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Members' report 2/2019

FUTURE MEDIA

KEY TRENDS AND TECHNOLOGIES

SUMMARY

Media production and consumption are accelerating, the media environment is becoming more complex, and junk news and misinformation run rampant. Three articles cover our changing media landscape from different perspectives: the future of public service media, diverging trajectories in commercial media, and the new frontiers of hi-tech media.

Members' report 2/2019
FUTURE MEDIA

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FOREWORD

Pictet Asset Management has been working with the Copenhagen Institute for Futures Studies (CIFS) for over a decade to establish a deeper understanding of megatrends – the powerful secular forces that are changing the environment, society, politics, technology and the economy.

CIFS is a leading global think tank and consultancy. CIFS uses a wide range of research methods, developed over the last 40 years, which include megatrend analysis, scenario planning, risk management, innovation initiatives and strategy development.

Through our partnership with CIFS, we have devised an investment framework that incorporates CIFS' 14 megatrends. The framework – which includes trends such as Demographic Development, the Network Economy, Focus on Health, Sustainability and Technology Development – enhances our thematic equity capabilities and informs the construction and development of our thematic equities strategies such as Water, Robotics or SmartCity.

As CIFS' partner, Pictet Asset Management has access to research into areas not normally covered by the investment analyst community such as changes in societal attitudes and beliefs, the impact this has on the environment and the business sector, and the acceleration of technological development. We are proud to be associated with CIFS and would like to share some of their research with you. We have sponsored this publication and hope you find it as insightful as we do.

HANS PETER PORTNER
Head of Thematic Equities
Pictet Asset Management

Members' report 02/2019

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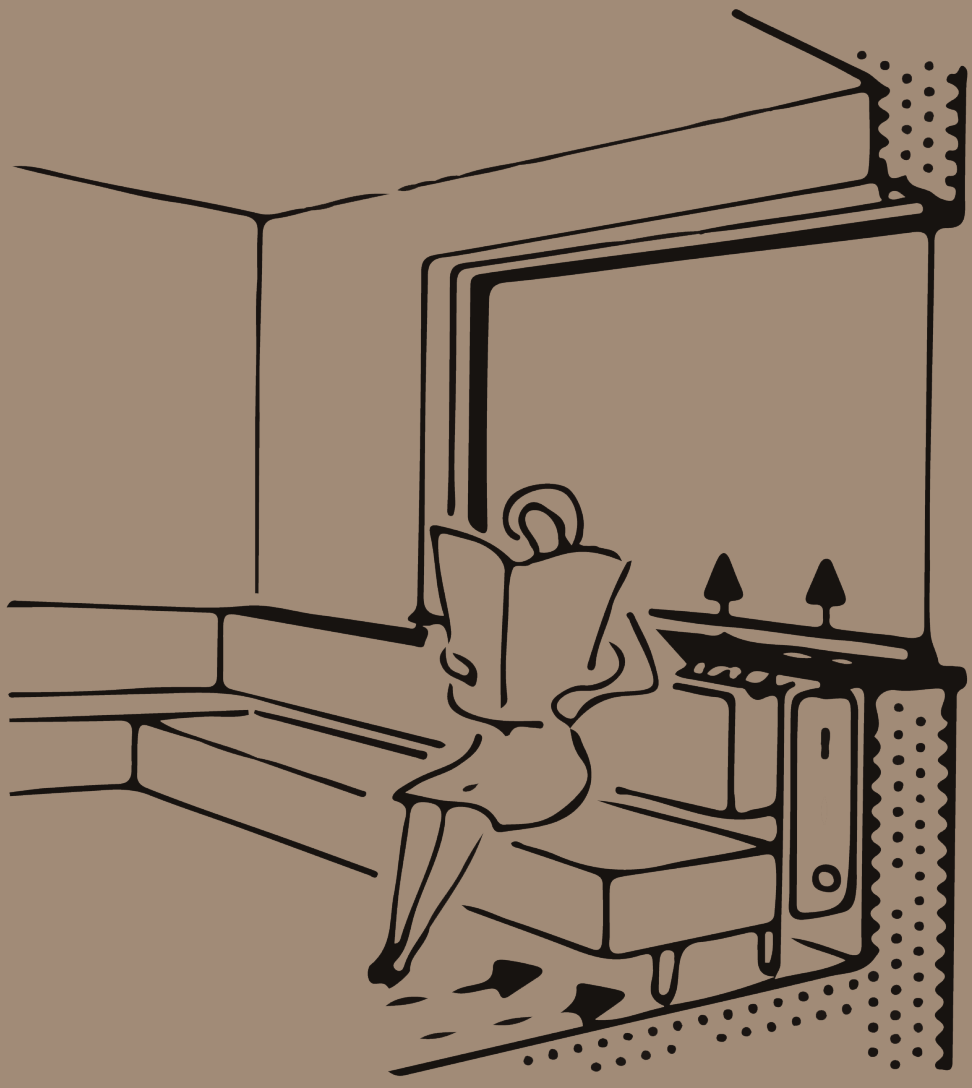


INTRODUCTION

We live in an attention economy. More and more sources of information, news and entertainment are competing for access to our limited mental space, which is starting to have a measurable effect on us. A recent study published in *Nature Communications* found that an abundance of information narrows our collective attention span. The scientists behind the study looked at Twitter data from 2013 to 2016, the last 100 years of books from Google Books, movie ticket sales going back 40 years, citations of scientific publications from the last 25 years, as well as data from Google Trends, Reddit, and Wikipedia.

They found that across both online and offline media domains, an increasing abundance of information combined with the cognitive limitations and time constraints of users leads to a rapid exhaustion of our already limited attention. On Twitter, for example, a hashtag stayed within the top 50 for 17.5 hours on average in 2013. In 2016, that number had decreased to 11.9 hours. There were similar patterns of acceleration in a number of other media domains.

The study provides empirical evidence for what many have long suspected: that human attention is being affected by an accelerating media environment and that attention, as a result, is becoming a scarcer commodity. Coinciding with this acceleration, we may be reaching a state of 'peak media', where the number of hours and minutes we can dedicate to our daily media consumption meets its upper limit.

So, what happens when we reach that limit? Will the fight for our attention lead to shorter formats, faster media and fiercer competition to optimize every minute and second of media consumers' time? Probably, but we may also see a consolidation in our media use, with more users turning towards the consumption of 'slow media' and allocating their limited mental resources in a way they find more meaningful. We tackle this question in the article 'Diverging Trajectories' on page 22. Here, you can also read about other trends impacting the future of commercial media: the conflicts between emerging and established platforms, and

between companies looking for access to customers versus consumer willingness to grant them that access.

The race towards peak media coincides with a widespread public distrust in media measured around the world. In many countries, legacy media outlets and public service institutions have traditionally occupied an important role at the centre of the public sphere, as a credible and impartial gatekeeper of news, information and entertainment. With media consumption increasingly moving to social platforms, this role is being challenged. Distrust in media varies greatly from country to country and media to media, and much of it has to do with the shift from broadcasted to networked truth, wherein individuals increasingly piece together their worldviews, opinions and even their identities through selected sources and outlets. The article 'Truth, Trust and Polarisation' on page 6 looks at how this development will impact the future role of public service media and, by extension, society and public discourse at large. The article also goes into details with how the digital space is giving rise to a growing media polarisation, where news and information in some countries are increasingly being sought from more politically extreme outlets.

The trends and trajectories outlined in the first two articles of this report are underlined by the emergence of new media technologies that shape how we consume and produce media. While technology doesn't drive developments on its own, it has an undeniable effect on the production, distribution and consumption of media. In the article 'Hi-tech Media' on page 34, we take a closer look at some of the emerging media-related technologies we believe will be the most impactful and thus the most important to monitor in the coming years. We look at 5G, which is expected to see wide adoption in the coming decade, as well as computergenerated content, computer-enhanced imagery, VR & AR, autonomous vehicles and tech challenging online advertisement.

We hope you enjoy reading.

CASPER SKOVGAARD PETERSEN

TRUTH, TRUST & POLARISATION
Trends impacting the future of public service media

In many countries, public service media has the task of maintaining an informed citizenship and contributing to social cohesion. This role is being challenged by three major trends we believe are especially important to keep an eye on: *the shift from broadcasted to networked truth, growing media polarisation* and *declining public trust in media*. These developments not only impact the future role of public service media, but also have broad societal relevance due to their influence on how we as citizens, organisations or businesses orient ourselves in a hyper-digital society. Monitoring their possible trajectories is of great importance to anyone who needs to navigate in the increasingly complex media environment.

WHAT IS PUBLIC SERVICE MEDIA?

The European Broadcasting Union (EBU) defines public service media (PSM) as "broadcasting made, financed and controlled by the public, for the public, with output designed to inform, educate and entertain all audiences. PSM broadcasters are often established by law but are non-partisan, independent and run for the benefit of society as a whole."

FROM BROADCASTED TO NETWORKED TRUTH

It is difficult to imagine we will ever return to a world where much of our news, information and entertainment was covered by a few big, trusted media institutions – and where citizens were mostly passive recipients of media. Yet this was the world and the reality in which public service broadcasting arose in the early-mid 20th century. Among its founding ideals is a commitment to providing

educational, well-balanced information and entertainment for public consumption. Because public service media institutions are supported mostly by public funds (78% in Europe)[1] – and also partly by commercial funding and private donations in some countries – they remain free of commercial pressures and the interests of advertisers. The ideal that follows from this model is that public service media can mediate reality for the receiver in a way that is free from political bias and unclouded by commercial interests, to the benefit of citizens and society at large. The question today is how public service media, born out of this 20th century ideal, can adapt and redefine its purpose in the 21st century.

The global media landscape has changed drastically since the days when radio, TV and newspapers were the dominant media technologies. Much of our consumption of media has moved online, and changes in the digital media landscape are happening at breakneck speed. In 2016, 45% of Americans aged 50 or older reported getting news from social media sites. One year later, the number had already risen by 10%.[2] The 2018 Reuters Digital News Report showed that 40% of respondents use Facebook for news, and 87% of respondents find their news online (including on social media).[3] The media we consume on these platforms is determined by our previous habits or our peers' recommendations, and as a result, our identities, tastes and political beliefs are increasingly formed through online networks. In some ways, universally used social media such as Facebook have become monopoly platforms for social life.

The rise of social platforms for sharing knowledge and information has empowered ordinary citizens and led to an explosive growth in amateur knowledge, and the dimishing role of experts as gatekeepers of knowledge. A 2017 Google report found that 67% of millennials use YouTube to find tutorials to help them learn new skills. The same study found that 91% of mobile users search for how-to content online when working on a project, and that 'how-to' searches on YouTube have been growing 70% year over year.[4]

On the flip side, this trend has also led to the undermining of the legitimate gatekeepers of truth: academics, scientists and others who speak from a position of authority and whose information and advice we used to trust almost unconditionally. According to the Weill Cornell Department of Healthcare Policy and Research in the US, more than 75% of people trusted their doctor's advice in 1966; in 2018, only 34% did.[5] RAND Corporation describes the diminishing role of facts and analysis in public life in a 2018 report titled *Truth Decay*. The report

lists the increasing relative volume and resulting influence of opinion and personal experience over fact as one of the primary drivers for this development.[6]

While online discussion on social platforms is free and open in theory, it is heavily reliant on the non-transparent workings of the algorithms that curate our experience. As we have seen in the last few years, this has made public dialogue vulnerable to political and scientific misinformation, which can spread like wildfire among like-minded peers. An outcome of sharing and communication of information becoming frictionless – meaning that the filters or barriers that usually exist between sender and receiver disappear – is that fringe groups like anti-vaxxers, flat-earthers, 5G scaremongers, political conspiracy theorists and troll bots have become staples of social media and the internet, and by extension, of public discourse. In this new environment, it is more difficult for ordinary citizens to navigate the maelstrom of information and misinformation. This information overlead leads many to pick and choose from the available information and piece together their own individual truths.

A recent report by Oxford University looked into the phenomenon of 'Computational Propaganda', a term used to denote "the use of algorithms, automation, and human curation to purposefully distribute misleading information over social media networks."[7] The research project tracked online misinformation on social media and found that a lot of so-called "junk news and automated accounts" could be traced to programmers and businesses in Germany, Poland and the United States. Further, the study found that no less than 45% of Twitter activity in Russia is managed by highly automated accounts, and that a significant portion of the political conversation over Twitter in Poland is produced by a handful of right-wing and nationalist accounts.[8] Ironically, the free and open structure of the internet has led to a centralisation of misinformation designed to shape and control public discourse.

What will the shift from broadcasted to networked truth mean in the long term? And what are the challenges and opportunities that these developments present for the role of public service media?

In 2017, Pew and Elon University conducted a research project[9] where they asked more than 1,000 media experts the following question: "In the next 10 years, will trusted methods emerge to block false narratives and allow the most accurate information to prevail in the overall information ecosystem? Or will the quality

and veracity of information online deteriorate due to the spread of unreliable, sometimes even dangerous, socially destabilizing ideas?"

The results showed uncertainty about the future, as respondents were divided equally on the positive and negative sides of the question. 51% of the respondents believed that the information environment will not improve. 49% believed it will. The 51% with a negative outlook believed that efforts to correct the situation will be stifled by bad actors, who will continue to use social media to appeal to the lowest common denominator: "selfish, tribal, gullible, and greedy information consumers who will believe whatever they are told." To these respondents, technology will cause more problems than it will solve, as it will allow users to be bombarded with even more misleading information. One expert even referred to our present time as a "nuclear winter of misinformation". The 49% with a positive outlook believed that we will find solutions to our current problems with misinformation, and they expressed a belief that technology, which can be used to spread misinformation, can also do much to combat it.[10]

Both the optimists and pessimists agreed that there is no quick fix to the challenges posed, and that technology alone cannot provide the solution to the situation it has helped create. What's needed, they believe, is a renewed focus on objective, accurate information fostered in all levels of education, and greater support for quality journalism. Similarly, a 2018 report by the EU Commission's High Level Expert Group on Fake News and Online Disinformation recommended five steps to counter disinformation and fake news in the future: enhancing transparency of online news through better data sharing; promoting media and information literacy to help users navigate the digital media environment; developing tools to empower users and journalists to tackle disinformation; safeguarding the diversity and sustainability of the European news media ecosystem; and promoting continued research on the impact of disinformation in Europe.[11]

One thing is clear: in a future of networked truth, the need for trusted and balanced channels of information is greater than ever, and public service media should arguably do even more than it currently does to fulfil this need. Some countries have already taken measures in this direction. In Norway, the fact-checking site Faktisk.no has been established for the purpose of preventing the spread of fake news and misguiding information. In other countries, the measures have been more extensive. In France, for example, a law was passed in 2018 which allows authorities to remove fake content and block sites that publish it.

Assuming the role of 'fact-checker' may help alleviate some of the problems caused by the rise of networked truth, but it is also a reactive position to take. Lies spread faster than facts (more on this on page 30) and fact-checking, while important, is treating the symptoms, not engaging with the root cause. In the long-term, proactive measures that focus on fostering information-, news-, and media literacy will likely have a more significant impact.

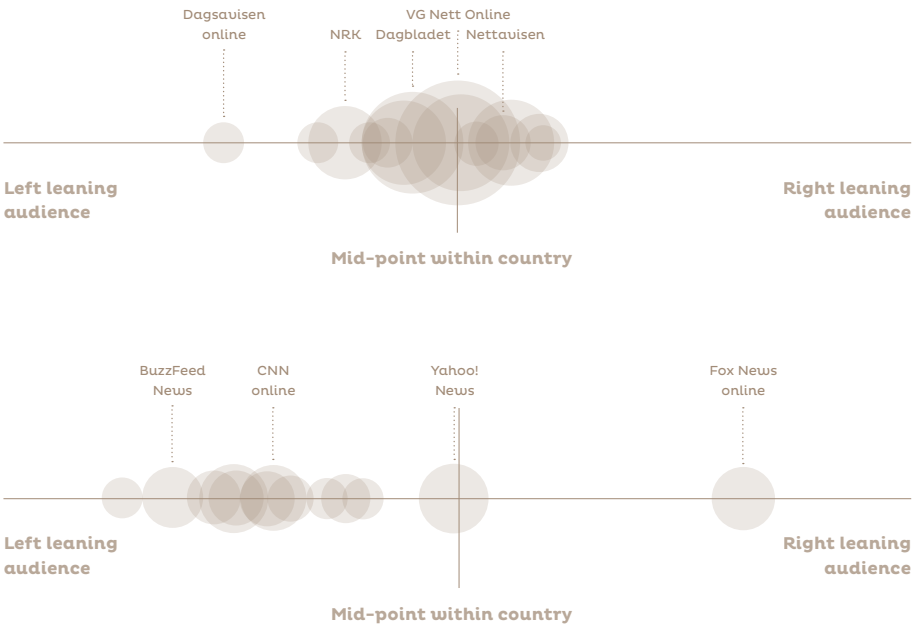
From the perspective of individual media users, a central question for the future is the extent to which the need for trusted and more transparent sources of information will outweigh the desire for more convenient products and services. As discussed in the CIFS report 03/2018: *Understanding the Future Consumer*, the horizontalisation and hyper-personalisation of digital ecosystems, which happen when digital giants leverage their vast insights into individual consumer behaviours across platforms, mean that citizens must often trade off transparency for convenience. Unless a different model gains ground – for instance, one where citizens have complete control over the data they allow platforms to access, and the situations in which they allow it – the question of whether fostering information literacy will have the desired effect, or if it will be overshadowed by the temptation of highly personalised offerings, remains open. In any case, a growing part of the responsibility will fall to the large private platform facilitators, who are driven by incentives other than the ones that drive public service media.

As a side note to the rise of networked truth, we can add that the same social platforms that are facilitating this development are also increasingly in direct competition with public service media. One example is sports broadcasting, which has historically been the domain of large TV broadcasters, but where new players are now making their presence known. Facebook has plans to use its 'live' function for sports broadcasting, and has recently purchased the rights to broadcast the Spanish football league La Liga in South Asia for three years. Should this development continue its momentum, it will be more difficult for public service broadcasters to keep up with the competition, which may force them to occupy niches the market is ignoring.

MEDIA POLARISATION

The shift from a broadcasted to a networked truth can be related to the growing trend of media polarisation, where media outlets progressively seek out their core audiences by appealing to values-based communities away from the political centre, instead of attempting to occupy a 'middle ground' between political extremes.

FIGURE 1.1: **MEDIA POLARISATION IN NORWAY AND THE U.S.**



Source: Reuters, digitalnewsreport.org/survey, modified by CIFS/(2017).

Media polarisation is not equally pronounced in all countries. In the UK, the Netherlands and the Scandinavian countries, there exists a strong cluster of media outlets around the political centre (viewed in equal measure by left-leaning and right-leaning audiences). Often, these are the large public service broadcasters, which are generally trusted. The situation is different in Spain, Poland and Italy, where the big media outlets are more spread out on the political spectrum. The U.S. is probably the most extreme example of a polarised media environment in the Western world. Here, many of the most popular media outlets are placed well off the centre of the political spectrum, and the centre has been largely abandoned. Although there are clear national and regional differences, the trend toward

growing polarisation is international in scope, and there are signs it will grow.[12]

A report on media polarisation by Reuters suggests that the political polarisation of media is connected to the emergence of digital-native news and media outlets, as many of the newer digital media brands appearing in Europe and the U.S. – and growing at the fastest pace (although still small) – are highly partisan. The report mentions Breitbart and Occupy Democrats in the U.S. and The Canary in the UK as prime examples of this trend. The New York Times found that when counted collectively, digital-only, hyper-partisan news outlets have tens of millions of followers in the U.S. alone, and most are cleverly engineered to reach their audience specifically through social media news feeds.[13]

Still, the precise effects of media polarisation on citizens' beliefs are unclear. A meta-study by the European Parliament titled *Polarisation and the news media in Europe* finds that "there is little evidence to support the idea that increased exposure to news featuring like-minded or opposing views leads to the widespread polarisation of attitudes." According to the study, however, there is evidence that increased exposure to like-minded or opposing views can strengthen the attitudes of a minority who already hold strong views.[14] Rather than polarise beliefs, filter bubbles can solidify the polarisation that already exists. The authors admit that there are still large gaps in the knowledge, which says a lot about the lack of transparency that characterises the digital media environment.

While not necessarily directly connected, the growing media polarisation and digitalisation of media consumption coincides with a growing political criticism of public service media. Increasingly, public service institutions are being forced to justify their funding models or to make budget cuts. In Switzerland, a referendum was held on whether or not to abolish the license fee – with 72% of the population voting in favour of keeping it. In France, President Macron has openly criticised public broadcasters. In Denmark, the largest public service broadcaster, DR, had its budget cut by 20% in 2018, and by 2022, all the Nordic public service institutions will likely have moved from license-financed public service to tax-based.[15] In Poland, public television and radio were put under direct control of the government in 2016[16] while in Greece, the public broadcaster ERT was shut down between 2013 and 2015 to cut government spending. In Bosnia-Herzegovina, national public service TV and radio have faced similar threats.

It is clear that the challenges facing public service media are mounting. In spite of

these practical challenges, there is a strong argument to be made that public service media has a renewed sense of purpose in our current era of relative truth, increasingly partisan news coverage and doctored narratives. In this view, a bigger part of the core future role of public service media will be qualifying opinions and content, fact-checking, and weeding out un-truths as discussed above. This, however, is easier said than done, especially considering that public service media outlets are increasingly moving their presence online, which means they must also take part in the networked and non-transparent media environment. This leaves them more vulnerable to accusations of bias, which they need to avoid, because the fragmented digital news and information environment makes it harder to clearly communicate who the sender of a piece of content is. In a similar vein, Reuter's 2017 report on polarisation and the European news media finds that for public service media, "maximising their online reach has the potential to reduce polarised news consumption. But in order to do this they [public service media] are increasingly reliant on social media and personalisation, which could plausibly increase polarisation."

Another related challenge is that public service media at its core must produce content that appeals to *all* citizens and serves to unify the population. In a politically polarised climate, this can be a difficult undertaking. Especially considering that in some countries, including the Czech Republic, Hungary and Poland, the editorial independence of public service media is being directly challenged or even dismantled by politicians and governments.[17]

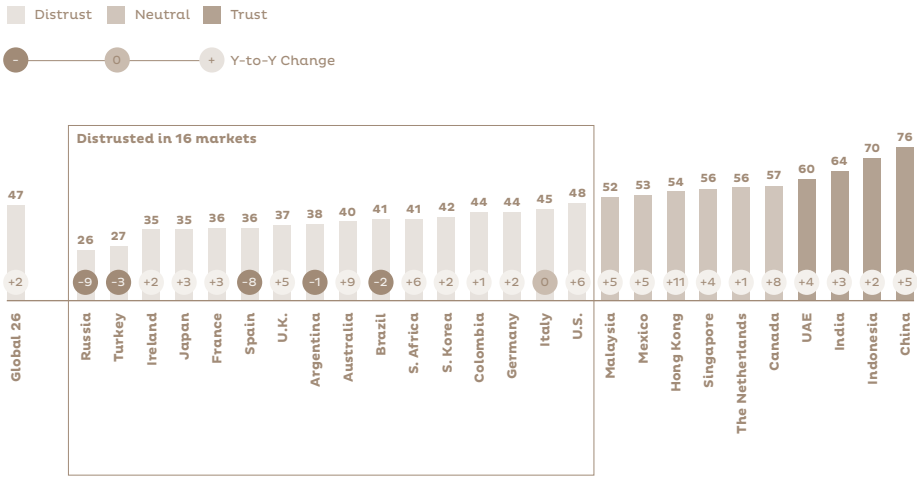
Partisan politics aside, there are also those who will argue that the traditional role played by public media in the past is made superfluous by the same developments in media technology that cause the rise of networked truth: the emergence of new outlets, platforms and technology, which both empower citizens to find information and expand their range of sources. Why does the public need to fund public media when the market offers a range of alternatives for citizens to choose from, the argument goes. The debate is not new, and it ignores the very real challenges connected to the rise of networked truth, but it continues to find new life as the technological environment in media changes.

LOW PUBLIC TRUST IN MEDIA

The world is lacking in trust. For almost two decades, there has been a global decline in trust in society's most fundamental institutions, observed by Edelman, among others.

The 2019 Edelman Trust Barometer, a yearly global survey of trust levels, reports that 'trust inequality' is at a record high, and while trust in media has seen a modest global rise compared to previous years, it remains the "least trusted institution" in many countries in 2019. (see figure 1.2)

FIGURE 1.2: **TRUST IN MEDIA RISES, REMAINS LEAST-TRUSTED INSTITUTION**
Percent trust in media



Source: Edelman Trust Index (2019).

The decline in trust in the media naturally varies among different regions and countries, just as there are differences in which kinds of news media citizens tend to trust from country to country. Even within Europe, the data shows high degrees of variation. Trust in radio and TV, for example, is generally higher in the Nordic countries and Estonia than in Southeast Europe. Trust in the written press is also low in Southeast Europe, as well as in the UK, but is high in Finland, the Netherlands, Albania and Portugal. In most countries, trust in digital media and social media is quite low. The exception is Eastern Europe, where these types of media are generally more trusted.[18]

In the U.S., trust in media hit an all-time low in 2016, with distrust being sharply divided among party lines. Citizens identifying as republicans expressed concern over "liberal bias" in "mainstream media", and citizens voting democratic showed concerns over right-wing news outlets like Fox News and Breitbart.[19] The situation in the U.S. is unique, in that the media landscape is highly polarised and commercialised (see figure 1.1) and that public media does not enjoy a position as privileged and widely trusted as in, for example, the Nordic countries. Even in the U.S., however, there has recently been a rise in the public's trust in local media.[20] Similarly, the innovation foundation Nesta reported an increasing interest in 'hyperlocal' news and media in the UK, following the adoption of smartphones and tablets.[21]

There is a wider point to be made that the more globalised the world becomes, the more we apparently need anchoring in the local, well-known or manageable. This can also be reflected in how social media is evolving. Mark Zuckerberg recently announced plans for the future of Facebook and Instagram, the world's two biggest social media platforms, that will move them away from being open, digital town squares and instead shift focus on private messaging within smaller groups and closed groups. The internet may still be a global village, but one that is increasingly separated into smaller communes.

In a world where trust is becoming a scarce resource, valuing trust above all else is one way in which public media can maintain its legitimacy in a fluctuating and non-transparent media reality. Taking this view, the future of public service media lies in doing even more to remain a fixed and localised point of reference in a fragmented and globalised world. This puts increased pressure on public service outlets to live up to the highest standards of transparency and integrity.

INTERVIEW: NRK

We reached out to Norwegian public service institution and CIFS member NRK for their thoughts on the future of truth, trust and polarisation. Below is an interview with Hilde Thoresen (Head of Research, Director General's Staff) and Marius Tetlie (Head of News Content).

Q: Our media use is becoming more frictionless, meaning that the filters between sender and receiver are disappearing. Politicians have a direct line to the population on social media, and YouTube has become a news platform in its own right. The public dialogue has largely moved to platforms such as these. What consequences do you think this will have for the future role of public service media?

A: It will be important to deliver content with a clear brand on all platforms. To contribute to a fact-based public debate, public service media must deliver content that follows the editorial guidelines and the ethical framework of public service. The challenge lies in getting media users to understand how this content differs from user-created content.

Social media and third-party platforms give rise to several dilemmas that public service media must face. The platforms lack transparency about everything, from their algorithms to how their companies operate and what societal responsibilities they have. There is a definite risk that public service media will lose the loyalty of their users and weaken their own platforms and channels if they become too dependent on third-party platforms in reaching their users.

Q: Trust in media is low in many parts of the world (how much varies greatly from country to country). What can public service media do to regain some of the trust it has lost?

A: First, it is important to keep in mind that the variations from country to country are big. In general, the Nordic public service media enjoy a high degree of trust. 88% of Norwegians think that NRK offers trustworthy content, and 73% think that NRK fulfils its goal of being impartial and independent. But it will be difficult to uphold this high degree of trust and legitimacy in the future, and public service media must work hard to be as relevant as possible for different groups in society. We believe there are three important factors at play:

First, we must be close to the audience and have a connection to what interests and engages them. Our journalism must reflect the kind of society we are and the challenges that preoccupy ordinary citizens. If the gap between people's interests and what public service media covers is too big, it will weaken citizens' trust in established media.

Second, it's important for all public service media to have their affairs in order – meaning, to run the organisation effectively, use public funds in a responsible way and avoid incidents that reflect badly on the reputation of the public service media institution.

Third, we see that established media outlets and public service media are affected

by the amount of trust the population has in established institutions in general.

Q: We see growing media polarisation (more in, for example, the U.S. than in Scandinavia). At the same time, there is a growing criticism of public service media from the political extremes and demands to cut spending in many countries. Will the role of public service media have to change?

A: Public service media must meet democratic, cultural and social needs in society. This will continue to be its goal in the future, but the way to meet that goal will change. It is crucial that public service media delivers content that is relevant and which reaches its audience. This sets demands for continuous innovation and for the ability to create relations and alliances with partners and institutions that see the value of strong public service.

Q: National public service media must increasingly compete on an international market, with international streaming services and social media, which are now beginning to compete for, for example, sports broadcasting. Should public service media continue to be a national and culturally unifying institution in a globalised media world?

A: Yes, this is at the core of our mission. We believe that public service media must continue to play a role in unifying the population around important events, but the international competition makes access to rights for international sports events more difficult. Drama is also an important way to unify at a national level. Finally, increased cooperation between the Nordic public service broadcasters – through Nordvision – is an important venue to meet the growing global competition.

Q: There are technological changes happening at great speed that affect how we consume media, and all citizens are now potential content creators. As a result, it has become harder to penetrate the noise. Which challenges and opportunities do you see in connection with the democratisation of media technology?

A: Public service media must keep up with developments and adapt its content to meet the changes. Public service media must offer new formats on new platforms that can compete at the highest level while working to recruit talents, build networks and ally ourselves with the young generations driving the changes.

1 Hilde Thoresen: "Politiske rammebetingelser for PSM i Europa" (2018)

2 Jeffrey Gottfried, Elisa Shearer: "News Use Across Social Media Platforms 2017", https://pewrsr.ch/2DQuVcQ (2017)

3 Nic Newman et al: "Reuters Institute Digital News Report 2018", https://bit.ly/2NCgL2g (2018)

4 David Mogensen: "I want-to-do moments: From home to beauty", https://bit.ly/2u8Muih (2015)

5 Dhruv Khullar: "Do You Trust the Medical Profession?", https://nyti.ms/2G84Wgp (2018)

6 Jennifer Kavanagh, Michael D. Rich: "Truth Decay", https://bit.ly/2D78Wff (2018)

7 Samuel C. Woolley, Philip N. Howard: "Computational Propaganda Worldwide: Executive Summary", https://bit.ly/2V7XmsC (2017)

8 Ibid

9 Janna Anderson, Lee Rainie: "The Future of Truth and Misinformation Online", https://pewrsr.ch/2XTTtsZ (2017)

10 Janna Anderson, Lee Rainie: "The Future of Truth and Misinformation Online", https://bit.ly/2H194jB (2017)

11 "A multi-dimensional approach to disinformation", https://bit.ly/2p4qjZr (2018)

12 Richard Fletcher: "Polarisation in the News Media", https://bit.ly/2uDjD4b (2017)

13 John Herrman: "Inside Facebook's (Totally Insane, Unintentionally Gigantic, Hyperpartisan) Political-Media Machine", https://nyti.ms/2mcTpT7 (2016)

14 Richard Fletcher, Joy Jenkins: "Polarisation and the news media in Europe", https://bit.ly/2CPMkly (2019)

15 Hilde Thoresen: "Politiske rammebetingelser for PSM i Europa" (2018)

16 Nils Muižnieks: "Public service broadcasting under threat in Europe", https://bit.ly/2ECThIT (2017)

17 "Public media and the global decline of media freedom", https://bit.ly/2FxBChR (2018)

18 "EBU Research Shows Strong Public Service Media Contributes to a Healthy Democracy", https://bit.ly/2gwfRmD (2016)

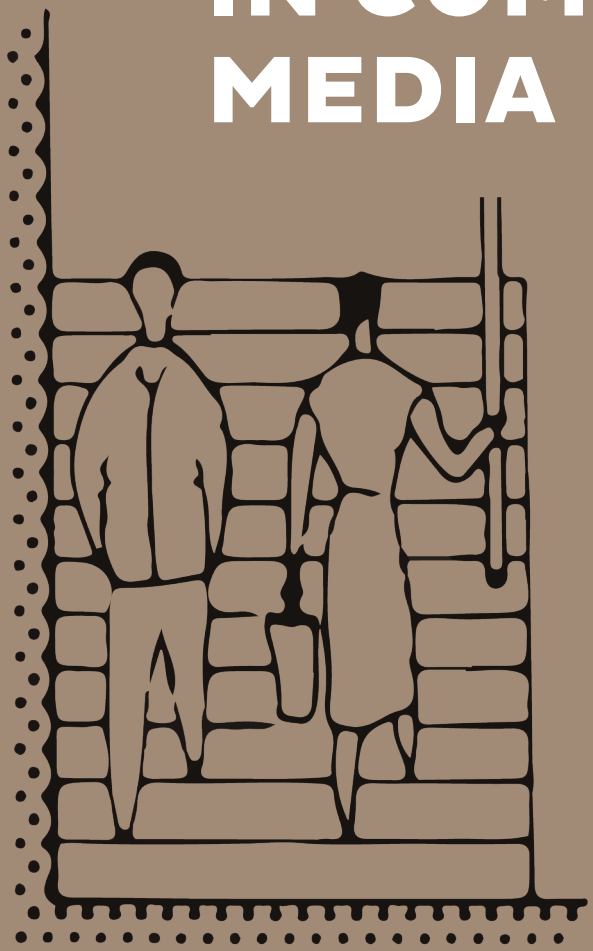
19 Ben Hammer, Joshua Tauberer: "Trust in mass media is at an all time low not because reporting has gotten worse, but because data access has gotten better", https://bit.ly/2yG67Rw (2018)

20 Indira A. R. Lakshmanan: "Finally, some good news: Trust in news is up, especially for local media", https://bit.ly/2VIYW4V (2018)

21 "Up your street: The rise of hyperlocal media", https://bit.ly/2PSZQtL (2013)

SOHINI KUMAR

DIVERGING TRAJECTORIES IN COMMERCIAL MEDIA



The future of commercial media will be characterised by diverging trajectories. Consumer and company behaviours are changing in response to evolving circumstances and on the whole, media companies and consumers seem to be moving in opposing directions across various trends. On one hand, companies are rapidly changing by diversifying in their functions and aiming to establish direct relationships with their customers. At the same time, consumers show signs of wanting to slow down and take control of their media experiences amidst concerns of misinformation and privacy. We also see clashes between emerging and established platforms, and struggles over personalisation, transparency and regulation playing an increasingly important role in defining the media landscape of the future.

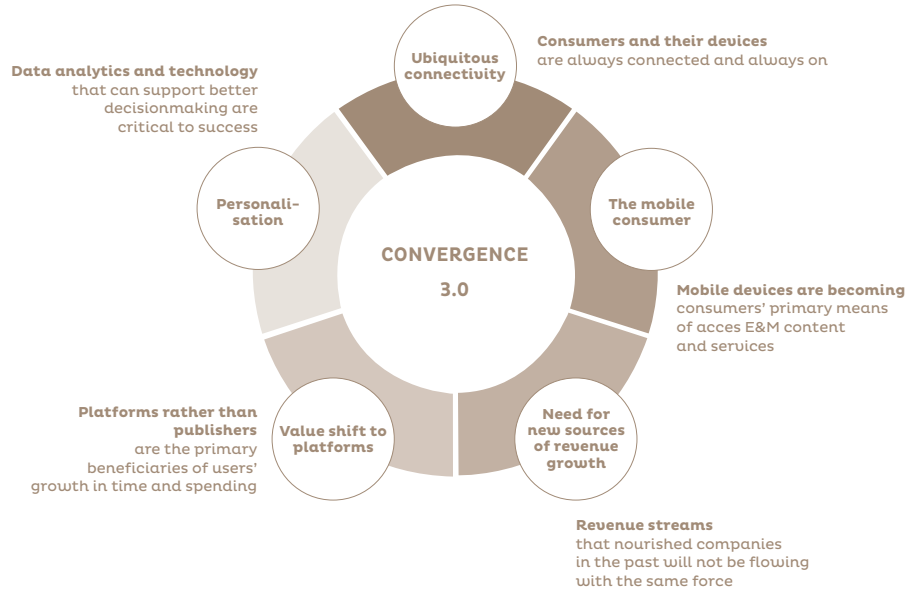
SLOWING DOWN VS SPEEDING UP

At first glance, the connected consumer may show little sign of slowing down, being perpetually connected and well-served with a selection of media experiences. Developments in technology continue to expand and heighten the competition for users' attention, and technology also changes the way we engage with and consume media. For example, there was a 140% increase in voice-assistant speaker ownership in the USA between 2017 and 2018.[1] Content is being consumed as fast as it is produced; as of June 2018, more than 4 million YouTube videos are watched every minute, about 694,444 hours' worth of video streamed on Netflix, and 750,000 songs streamed on Spotify.[2] YouTube now has 6 second ads and Snapchat features shows that are only minutes long.

The bar can only be raised with 5G connectivity on the horizon. While uptake will be slow (the technology is not expected to be widely adopted even by 2025, with adoption rates varying from region to region), 5G is set to be the connectivity technology of the future. It will give users the ability to transmit large amounts of data about 100 times faster than 4G and may also provide more extensive en-

cryption, contributing to safety online.[3] This will raise consumers' expectations of speed and security.

FIGURE 2.1: **A HANDFUL OF FACTORS COMBINE TO CREATE A NEW STYLE OF CONVERGENCE**



Source: Perspectives from the Global Entertainment & Media Outlook 2018–2022 (2018).

In line with this trajectory, the media and entertainment industry – which includes books, magazines, newspapers, video games, audio (music, radio, podcasts), cinema and TV (traditional and online) – is growing in size and diversifying its offerings; PwC estimates that between 2017 and 2022, global entertainment and media revenue will increase from less than 2 trillion USD to close to 2.5 trillion USD.[4] A "converged entertainment ecosystem" is developing, where companies' functions overlap and there are fewer distinctions between media formats and adjacent industries, such as telecommunications and technology (see figure 1).[5]

Technological developments support this growth by allowing faster speeds of production: 72% of publishers responding to Reuters' 2018 survey on media and technology trends said they were doing trials with AI, which is already helping journalists deal with more information at a faster pace and deliver content in volumes that would not otherwise be possible.[6] The near-term use of AI in news production and consumption falls under three categories: using machine learning to personalise content and create better recommendations through intelligent news aggregation apps; automating stories and videos (including virtual news anchors); and providing tools to help augment and support journalists to deal with information overload (including software that helps journalists find stories in big data sets).

The mindful consumer

The first McDonald's in Italy was planned to open in Rome in 1986. The decision was met with protests for many reasons. Amongst thousands of protestors on site was journalist Carlo Petrini, handing out plates of pasta to advocate for 'slow food' as an antidote to fast food. Despite the objections, the McDonald's was built, and it was the largest in the world at the time. But the incident started the Slow Food movement, which in 2014 had 150,000 members in 150 countries and now has millions of global participants.[7] Following the tracks of Slow Food, we see a similar movement in slow media.

Look beyond the dominant trend of technology speeding up media production and consumption, and another type of consumer appears — one who is more mindful of their consumption habits. People are gradually becoming aware of time spent online – both Android and Apple have introduced features that track how much people use their devices, and steady support for slow media indicates a potential sub-trend to speedy mainstream. Dutch slow news platform De Correspondent, which focuses on in-depth coverage on a topical basis under the tagline "Unbreaking News", broke a world record in journalism crowdfunding when it raised 1.7 million USD from almost 19,000 supporters in 2013. Over five years, De Correspondent grew to have more than 60,000 members and became one of the largest member-supported journalism platforms in Europe.[8]

Similar start-ups are gaining ground worldwide, from Europe (Italy, Finland, Denmark) to the UK, US and Canada. UK-based Tortoise raised more than 500,000 GBP from 2,530 backers through its Kickstarter.[9] One of subscribers' main reasons for supporting Danish newspaper Zetland is the small number of

articles it publishes, and the Times UK has experienced a rise in views and subscribers within a year of abandoning the breaking news cycle and slowing content production to three digital editions a day.[10] Slow TV is popular in Norway, where more than half the country watched a cruise ship's 134-hour journey in 2011.[11] BBC Radio 3 offers a range of slow radio shows, while podcasts, which differ from other media in their lack of commenting and sharing features and thus show characteristics of slow media, are growing in popularity.[12]

SLOW JOURNALISM

- "Counter discourse" to mainstream media and the breaking news cycle.
- Renewed focus on quality (i.e. comprehensive research, context, reflection) and transparency.
- Effort to counter lack of accuracy and verification (e.g. reporters running stories before they have even taken place) stemming from increasing speeds.
- Does not consider itself a rival to or replacement for mainstream media.

Source: Megan Le Masurier: What is Slow Journalism? (2014)

Expected trajectory

The amount of people online is growing by more than one million each day, with users' time online averaging at nearly 7 hours a day.[13] Speeding up is undeniably the dominant trend and its course is not threatened by the countertrend of slowing down.

However, alternative behaviours exist as an undercurrent. Parts of the population are looking to slow down while the media industry charges ahead to churn out content faster than ever. This is illustrated, for instance, in a 2016 study conducted in the Netherlands. It found that the younger demographic is most concerned

with having news for free and available on mobile devices, which indicates an inclination for fast-paced media; however, nearly one in three users valued qualities embodied by slow media, such as diversity and comprehensive stories.[14] Like its gastronomical counterpart, slow media does not mean the end of existing media, but introduces consumers to an alternate approach.

There are only 24 hours in a day and we will eventually reach a state where the limits of our attention and time delegated to media consumption have been reached. A survey from Nielsen estimates that the average American adult spends almost 12 hours daily on media consumption (with multi-tasking and simultaneous media use factored in).[15] It is clear that the time spent consuming media cannot continue to grow at the pace it has so far. In fact, media consulting firm Activate estimates that it will slow down significantly and only grow by 11 minutes towards 2022.[16] When a state of "peak media" is reached, it may create a growing momentum and interest for slow media, with more people trying to fill out their day with meaningful content, or it may further exacerbate the trends toward shorter formats and faster media designed to better compete for our finite attention spans.

A changing political and societal context may influence the trajectory of the 'slowing down' countertrend. A 2016 study done in the USA found that, while 20% of adults felt burdened with information overload, many believed it would lead to freer access to a greater amount of knowledge. These sentiments assumed that the information would be effectively filtered.[17] In today's world, there are virtually no barriers between (mis)information generation and propagation, facilitated by the horizontalisation of technological platforms' services and use of AI. And this will not improve: Gartner estimates that by 2022, the majority of individuals in mature economies will consume more false information than true information, with AI becoming more adept at creating manipulated media than detecting it.[18] Thus, growing content overload and misinformation may raise the profile of slow media (and the slowing down movement in general) as a supplement to fast and non-transparent content.

ESTABLISHED VS EMERGING PLATFORMS

Between increasing volumes of content and dubious credibility, consumers can assume more proactive positions to control their media experiences. New initiatives are centring themselves around consumers rather than publishers: examples include Kinzen (a news app that allows its users to be in charge of curation), Spaceship Media (which generates journalism through human dialogue) and Tortoise

(which allows members to participate in newsroom discussions). A similar pattern follows in other media. Deloitte's 2019 Digital Media Trends Survey revealed that customers in the USA are increasingly building their entertainment experiences by picking and choosing amongst available platforms and subscription services and creating combinations that suit them.[19]

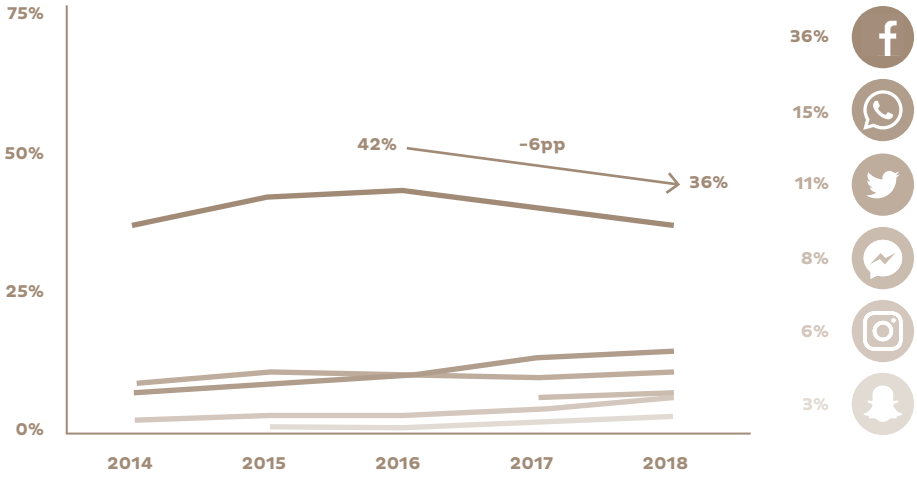
The empowered consumer's choices are reflected in the rise and decline of certain media and tech platforms. Increasingly, younger generations are foregoing traditional media in favour of new platforms – primarily social media and streaming sites such as YouTube and Twitch. In Denmark, where public service media has traditionally based much of its raison d'être on producing quality programming for children, YouTube has now become the primary channel for both information and entertainment for the very young. 75% of 8-12-year olds use YouTube every day, and their viewing habits cover everything from makeup and gaming to natural science.[20]

Meanwhile, news consumption on Facebook is on the decline for most countries.[21] In 2017, 46% of people in Denmark got news daily from social media (Facebook being the most popular), with similar figures across other European countries.[22] However, Facebook has been less popular for news in certain places since 2016 while other platforms grow in popularity (see figure 2.2). This could be because of Facebook's algorithm changes, but also because of consumers' changing needs concerning issues like privacy and convenience, which other platforms may be fulfilling better. Further, a 2017 global survey found that talk of fake news negatively impacted trust in social media, messaging apps, and digital-only news platforms, compared to traditional news sources.[23] Nevertheless, there are currently varying degrees of convergence in use, with some consumers discovering news on Facebook or Twitter tending to discuss it through messaging platforms.[24]

With the changing nature of media (both in its form and consumers), media companies may increasingly strive to gain control over their output against consumers and intervening platforms. For example, Google News is combining with Google Assistant to create an interactive voice-controlled news aggregator that allows users to navigate their own consumption of content, rather than being guided by publishers.[25] Media consumption is also changing: new direct-to-consumer businesses models are becoming popular and subscriptions are on the rise, occasionally replacing traditional media outlets such as TV.[26] Overall, there is a horizontalisation of expectations, wherein new experiences provided outside

the media industry become the standard to which everything else is compared – consequently, companies have to contend with more than direct competitors for users' loyalty.[27]

FIGURE 2.2: **PROPORTION THAT USED EACH SOCIAL NETWORK FOR NEWS IN THE LAST WEEK (2014-18)** – SELECTED MARKETS



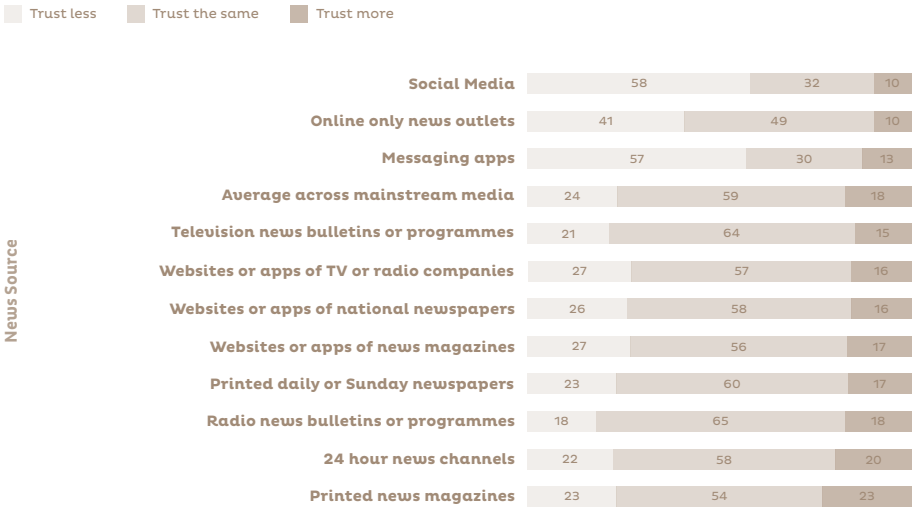
Source: Reuters Institute Digital News Report (2018).

Expected trajectory

Changing habits and expectations pose a challenge but can also form opportunities for companies willing to adapt. The BBC, for instance, is using Instagram's story feature to reach a younger demographic, which that might not otherwise encounter their content.[28] Developing technologies also impact the popularity of different kinds of content: for example, new audio devices support the popularity of podcasts and impacts how people discover content through more varied sources; this is akin to how younger generations' preference for social streaming platforms is related to the proliferation of smart phones and tablets.

While new platforms for the production and consumption of media are emerging, there is a global convergence of power and influence happening, with the 'duopoly' of Facebook and Google continuing to dominate when it comes to digital ad revenue.[29] However, new technologies such as blockchain may present interesting cases for new modes of media dissemination that are not as reliant on ads. If current issues related to scaling, transaction costs and speed are solved, blockchain can present a more effective way to sell pieces of content online for small prices while avoiding disproportionate transaction costs.[30]

FIGURE 2.3: **THE IMPACT OF HEARING ABOUT "FAKE NEWS" ON TRUST IN POLITICS AND ELECTION COVERAGE ON PLATFORMS USED (BRAZIL, FRANCE, UK, U.S.)**



Source: Kantar UK Insights, uk.kantar.com/business/brands/2017/trust-in-news (2017).

INCREASING ACCESS VS CONSUMER WILLINGNESS

More than ever before, companies have to diversify their functions, the products they offer, and their revenue streams. There is more competition between players to take control over user experiences and relationships. Media companies are

accordingly reconsidering their business models. Print media does not generate enough revenue, while digital advertisement must compete with large tech companies that have greater scale and capabilities; subscription and membership thus seem to be ideal for the future, with the aim of gaining customers' loyalty.[31] In 2017, The New York Times earned more money through subscriptions than advertising, and reached 1 billion USD in subscription revenue; similarly, Netflix and Amazon Prime are seeing continuous growth with their services. Even though digital advertisement is also a priority, it must compete with large tech companies that have greater scale and capabilities.[32] User acceptance also plays a role in its effectiveness – for instance, Candy Crush increased its revenue by 35% by removing advertisements.[33]

Countries in which publishers have direct relationships with their customers are more likely to be successful with this strategy (e.g. Norway and Finland, where two-thirds of respondents to a survey conducted by Reuters access news via the publisher's website or app) compared with those that depend on platforms (e.g. South Korea, where 47% prefer to search for news and 30% go to aggregators rather than going directly to the source).[34] Advertising is also a significant revenue stream, as certain countries are less accustomed to paying for digital content. Finally, companies also recognise the importance of personalised service: 73% of publishers responding to the survey saw personalisation as an important strategy.[35] However, while companies look for more direct access to their customers, consumers are concerned about privacy and data protection, creating a potential conflict of interest.

Lack of transparency

Most people might never have imagined seeing Barack Obama insult President Trump, but that is now somewhat a reality. In 2018, actor and filmmaker Jordan Peele worked with Buzzfeed to produce a video warning of misinformation. Using AI, they spread the message by using Obama as a puppet. This kind of technology is on the horizon: Adobe has previously worked on developing a "Photoshop of speech"[36] while start-up Lyrebird allows users to clone voices. AI can both help and worsen the problem. While it can be harnessed for less than moral purposes, it can also be used to combat misinformation. Machine learning algorithms have been used to detect spam by analysing text. Such an algorithm can be used to spot clickbait articles by seeing how well titles and content match, or by comparing articles to verify facts; however, as methods of detecting misinformation develop, the misinformation itself will be more difficult to discern from genuine content.[37]

In this environment, transparency about the validity of the news and media we consume is justifiably difficult to achieve. An investigation by Science magazine found that false information online spreads faster than the truth. The investigation concerned 126,000 rumours spread on Twitter between 2006 and 2017, and found that the top 1% of false news cascades reached between 1000 and 100,000 people, while the truth rarely reached more than 1000. One of the reasons for this is the novelty of false news, which increases the likelihood of it being shared. The study concluded that human behaviour contributes more to how differently true and false information spreads than automated bots do.[38]

Role of regulation

Regulators are becoming harsher in their attempts to hold platforms accountable for their handling of information. The UK's Department for Digital, Culture, Media and Sport recently submitted proposals that suggest appointing an "independent regulator" to enforce rules and hold tech companies accountable for breaking them. Websites could then be fined or blocked if they do not manage 'online harms' such as harassment and hate crimes. The proposals were met with accusations of freedom of speech violations, with the head of research at think tank Adam Smith Institute saying they are "a historic attack on freedom of speech and the free press".[39]

Similarly, the Singaporean government recently introduced a bill that would allow ministers to order social media platforms to feature disclaimers next to posts the government considers false, and even remove them. A perceived mistake would allow the government to fine companies for up to 740,000 USD, with individuals in danger of up to 10 years of jail time. This motion was also criticised for infringing on freedom of expression.[40] Taken to the extreme, the rise of misinformation may thus allow politicians to restrict freedom in media.

Expected trajectory

Media users are becoming more concerned about privacy — the more they customise their media experiences, the more data they feed into multiple platforms and services. Survey respondents in the USA indicated that they want the same control over their data as they wield over their media choices.[41] Yet, users continue to prioritise convenience over privacy. A recent survey found that 79% of respondents think companies know too much about them, yet 90% are willing to share behavioural data for an easier shopping experience.[42]

Thus, attitudes towards privacy are contradictory. Even amidst reports of 'techlash'

and a little more than half of internet users worldwide expressing increased concern about their online privacy in 2018,[43] a USA survey measuring trust in protecting personal data found that tech giants topping the list (Amazon is most trusted in keeping private date secure, followed by Google and Apple).[44] Facebook users in particular have been let down repeatedly, with the worst violations of trust perhaps culminating in consulting firm Cambridge Analytica using data from 87 million Facebook profiles without users' consent, yet it was the top social media platform in early 2019, with a steadily growing number of users.[45] Moreover, as mentioned before, social media and messaging apps see little trust, yet are widely used for news. These behaviours show that convenience tends to overshadow concerns, and may thus lead to consumers granting media companies direct access to their data, regardless of any unease.

Direct relationships and personalisation are thus the dominant trends. To a small extent, companies face a dilemma: the expectation for quality content grows but in striving to provide it, companies might face user uneasiness. A more significant force may come from official regulations; for instance, media companies in Portugal are working together to compile one list of consumers' information with their consent.[46]

CLOSING THOUGHTS

Exploring these trends and trajectories brings some significant issues to the forefront. Firstly, we find that the democracy of media is at risk. Thanks to newer channels facilitating access, content can easily reach more people, but barriers may be going up again. In order to protect quality, widespread adoption of the subscription model could lead to an imbalance of access between consumer segments, meaning that only those who can afford the expense are allowed to access quality content. While companies such as Tortoise may aim to close the "power gap", their revenue model automatically closes off a part of the population that cannot afford to participate in its vision.

Secondly, development varies depending on geography, societal and political circumstances, and nuances may appear upon closer inspection that cannot be covered in a general overview. The trends outlined may differ in their impact, but still look to be significant overall. Ultimately, the dominant trends are not in danger from subtrends, but the industry will experience conflict as behaviours diverge. Media companies might thus find themselves in a contradictory position, under pressure to do more and less at the same time.

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KLAUS Æ. MOGENSEN

HI-TECH MEDIA

Technological development and changes in media consumption are closely connected. We have identified six technological trends that we believe will greatly impact how media is produced and consumed in the future and will thus be important to monitor in the years to come: the rise of computer-generated content, computer-enhanced imagery, 5G and media, VR and AR, media on the move, and technology challenging online advertisement.

COMPUTER-GENERATED CONTENT

As the production, distribution and consumption of media accelerates, new technologies are applied that both meet the never-ending hunger for instant media gratification and uphold the same acceleration that produces this need. One example is computer-generated content, which can rapidly write and produce content, and which is already being applied across several domains.

Take, for example, computer journalism, where artificial intelligence (AI) produces short articles based on sports results and statistics, annual or quarterly financial reports, weather and seismic data, and more, and computer-assisted reporting, where reporters use AI to find facts, verify claims, and more. Several educational institutions today offer courses in computer-assisted reporting, and annual conferences are held on the subject.

In late 2018, Google announced a partnership with Polis, the international journalism think-tank at London School of Economics and Political Science, to create 'Journalism AI'.[1] The project will focus on helping the news industry use AI in more innovative ways, including verifying user-generated videos to provide footage of real-time events without accidently disseminating fake news. *The Guardian Australia* is experimenting with letting an automated system called Reporter-Mate write articles for the online edition of the newspaper.[2]

According to *The New York Times*, no less than a third of the content published by Bloomberg News uses some form of automated technology. The Cyborg computer system used by the company can assist reporters in writing thousands of articles on company earnings reports each quarter. The program can read through a new financial report in seconds and generate a news story with the most important facts and figures.[3] In April 2019, academic publisher Springer Nature published the textbook *Lithium-Ion Batteries: A Machine-Generated Summary of Current Research*, written by the AI Beta Writer. As its name indicates, the book is a summary of thousands of peer-reviewed papers published on lithium-ion batteries. It includes quotations, hyperlinks to the work cited, and automatically generated referenced contents. It is not exactly elegantly written, but could be a good aid to anybody – journalist or not – who wants to become updated on the subject.

So far, computer journalism is no serious contender to human journalism in terms of quality of writing. AI-produced articles tend to be rather dry, with a focus on facts over narrative, and computer journalism is mainly used to quickly produce articles on events that may not interest most readers, but can find readership among local audiences or industry watchers. In the future, however, AI systems are likely to steadily improve and produce better written articles on increasingly complex subjects while doing their own research and fact-checking while writing. For example, a computer journalist could write a review of a rock concert based on a set list and tweets mentioning the concert with hashtags. Live news reporters will likely be assisted by AI that fact-check politicians' statements in real time and hold them accountable for previous statements or votes on particular issues they bring up in debate. Human journalists may work with AI, with a human reporter asking the AI to research a given subject and summarise the most relevant points, after which the reporter chooses the angle for the article and writes the human interest parts, while the AI writes up fact boxes and creates graphs and figures where necessary.

We might also see real-time CGI newsreaders on TV and blogs, created to look as authoritative and/or attractive as possible, perhaps even tailored to the individual watcher's preference. This may even be used as a tool for manipulation, making political messages more easily accepted because of emotional attraction to or respect for the virtual newsreader.

In fact, AI journalism looks like it could be used extensively to create convincing fake news stories. The non-profit research company OpenAI has developed an AI

called GPT-2 that generates fake news stories based on input from a few words to a full page. It can be made to put a positive or negative spin on the news, portraying an idea or politician in a favourable or unfavourable light. It can even do fiction. When fed with the opening line of George Orwell's novel *Nineteen Eighty-Four*, "It was a bright cold day in April, and the clocks were striking thirteen", it produced a convincing follow-up paragraph: "I was in my car on my way to a new job in Seattle. I put the gas in, put the key in, and then I let it run. I just imagined what the day would be like. A hundred years from now. In 2045, I was a teacher in some school in a poor part of rural China. I started with Chinese history and history of science."[4]

An adage says that life imitates art. Today, we are at the dawn of an age where AI imitates art. We have seen a few cases where AI has been fed samples of fiction in certain genres or by a certain author and then been tasked to create new content on this basis. The results so far have been hilariously surreal. The best-known case might be the AI that in 2017 wrote a chapter for a new Harry Potter book entitled *Harry Potter and the Portrait of What Looked Like a Large Pile of Ash*,[5] which includes sentences like: "Harry tore his eyes from his head and threw them into the forest. Voldemort raised his eyebrows at Harry, who could not see anything at the moment." This makes an odd sort of sense, even though Harry's motivation for his actions seems rather vague. Another example is the 2016 science fiction short film *Sunspring*, which an AI named Benjamin wrote by analysing a few dozen screenplays of science fiction movies, as well as one-sentence ideas from a competition held by *New Scientist* (including one written by a CIFS futurist, on which the first spoken sentence in the short is based). The nine-minute short film, which includes a song with lyrics written by the AI based on a database of 30,000 folk songs, has an IMDb rating of 5.7, better than many commercial movies. It can be watched on YouTube.[6]

In both cases, the input databases for the AIs have been rather small – seven novels or a few dozen screenplays. It is possible that with far more input, the results will be better, especially if coupled with narrative models like Campbell's The Hero's Journey. Such AI may be best at churning out scripts for endless, formulaic soap operas and sitcoms, but as there seems to be a large audience for such, this may not be a problem. A little surrealism could in fact spice up such series.

Before we reach this stage, AI-generated plots may be used as inspiration for human scriptwriters struggling to come up with new ideas. The AI may also help a writer

to write dialogue by trawling social media and analyse current language patterns. As is often the case, the best results may be reached by collaborations between people and AI.

FREE OR LOW-COST WEB-BASED SERVICES OFFER ENHANCEMENT OF IMAGES IN VARIOUS WAYS, USING AI:

- Algorithmia colourises black-and-white photos, identifying different regions of the image and selecting colours for them based on comparisons with a database.
- PaintsChainer similarly colourises simple line drawings, with the option to add colour guidelines.
- Let's Enhance upscales and adds texture to low-resolution images.
- Remove.bg removes backgrounds from photos for easy copying of figures or items into other settings.

The results of these AI-powered algorithms are often far from perfect, but hint at what might be achieved in the future.

COMPUTER-ENHANCED IMAGERY

When the movie *Rogue One: A Star Wars Story* was released in 2016, it made headlines not so much because of its story, but because of one of the actors involved. The movie takes place immediately before the original *Star Wars* movie from 1977 and features several characters from that movie – including the high-ranking Empire officer Grand Moff Tarkin, played in the original movie by British actor Peter Cushing, who died in 1994. He was replaced in the new movie by the actor Guy Henry, who in turn had his face overlaid by a computer-generated copy of Peter Cushing's face as it looked in 1977. Henry's facial movements were copied

very convincingly by the overlay, and viewers unaware of the fakery could see nothing unnatural about it. In this way, a long-dead actor came alive again. The end of the movie also featured a short scene with a young version of Carrie Fisher's character Princess Leia as she looked in 1977, overlaid on the face of the rather unknown actress Ingvild Deila.

Given the state of motion capture today, we should not be surprised by such resurrections of old-time actors. In fact, the most surprising thing is that technology hasn't been used for this sort of necromancy more often. It seems logical to use the technology to recreate popular actors like Humphrey Bogart, Marilyn Monroe, John Wayne, and Audrey Hepburn in new movies, together or acting opposite modern actors. Not only could looks be recreated, but also mannerisms and patterns of speech. The greatest barrier may be ethical and legal issues; in fact, British reviewers of *Rogue One* called the use of Peter Cushing's likeness "a digital indignity".

Such techniques are obviously also well suited to creating fake media, wherein politicians and celebrities are put into embarrassing situations or made to appear to say something they would never say. There are even ways to manipulate video feeds in real time, transposing an actor's facial expressions onto the live feed of a politician.[7] Similar methods can be used to map a politician's speech patterns onto an actor's spoken words, and if these techniques are combined, media could fundamentally change what is being said and done, even in live media coverages. Future media technology is hence likely to lead to more convincing misinformation and further increase distrust in digital news media.[8]

We often see older movies or TV shows re-released in high definition, but the process of upscaling old TV or DVD formats is expensive and time-consuming. Here, AI may once again help with the result. A fan of the old *Star Trek* series *Deep Space 9* has, of his own accord, developed a system using machine learning and neural networks to upscale selected scenes of the series from an old NTSC video tape to 1080p HD. The result isn't quite up to the quality of a professional remaster, but is far better than the original, and with a little more work, the algorithm could be used to make decent, inexpensive HD versions of old low-resolution movies and TV.[9] The best results, however, seem to be from human/AI collaboration, as seen in Peter Jackson's 2018 World War I documentary *They Shall Not Grow Old*, which used old black-and-white footage that was enhanced, colourised, and converted to 3D with the help of the latest computer technology.[10] More importantly, looking ahead, the *Star Trek* case highlights the democratisation of modern media

technology: techniques that were once reserved for large media corporations can now be leveraged by amateurs with very small budgets, something also seen with computer-enhanced imagery in various fan-made *Star Trek* and *Star Wars* shorts. The Kinect module for the Xbox game station can, with free software, be used for motion capture.[11] This promises a wealth of high-quality content from even very small production companies in the future, and major Hollywood studies with billion-dollar budgets may not be alone in producing blockbuster movies.

5G AND MEDIA

Mobile technology has gone through several radical changes or 'generations'. The first generation, from around 1982 and now often known as 1G, is classical analogue transmission of voices. Its successor, 2G from 1991, was the first digital phone technology, and it allowed data transmission at a speed of up to 64 kilobits per second (Kbps), text messages, and later, MMS. 3G from 1998 was the first broadband technology for mobile phones, with transmission speeds of up to 2 megabits per second (Mbps), enough for limited use of the internet. Today, most smartphones use the 4G network, introduced in 2008, with typical transmission speeds of 100-200 Mbps. The next generation, 5G, which promises transmission speeds of 1-10 Gbps, is about to be unrolled across the world, with 5G networks under construction even though no commercial 5G smartphones are available at the time of writing. Several major smartphone companies promise 5G phones sometime during 2019, although it will probably take a decade or more for the technology to become the most widely used wireless technology. The Swedish communication company Ericsson predicts that by 2024, 5G networks will reach 40% of the global population. Around the same time, however, 5G may only make up around 14% of the total number of mobile non-IoT connections worldwide, as estimated by Deloitte.[12]

It is expected that subscription plans involving 5G will be very expensive, so it won't be for everyone.[13] "Operators are spending huge amounts of money just for the spectrum space to provide 5G connectivity, and they will have to pass the cost on to their customers," thinks previous Tata Communications COO John Hayduk. The result, he believes, is that many consumers will stick with 4G. Given the expenses of putting up 5G transmitters, which need to be much closer together than 4G transmitters, 5G is likely to remain more expensive than 4G for quite some time. As major carriers begin to sell 5G, smaller carriers that haven't invested in 5G technology may lower the cost of their 4G subscription plans as a response, or increase the data allowance significantly, in order to retain or enlarge their

market shares. This may slow the transition to 5G even more. Adding to this is the problem that there is no single 5G standard, so all 5G phones may not be able to run optimally on all 5G networks. At worst, we may see a situation like the old VHS/Betamax video tape issue, or the later Blu-ray/HD-DVD issue, where two (or more) industry standards compete with great uncertainty regarding which will win, which may cause consumers to delay investing in 5G phones until the situation is resolved.

5G makes use of very high frequencies for the transmission of large amounts of data, a few blocks at a time, with speeds of up to 20 gigabits per second (Gbps) – about a hundred times faster than 4G, with the latent period down to a millisecond. However, everything comes at a price, and the high frequency means that signal range will be shorter than that of existing networks, and obstacles such as walls, hills, rainy weather, or even hands can more easily block the signals (some 5G phones will be equipped with multiple antennas to remedy this problem). Some will be familiar with this problem from Wi-Fi, where the range of 5 GHz transmitters is shorter than that of 2.5 GHz. Hence, 5G transmitter masts need to be closer to each other, maybe down to covering individual housing blocks. This probably means that 5G will mainly be an urban phenomenon, whereas rural areas will still have to make do with 4G for quite some time. It may also be difficult to access the 5G network in natural parks and recreational areas, such as forests, marshes, and beach meadows, so most 5G smartphones will probably use 4G as well as 5G networks, and switch between them according to the situation.

It may look as if 5G technology is something phone carriers are pushing on consumers rather than being something consumers have asked for. An often-used selling point is that you can download a HD movie in seconds rather than minutes; but is this really something that users are willing to pay high premiums for? Most users will probably do fine with 4G+ or LTE Advanced, which offer 300-500 Mbps transmission and are offered by many smartphones and phone networks. 5G, however, has uses beyond phone services and media. It is thought to be a central component in the "Internet of Things" and pivotal in making autonomous cars communicate with each other without serious lag. It will also reduce lag in augmented and virtual reality.

In early 2019, around 250 scientists from around the world signed a petition to the United Nations and World Health Organization outlining their concerns that "cellular and cordless phones [2G, 3G and 4G networks] … and broadcast antennas,"

amongst other radio frequency emitting devices, may produce cancer risks due to the electromagnetic field (EMF) radio waves they produce.[14] This has caused concerns that 5G networks, with higher radiation frequencies than earlier generations of mobile phone networks, may be detrimental to health and even cause cancer epidemics. However, according to expert agencies and studies, there's nothing to suggest 5G waves are a significant health risk, though more research needs to be done on the subject to completely dismiss fears.[15] Real or not, such dangers might cause resistance to having 5G towers near homes, as has been the case for high-voltage electrical lines – and if future studies suggest that the danger may in fact be real, this could result in a setback for 5G technology and a call to return to earlier technologies.

VIRTUAL REALITY AND AUGMENTED REALITY

Virtual reality (VR) and augmented reality (AR) have been around for some years now, but have yet to become mainstream. Most headsets are still uncomfortable to wear, and image lag is a major problem that can lead to disorientation and nausea. Focusing on a screen a few centimetres from your eyes, no matter how far away the image you're watching seems to be, is also known to cause the same effects. These are technical issues that may be solved with further development. Among other solutions is a technology called virtual retinal display (VRD), where the image is painted onto the retina by coloured lasers rather than being displayed on a screen. This changes the focus distance to match the apparent distance of images, and even changes focus distance while you watch, focusing on close, intermediate, or distant images while blurring details at other distances. A market report on virtual retinal displays released in July 2018 expects "huge opportunities in the entertainment and gaming industry" for VRD towards 2023, with about a billion users of VR and AR globally by 2020.[16]

Given the state of the technology, one billion users as early as 2020 seems rather unlikely, unless you count occasional users and/or include very simple AR experiences like the popular smartphone game *Pokémon Go*, which overlays images onto real surroundings as seen through the phone's camera. Perhaps unsurprisingly, the largest VR markets so far seem to be pornography and games. Even so, the market for VR porn only had an estimated USD 15 million in revenue in 2018, while the market for VR games comes in at USD 130 million – roughly 0.1% of the game industry's revenue, which was expected to hit USD 125.4 billion in 2018, according to market researcher Newzoo.[17] These numbers do not exactly suggest a booming market for VR. A major limitation of VR is that users cut themselves

off from their surroundings, which can be dangerous unless the user is sitting down. The technology can also be viewed as antisocial: you can watch TV or movies together, and even when playing a traditional computer game, you are still aware of your surroundings and can interact with people around you. In contrast, VR is in general a solitary experience, though some VR content allows multiple simultaneous users.[18] VR may have its greatest future in professional use, such as training simulations, and is already used extensively in the military for this purpose.

AR is likely to have a great future in social gaming. AR headsets like Microsoft HoloLens have shown the ability to tie computer-generated visuals to real-world objects like a table, allowing the viewer to walk around the visuals and interact with them. On a greater scale, this feature could allow adding virtual scenery to a real-life gaming environment, and with proper synchronisation of AR headsets, these additions could be shared with other players and even interacted with. The same technology could also be used to add to theatre or concert experiences, setting a wider stage than permitted by physical constraints, at the cost of having to wear a headset.

News and media outlets are also experimenting with AR-based reporting. Examples include *The New York Times*, which has included a so-called 'Interactive Features' option on its app. Similarly, the UN took full advantage of the medium in 2015 by creating an AR story in 360 degrees from inside a refugee camp.

MEDIA ON THE MOVE

With smartphones and wireless internet, using media on the move has become far more common in recent years, and is no longer limited to reading books or listening to music. We expect the next major change to be autonomous cars, which could fundamentally change the way we consume media. Today, commuters by car are mainly limited to auditory media use, since driving a car requires keeping visual attention on the road. When riding autonomous cars – which are expected to be commercially available to consumers from 2021 – drivers can direct their attention anywhere and hence engage with any kind of media content they wish. Even cars that only offer autonomous driving on highways (which are expected earlier and likely to be less expensive than true self-driving cars) will allow visual media consumption during major parts of the commute. A commute time of between 25 and 50 minutes, twice a day, adds up to four to eight hours a week, a large fraction of which could be used for media consumption. To this we can add vacations, during which tedious travelling on highways could be used for collective binge-watching of movies or TV series, or playing social video games.

Mobile devices like smartphones, tablets and even VR headsets could be used for this sort of media consumption, but autonomous cars may also be equipped with their own media units, possibly even turning the windshield into a large screen while blacking out side and rear windows. Car-sharing services using autonomous cars could very well use media equipment as a selling point, and media subscriptions may be bought by such services rather than by individual users, as well as allowing users to log into their own subscriptions automatically when unlocking the car.

Cars are more private spaces for media consumption than public transportation or even homes, particularly if windows can be blacked out. This may influence both the content and how it is consumed. Commuters may largely access media that they don't want to share with others. As mentioned above, virtual reality shuts out the surrounding world, and hence the privacy and comfort of a car is ideal for VR experiences.

Autonomous cars are not expected to be very common until ca. 2030 and will not exceed 50% of new car sales before ca. 2040,[19] and until then, most autonomous cars are expected to belong to sharing services and taxi companies. Hence, the main buyers of media equipment for autonomous driving are likely to be such services, at least for the first decade or two.

TECHNOLOGY CHALLENGING ONLINE ADVERTISEMENT

The advertisement environment is changing rapidly due to modern media technology, and there is an arms race going on between online ads and technology that allows users to bypass them. A report showed that in 2018, more than 70 million US citizens – a quarter of US internet users – used ad blockers when browsing the internet; up from 58 million in 2016.[20] The share of internet users using ad blockers is expected to increase, and several major browsers have ad blocking as a standard feature. As a response, a growing number of content providers require users to turn off ad blockers before accessing content, but this may drive users to other channels. In addition, there are free browser add-ons like Greasemonkey and Tampermonkey that allow bypassing such anti-ad blocking scripts; an example of the arms race between advertisement-dependent media and users who want to avoid advertisement.

A report from Adobe and PageFair set the estimated global economic cost of ad blockers at USD 41.6 billion in 2016, almost double from the previous year, sug-

gesting that the cost in 2019 could well exceed USD 100 billion. Other estimates are more conservative and set the cost at as little as USD 1 billion.[21] Estimates are necessarily based on guesswork regarding how many more products or services consumers would buy if they had, in fact, seen the blocked advertisements, which is obviously highly uncertain. Given the global annual consumption of goods and services of nearly USD 40 trillion, however, even a loss of 100 billion accounts for only 0.25%; perhaps a small price to pay for the distraction caused by and time consumed due to unwanted advertisement.

The ongoing shift from flow TV to streaming services reduces the amount of time media users are exposed to commercials during a typical day. Streaming services typically don't have commercials, and when Netflix in 2018 tested 10-20 second promotional videos for other content between episodes of TV series, the response was mainly negative.[22] Fear of having users choose competing streaming services may make streaming companies refrain from adding commercials, even personalised 'promotional videos' for their own content. YouTube is one streaming service that habitually uses commercials before video content and as pop-up lines at the bottom, but there are popular browser add-ons available to avoid this. There are apps that allow watching YouTube videos free of commercials (at the cost of functions like creating playlists). Even on ad-based flow TV, commercials can be bypassed by digitally recording shows and skipping commercials on playback (which also allows pausing for restroom breaks or kitchen raids, an oft-quoted advantage of commercials breaks).

This development can be seen as a problem for media that have to a large extent relied on advertisement income to finance the production and consumption of content. However, consumers have proven willing to spend money for quality content free of advertisement, as seen with the success of streaming services and other subscription media, as well as with people paying a premium to avoid in-app advertisement. This suggests that the path may be to focus more on content that consumers are willing to pay for rather than on advertisement, which consumers are increasingly able and willing to block.

This development is unlikely to mean the end of advertisement, but will likely lead to a transformation of advertisement. We will likely see more product placement and other sorts of imbedded advertisement that can't easily be blocked, though there are limits to how much of this sort of advertisement you can include in content without either detracting from the perceived quality of the media

or making the advertisement so subtle that it isn't noticed, even subconsciously. Advertisement may also be targeted better than today. The best sort of advertisement may be what consumers actively seek out and will not try to bypass, such as ads on specialist websites, which are used by consumers to stay updated on fields in which they are especially interested.

BLOCKCHAIN AND MEDIA

Blockchain technology may impact media in several ways. A blockchain is a digital, distributed, and timestamped ledger that cannot be tampered with and hence serves as a secure record of transactions. In 2017, Deloitte and the Blockchain Institute published a report examining ways that blockchain may impact media in the future. The main findings of this report include:

- Paid content can receive a boost from new, micropayment-based pricing models. As micro-payments become economically efficient and digital content is harder to copy illegally, new pricing opportunities arise. Consequently, low-price content can efficiently be settled between seller and buyer, bypassing aggregators.

- Monetisation options emerge for an increasingly fragmented content inventory such as blogs, news bites, photos. C2C / P2P content-sharing and usage becomes transparent and monetisable through the blockchain. Transparent and controllable P2P transactions become possible, with automated real-time billing.

- Allocation of advertising budgets becomes more accurate and targeted as media usage can be directly linked to the respective content items. Blockchain allows everybody to become a marketer as reach of lead generation becomes trackable and can be compensated, making a more liberalised advertising market possible. Precise consumption-based analysis of playtimes is possible, as an alternative to imprecise estimates.

- Copyright infringements and piracy would be nearly impossible. Content consumption/usage is captured in a blockchain, allowing near real-time, transparent allocation of royalty payments. National and regional limitations of paid content subscriptions and DRM complexities will be decreased by the blockchain.

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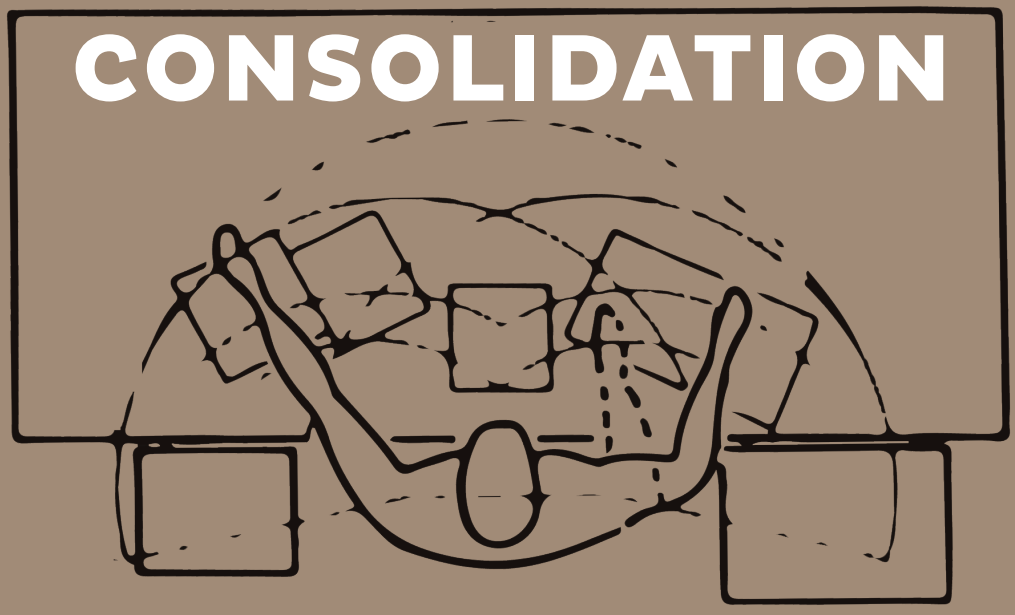
CONCLUSION

ACCELERATION AND CONSOLIDATION



The articles in this report present three different angles tackling the broad topic, 'the future of media'. Despite their different approaches, some common themes arise from cross-reading that are worth examining in more detail.

Trust and transparency are two of the major themes that reach across several of the trends discussed in the report. While technology has enabled us to access and consume more media than ever before, the platforms through which we access this content make it more difficult for us to assess the quality or distinguish the author. The borders between news, opinion, entertainment and status updates disappear when everything is presented in the same feed, causing distortion and blurring the lines between truth and fiction. Seen from the perspective of the user, the media environment is clouded by this 'fog of war'. As a result, while we have never consumed more media than we do today, we have very little faith in the social platforms we find content through to act as effective filters of misinformation and doctored content.

In the short term, this situation does not look to improve, as technology will likely do more to facilitate distrust and the spread of misinformation than it will to foster trust and sound information. Computer-enhanced imagery, troll bots and deepfakes are a few examples of how simple it has become to use easily accessible media technology to distort reality and disproportionately affect public discourse. And with the barriers between (mis)information generation and propagation becoming virtually non-existent due to the horizontalisation of technological platforms' services and use of AI, we may have only seen the beginning of this development. Countermeasures already exist, such as algorithms that could identify clickbait articles or false news, but for now the technological arms race seems to be in favour of the manipulators.

In this new environment, we cannot rely on technology alone to solve the pro-

blems it has helped create. It will be necessary for people to be extra vigorous when it comes to the validation of information and news, no matter whether it comes through text, images or video. However, only relying on the media users to make the right call is not a realistic prospect. There will thus be a growing need to fact-check and weed out untruths in the digital space. But beyond fighting the symptoms in a reactive way, it will be necessary to engage proactively with the root cause of the problem by fostering critical media literacy skills at all levels of society. This need will only grow in importance in the years to come, and public service institutions can play a crucial role here if they are able to do enough to take up the mantle amidst growing political criticism and demands for budget cuts.

Not only will media literacy need to improve. Public service media as well as commercial media institutions will also have to work out how to keep a high degree of trust and transparency while engaging in the networked media environment facilitated by the social platforms. The social media owners – large private multinationals – must also adapt to the new reality and decide between the role of publisher (with the editorial, moral and legal responsibilities that follow from this role) and being the new, global public square, free and open for anyone to share information and communicate through.

As we accelerate toward a state of 'peak media', where the limits of our mental capacity for consumption of news, information and entertainment are reached, we may see a reinforcement or a shift in media users' habits. It is unlikely that there will be a collective awakening where we will all choose to turn off our smartphones, but perhaps we will see a strengthening of the now modest movement towards slow media that fills our finite mind space with content we find more meaningful.

On the flip side, competition for a slice of our attention will surely also become even fiercer in the future. And while the markets for smartphones are nearing saturation, new technologies may prolong the sprint toward peak media by adding more hours and minutes to our daily media use. Autonomous vehicles, for example, could become the new entertainment centres, allowing passengers to fill up their commutes with media beyond just audio.

Publishers' ability to churn out content faster and faster will also be enhanced by technology that automates parts of the workload of media production. AI journalism and CGI newsreaders are examples of this. Even so, while a few more

hours and minutes may be squeezed into our already media-saturated daily lives, and while production will be faster and more efficient, it is safe to say we will eventually reach the upper ceiling of how much content we can handle. When that limit is reached, we may be moving from an age of unchecked media acceleration to an age of consolidation, where media users assume a more proactive position to control their media experiences.

Such a shift from acceleration to consolidation is unlikely to only come from the ground up. Currently there are significant discrepancies between media users' expressed wishes and concerns and their actual online behaviour. Most internet users claim to be concerned about their privacy but very few do anything to protect their data online – a phenomenon known as the privacy paradox. Similarly, most of us use social media platforms to access our news and information, but we have little trust in these platforms to act responsibly when it comes to effectively combating misinformation. All the privacy-related scandals that have haunted Facebook in the last few years have apparently made little difference in the grand scheme of things, as both the number of daily active users and overall revenue of the company continue to rise.

So, how can the gap between the values and wishes of media users and their actual behaviour be closed? Most likely, the solution will come from regulation, technology, or a combination of both. Blockchain or other distributed ledger technologies, for example, could help pave the way toward a more transparent data and media environment through the establishment of 'digital identities', where the users have control over when and with whom they choose to share their sensitive data.

The implicit focus in this report has been on Western media. With 1 million users joining the internet each day, most of them in the developing world, it is clear that this scope does not give us the full global picture. Additionally, the important role of China in future media development has been completely absent from the discussion. However, even the Western geographical limitation of scope can at times be too broad. The media situation in the U.S., for example, is wildly different from the Scandinavian countries. But although the trends and development patterns discussed vary geographically in their impact, they are all international in scope and, we believe, will continue to have broad relevance in the decades to come.

We hope you enjoyed reading.

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