	37.50	36.36	19.67	22.29	16.03	10.61
Product(s) > Conceptual Product	0.00	0.00	0.00	1.20	0.27	0.76
Product(s) > Industry Product	8.33	6.06	3.28	3.01	2.17	1.14
Product(s) > Rumoured Product	0.00	3.03	3.28	2.41	4.35	7.20
Regulation	0.00	0.00	0.00	0.00	0.54	0.00
XR Overview	0.00	0.00	1.64	5.42	3.26	1.52
Other	0.00	0.00	0.00	0.00	1.36	2.65

I.2 Applications

Percentage of Articles Mentioning Each Application Type per Year (percentage based on number of articles mentioning applications per year)						
Application Type/Year	2012	2013	2014	2015	2016	2017
Accessibility	8.33	3.03	2.46	2.41	1.63	2.27
Architecture/Planning	4.17	6.06	4.92	1.81	1.63	1.14
Art/Design	8.33	3.03	4.92	9.04	7.34	6.44
Automotive Support	0.00	0.00	2.46	2.41	0.54	0.00
Children's Toys/Interactive Stories	0.00	3.03	0.82	0.60	0.82	1.89
Cosmetics	0.00	0.00	0.00	0.00	0.27	1.89
Crime Prevention and Justice	0.00	0.00	0.82	0.60	0.82	1.14
Documentary	0.00	0.00	2.46	3.61	2.99	3.03
Drones	0.00	3.03	0.82	1.20	1.36	1.14
Education	4.17	6.06	18.03	14.46	11.96	5.30
Emergency Services	4.17	3.03	0.82	0.60	0.27	0.38
Film/TV/Video	4.17	3.03	17.21	27.11	23.91	10.61
Fitness	0.00	0.00	0.82	1.81	0.27	3.41
Food and Drink	8.33	0.00	0.82	0.60	1.36	0.76
Health	8.33	6.06	23.77	10.24	11.41	10.23
Industrial and Workplace Management	0.00	6.06	2.46	6.02	2.45	2.65
Journalism	4.17	6.06	0.00	5.42	6.52	1.52
Marketing and Advertising	12.50	12.12	19.67	5.42	2.99	1.52
Military and Defence	8.33	3.03	7.38	3.61	1.09	1.89
Museum/Exhibition/Archive Viewing	0.00	6.06	1.64	4.22	3.26	3.41
Music	8.33	3.03	9.02	4.82	6.79	4.17
Organisation	16.67	3.03	0.82	1.20	1.63	0.00
Photography/Video Recording	8.33	39.39	9.02	3.01	3.26	4.17
Pornography, Teledildonics and Sex	0.00	6.06	3.28	2.41	10.05	10.61
Product Development and Testing	0.00	3.03	0.00	3.61	0.82	1.52
Real Estate	0.00	3.03	2.46	1.81	1.63	0.76
Research	16.67	3.03	1.64	1.81	1.63	2.27
Retail	8.33	9.09	5.74	7.83	4.08	4.17
Simulation	0.00	3.03	4.10	4.82	5.71	5.30
Social Change and Awareness	0.00	0.00	5.74	7.23	5.98	6.44
Social Media and Communication	25.00	36.36	17.21	21.08	13.32	15.91
Space and Science	0.00	3.03	4.92	4.82	2.99	2.27
Sport	4.17	0.00	14.75	10.24	10.87	5.68
Theatre	0.00	0.00	0.82	1.81	1.63	0.00
Theme Park and Rides	0.00	0.00	7.38	6.02	7.88	7.95
Tourism/Travel	20.83	24.24	17.21	15.66	10.87	12.50
Training	0.00	3.03	9.02	3.01	7.34	7.20
Videogames	16.67	24.24	60.66	51.20	51.63	38.26
Web Browsing	20.83	21.21	1.64	0.00	0.82	1.14
Wellness	0.00	0.00	1.64	0.60	0.82	1.89
Other	0.00	6.06	1.64	4.22	2.99	1.89

I.3 Sources

Percentage of Articles per Year Using Each Source At Least Once						
Source Type/Year	2012	2013	2014	2015	2016	2017
Application Creator	20.83	12.12	33.61	45.78	40.76	42.05
Celebrity	0.00	0.00	0.82	1.20	1.63	1.52
Device Creator	50.00	51.52	53.28	44.58	40.49	25.38
External Journalist/Blogger	4.17	0.00	2.46	1.20	2.45	4.17
Fiction Creator	0.00	0.00	0.00	0.00	0.54	0.38
Game Industry Specialist	0.00	0.00	10.66	3.61	7.07	3.79
General Public	8.33	15.15	5.74	4.22	7.61	9.09
Investor/Funder	0.00	0.00	4.10	1.81	0.82	1.14
Marketing Materials	0.00	0.00	0.00	1.20	2.45	1.14
Official Reports and Documentation	0.00	6.06	5.74	3.61	3.53	9.09
Other Article by Same Publisher	0.00	0.00	0.00	0.00	0.27	0.38
Other Industry or General Specialist	8.33	27.27	20.49	12.65	22.55	18.56
Other News Source	20.83	36.36	11.48	12.65	17.12	18.56
Peripheral Creator	0.00	0.00	5.74	2.41	2.72	3.41
Platform Creator	0.00	0.00	2.46	6.02	5.43	6.82
Politician	0.00	0.00	0.00	0.00	1.09	1.89
Researcher/Analyst	8.33	3.03	7.38	10.84	13.59	18.18
Retailer	0.00	0.00	0.00	0.00	1.63	0.76
Technology Industry Specialist	4.17	15.15	4.92	5.42	6.52	12.12
User (General)	0.00	3.03	13.11	11.45	11.41	15.15
User (Professional)	0.00	9.09	2.46	1.20	3.53	1.89
XR Event Organiser	0.00	0.00	0.00	0.60	1.90	2.27
XR Facilitator	0.00	0.00	1.64	7.23	7.34	10.23
XR Industry Specialist	8.33	3.03	3.28	3.01	6.25	1.89
XR Job Advert	0.00	0.00	1.64	1.81	0.27	1.52
Unclear	12.50	15.15	13.93	9.04	8.70	10.98
Not Specified	4.17	6.06	13.93	10.84	14.13	10.98
Other	0.00	15.15	1.64	1.81	5.71	2.65

I.4 Multimedia Attribution

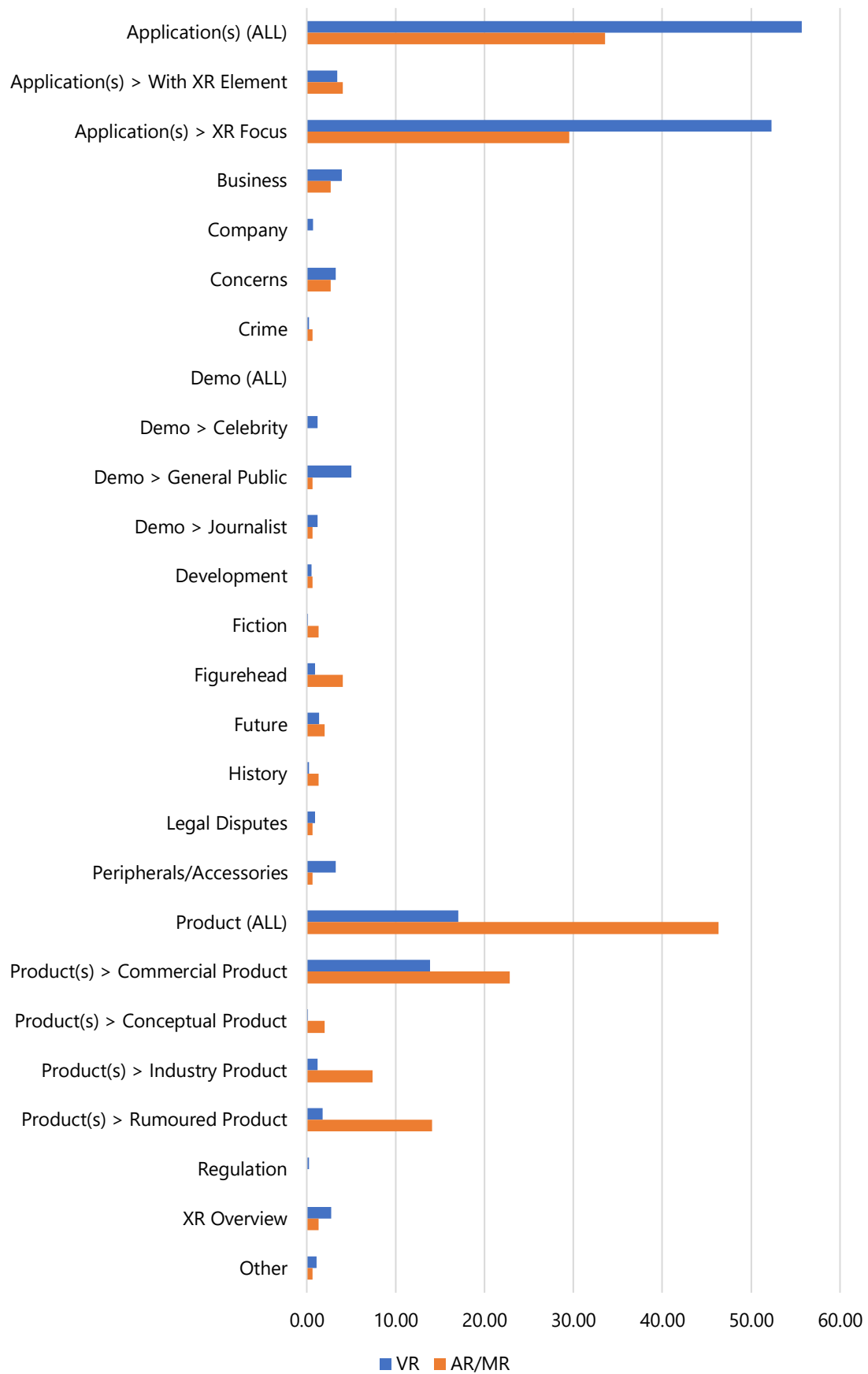
Percentage of Articles per Year with Multimedia Attributed to Each Type						
Attribution Type/Year	2012	2013	2014	2015	2016	2017
Agency	20.83	39.39	45.08	28.31	38.59	36.36
Application Creator	12.50	9.09	24.59	28.31	20.92	26.14
Celebrity	0.00	0.00	0.00	0.00	0.27	1.52
General Media	4.17	6.06	3.28	3.61	1.63	4.92
General Public	0.00	3.03	2.46	3.01	4.89	2.65
Journalist	0.00	3.03	4.10	2.41	4.35	4.55
Other News Outlet	4.17	6.06	5.74	4.82	10.33	15.91
Other Industry Specialist	0.00	0.00	8.20	6.02	7.07	6.82
Publisher	4.17	3.03	7.38	6.63	8.97	5.68
Social Media	12.50	18.18	0.00	2.41	2.45	1.89
Stock Image	4.17	9.09	11.48	12.05	24.18	21.97
Technology Industry Specialist	0.00	0.00	2.46	2.41	1.63	6.06
XR Facilitator	0.00	0.00	0.00	1.20	3.80	1.52
Device Creator	16.67	36.36	40.16	34.34	24.18	21.97
Unclear	12.50	30.30	8.20	15.06	11.14	9.47
No Attribution	58.33	63.64	42.62	45.78	44.84	37.88
Other	4.17	18.18	8.20	7.23	4.89	7.58

Appendix J: Comparing VR and AR/MR Articles

J.1 Topics

Percentage of VR and AR/MR Articles with each Topic		
Topic	VR	AR/MR
Application(s) (ALL)	55.72	33.56
Application(s) > With XR Element	3.41	4.03
Application(s) > XR Focus	52.32	29.53
Business	3.95	2.68
Company	0.68	0.00
Concerns	3.27	2.68
Crime	0.27	0.67
Demo (ALL)	0.00	0.00
Demo > Celebrity	1.23	0.00
Demo > General Public	5.04	0.67
Demo > Journalist	1.23	0.67
Development	0.54	0.67
Fiction	0.14	1.34
Figurehead	0.95	4.03
Future	1.36	2.01
History	0.27	1.34
Legal Disputes	0.95	0.67
Peripherals/Accessories	3.27	0.67
Product (ALL)	17.03	46.31
Product > Commercial Product	13.90	22.82
Product > Conceptual Product	0.14	2.01
Product > Industry Product	1.23	7.38
Product > Rumoured Product	1.77	14.09
Regulation	0.27	0.00
XR Overview	2.72	1.34
Other	1.09	0.67

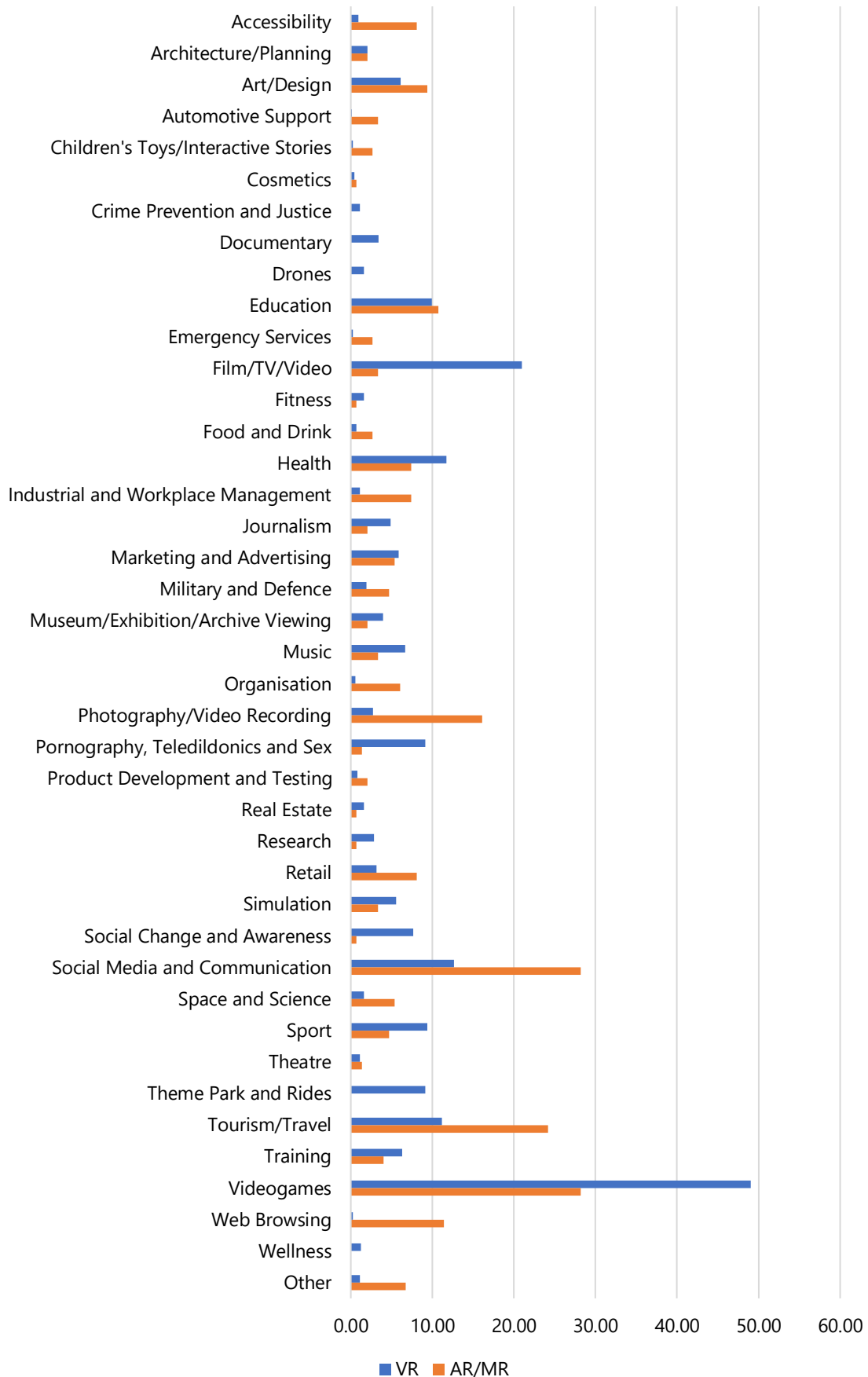
Percentage of VR and AR/MR Articles with each Topic



J.2 Applications

Percentage of VR and AR/MR Articles Mentioning Each Application Type		
Application Type	VR	AR/MR
Accessibility	0.95	8.05
Architecture/Planning	2.04	2.01
Art/Design	6.13	9.40
Automotive Support	0.14	3.36
Children's Toys/Interactive Stories	0.27	2.68
Cosmetics	0.41	0.67
Crime Prevention and Justice	1.09	0.00
Documentary	3.41	0.00
Drones	1.63	0.00
Education	9.95	10.74
Emergency Services	0.27	2.68
Film/TV/Video	20.98	3.36
Fitness	1.63	0.67
Food and Drink	0.68	2.68
Health	11.72	7.38
Industrial and Workplace Management	1.09	7.38
Journalism	4.90	2.01
Marketing and Advertising	5.86	5.37
Military and Defence	1.91	4.70
Museum/Exhibition/Archive Viewing	3.95	2.01
Music	6.68	3.36
Organisation	0.54	6.04
Photography/Video Recording	2.72	16.11
Pornography, Teledildonics and Sex	9.13	1.34
Product Development and Testing	0.82	2.01
Real Estate	1.63	0.67
Research	2.86	0.67
Retail	3.13	8.05
Simulation	5.59	3.36
Social Change and Awareness	7.63	0.67
Social Media and Communication	12.67	28.19
Space and Science	1.63	5.37
Sport	9.40	4.70
Theatre	1.09	1.34
Theme Park and Rides	9.13	0.00
Tourism/Travel	11.17	24.16
Training	6.27	4.03
Videogames	49.05	28.19
Web Browsing	0.27	11.41
Wellness	1.23	0.00
Other	1.09	6.71

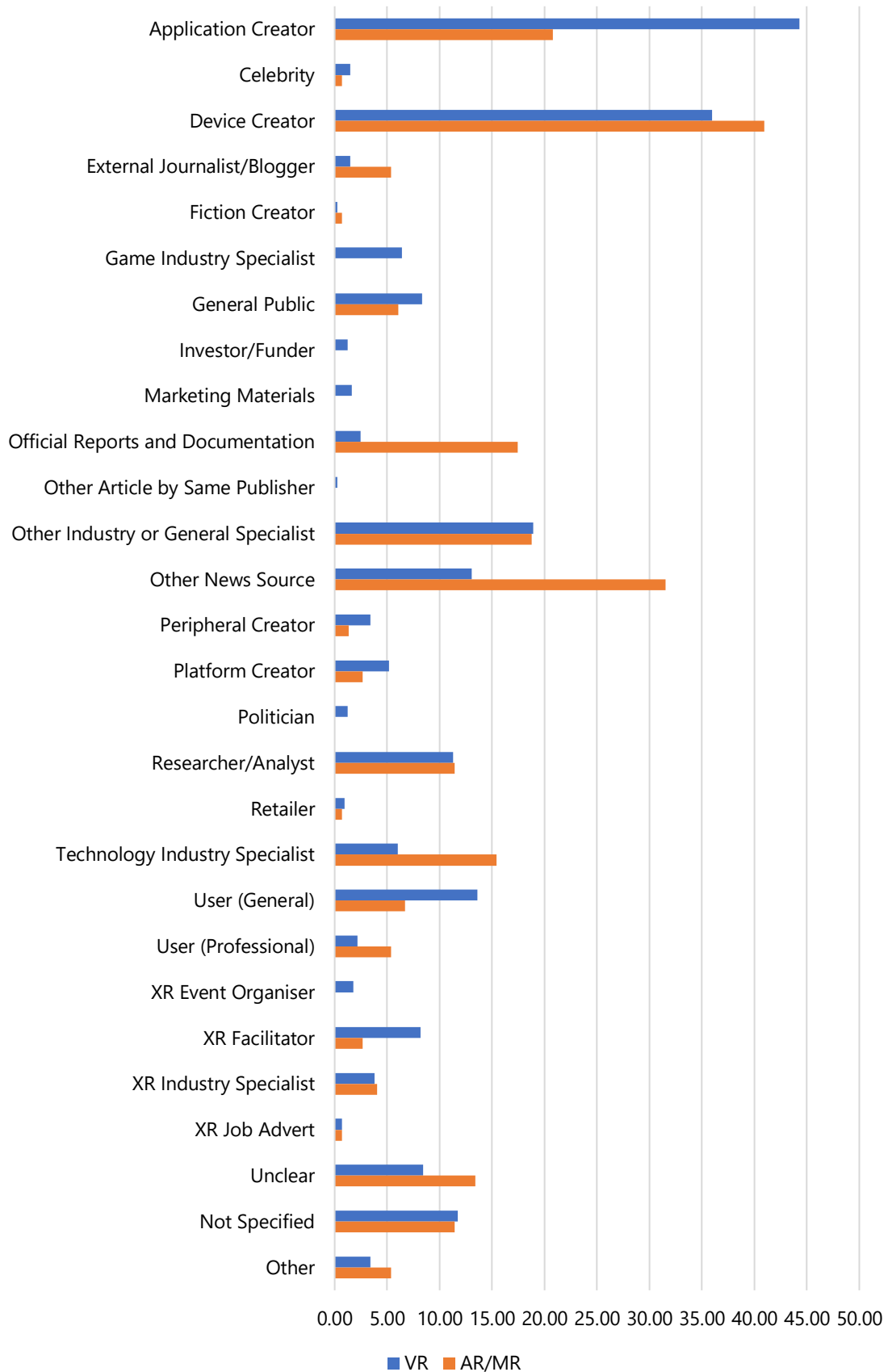
Percentage of VR and AR/MR Articles Mentioning Each Application Type



J.3 Sources

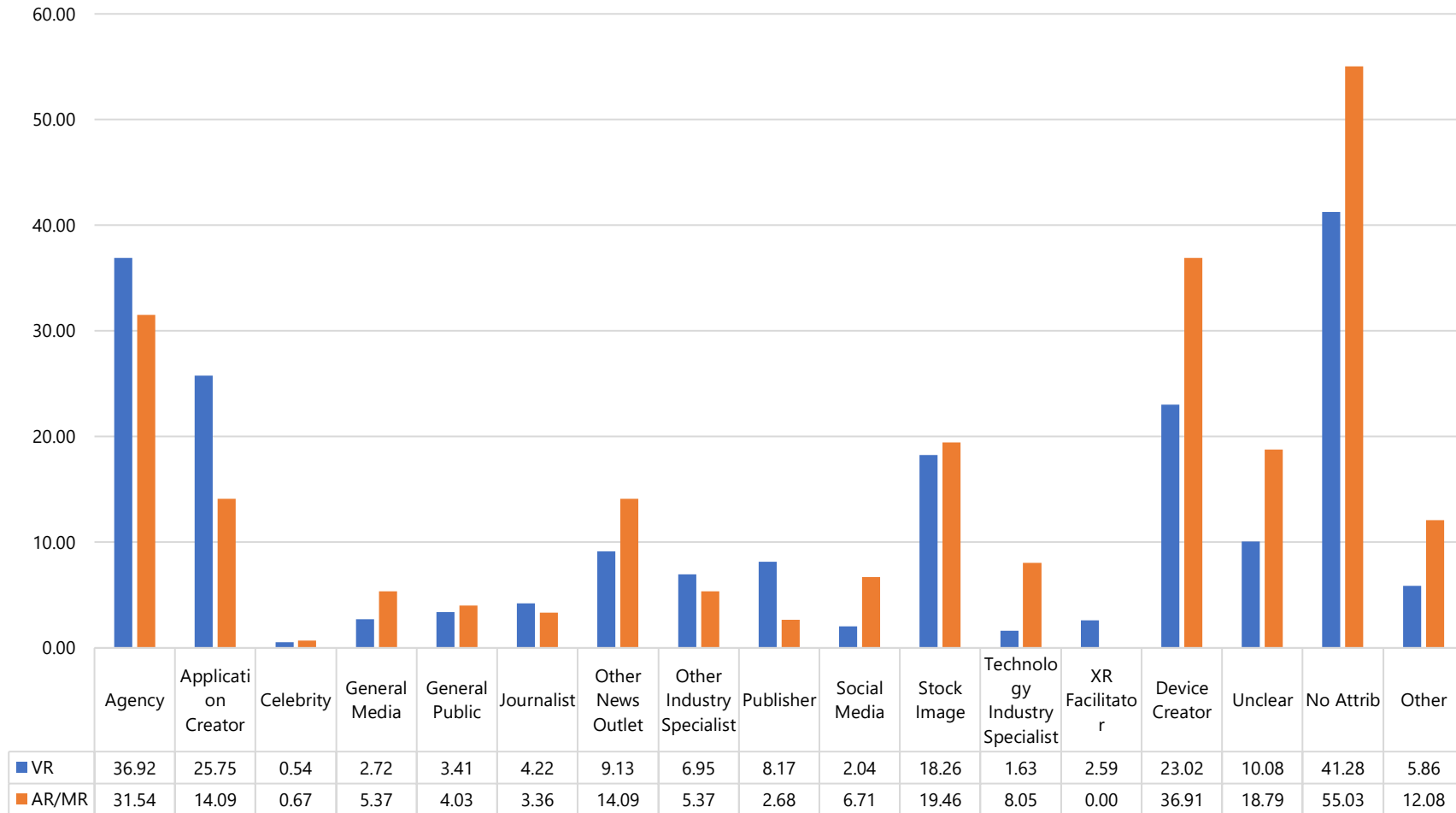
Percentage of VR and AR/MR Articles Using Each Source At Least Once		
Source Type	VR	AR/MR
Application Creator	44.28	20.81
Celebrity	1.50	0.67
Device Creator	35.97	40.94
External Journalist/Blogger	1.50	5.37
Fiction Creator	0.27	0.67
Game Industry Specialist	6.40	0.00
General Public	8.31	6.04
Investor/Funder	1.23	0.00
Marketing Materials	1.63	0.00
Official Reports and Documentation	2.45	17.45
Other Article by Same Publisher	0.27	0.00
Other Industry or General Specialist	18.94	18.79
Other News Source	13.08	31.54
Peripheral Creator	3.41	1.34
Platform Creator	5.18	2.68
Politician	1.23	0.00
Researcher/Analyst	11.31	11.41
Retailer	0.95	0.67
Technology Industry Specialist	5.99	15.44
User (General)	13.62	6.71
User (Professional)	2.18	5.37
XR Event Organiser	1.77	0.00
XR Facilitator	8.17	2.68
XR Industry Specialist	3.81	4.03
XR Job Advert	0.68	0.67
Unclear	8.45	13.42
Not Specified	11.72	11.41
Other	3.41	5.37

Percentage of VR and AR/MR Articles Using Each Source Type at Least Once



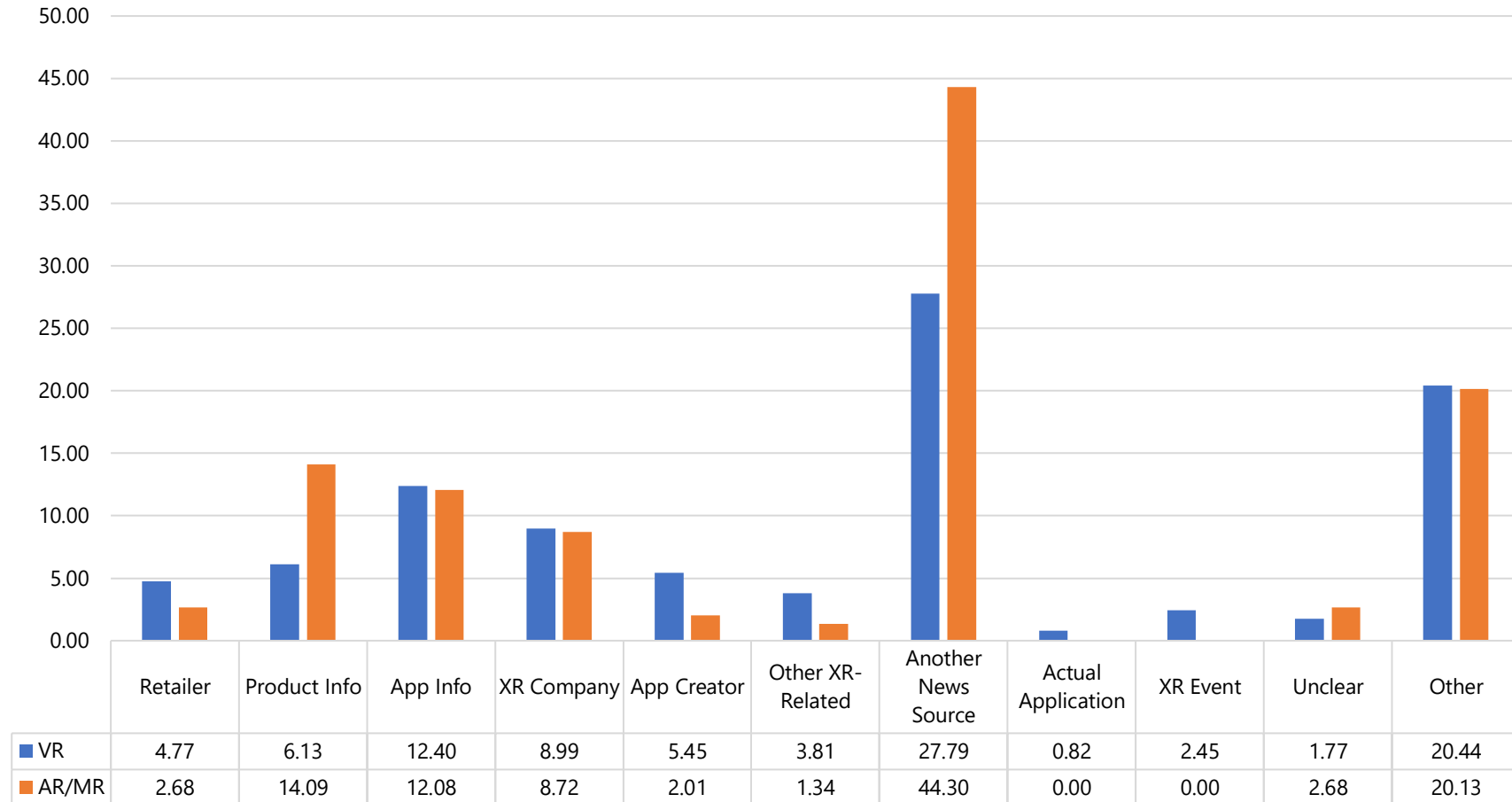
J.4 Multimedia Attribution

Percentage of VR and AR/MR Articles with each Media Attribution Type



J.5 Links

Percentage of VR and AR/MR Articles Including Each Link Type



J.6 Word Categories

Percentage of VR and AR/MR Articles with At Least One Word from each Category		
Word Category	VR	AR/MR
Advanced and High-Quality	27.66	34.90
Affordable	16.76	3.36
Ailments	16.21	2.68
Comfortable	10.49	13.42
Concerns	24.39	21.48
Different and Unique	13.22	7.38
Difficult to Use	1.36	2.68
Easy to Use	10.35	14.77
Expensive	7.90	4.03
Immersive	62.67	23.49
Important	12.53	11.41
Much-Anticipated	26.02	21.48
Negative	24.11	21.48
Positive	54.63	42.28
Revolutionary and Transformative	14.99	18.79
Social	11.72	10.07
Successful	16.08	14.77
Transcendent	12.67	24.83
Trivial	4.22	2.68
Uncomfortable	3.13	3.36
Unsuccessful	4.36	6.04

Percentage of VR and AR/MR Articles with ≥ 1 Word from each Category

