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BETWEEN TECHNO-OPTIMISM AND TECHNO-SKEPTICISM: THE NARRATIVES OF DIGITAL PIONEERS ON THE IMPACT OF KEY DIGITAL TECHNOLOGIES

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Cytowanie

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ABSTRACT

The purpose of the paper is to analyze articles from ten leading technology-focused media to distinguish key narratives of technological development. It argues that the media put forward ethical and political agendas. Another aim of the article is to deepen the reflection on the role of media sources in the processes of deep mediatization and the interpretive flexibility of technology.

To analyze the media sources, a mixed-methods approach was deployed, comprising text-mining tools (co-occurrence analysis, sentiment analysis) and qualitative analyses (sociology of knowledge approach to discourse, SKAD). The dataset comprised articles chosen on the basis of popularity (i.e., shares on Twitter). The qualitative analysis was conducted on 100 articles from these sources.

The key results are: 1) the fundamental dichotomy organizing the narratives is that of techno-optimism (concerning the *potential* of digital technologies) versus techno-skepticism (related to the *human factor* in realizing this potential), 2) the narrative understanding of tech development involves creating a more equitable, accessible, and sustainable digital world, and 3) the media act as brokers between tech giants, policymakers, and the public opinion, while influencing the debates on technological development.

The article's originality pertains to 1) the inclusion of tech-oriented media in the reflections on deep mediatization and interpretive flexibility of technology, by showing how media contribute to the construction of social knowledge of technological development. 2) The mixed-methods design is an innovative methodological approach, which may inspire further studies on media discourses.

INTRODUCTION

While popular visions of technological change may involve *Terminator*-like images, the reality may be visually less spectacular, but just as profound nevertheless. Reflections about the potential and application of Artificial Intelligence (AI) and machine learning, cloud computing, or Internet of Things (IoT) are the topics of continuous debates in popular technology-focused media. These solutions are often discussed in the context of sustainability and rising awareness of the environmental impact of technological development, equality and equity (particularly with regard to job automation), accessibility (especially pertaining to the emergence of new devices and assistive technologies), as well as mobility (particularly in the context of autonomous vehicles and electric cars). Being the spaces of exchanges between developers, experts, entrepreneurs, and propagators of digital technologies, tech magazines offer insights into how the narratives on technological development are shaped and what are their key elements.

However, in academic writing on social shaping of technology, these particular actors have not been the object of in-depth analyses to date. With the goal to fill that gap in knowledge, this paper investigates the narratives of ten leading international technology-focused media (incl. *Wired*, *MIT Tech*, *the Verge*, *the Guardian*, *Forbes*, or *the New York Times*) in order to answer the following questions:

1. What are the key narratives of technological development produced by the media sources?
2. What understanding of technological development emerges from these narratives?

To analyze the media, a mixed-methods approach was deployed, comprising the text mining component - utilizing the co-occurrence analysis as well as advanced sentiment analysis (BERT) - and the qualitative analysis component (SKAD).

Answering the two research questions enabled us to draw conclusions about the role of the media - understood as digital media pioneers (Hepp, 2016, 2020) - in the broader discourses of technological development, as well as in the processes of deep mediatization (Hepp, 2020). Furthermore, the results contribute to the discussions on interpretive flexibility of technology by showing that media debates on technology have a certain agenda and a normative viewpoint, therefore they influence how these technologies are interpreted by its users (Sahay and Robey, 1996).

I. The role of media pioneers in times of deep mediatization

From a constructivist perspective, mediatization can be understood as a metaprocess which makes all social domains increasingly connected with media use, and as a result more and more dependent on the media (Krotz, 2009). Mediatization has a quantitative dimension: it pertains to the fact that in modern societies there are more devices, more technologies, and more connections enabled through media - digital ones in particular - and that they all constantly develop and improve, and at the same time become more available to wider audiences. This increase and availability influences how, when, and for what purposes media are used. Simultaneously, mediatization has a qualitative dimension, which reflects the tightening of connections between all social domains and the media. Both dimensions change how humans communicate, therefore it is important to focus on the mediatization processes as communicative ones, and to shed light on different individual and supra-individual actors that actively partake in them.

Deep mediatization is a connected concept which points to the intensification of mediatization processes through the development of digital media. It comprises several trends, such as differentiation, increased connectivity, media omnipresence, faster pace of innovation, and datafication (Hepp *et al.*, 2017). Those trends affect the actors' constellations (i.e., meaningful sets of actors on micro, mezzo, and macro levels) and their communicative practices (i.e., actions pertaining to communication), and have several consequences for all social domains (Hepp *et al.*, 2017). Those consequences include enabling new chances for participation, social contingency and optionality of media use, spatial extension of communications, blurring of boundaries between domains (for instance, between journalism and private communications), creating the pressure to adapt to the rapid pace of innovation, stabilizing of society, increasing digital divides in society, as well as opening up new possibilities for control. These consequences, and how societies adapt to them, in turn influence the directions in which deep mediatization processes are heading.

A critical appraisal of the concept points to a few issues which need some clarification. First of all, the aforementioned trends and consequences had also been observed before the advent of digital media - for instance, even the earliest mobile phone enabled spatial extension of communication, as it allowed people to communicate without being confined to a particular location. The blurring of boundaries had also been observed before the Internet, for instance in the case of popular TV talk-shows, which mixed psychology and entertainment, leading to a rewriting of cultural scripts and norms (Abt and Seesholtz, 1994). Another criticism would be the benchmark for the pace of innovation: Andreas Hepp *et al.* assume that the leaders in technological development dictate the pace for all social domains, hence other actors are either runners-up, or lagging behind (Hepp *et al.*, 2017). However, while it is beyond doubt that tech giants indeed are leaders when it comes to releasing new products and services, the question arises if other domains (whose aim is not to improve and develop technologies as such), actually need to 'keep up' with that pace. For instance, religious organizations selectively use digital media for their own purposes, which points to a variety of media use paces and patterns (Kołodziejaska *et al.*, 2022). In sum, one should not attribute all major social changes solely to the deep mediatization dynamics, and it also is worth asking who actually dictates the pace of technological development in particular domains, rather than subsuming all lines of progress to tech pioneers. What follows is the critical reflection on the role of other actors – such as tech-focused media – in the adoption of new technologies and their social reception, especially since (as the following analysis will show) the position of tech giants and the assumed 'right' pace and direction of innovation is often contested.

Despite these criticisms, it is important to note that when discussing the making of deep mediatization, Hepp (2020) points to various types of supra-individual (collective) actors who influence the process the most. Firstly, there are corporate actors such as media, tech companies, and governments. Market regulations and the economy for the large part enable certain enterprises to flourish (think *Tesla* or *Google* in the US), but it is also the role of various state and international agencies to regulate the limits within which those enterprises function (for instance, the GDPR introduced in the EU in 2018). The role of tech companies is that of creating new solutions

but also trends - here the media are also vital, as they inform the public about new developments and can popularize certain trends of technology use. Hepp refers also to collective actors, especially pioneer communities, i.e., 'groups of media and technology related pioneers that seek to foster media related developments across society' (Hepp, 2020, p. 18). These communities may be formalized to a varying degree, and include hacker communities, the *Quantified Self* movement, computer DIY groups (such as *Raspberry Pi* users), etc. The pioneers are interested not only in technological development, but also in putting forward certain tech-oriented ethical and political agendas (Hepp, 2020, p. 18). In terms of organization, they are typically fluid, connecting like-minded individuals with adequate skills and qualifications, but may not be formalized. One could see this distinction between corporate and collective actors as top-down and bottom-up creators and propagators of technological change. However, associating the media predominantly with corporate actors may not reflect the complexity of the media landscape today: on the one hand, media are often part of international conglomerates, and even if they are local entities, they are formally organized, bound by laws and regulations, and part of the market. On the other hand, tech-focused media often feature contributors who are activists and members of pioneer communities (like Evgeny Morozov and Shoshana Zuboff), and discuss several issues and values that pioneer communities also advocate for, such as equity, open source software, the need for anti-monopolistic regulations, and supporting environmentally sustainable solutions. This leads to the conclusion that the media also put forward community-supported political agendas, and take a stand regarding the desirable direction of technological development. Therefore, we propose to include at least some tech-focused media in the reflection of digital pioneers and investigate the narratives on technological progress they produce, in order to better understand their influence on deep mediatization processes.

The aforementioned discussion dovetails with the debates on the interpretive flexibility of technology, which is a concept based in the broader theoretical framework of social shaping of technology. Interpretive flexibility is defined as the 'capacity of a specific technology (or other knowledge system) to sustain divergent interpretations of multiple groups' (Sahay and Robey,

1996, p. 260). Within that framework, it is generally agreed that information technology both shapes and is shaped by the environment in which it is created and used (Orlikowski, 1992; Rose and Jones, 2004). Studies show that the same technology may be used differently depending on the setting and the needs of the actors (stakeholders) (Sahay and Robert, 1996), which also points to the potential of technology to be shaped in multiple ways. The concept of interpretive flexibility may therefore be used to explain the duality, as it focuses on how technological artifacts are culturally produced and interpreted (Pinch and Bijker, 1987) - the latter point suggests that even if the technology is produced and established, its interpretation does not necessarily cease as well. Some researchers argue that 'for a technology to be interpreted flexibly, it must both offer an appropriate range of functions and capabilities, which can be tailored to the users' needs, and its users must be actively engaged in its constitution' (Orlikowski, 199, p. 421). Furthermore, since technologies evolve, they may be adapted by various actors for purposes not originally designed (for instance, after a few modifications a computer fan can be turned into a desk fan, and *Raspberry Pi* may be used in the construction of smart speakers) which in turn prolongs their lifespan. Simultaneously, each technology has certain limitations which must be considered when analyzing its potential for interpretive flexibility.

This indicates that when reflecting on the social construction of technology, it is important to see beyond the processes of production and implementation, and by extension, include in the analyses of stakeholders - aside from developers/producers and end users - also intermediary actors, such as the governments (responsible for creating an economic and political environment conducive to the development and proliferation of certain technologies), and the media (who produce and disseminate narratives on the technologies, which enable other actors to form an opinion about them, and which may help increase demand for certain solutions, devices, etc.). By analyzing the tech journals as digital pioneers, this paper aims to shed more light on the possible contribution of media stakeholders to the processes of interpretive flexibility of technology.

II. DATA SOURCES

The analysis is based on articles published in ten tech media sources identified as digital pioneers (*Wired*, *MIT Tech*, *Guardian Tech*, *The New York Times technology*, *Forbes*, *Cnet*, *The Verge*, *Venturebeat*, *ZDnet*, and *TechCrunch*). We have focused on four umbrella topics regarding links of technology with critical social challenges: sustainability, accessibility, equality and mobility. The most influential articles were chosen by measuring their social media impact on Twitter. Twitter was selected as the proxy of social media presence as it remains, despite the 2022-23 controversies, one of the most meaningful spaces for the modern tech debate. According to Twitter's text mining analysis, conversations on technology's future are among the fastest-evolving ones on the platform. Therefore, choosing this medium as a benchmark for social media impact was well justified.

There were four article selection criteria:

1. An article was shared on Twitter between 01.01.2020 and 01.06.2022.
2. Its source was among the predefined set of ten online magazines.
3. At least one of the keyword combinations pertaining to the four umbrella topics was present in the article's title or the tweet. Keyword combinations included keywords related to the umbrella topics (sustainability, accessibility, equality, mobility) and the word 'technology' or mentions of specific technologies (5G, AI, Internet of Things, Metaverse).
4. Tweet redirecting (to the article) was in the first quartile of posts in terms of the number of retweets.

Academic access to Twitter's API was granted for this project, allowing us to query and retrieve archive tweets. Next, article text and metadata were extracted with the use of the Python package

Newspaper3k and custom Selenium web scrapers. As a result, 3732 articles were retrieved. This dataset/corpus was then used in two ways. First, the entire dataset was used in the quantitative analysis. Second, a sample of 100 randomly selected articles was selected for the qualitative analysis. The articles were evenly distributed among the sources (i.e., ten articles selected per source).

III. METHODS

3.1. Quantitative methodsⁱ

Two text mining methods were applied to the corpus of articles: sentiment and co-occurrence analysis, using two pre-trained word embedding models. For sentiment analysis, the BERT model was used (Devlin *et al.*, 2018), which is a pre-trained transformer model by Google NLP (Sousa *et al.*, 2019). Pre-trained generic language models have achieved great results on different Natural Language Processing (NLP) tasks (Tenney *et al.*, 2019). Such models are trained on large amounts of text without supervision, and may be effectively applied for text classification, term similarity detection or sentiment analysis, among others. One of these models, Word2Vec, is often used for word similarity tasks (Jatnika *et al.*, 2019), while BERT is one of the most successful language models currently available (Sousa *et al.*, 2019). In the context of sentiment analysis of text data, it proved to exhibit unmatched superiority to other models (Alaparthi and Mishra, 2021).

For co-occurrence analysis, the Word2Vec model (Mikolov *et al.*, 2013) was deployed. Co-occurrence analysis enables the researchers to find terms related to keywords of interest. We take advantage of the fact that in the vector space of the Word2Vec model, words often used in similar contexts are typically found closer to each other. Word closeness is identified by calculating cosine similarity between word vectors for selected keywords (terms) and all the words in the model, fine-tuned on the corpus. For instance, by calculating co-occurrences, i.e., most similar word vectors to the vector of the word *sustainability*, we can learn about issues often discussed in this context in tech media - *circular economy*, *digital transformation* or *supply chains*.

With sentiment analysis, the tone of the narratives can be examined by using three labels: positive, neutral and negative. The values for all labels can range from 0 to 1, and they sum up to 1. The RoBERTa-base model trained on more than 124 million tweets from January 2018 to December 2021 was used, and fine-tuned for sentiment analysis (Loureiro *et al.*, 2022). The sentiment was calculated on a sentence level and then averaged. Next, the sentiment of articles regarding the specific issue, e.g., *tech giants* or *innovation* was compared with the baseline, which is a random sample of articles from the same corpus. To demonstrate how the model performed on the dataset, we selected three examples of labeling with varying levels of sentiment for fragments regarding *innovation* (Buttigieg, 2022):

To some, "government" and "innovation" are not words that go together naturally. But in reality, the public sector has always played a vital role in unlocking the innovative capacity of the American people. [positive: 0.37, neutral: 0.58, negative: 0.05]

Innovation is not an end in itself, but a chance to improve. Our innovation efforts should serve our most important public policy goals, like creating economic opportunity, advancing equitable access to transportation, and helping to confront the climate crisis. [positive: 0.8, neutral: 0.19, negative: 0.01]

In recent years, "innovation" has become such a buzzword that it risks losing its meaning—and policymakers risk losing our focus as we contend with the constantly shifting and rapidly developing world of transportation technology. [positive: 0.04, neutral: 0.49, negative: 0.47]

This test demonstrated that the model is capable of discerning the tones of the selected fragments. Naturally, like all models, also the chosen ones are not without their flaws: for instance, it is not clear how they would perform on parodic or ironic texts, and since they are based on generalizations and simplifications, not all nuances of language can be accurately identified and encompassed by them. Nevertheless, since the analyzed corpus consisted of articles in tech media, the number of parodic and ironic contexts was relatively low, and the inevitable simplification was not

an obstacle that would render the results biased or otherwise questionable. The main aim of the quantitative analyses was to inform and direct the qualitative segment, and point to potentially significant areas of investigation – the aim which was fulfilled. Furthermore, the mixed methods framework was chosen as allowing us to verify if the observations made on the basis of one approach could be verified and deepened by the other.

3.2. Qualitative methods

The qualitative analysis was conducted on one hundred articles from ten technology-focused online media sources. These sources have different scopes and profiles - from more commercial and startup- and business-oriented (like *Forbes*, *TechCrunch*, *Cnet*, *ZDnet*, *The Verge*, and *Venturebeat*), to more general, with both technological and social outlooks (*Wired*, *Guardian Tech*, *MIT Tech*, *The New York Times technology*). However, all of them publish technology news, feature stories, product reviews, and guidebooks. The sources are repeatedly listed as “most influential technology magazines” in numerous rankingsⁱⁱ, covering a variety of tech-related topics, and are intended for broad audiences. With the exception of *Guardian Tech*, all media are US-based, which is an important caveat when extrapolating the results of the analysis to other contexts, as it influences the tone of the discussions and the most important topics.

For the qualitative segment, the Sociology of Knowledge Approach to Discourse (SKAD, Keller, 2013) was deployed. The aim of the method is to reveal how social knowledge is constructed, with what means, and by what actors. It combines the Foucauldian concept of discourse with the interpretive paradigm within social sciences: it recognizes that social knowledge is influenced by discourse, created through discursive means, but that it also simultaneously influences the discourse. As a framework, SKAD makes the researcher cognizant of the narratives, defined as organized and connected storylines, actors, patterns of meaning, and common themes (Keller, 2013, p. 124). The focus on meaning-making processes also highlights the inherent power structures and power negotiations within discourses. The analysis starts with mapping the prob-

lem/phenomenal structure, whose aim was to identify key actors, topics, and values associated with them. In terms of procedures, in our study this step took place through qualitative thematic coding of the segments (i.e., paragraphs and equivalents) of the articles. Next, the meaning patterns (*Deutungsmuster*) were identified, which consisted of interpretive schemes, framing, and constellations of topics. By code grouping and systematization, the schemes were revealed, followed by the interpretive segment of narrative structures' analysis. Here, the aforementioned organized storylines and patterns were identified and connected, allowing the selection of key narratives which pertained to the impact of new digital technologies on mediatized societies. Therefore, the method enabled us to analyze the social construction of knowledge on the new technologies and their societal impact within the analyzed sources, which was the most suitable approach for filling the theoretical gap identified in the introduction.

IV. RESULTS

4.1. Techno-optimism: the potential of new technologies

The most significant conclusion drawn from the study is that the fundamental dichotomy that organizes the narratives is that of techno-optimism versus techno-skepticism. The optimistic outlook pertains to the *potential* of several technologies, including artificial intelligence (AI) and machine learning, Internet of Things (IoT), cloud computing, assistive technologies, and autonomous vehicles. In the analyzed articles, the term 'AI' appears 488 times, 'autonomous [vehicles]' 97, cloud 51 times, the acronym 'IoT' 16 times, and 'assistive [technologies]' 10 times in total (although it must be clarified that apps, devices and solutions that constitute the Internet of Things, or enhancing accessibility are named in numerous articles, without referring to the term 'assistive' or 'IoT', which explains the low number of counts). This would indicate that AI attracts most attention of the magazines, which should not be surprising given the dynamic development of artificial intelligence and the heated debates it generates, the latest one concerning ChatGPT. Autonomous vehicles, as a technology yet to be implemented, typically appear in more predictive articles, but

their importance is undeniable. All the aforementioned technologies are generally identified as offering great benefits to their users, both individual and corporate, and praised for their versatility. The techno-optimistic segments often argue that adopting these technologies is a necessity for future enterprises and organizations, as in the following examples:

'Of all the ways AI is expected to improve modern life, perhaps none is more intriguing than its impact on mass transit. The pandemic will not last forever. So, at some point, people around the world will once again need to move from place to place quickly, efficiently, and at a reasonable cost. In most cities, however, mass transit systems like subways, buses, and planes already struggle to keep up with rider levels, resulting in gridlock, accidents, and dissatisfied consumers. But since these are mostly problems of logistics, and logistics thrive on data analysis, AI stands ready to provide dramatic improvements to our mobility. (Cole, 2021)

“The idea [of turning self-driving vehicles into supercomputers] has tremendous potential because we're looking at not thousands, but tens of millions of supercomputers in these cars,” he says. “In the United States or Germany it may not be as big a deal, but in a smaller country, as autonomous trucks and cars hit the road, it completely shifts the potential for compute in that country.” There’s also the prospect of donating compute to combat the world’s biggest problems. Last year, the owners of gaming PCs “donated” more than 250,000 GPUs to the Folding@Home project to help scientists understand the structure of Covid-19 proteins.’ (Johnson, 2021)

The optimism does not entail a lack of criticism, but what is important here is building the narrative around the *potential* of different technologies to improve different social domains: from individual experiences of users with disabilities, to businesses, to entire economies. The focus is on showing how these technologies can be used to increase accessibility, enhance mobility, improve sustainability, and also contribute to a more equal society. While in some cases the potential is

discussed in purely economic terms (especially when a particular product or service is promoted), many articles reflect on the broader social consequences of developing and popularizing the aforementioned technologies.

The techno-optimistic segments indicate that the pioneers not only envision a certain future of technological development but also position themselves as proponents of particular directions of this development. For instance, the pioneers advocate for a more democratic, equitable, and accessible internet and inclusive technological development. From their perspective, we have at our disposal various tools and resources which can be used to achieve this. For instance, tech companies should make sustainability their top priority in order to make up for their negative environmental impact and contribute to a better future:

'Tech leaders must also understand their technology as a "circular economy." This goes beyond stipulating green requirements in procurement contracts or setting policies for zero-landfill asset disposal. That should be a given. Instead, it is about truly evaluating, challenging, and seeking out innovation in the entire "cradle to grave" of every tech investment. (...) In contrast to traditional mining, urban mining is the practice of recovering these metals from electronic waste. Making innovative use of materials already in the supply chain is an alternative that IT manufacturing organizations must accelerate through the adoption of processes such as bioleaching and other developing methods.' (Forrester Research, 2021)

The segment may be interpreted as an appeal to tech companies to follow a strict sustainability protocol. The assumed position of the pioneers is to steer the tech giants in the right direction, as well as to offer some solutions to the identified problems. By debating these solutions, the pioneers may also bring them to the attention of the public opinion, and nuance the (probably) one-sided view of big tech. In the segment above, in response to the issue of resource depletion and technological waste, urban mining is suggested as a better alternative (and its association with

the innovative use of materials is unequivocally positive). The pioneers' standpoint is therefore to explain how the potential of new technologies could be realized, what steps are necessary to make it happen, and how different actors (tech companies, individual users, governments, etc.) can play a part in the process.

One must naturally consider that some of the techno-optimistic content is either overt or implicit advertising, however, it is important to note that the focus in the optimistic narratives is primarily on the revolutionary, transformative potential of the technologies. At the same time, the aforementioned segments exemplify the de-humanization of key technologies, which is particularly well visible in discussions around AI, where it is often portrayed as an autonomous, independent actor. Human actors - collective, corporate and individual - appear in the texts as beneficiaries of the new technologies, its supporters, sometimes creators. The social and cultural contexts in which these technologies are created and implemented, however, are in many cases beyond the scope of the narratives.

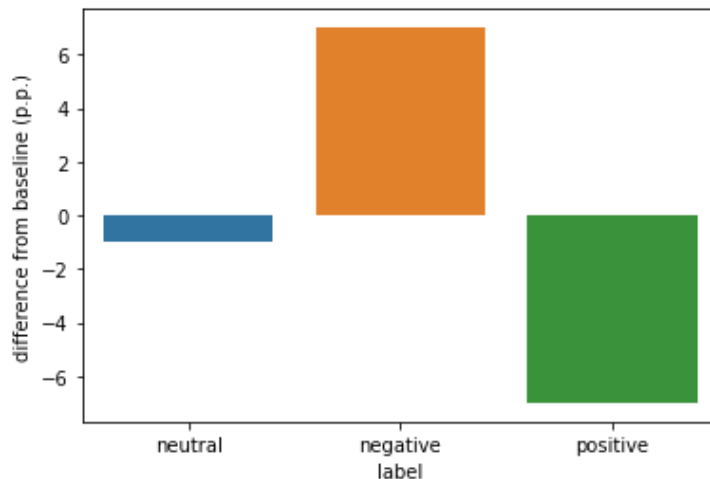
4.2. Techno-skepticism: pursuit of power as hindrance to realizing technological potential

The other side of the narrative dichotomy is skepticism, through which the human face of new technologies becomes more visible: here, the fears are that their potential will not be fulfilled, or that they will be deliberately abused by corporate actors in their pursuit of power. In these narratives, the technology in its 'pure' form remains a chance for progress and a source of hope for future generations, however, it is stressed that the current actors' constellation is not conducive to making this wish come true.

The first actor in this constellation, big tech, is identified as a set of corporate entities who, despite competing with one another, share several goals (like profiting from new products and services). Their role in technological development is undeniable, and their resources enable them to introduce and improve new technologies at a pace unattainable for others. At the same time,

the narratives stress that the tech giants' actions lead to market monopolization, privacy infringements and data abuse, contribute to rising inequalities and the environmental disaster, to name just a few examples. Sentiment analysis for 'big tech' and 'tech giants' shown in Figure 1 reflects this ambiguity - positive and negative sentiment are on a similar level:

Figure 1. Sentiment analysis for tech giants / big tech compared to the baseline. Source: own elaboration using the BERT model.



Furthermore, the common term co-occurrences with 'tech giants' identified within the corpus may be different from what one would expect from technology media, as illustrated by Table 1 below:

keyword	co-occurrences
tech giants	Google Facebook Apple behemoth deep pocket rival dominance secretive

Table 1. Selected co-occurrences for the keyword tech giants. Source: own elaboration.

In the table above, associations such as 'behemoth', 'deep pocket', 'dominance' and 'secretive' point to a negative attitude of the authors towards these corporations. This would suggest that despite being tech-oriented media (in some cases with a clear business/ advertising profile), the

pioneers address the imbalance of power from a normative standpoint. This would uphold our previous argument that the analyzed media position themselves as supporters of certain technologies, but not necessarily of the multinational corporations that profit from them.

The qualitative analyses further affirm this observation. The segments on the lack of accountability on the part of tech giants make the aforementioned positioning particularly well visible. Some of the authors overtly express fears of market monopolization and making global societies dependent on a few select providers - a scenario in which those providers will be practically free to exploit all the weaker players.

If we analyze the co-occurrences with the term 'monopoly' (see Table 2 below), we can make a few important observations on the pioneers' attitude towards some of the tech giants' activities. 'Unequal' and 'imbalance' may be seen as a neutral description of what a monopoly is, and terms like 'globalization' may refer to the global context in which tech giants operate, and their ambitions. Simultaneously, 'oppression' points to a normative standpoint, and while it cannot be determined if it is the monopolization which is considered a form of oppression or the effects of monopoly on the economy, society, etc., it is beyond doubt that the pioneers view monopolization as a negative process. Furthermore, 'civil society', 'govern', and 'activism' may point to actors or measures aimed at preventing monopolization and creating a more balanced economy.

keyword	co-occurrences
monopoly	unequal disinformation globalization civil society activism imbalance oppression govern

Table 2. Selected co-occurrences for the keyword monopoly. Source: own elaboration.

The qualitative analysis has shown that tech giants are sometimes presented in the narratives as benefiting from a certain perception that the public has of them:

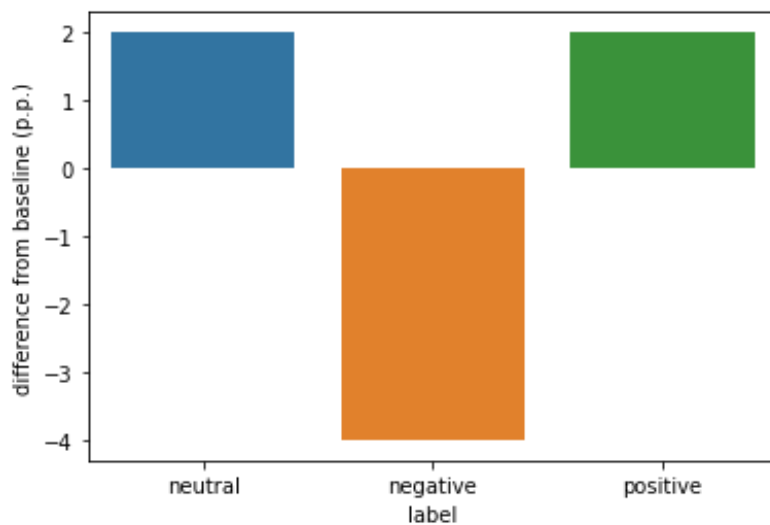
‘The old Silicon Valley mantra “move fast and break things” has not aged well in the era of AI. It presupposes that tech companies exist in some sort of amoral liminal space, apart from the rest of the world where everything exists in social and historical contexts. “We can see all around the world that tech is being deployed in a way that’s pulling apart the fabric of our society. And I think the reason why is because ... tech companies historically don’t see that they’re part of that social compact that holds society together,” said Will Griffin, chief ethics officer at Hypergiant.’”(Colaner, 2020)

The excerpt condenses several motifs of the skeptical narrative. It points to the departure from the early, trailblazing days - major tech companies are no longer ‘basement inventors’, but rather one of the most powerful entities in the world. The leeway they had been given in their beginnings should therefore be critically revised. However, in the popular imagery they may still play the ‘we are just a group of eager engineers’ card to maintain a friendlier, more approachable image, rather than assuming their actual role as corporate giants. What follows is a different approach that other actors, like governments and policymakers, must find to negotiate with them. The detachment from social and historical contexts that the aforementioned text mentions is symptomatic of tech privilege - which benefits the select few, but whose costs are borne by common people. The criticism therefore pertains to the actions of the tech giants themselves, and their role as agents of disruption and anomy. Therefore, the giants’ ‘fault’ of not reaching the technology’s full potential is identified by the digital pioneers as stemming from prioritizing profit over all else, including innovation itself.

4.2. Techno-skepticism: the regulatory function of governments and state agencies

The second key actor identified in the narratives is the governments and regulatory agencies. The sentiment analysis for the term ‘government’ (see Figure 2 below) shows a dominance of negative labels, which would suggest that the pioneers reflect critically on the actions of the policymakers. Due to the dominance of US-based titles, it can be assumed that the criticism pertains mostly, although not exclusively, to the US government.

Figure 2. Sentiment regarding government compared to the baseline. Source: own elaboration using the BERT model.



In order to gain a better understanding of the object of the pioneers’ criticism, the SKAD analysis investigated the position of the ‘government’ actor in the constellation, and the values and practices ascribed to it. The results indicate that the ascribed function of the government is to facilitate growth and sustainable technological development, and simultaneously to remain the advocate of citizens rather than business ally of multimillion-dollar companies. The narratives point to the governments as the most capable actors, whom the citizens must trust to keep their best interests in mind - at the same time they express doubt if this is indeed the case. It is stressed in several sources that policymakers should take on a decisively proactive controlling role, so as to be the true guardians of the law:

‘There are signs of trouble ahead for the tech leaders but critics worry if the trend continues we will enter a “Blade Runner future” where our entire lives are controlled by a hand-

ful of super-rich, super-powerful corporations directed by a generation of plutocrats with wealth unseen in human history. “We are looking at a (...) world where a handful of companies will dominate all economic activity,” said Chuck Collins, senior scholar at IPS. “This is not just bad for the economy, it’s bad for consumers, for communities, for competition. There is real harm here,” he said. (...) And alongside all that cash comes political power and the means to fight any official or government that challenges them. “We are creating a political and corporate oligarchy that is fundamentally against a healthy democracy and competition,” said Collins.’ (Rushe, 2021)

‘In response to Maughan’s question about what policy changes could encourage tech companies to get serious about addressing bias in AI, Norman pulled it right back to the responsibility of citizens in communities. “Policy and law tell us what we must do,” (...). For businesses, their bottom line is where it hurts. One could argue that it’s almost crass to think about effecting change through capitalist means. On the other hand, if companies are profiting from questionable or unjust artificial intelligence products, services, or tools, it follows that justice could come by eliminating that incentive.’ (Colaner, 2020)

The first segment directly refers to tech monopolization as a threat to the rule of law and democracy, and to the citizens who are not able to protect themselves against the corporations unless the law and the policymakers are on their side. Note that the interests of communities and citizens are juxtaposed with the financial goals of tech leaders, while the laws and policies are a buffer between those groups. The narrative designates the governments as instrumental in ‘disciplining’ the tech giants, but at the same time suggests, as the second excerpt does with some reluctance, that only manipulating the financial incentives may bring the desired results. Simultaneously, the pioneers point to the EU as a role model for regulating tech giants in a sustainable and responsible manner:

‘Academics have long warned that the structure of the digital economy was likely to create a “winner takes all” scenario. And there are clear signals that governments around the world are waking up to that threat. Europe in particular has challenged big tech’s dominance and its globe-spanning ability to avoid paying taxes. The US has been slow to catch up and even recently threatened tariffs on the UK and other countries that were planning to impose new taxes on US technology companies. But the Biden administration has also made key appointments that suggest tech’s easy ride is over.’ (Rushe, 2021)

The EU is praised for a tough-minded approach to regulating tech giants, in contrast to a more lenient US, which indicates a clearly normative standpoint that some pioneers are presenting. Interestingly, while academia is cited every so often in the articles, it is depicted neither as a powerful ally nor the real innovation hub; rather, it may offer its support and enhance our understanding of how various technologies can be implemented and how they affect the world. The knowledge should, as can be elicited from the narratives, be used to support equality, sustainability, and accessibility, but there is no illusion regarding the negotiating power of the academic community when faced with tech giants on the one hand, and the government (and government monies) on the other hand.

4.3. Techno-skepticism: protecting citizens’ rights and interests

This brings us to the third actor: citizens and communities. The analyzed media usually position themselves as educators of the public, but as was already shown, also its advocates. The common co-occurrences with ‘citizens’ (see Table 3 below) suggest a variety of directions of the narratives.

keyword	co-occurrences
citizens	smart city quality life community civic engagement

	vulnerable population
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Table 3. Selected co-occurrences for the keyword citizens. Source: own elaboration.

On the one hand, the associations refer to 'smart cities' - technologically-based frameworks that affect, both positively and negatively, the urban landscapes, mobility, and daily lives of people who inhabit those spaces. 'Quality life' points to a similar theme, namely that of technologically-based solutions that affect the quality of citizens' lives. On the other hand, another common co-occurrence is that with 'community' and 'civic engagement', which refers to democratic processes and possibly also various forms of governance. 'Vulnerable population' indicates that the citizens may be regarded as such, which also raises the question of how the pioneers perceive their role vis a vis the citizens they refer to.

The qualitative analysis has shown that the citizens are indeed often depicted as the most vulnerable, at risk of exploitation, facing an uncertain future, and who bear the cost of technological development. For instance, in the debates on AI ethics, the pioneers reflect on how to effectively implement ethical frameworks and control protocols so that the interests of users are protected. Consider the following:

'International organizations and corporations are racing to develop global guidelines for the ethical use of artificial intelligence. Declarations, manifestos, and recommendations are flooding the internet. But these efforts will be futile if they fail to account for the cultural and regional contexts in which AI operates. AI systems have repeatedly been shown to cause problems that disproportionately affect marginalized groups while benefiting a privileged few. The global AI ethics efforts under way today—of which there are dozens—aim to help everyone benefit from this technology, and to prevent it from causing harm. Generally speaking, they do this by creating guidelines and principles for developers, funders, and regulators to follow.' (Gupta and Heath, 2020)

In the article from which the excerpt above is taken, the authors position themselves in favor of a more equitable, accessible, and democratic internet. The skepticism is associated primarily with market monopolization and the concomitant inequalities, the lack of diversity in tech, and with data abuse that results from insufficient control over the tech giants. In segments like these, the pioneers reflect not only on how technology is consumed, but also, more importantly, how it affects people as individuals and communities. There are several other recurring themes in the analyzed sources which reflect that position: rising inequalities and the fight for a more equitable, accessible internet, changes to the job market brought about by AI and job automation, the strain on the environment that technological development brings, and the changing urban landscapes due to new forms of work and mobility. For the pioneers, technological development must come hand in hand with improving the lives of everyone, and not just the 'privileged few'.

Drawing on all of the results presented so far, it can be concluded that the understanding of technological development and progress, according to the pioneer narratives, must first of all balance the interests of various actors (the citizens, the governments/states, and business) - whose inherent part is controlling big tech through effective state policies and laws. Secondly, the goals of progress should be about sustainability (especially in view of the environmental crisis), accessibility (creating services and products for everyone), and equity (and inclusivity). Mobility solutions, especially fully autonomous vehicles, serve as a means to this end. Thirdly, progress should be about protecting the vulnerable, instead of assuming and promoting a 'winner takes all' approach.

Conclusion: the role of digital pioneers in public debates on technological development

The analyses have shown how through the narrative dichotomy of techno-optimism and skepticism, the digital pioneers position themselves in the actors' constellation. This fundamental dichotomy points to the great potential of key digital technologies to be used for the development of a more equal, sustainable, and accessible world for everyone, at the same time expressing

doubts if in the global system of power such a use will ever become a priority. While both small- and large-scale efforts to bring us closer to the optimistic scenario are lauded by the pioneers, they simultaneously warn their readers against the processes they identify as harmful (or even disastrous), such as market monopolization or lack of ethical framework for AI development.

Therefore, when identifying the role of the pioneers, it can be concluded that they are interested in putting forward their own agenda (Hepp, 2020) as far as the desirable direction of technological progress is concerned. The pioneers act as brokers between tech giants, policymakers, and the public opinion: they inform and educate about new developments, praise what they perceive as important, beneficial to the users, or conducive to equity, accessibility, and sustainability in tech, and simultaneously warn against negative consequences of the use (and abuse) of technology. In doing so, they bring into the public attention the most pressing issues, and contribute to and influence the debates on technological development. As such, they are not only digital pioneers, but also important actors from the perspective of interpretive flexibility of technology. If we acknowledge that technological artifacts are culturally produced and interpreted (Pinch and Bijker, 1987), and that information technology not only shapes the environment in which it is created and used but also is shaped by that very environment (Rose and Jones, 2004), then the key technological media actively contribute to that process. Indeed, titles like *Wired* have for decades influenced the debates on technological development - for instance, the magazine was at the forefront of debates on digital culture since the 1990's (Keegan, 1995), and its contributor Jeff Howe coined the term 'crowdsourcing' and effectively started the debate of using digital platforms to crowdsource work (Whitford, 2008). Therefore, the media pioneers must be reckoned with by other actors. In consequence, their role and position should also be included in the reflections of interpretive flexibility. Further research is needed to offer in-depth analyses of the scale of their influence on technological discourses.

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ⁱ The data for the text mining segment is available at <https://doi.org/10.18150/YUR0PN>

ⁱⁱ Some of these sources include: relevance.com, 2023; VitisPR, 2019; Imperva, 2017.