Fast-food information, information quality and information gap: a temporal exploration of the notion of information in science communication on climate change

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Abstract

Purpose – The purpose of this study is to discuss the concept of information in relation to temporality within the context of climate change communication. Furthermore, the paper aims to highlight the empirical richness of information as a concept by analysing its use in context.

Design/methodology/approach – The discussion is based on 14 semi-structured interviews with initiators and collaborators of 6 open letters on climate change published in 2018–2019. By taking three specific notions the interviewees introduced—fast food information, information quality and information gap–as the analytical point of departure, the study aims for a contextual understanding of information grounded in temporal sensitivity.

Findings – The paper finds that information in the context of open letters is informed by different, and at times contradicting, temporalities and timescapes which align with various material, institutional and discursive practices. Based on this finding, the paper argues that notions of information are intrinsically linked to the act of communicating, and they should be viewed as co-constituting each other.

Originality/value – The paper contributes with an empirically informed discussion regarding the concept of information as it is used in a specific context. It illustrates how "information" is far from being understood in a singular fashion, but is made up of multifaceted and at times contradictory understandings. Ultimately, they correspond to why and how one communicates climate change information.

Keywords Temporality, Climate change, Information, Materiality, Science communication, Open letters

Paper type Research paper

Introduction

This paper explores the concept of information as it is used and understood in the context of researchers' public communication efforts regarding climate change. More specifically, the paper highlights information and its temporalities, and how temporal understandings of information can contribute to our understanding of science communication on the topic of climate change.

Research on the subject of information has been described as concerned with the chain of communications surrounding information. It is a field in which information cannot be seen in isolation from people, technology, organizations and social events (Bawden and Robinson,

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2012, pp. 6–8; Frohmann, 2001). Likewise, practice-inspired studies on information stress the interconnections and entanglements of different elements—artefacts, materials, activities, discourses, actors, contexts, emotions and situations—and how these entanglements contribute to meaning-makings and perceptions (see Palmer and Craigin, 2008). Up to now, however, the role of temporal aspects in communication and information activities has been largely understudied despite being implicitly omnipresent in many research areas (Haider *et al.*, 2021). This is interesting since temporal aspects have been argued to be central to our experience of everyday life (Adam, 2008; Rosa, 2013). A more thorough inquiry into temporality and how it shapes ideas of information can furthermore illustrate how information is operationalized in different contexts (Haider *et al.*, 2021).

In relation to climate change and the communication of climate change information, temporal perspectives emerge as particularly interesting. Although temporal aspects forego our attention in everyday life, climate change has put time, and particularly the omnipresent future, on the agenda. What is more, climate change has come to epitomize conflicting notions of time, where accelerated short-term time goals have been given precedence over long-term cyclical time perceptions. Climate change is fundamentally about time, about changes that occur too fast to accommodate the life cycles of a variety of earthly organisms (Adam, 1993). In addition, time lags, characterized by the invisibility between cause and effect, also constitute specific temporal aspects related to climate change (see Adam, 1993; Rosa, 2013). While climate change as a topic has been explored in relation to temporality (Adam, 1993), the concept of information and its temporal connotations in science communication on climate change has received less attention. This study will provide an exploration of the temporal aspects of the concept of information in relation to climate change communication undertaken by scientists and academics. The term *science communication*, which generally comprises formal or informal communication of scientific topics to a lay audience by various actors, including academics (see Bucchi and Trench, 2014), will be used to denote researchers' communication efforts to a wider public.

The paper is primarily a conceptual exploration that builds on empirical material from research on science communication through open letters on climate change. Open letters on climate change provide an interesting angle for temporal explorations of the concept of information. First, public communication on the topic of climate change is generally characterized by a specific temporal dimension—that of urgency—and open letters as a form of communication feed into this urgency by their specific genre characteristics, such as appealing for public awareness and understanding (see Graminius, 2020). Second, open letters are often described as political tools and not typical sources of information, which makes academics' involvement in open letters as part of their science communication efforts an interesting angle to explore.

During the course of interviewing initiators to open letters on climate change, the notions "*fast-food information*", "*information quality*" and "*information gap*" emerged as concepts interviewees used when explaining their activities. When analysed, these qualifiers to the word information situated "information" in a field of activities, materials and discourses linked to temporality. This paper takes these three notions the interviewees used—*fast food information, information quality and information gap*–as a point of departure, and asks, "How do different temporal aspects and their integration in materials and discourses inform the interviewees' ideas of "information"? Furthermore, the paper seeks to understand how the interviewees' conceptualization of information is shaped by the communication event: What can an investigation into the temporal aspects of the concepts of information used in one communication initiative tell us about researchers' view of their activities and the general environment in which they are situated?

Time, academia and climate change communication

According to Rosa (2013), contemporary society is foremost an experience related to temporal structures and specifically that of acceleration. To Rosa, there are three types of temporal

changes characteristic of modern society: technological acceleration, the acceleration of social change and the acceleration of the pace of life. A "shrinking of the present" is one outcome of this temporal pace, and to Rosa, this affects our understanding and activities in the world. Likewise, Adam (2008) argues that timescapes—slow or fast paced rhythmic realities—are central to how we come to understand the world around us.

There are several ways in which temporality intersects with academic realities. Acceleration of time is experienced in everyday academic life by time constraints, temporary positions and one dimensional trajectories of what professional success entails (Vostal, 2015; Hammarfelt *et al.*, 2020). The increasing pace of the communication of research results is another way in which the acceleration of time is manifest in academia (Cronin, 2013). Furthermore, researchers have at times difficulties separating work from free time, a feature that is visible in science communication efforts (Graminius, 2020). The indistinction between work and leisure time ties into Novotny's (1994) idea of a growing conflation between private and public time, a temporal dimension based on the capitalist understanding of time as a commodified realm of existence. What is interesting is the role communication plays in the intersection of private and public time: communication technology and information intermediaries such as search engines bridge time spaces and conflate them (Haider *et al.*, 2021; Novotny, 1994). Communication technology is seen as complicit in accelerating time and the flows of information (Kavanagh and Rich, 2018). Put together, all these factors have led to calls for slow scholarship, which has been argued to both decelerate the pace of work and to improve the quality of scholarly work (Cronin, 2013).

The temporal aspects mentioned above primarily relate to the *conditions* of academic scholarly communication, but there are also instances where temporal aspects and the *content* of communication intersect and overlap. In Adam's (2008) analysis of academia, the author stresses that science operates from a presentist view of life. The embrace of the future, or the conscious effort of acknowledging one's actions as stretching into timescapes ahead of us, is one aspect lacking in contemporary science (Adam, 2008). While this may be true for a variety of disciplines, when it comes to climate change and climate science, the centrality of the future and academics' embrace of the future in their science communication efforts is increasingly evident. For instance, in communication relative to climate change issues, future predictions and future scenarios constitute ways in which temporality is foregrounded in the topic (e.g. IPCC, 2018). Increasingly, climate futures are seen as ways of narrating and directing human practices and lifestyles, as well as constituting a type of science communication (e.g. Climaginaries, 2021). In these narratives, time is used as an empowering device—humans create certain futures instead of being doomed to live in them.

Despite the centrality of time in relation to both environmental issues and academic realities, temporal aspects are seldom explicitly mentioned in research papers on environmental issues or in science communication efforts. Instead, time serves as the underlying infrastructure, shaping perceptions and ideas without necessarily drawing our attention to its existence. Thus, how notions of time might inform communication activities and perceptions of information are not well understood, and therefore worth exploring.

Temporality, quality and the concept of information

Information is a theoretically and empirically rich and multifaceted concept, and scholars have discussed information in multiple ways, such as whether information can be defined as a thing and as a process of being informed (Buckland, 1991), whether information can be seen as the quality of being informed (Day, 2001), whether information is the content of communication (Koopman, 2019; Shannon and Weaver, 1965; Terranova, 2004) and whether information is meaningful, truthful communicative action (Budd, 2011), to name a few. It has also been discussed whether information is situational, historic and context-dependent

(Day, 2001; Frohmann, 2001), whether it is objective (Bates, 2005), and how information is linked to material aspects (Hobart and Schiffman, 1999), to entertainment (Case and Given, 2016, pp. 125-126), and, to a lesser extent, to temporal aspects (Day, 2001; Matsuno 1998 in Capurro and Hjörland, 2005; Peters, 1988). Information has also been discussed in relation to intention (Soe, 2018), to trust (Haider and Åström, 2017), to knowledge (Bawden and Robinson, 2012; Capurro and Hjørland, 2005) and to quality (Rieh, 2002). Yet, despite the theoretical richness of the concept, in everyday speech and use, it tends to fall flat and be presented as one thing, which makes more thorough empirical investigations of information so interesting. Far from representing one understanding of "information", this study illustrates how the concept of information is made up of multiple and various understandings, underpinned by temporal, material and discursive assemblages.

Apart from temporality, the link between information and quality are aspects of specific interest to this paper since "*information quality*" constitutes one of the three notions mentioned and used by interviewees. In scholarly papers, quality has mainly been discussed in relation to information retrieval and relevance criteria; that is, how users sort among the information encountered (Rieh, 2002). To Taylor, information quality is linked to perceived value, and value is defined in relation to accuracy, comprehensiveness, currency, reliability, and validity (Taylor, 1986 in Rieh, 2002, p. 147). Rieh expands on Taylor's notions and argues that quality is linked to aspects of authority, such as the authority of the speaker and different materially mediated aspects of authority, such as ranking (Rieh, 2002, p. 157). Research on information quality stresses the subjective experience of what constitutes quality and how information systems can be designed to enhance quality aspects of information (Rieh, 2002, p. 157). However, in order to deepen our understanding of what constitutes "quality", the contextual aspects could be expanded on beyond personal and material notions. For instance, how do temporal aspects inform notions of what constitutes information quality?

Temporality and the concept of information are foremost implicitly linked in research accounts. For instance, in Buckland's conceptualization of information-as-thing, permanence and durability emerge as temporal aspects linked to information (Haider *et al.*, 2021). However, there are exceptions, as some studies explicitly address temporality. In a temporal analysis of the term "information age", Day argues that information is linked to the future and the present: what we call the information age is extending into the future, building connections between the present and the future (2001). Moreover, Peters (1988) notes how information is related to time, and specifically to what is fresh and new. According to Peters, information has an inbuilt ideology of progress where new information is the only information which counts (1988). In these two accounts, specific temporal aspects—newness, future, freshness—are presented as intrinsic to the concept of information. However, when analysing the concept of information from a situated context, other temporal aspects emerge. Looking at the concept of information in evolutionary science, Matsuno highlights the diachronic character of information; in other words, information as changing over time. The author further discusses temporal schisms between the production of information and the nature of the final product of information, which he sees as static and atemporal. At the same time, "information products" may be used in different temporal contexts that do not correspond to their time of production, thereby producing temporal schisms (Matsuno, 1998 in Capurro and Hjørland, 2005, p. 365). In this account, the production and consumption of information give meaning to the notion of information, and illustrate how temporal aspects play a role in forming our perceptions of information. Thus, by using a situated and contextual approach to investigate the concept of information, a temporal richness and complexity emerge.

Following a situated and contextual approach, I will highlight conceptual understandings of information in relation to climate change communication, and more specifically, academic

outreach in the form of open letters. Temporal perceptions play a fundamental role in environmental matters, as climate change is a temporal counter-force to the acceleration paradigm. Climate change presents the limits to speed as future life on Earth is endangered by the acceleration processes set in action (see Rosa, 2013). However, in interviews with academics communicating climate change through open letters, content, meaning the actual information on climate change, played a less prominent role than one might assume in forming researchers' perceptions of temporality in relation to information. As will be shown in the analysis, it is primarily the notion of *information gap* which carries explicit links to the topic of climate change. In the case of *fast food information* and *information quality,* temporal aspects are primarily linked to the medium of communication. At the same time, it is worthwhile stressing that the epistemic content of information cannot be separated from the social world; it influences our understandings and activities (Haider and Sundin, 2019). As such, the link between the topic of climate change and the notions of *fast food information* and *information quality* can be seen in less direct terms, and primarily through the context of the politicized and at times hostile communication environment, which comprises climate deniers, negligent politicians and campaigns aimed at discrediting science (Serrao-Neumann *et al.*, 2018). As the analysis will show, temporal aspects are linked to the nexus of activities, discourses and artefacts which make up the climate change communication context.

Research methods

This conceptual analysis is informed by empirical research on the use of open letters in climate change communication. The material for this paper consists of 14 semi-structured interviews with initiators and collaborators of 9 European open letters on climate change published in major European news outlets in 2018–2019. By using a combination of an initial snowball approach and online search on Google and Startpage, nine open letters addressing the subject of climate change under this specific time period were collected (see Andersen *et al.*, 2018; Anonymous, 2018; Buizza, 2019; Green *et al.*, 2018; Hedberg *et al.*, 2019; Kubkowski *et al.*, 2019; Rotmans *et al.*, 2019; Scientists for climate, 2019; Scientists4future, 2019). The analysis was restricted to open letters on climate change published in a European context and more specifically within the European Union (pre-Brexit). The reason for this geographical restriction relates to comparability. Despite different national issues and conditions that researchers in these countries face, the European Union arguably provides a uniting framework. For instance, the European Commission's 2030 climate target plan and the numerous science communication and environmental communication policies and incentives promoting public scientific engagements issued by the European Science Engagement Association (EUSEA) and *European Economic Area* (EEA) constitute a basis for comparability. Furthermore, the letters had to be initiated, written and signed by academics as part of researchers' public communication engagements. In total, the letters came from 11 European countries: Sweden, Austria/Germany/Switzerland, France, UK, Denmark, Belgium, Netherlands, Poland and Italy. However, only six letters are used in this paper since initiators/collaborators from some countries were unavailable for interviews or declined participation, more specifically Austria/Germany/Switzerland, France and the Netherlands. The interviews were conducted in person or by phone. In addition, the study includes an interview with an initiator of a "failed" open letter. The open letter was planned for publication in the Swedish news media, but was rejected and never got published, thus the use of the word "failed". Like its six counterparts, the failed open letter conforms to the selection criteria, and it is only in relation to the last step, "publication", that it is different. The "failed" letter thus provides an interesting angle, where an interview can help to further elucidate the processes, strategies and understanding of open letters, and ultimately of science communication undertaken in this form. Therefore, the following analysis is based on material from a total of 14 interviews.

During the course of the interviews, three notions of information emerged and were repeated as ways in which researchers explained their initiatives: "*fast-food information*", "*information quality*" and "*information gap*". Although these notions initially seemed to be unconnected, random and contradictory, a closer examination revealed how temporality, materiality, discourse and professional context informed the interviewees understanding of these concepts, which in several ways also connected the three different notions of information and specifically illustrated the close intertwinement of information and communication as co-constituting each other. Contrary to calls for analytically separating information from the act of communication (Koopman, 2019), this paper demonstrates the close entanglement between information and communication.

In the analysis below, I will explore the notions of "*fast-food information*", "*information quality*" and "*information gap*" which the interviewees made use of. The section is divided into three sections presenting and discussing the notions individually with concluding summaries.

Analysis and discussion

Fast-food information

The first time fast-food information was mentioned by an interviewee, clarification of the concept was needed, which in turn unravelled interesting links to temporal and material aspects.

Fast-food information, as the term indicates, is understood as something that is digested fast but is not fulfilling. Fast-food information has got a fast turnover, it does not stay in your digestive system or in the virtual world of information where it is found. It disappears, carries no weight, and is part of a fast flow of everyday impressions. Using Peters's (1988) notion of information as defined by newness and freshness, fast food information, as my interviewees presented it, could be seen as an excessive form of information, so fast that it barely has time to be registered. The "fast" in "fast-food information already highlights the temporal aspects informing the notion. The speed of information draws parallels to Rosa's assertion that contemporary society is foremost an experience related to temporal structures, and specifically that of acceleration (2013). In relation to climate change, natural limits to speed are represented by the capacity of eco-systems to process toxic substances and waste (Rosa, 2013, p. 81). Thus, one might assume that temporal issues in relation to climate change communication, and especially in relation to its content, would be central. However, the interviewees primarily used fast-food information in relation to the channels used for communication, the perceived ability of the reader to digest the information, and the intention of the speaker. These aspects are primarily what constitute "fast" in "fast-food information". As such, temporal issues forming the notion of information are directed towards the *intention*, *consumption* and *execution* of a communicative act.

The communication platform contributes to making "information" into "fast-food information". In particular, the affordances and functions of social media [1]—word limits, shares, likes, followers and the ease by which you can communicate on social media—are described as contributing to the perceived temporal speed of information. As one researcher put it:

> I do not want to go on Twitter and I do not want to use it. Because I think Twitter really contributes to this superfast information environment, fast-food information environment. I see people who are constantly tweeting, but then they do not pay attention to what is actually happening, they do not listen to the talk when they are there because they are only tweeting about it. And people just click on it and say "like", "yes", or "retweet", and that is it. What is the quality of this information? What is the quality? Then you can say like, "oh, I have been retweeted 20 times", but it really does not say anything about what people actually do with the information.

Several issues are assembled in this quote. First, the affordances and materiality of social media contribute to a general sense of passing on, of moving forward, of flows. Such depictions of social media are common—flows and speed are general attributes which contribute to making information "fast" (Kavanagh and Rich, 2018). Second, materiality and speed influence how this information might be processed and perceived by the reader. The affordances of a platform increase the speed of information. As the interviewee points out, a "yes" and a "like" are functions that do not require a lengthy response; they are clicks away, and thereby increase the rush-like speed of this piece of information. In addition, the temporal and material affordances of information are issues which inform researchers' perceptions of how information might be perceived by readers. The quote above implies that the digital functions and the speed they encourage direct readers' attention away from the actual content of information to numerical ratings of "clicks" and "likes". Thus, interviewees expressed doubts about whether the information on social media platforms, accurate or not, could "inform". In a sense, re-tweets, likes and speed were seen as hindrances to processing information. These arguments stand in contrast to other studies which look at intersectional meaning-making, where information is produced and processed in particular assemblages by users, resulting in a particular view of a problem (e.g. Graminius and Haider, 2018; Haider and Sundin, 2019). In contrast, the interviewees' description of fast-food information implies a ranking of information; there is recognition that digital aspects and temporal issues such as speed influence information but that these matters also produce "lower quality" information with less "nutritional value". It is not a matter of information being untruthful; it is rather about degrees of quality which differ from the more absolute views of truth discussed in relation to information (e.g. Budd, 2011). Like Rieh's (2002) suggestion, the notion of "quality" is here materially mediated, but also firmly linked to temporality.

Social media has received a lot of criticism, and several scholars see the platforms as being complicit in propelling what has been called truth decay (Kavanagh and Rich, 2018). It has been claimed that social media does not offer space for facts, but rather for opinions since emotional content travels faster than other types of content on social media (Jacques *et al.*, 2019; Vosoughi *et al.*, 2018). Contrary to such claims, the interviewees in this study do not see social media and information as impossible bedfellows (despite the alleged attacks from climate deniers on social media platforms). Quality is rather a matter of complexity and degree: different assemblages of materiality and temporality come together and shape the "quality of information". Arguably, the speed of information could also be seen as a factor that enhances information quality. For instance, in cases of emergency, "fast" information may be useful and valuable when a fast reaction is required. Although the climate crisis also constitutes an emergency, the interviewees see "fast" information as directing attention away from the actual content of what is being communicated.

Along with the aforementioned issues comes the matter of communicative intent. The interviewees expressed ambivalence about the use of specific social media platforms like Twitter and Facebook, especially when it comes to the intention of the speaker. As one interviewee put it in relation to using these platforms for science communication: "it is like exponentially increasing the load of information". The reason why scientists and scholars would use such platforms was partly linked to institutional demands of communicating results to the public and to the fact that public exposure could improve your career prospects:

> So now as a researcher, I have this dilemma, because there are increasing expectations for us to communicate to the public in blogs, Twitter, etcetera, and we are continuously reminded by our communication officers to do it. But you know, you have to really put a lot of work into it, and you also want to have something to say. I mean, it is almost like what matters more now is how loud you can shout, not what you say. And that is annoying, because it seems to take away focus from actually doing research. As long as you are really good at communicating you can actually, well, it does not matter how much research you do or what you do, as long as you can just sell it.

To be seen and heard was considered important to careers, but it was also frustrating; a way of shouting without having anything to say. Such views are not uncommon, and social media communication has been likened to shouting, an inferior way of communicating with the public in comparison with, for example, face-to-face encounters (Facer, 2019). The increasing neoliberalisation of the academic sphere has contributed to making communication important for career prospects. Scholarly output counts towards professional promotion, and visibility in the media can enhance the chances of securing grants (Feldman and Sandoval, 2018). However, social media was not viewed as entirely negative. It should be pointed out that there were also instances in which social media had helped the interviewees to elucidate and spread concerns about climate change, especially through the means of climate blogs or instances when celebrity scientists retweeted a message.

Fast-food information arguably intersects with trust and distrust and, as exemplified above, with distrust in a specific platform. However, in this case, trust and distrust are not only linked to the communication channel used, but also to the institutional structures which impel researchers to communicate, as well as towards fellow academics in the field. The intent of the speaker is put into question: What is it one wants to communicate? What is it that compels a fellow researcher to communicate climate change information on Twitter? Are there self-promotive aspects tied to the issue? The relationship between intent and information is often seen as the arbitrator between what constitutes information and disinformation (Soe, 2018). Yet, this study also shows that the intent of the speaker is part of the assemblages of practices, temporal structures and materiality which make up "fast-food" information. Scientists are complicit in creating fast-food information as much as any other user of social media. It is not a matter of who talks, e.g. climate deniers or politicians; it is about *how*, *where* and *why* one communicates.

To summarize, this section illustrates how the interviewees' conceptualization of information is shaped by their perceptions of communication platforms and their affordances, by temporal issues such as speed, and by the intent of the speaker. All these factors come together and contribute to what is perceived as "fast-food" information. If pursued further, the institutional sphere, with its demands to communicate research findings, is perceived to influence the intent of the speaker, indirectly contributing to the interviewees' ideas of the fast-food information environment, and by extension, the understanding of the concept of information.

Information quality

If the interviewees' see *fast-food information* as linked to speed, social media and dubious quality, the concept of *information quality* constitutes the very opposite. In fact, the interviewees view the two terms as temporal binaries. Information quality is characterized by a slow pace; there is time to digest information because it exists for a longer amount of time in the virtual and non-virtual world. In Rosa's outline, accelerated fast-paced time, which characterizes many aspects of our society, is at odds with slow, longitudinal and rhythmic timescapes, as exemplified, for instance, by the climate crisis (Rosa, 2013). Simultaneously, a variety of temporal structures that are part of our everyday life are intricately entangled in how we envision futures and the past, and as such, we are accustomed to dealing with different temporalities on a daily basis (Adam, 2008). Thus, there is not necessarily a contradiction and tension between fast and slow temporal rhythms. Furthermore, there is danger in assigning negative connotations to fast speed and positive connotations to slow speed. As Vostal (2016) points out, fast-produced research can be of both good and poor quality, a position which is contrary to the idea of slow scholarship, where a slow pace is supposed to improve the quality of scholarly work (see Cronin, 2013). However, the interviewees in this study link a slow pace with quality. Just like slow timescapes are called upon to battle climate change, "information quality"

similarly echoes the need for a slow pace. Whereas academic slow-writing initiatives call for temporal deceleration in general, in the context of open letters, the interviewees saw the news media as playing a central role in producing information quality. Contrary to general notions of the fast-paced news media environment (Pepermans and Maeseele, 2017), information in the news media (as opposed to social media) was perceived by the interviewees as "longer lasting" As one interviewee put it: "I think an open letter like that may be taken perhaps a bit more seriously. Perhaps it has a longer life. So the mechanisms on social media work another way." Another interviewee also expressed the idea that "the news media is the audience of the news media", and in this way, information produced in one outlet travels to another. The turnover is not immediate; there are possibilities of a prolonged life for information as the news media carries the potential for ripple effects into other types of media. A piece of information can thus be spread and exist for a longer period of time. Arguably, social media also harbours these ripple potentials, but they were not viewed as such among the interviewees. Using the news media was seen as an attempt to slow down, to stretch the life of information, which echoes Peters's (1988) observations of information as defined in terms of temporal life spans. Information quality is, just like Rieh (2002) stated, mediated not only by material issues, but also by temporal aspects.

In terms of the intersection between temporal and material issues in relation to the perceived consumption and processing of information, it is worth repeating the quote from the previous section:

> And people just click on it and say "like", "yes", or "re-tweet", and that is it. What is the quality of this information? What is the quality? Then you can say like, "oh, I have been re-tweeted 20 times", but it really does not say anything about what people actually do with the information.

As suggested here, the material aspects need to invite for information to be processed and not to encourage a fast-paced environment, which social media is perceived to do. The rather strict division most interviewees make between social media and news media is interesting. Despite the fact that most news media outlets display links to their social media sites and share news in social media, not to mention numerical indications of how often something has been read or commented on in their online newspaper publications, most interviewees still perceive the materiality of news media as contributing to deceleration and hence quality.

Access to communication platforms is another aspect linking the materiality, temporality, consumption and production of information to the notion of information quality. As this person put it (speaking of social media):

> R: The problem is that everybody has a certain limit as to how much they can read or consume, digest and take in. I mean, putting more food on the buffet does not mean that people can eat more.
>
> C: Mhmm, mhmm
>
> R: So there I think, maybe we have to take a step back and think like, maybe it is not about quantity, but about quality. Let's put out the best we have.

To reduce the amount of information by communicating less is important to this interviewee. The ease by which social media enables you to communicate is one issue that contributes to the fast pace and supposed decrease of "quality". Users can just type what they want to say and proceed to click "send", making the production of information immediate and spontaneous. As long as you have an account, access to the social media platform in question is generally granted. In contrast, news media were generally perceived as more inaccessible. To access news media, elaborate preparations and strategies were necessary. In addition, researchers pointed out that the letters underwent several rounds of peer review before publication, a practice which was not necessarily adhered to while using blogs or tweets. Thus, the production practices, the longer and more elaborate time frames needed to

prepare to access and publish on news media platforms, and the factual checks which came with such an approach contributed to shaping the notion of "information quality".

Although it is primarily the practices surrounding the communication of climate change information that shape the interviewees' perception of what constitutes information quality and not the content itself, it is nevertheless worth pointing out that the topic—climate change—is characterized by a particular politicized communication context involving climate deniers, passive politicians, and aggressive campaigns aimed at discrediting climate science (Serrao-Neumann *et al.*, 2018). Thus, the aspects valued by researchers—long time frames for preparation, slow pace, news media and so forth—are arguably accentuated due to the specific conditions linked to the topic of climate change. For instance, another aspect related to news media outlets concerned their trustworthiness and legitimacy. Interviewees frequently stressed the legitimacy news media outlets offered and their general position as a beacon of trustworthiness in an increasingly complex information landscape. As one interviewee put it when asked about using news media to publish the letter: "They have very high credibility". Another interviewee conflated the news media with the open letters as a communication form: "So we do use social media, but I think the open letters, or if you want to call them press letters, you know, one reason for me to use them is that they got some legitimacy". The link between legitimacy and news media may be accentuated by the politicized communication environment in which climate change communicators find themselves. In any case, the news media functioned as a seal of trust, of quality, thus rendering the information in these outlets qualitative in the eyes of the interviewees. This discourse is furthermore something that is actively nurtured by the news media outlets themselves. For instance, The Guardian, New York Post, and Sweden's largest news media outlet Dagens Nyheter [The Daily News] are some examples in which self-promotive ads are inserted to encourage the reader to support "qualitative information and journalism". Davies (2018) points to similar issues in relation to news media logos and information-sharing behaviours. News media logos are seen as seals of approval, producing legitimacy which encourages readers to share this type of information in their social media networks (Davies, 2018, p. 15). These discourses of legitimacy, and ultimately the notion of information quality, can be seen from the perspective of coproduction. From a practice perspective, Haider and Sundin (2019) stress how facts are coproduced and stabilized in the form of documents such as books, articles, and other artefacts of scholarly communication. Likewise, newspapers can here be seen to "stabilize" open letters by attributing a certain form of legitimacy, and thus coproducing the notion of information quality. Legitimacy can also be linked to authority. Rieh (2002) finds quality to be linked to aspects of authority, such as the identity of the speaker. Here, the news media constitutes a form of authority which lends legitimacy and quality to the open letters.

As sites of legitimacy and trust, it also naturally follows that publication in these outlets carries a sense of righteous purpose and intent. The intention to inform, as discussed in relation to fast-food information, constitutes one way to define information (Budd, 2011; Soe, 2018). With regard to information quality, the ability to inform is linked to temporal longitudinal aspects taking the platform of communication, its materiality, surrounding discourses and publishing practices into account. In comparison with social media, interviewees did not perceive the use of news media as "shouting". Thus, the intention to inform was deemed to be stronger and of a higher quality if news media was used. However, information quality is not a matter of being truthful or untruthful since discussions about information and truth generally position the relationship (Budd, 2011). Like fast-food information, *information quality* signifies a matter of degree; the information is of higher quality than fast-food information, but not necessarily truer. To conclude, information quality illustrates how the interviewees' ideas of information are bound up with temporal issues, in this case longitudinal, slow timescapes and material platforms for communicating,

such as news outlets. Furthermore, discourses about quality and authority, as well as the intent to inform, intersect with temporal and material elements that form the notion of what constitutes "information quality". In this context, information quality and fast-food information are perceived as opposites: one constitutes an example of the best way to communicate climate change information and an expression of what information ultimately should be, and the other a communication alternative to be avoided as information communicated in this way is of less quality.

Information gap

When communicating climate change through open letters, interviewees made use of the concept of "information gap" to explain their motivation for engaging in this type of activity. In this case, intersections between the specific content, which is climate change, and the concept of information were more explicit. As one interviewee put it: "Yeah, so I guess the main thing was that the other initiators and I saw some information gaps in the public debate about the challenge of climate change". While the other two concepts discussed primarily resonated with the wider context of the climate change communication environment, this quote illustrates the direct references to the topic of climate change and how the notion of "information gap" is informed by the perceived lack of content. Sometimes the term information gap was not explicitly stated, but implied:

> I find a lot of ignorance in *x country* and at the decision levels, and if there is such an ignorance it means. . .You know, so a lot of these people are 40–50 years old, so people who went to school 20–30 years ago, I mean, we already knew about climate change then, so the fact that people do no't know this now, that they are disputing it, means that not enough information has been circulated.

These descriptions of the communication event echo a traditional approach to science communication, stemming from the idea of science as the single knowledge provider in society (Bucchi and Trench, 2014). The concept of "information gap" invites comparisons with what is generally referred to as the deficit-diffusionist model of communication: science communication is envisioned as a bridge between the scientific community and society (Bucchi and Trench, 2014). In this approach, the public is passive and undifferentiated, a recipient of knowledge. Science and scientists are on the other hand imbued with cognitive authority and knowledge (Bucchi and Trench, 2014). This can be linked to Day's claim that the rhetoric of information is often bound up with professional authority (2001, p. 2). According to Day, "science" can be used to block examinations of how the term information is used, and for whom (p. 117). In the specific case of the open letters, it is primarily politicians to which scientists feel the need to "close the gap". The content is in essence directed towards politicians and their perceived failure to deliver impactful climate action, which the authors primarily attribute to lack of information. The open letters are seen as ways to reach this specific group, and to make political inaction in climate change issues visible.

Furthermore, "Information gap" carries a connotation of information as something that can be transferred through communication. This vision of information largely reflects Shannon and Weaver's influential, but largely discarded, model of information. Originating in the crossing of science and engineering, Shannon and Weaver's communication circuit builds on visions of a sender, receiver and a signal (Shannon and Weaver, 1965). Their theory attracted great attention and application in various disciplinary fields, yet, Shannon issued words of caution since he was critical of its use outside the fields of mathematics and engineering (Shannon, 1956). One may say that Shannon foresaw the limits of its application in the field of social theory, as the model has been criticized for its one-dimensional way of treating communication and the proposition that information is the content of communication (Koopman, 2019; Peters, 1988; Terranova, 2004). Nevertheless, the mathematical and technical perceptions of communication and information are still widespread in

contemporary society. As Terranova points out, public relations (PR) specialists and professional communicators tend to approach information as a matter of creating a robust signal that survives the mutations in the informational space while drowning the noise of the surrounding environment (Terranova, 2004). The interlocutors in this study arguably share this preference for a "robust signal". Obtaining a large number of signatories is one tactic researchers make use of in order to add weight and visibility to their initiative. As one researcher explained, signatories can be seen as promoters of a message that cuts through the wide expanse of noise in the digital universe of information and misinformation. Seen through the communication circuit metaphor, information on climate change is sent to politicians to close the gap of ignorance, and like a signal, this information is amplified by the number of signatories.

In relation to temporality, information is here synchronic–it exists at one point in time. As Matsuno points out, Shannon and Weaver's information circuit does not consider processual temporal aspects of information (Matsuno 1998 in Capurro and Hjörland, 2005). Furthermore, the word "gap" invokes the idea of a temporal schism between those who have information, and those who do not yet have it. These temporal notions can be contrasted with the temporal issues present in the analysis of fast-food information and information quality, which relate primarily to the rhythm and the speed of information. Additionally, what is interesting in this context is that the quality of information is related to this specific point in time when information is transferred through the act of communicating. This temporal synchronism serves as a marker, an alarm clock, a type of charged moment of time where a specific valuable piece of information is communicated. This is evident in the preparations leading up to the event, which in all cases involved an elaborate peer review process, and in the intent to inform. As this interviewee put it:

> We did this because we perceived a large discrepancy between what science told us about this problem and about X country's role in this problem, and the public debate about this problem. And this discrepancy, I think, is where science communication is super important. To kind of try to bridge that gap.

As such, "information gap" can also be interpreted as a certain conscious effort where the aim is to make people rethink climate change, make them understand climate change through carefully prepared information to be communicated at one specific time. The event, this specific charged point in time, is approached as a turning point after which previous problems and contradictions (in this case the lack of information) are resolved. Accordingly, "information gap" can furthermore be viewed as a rhetorical device, where the power and success of a certain communication event is accentuated beforehand.

Following LIS discussions on information and intent, Soe (2018) argues for an intentional perspective on information, divorced from truth claims. Likewise, Budd (2011) takes his departure in intention, as he holds that something communicated with the intent to deceive cannot be considered information. He defines information as "meaningful communicative action that aims at truth claims and conditions" (2011, p. 70). One of the differences between Soe and Budd concerns the issue of truth in relation to intention. Likewise, the information gap metaphor differs from *fast-food information* and *information quality* in terms of truth value. The communicative act is meant to close a gap and spread information on climate change. Truth is never explicitly invoked as a reason for the initiative, but it is implied since the interviewees stress the extensive peer review processes involved in the making of the open letters on climate change and the importance of providing correct information. The communication environment, politicized debates, climate deniers and smear campaigns contribute to make it a matter of urgency to get "the facts right", as the researchers put it. As such, the idea of a gap shares similarities with information quality, but in different ways from the previous concepts. Arguably, the first two concepts address the issue of *how one communicates*, which intersects

with specific material and temporal issues. In the context of "information gap", it is primarily the question of *why one communicates* that the concept addresses.

To summarize, the use of the "information gap" metaphor in this context illustrates how information is perceived as an item and function of communication—it can be sent, it is linked to the intent to inform, and it also needs to be mobilized to be seen and heard. The implied truth-value of information is not enough to make it visible to readers. In comparison with the other two concepts, the "information gap" perspective lacks material aspects related to information. At the same time, the temporal perspective that the term offers differs from the other two in that it is a specific point in time that is evoked. Along with this perception, there is a certain idea of it functioning as a marker, a way to draw attention. What is also at stake is the view that some people have information, and some do not (politicians), which if pursued further is a story about how scientists view and position themselves in relation to politicians and other actors in society.

Conclusion

By situating information in context, this conceptual study reveals how apparently contradictory notions of information coexist and permeate the interviewees' understanding of information. The "information gap" metaphor primarily illustrates the envisioned relationship between the speaker, the audience and the immutable force of information as existing outside material context; it is interconnected with an amount of truth-value and the intent to inform. The temporal perspective informing this notion is synchronic; it highlights one specific point in time and marks the communicative event as special. It also connotes a temporal schism, a time lag between those who have information and those who do not yet have it. On the other hand, information quality and fast-food information link information to the communication platforms used and their affordances, temporal rhythms, legitimacy discourses and institutional ideas of science communication. Together, these three notions contribute to a more nuanced view of information, and ultimately shed light on how researchers may approach and perceive of, public communication efforts.

The researchers interviewed implicitly think of information as situated in context, as their reflections on the use of different communication mediums and their relation to information suggest. At the same time, the information gap metaphor they use also suggests a decontextualized notion of information. These supposedly contradicting notions of information respond to the "how" and "why" of communicating, as well as to ideas of professional identities and the politicized environment of climate change. *Fast-food information* and *information quality* primarily address the best/worst ways to communicate, whereas *information gap* responds to why communicating is important in the first place. The larger environment in which the interviewees are situated furthermore informs their concepts of information. For instance, as scholars and scientists, they operate in a professional environment where knowledge creation is institutionally sanctioned. Thus, notions of one's professional activities arguably influence concepts such as information gap. Likewise, institutional demands to communicate publicly, and intersections between public communication and career prospects, are issues influencing notions of fast-food information. Additionally, climate change as a topic has become highly politicized. To communicate climate change information may require careful preparation involving strategies to ensure publication through legitimate and trustworthy channels, such as certain news media outlets. These practices and institutional arrangements help to inform the notion of information quality. By taking a closer look, what appears to be a conceptual contradiction can be explained by the multiple and overlapping contexts in which the researchers are situated.

To understand not only the interviewees' idea of information, but also the activity of communication they engage in, the mentioned notions—information gap, information

quality and fast-food information—reveal the intersection between temporality, materiality, intentions, notions of truth, audiences, discourses and practices to purely consider one aspect or to view them in isolation risks missing the nuances of these activities and understandings. Thus, contrary to Koopman (2019), who argues for a research approach where information is separated from the act of communication, this emic conceptual outline illustrates the closely intertwined notions of information and communication as co-constituting each other.

In their discussion of the concept of information, Capurro and Hjörland (2005) tentatively ask what else we might need to know about information. Perhaps there is room for more research on the concept of information and temporal issues since this study shows how notions of information come into being in the contextual intersections of time, actions and materials. The relationship between temporality and information in this study is much more complex than what previous studies have shown. Whereas earlier research primarily highlights temporal aspects as intrinsic to the concept of information, such as newness and freshness (see Day, 2001; Peters, 1988), a situated analysis illustrates how various, and at times contradictory, temporal aspects co-exist in the emic uses of the word information.

Interestingly, the temporal aspects also show certain similarities with the topic of climate change that the interviewees discuss. The "slow" temporal rhythms that contribute to the quality of information are also seen as the temporal solutions to climate change (Rosa, 2013; Adam, 1993). Additionally, the information gap and the time lag between those who have and those who do not have information evoke parallels to the supposed time lag between the cause and effect of climate change (Adam, 1993). Based on the temporal aspects related to climate change, a word of caution might also be added. Just like climate change is characterized by a process that is continuously unfolding based on our past and present actions and therefore requiring continuous mitigation efforts (Adam, 1993), there might be reasons to approach communication as a continuous process as well, and not just put all effort into emphasizing one specific communication event in time, like the ideas surrounding "information gap" indicate. At the same time, it should be noted that most of the interviewees engaged in many other ways of communicating too, so it is curious that the notion of "information gap" was so persistent. The interviewees implicitly knew that this engagement would not "solve" the problem and magically bridge gaps and induce action, as their many other countless and continuous communication engagements indicate. Perhaps the notion of information gap is simply "sticky", and primarily relates to the idea that the academic profession is a field where certified knowledge is produced.

This discussion also raises questions on how the topic of climate change communication might have influenced the notions of information. As described in the analysis, the politicized environment in which climate change communicators find themselves may have contributed to the preference for slow temporal rhythms, news media as a quality emblem as opposed to social media, and the sense of a temporal schism with regard to issues which informed the different notions of information among interlocutors. Another communicated scientific topic might introduce other contextual conditions, which could ultimately produce different notions of information. More studies into the entanglement of the concept of information and how it comes into being in contextual intersections of temporal issues, material practices, topics and professional identity politics would further deepen our understanding of the concept of information.

Note

1. Blogs also constitute social media, but these platforms were viewed positively. When researchers spoke of social media in the negative sense, they primarily meant Facebook or Twitter as they were perceived to forcefully push information onto people.

References

Adam, B. (1993), "Time and environmental crisis: an exploration with special reference to pollution", *Innovation: The European Journal of Social Science Research*, Vol. 6 No. 4, pp. 399-413.

Adam, B. (2008), "The timescapes challenge: engagement with the invisible temporal", in Adam, B., Hockey, J., Thompson, P. and Edwards, R. (Eds), *Researching Lives through Time: Time, Generation and Life Stories*, University of Leeds, Leeds, pp. 7-12.

Andersen, G., Jacobsen, S.G. and Lund, J.F. (2018), "Klimaopråb: politikerne spiller hasard med vores fremtid", *Politiken*, available at: https://politiken.dk/debat/debatindlaeg/art6508380/Politikerne-spiller-hasard-med-vores-fremtid (accessed 1 March 2019).

Anonymous (2018), "Réchauffement climatique: Nous en appelons aux décideurs politiques", *Liberation*, available at: https://www.liberation.fr/planete/2018/09/07/rechauffement-climatique-nous-en-appelons-aux-decideurs-politiques_1677176 (accessed 15 March 2019).

Bates, M.J. (2005), "Information and knowledge: an evolutionary framework for information science", *Information Research*, Vol. 10 No. 4, pp. 1-15.

Bawden, D. and Robinson, L. (2012), *Introduction to Information Science*, Facet, London.

Bucchi, M. and Trench, B. (2014), "Science communication research: themes and challenges", in Bucchi, M. and Trench, B. (Eds), *Handbook of Public Communication of Science and Technology*, Routledge, London, pp. 1-14.

Buckland, M. (1991), "Information as thing", *Journal of the American Society for Information Science and Technology*, Vol. 42 No. 5, pp. 351-360.

Budd, J. (2011), "Meaning, truth, and information: prolegomena to a theory", *Journal of Documentation*, Vol. 67 No. 1, pp. 56-74.

Buizza, R. (2019), "No alle false informazioni sul clima. Il riscaldamento globale e di origine Antropica", *Sant' Anna University Homepage*, available at: https://www.santannapisa.it/it/news/no-false-informazioni-sulclima-piu-di-200-scienziati-e-intellettuali-aderiscono-alla-lettera (accessed 2 September 2019).

Capurro, R. and Hjörland, B. (2005), "The concept of information", *Annual Review of Information Science and Technology*, Vol. 37 No. 1, pp. 343-411.

Case, D. and Given, L. (2016), *Looking for Information: A Survey of Research on Information Seeking, Needs, and Behaviour*, 4th edition, Emerald, Bingley.

Climaginaries (2021), "Narrating socio-cultural transitions to a post-fossil society", available at: https://www.climaginaries.org/ (accessed 22 March 2021).

Cronin, B. (2013), "Slow food for thought", *Journal of the American Society for Information Science and Technology*, Vol. 64 No. 1, p. 1.

Davies, W. (2018), *Nervous States: How Feelings Took over the World*, Jonathan Cape, London.

Day, R. (2001), *The Modern Invention of Information: Discourse, History, Power*, Southern Illinois University Press, Carbondale and Edwardsville.

Facer, K. (2019), "Learning to live with a lively planet", Inaugural lecture, Oct 1st 2019, Uppsala University, available at: http://media.medfarm.uu.se/play/video/9204/livestream (accessed 25 January 2020).

Feldman, Z. and Sandoval, M. (2018), "Metric power and the academic self: neoliberalism, knowledge and resistance in the British university", *Triple C*, Vol. 16 No. 1, pp. 214-233.

Frohmann, B. (2001), *Deflating Information: From Science Studies to Documentation*, University of Toronto Press, Toronto.

Graminius, C. (2020), "Conflating scholarly and science communication practices: the production of open letters on climate change", *Journal of Documentation*, Vol. 76 No. 6, pp. 1359-1375.

Graminius, C. and Haider, J. (2018), "Air pollution online: everyday environmental information on the social media site Sina Weibo", *Journal of Documentation*, Vol. 74 No. 4, pp. 722-740.

Green, A., Read, R. and House, R. (2018), "Facts about our ecological crisis are incontrovertible. We must take action", *The Guardian*, available at: https://www.theguardian.com/environment/2018/oct/26/facts-about-our-ecological-crisis-are-incontrovertible-we-must-take-action (accessed 14 April 2019).

Haider, J. and Åström, F. (2017), "Dimensions of trust in scholarly communication: problematizing peer review in the aftermath of John Bohannon's 'Sting' in science", *Journal of the Association for Information Science and Technology*, Vol. 68 No. 2, pp. 450-467.

Haider, J. and Sundin, O. (2019), *Invisible Search and Online Search Engines: The Ubiquity of Everyday Search*, Routledge, London.

Haider, J., Johansson, V. and Hammarfelt, B. (2021), "Time and information: towards a research agenda for library and information science", *Journal of Documentation*, Forthcoming.

Hammarfelt, B., Rushforth, A.D. and de Rijcke, S. (2020), "Temporality in academic Evaluation: 'Trajectoral thinking'in the assessment of biomedical researchers", *Valuation Studies*, Vol. 7 No. 1, pp. 33-63.

Hedberg, M., Nilsson, D. and Nicholas, K. (2019), "Vi klimatforskare stödjer Greta och skolungdomarna", *DN*, available at: https://www.dn.se/debatt/vi-klimatforskare-stodjer-greta-och-skolungdomarna/ (accessed 17 May 2019).

Hobart, M. and Schiffman, Z. (1999), *Information Ages: Literacy, Numeracy, and the Computer Revolution*, John Hopkins University Press, Baltimore.

IPCC (2018), "Special report on global warming of 1,5 degrees", *IPCC*, available at: https://www.ipcc.ch/sr15/ (accessed 17 February 2021).

Jacques, C., Islar, M. and Lord, G. (2019), "Post-truth: hegemony on social media and implications for sustainability communication", *Sustainability*, Vol. 11 No. 2120, pp. 1-16.

Kavanagh, J. and Rich, M. (2018), *Truth Decay: An Initial Exploration of the Diminishing Role of Facts and Analysis in American Public Life*, Rand Corporation, Santa Monica.

Koopman, C. (2019), "Information before information theory: the politics of data beyond the perspective of communication", *New Media and Society*, Vol. 21 No. 6, pp. 1326-1343.

Kubkowski, P., Parfianowicz, W. and Sobczak, K. (2019), "O Uniwersytet odpowiedzialny wobec społeczeństwa i wobec planety.List otwarty do środowisk akademickich", *University of Warsaw Homepage*, available at: http://ikp.uw.edu.pl/ouniwersytet-dla-ziemi/ (accessed 1 September 2019).

Nowotny, H. (1994), *Time: The Modern and Postmodern Experience*, Polity, Cambridge.

Palmer, C. and Cragin, M. (2008), "Scholarship and disciplinary practices", *Annual Review of Information Science and Technology*, Vol. 42 No. 1, pp. 163-212.

Pepermans, Y. and Maeseele, P. (2017), "Climate change journalism: from agony to agonistic", *Debate DMA Desenvolv, Meio Ambiente*, Vol. 40, pp. 125-140.

Peters, D.J. (1988), "Information: notes toward a critical history", *Journal of Information Inquiry*, Vol. 12 No. 2, pp. 9-23.

Rieh, S.Y. (2002), "Judgment of information quality and cognitive authority in the web", *Journal of the Association for Information Science and Technology*, Vol. 53 No. 2, pp. 145-161.

Rosa, H. (2013), *Social Acceleration: A New Theory of Modernity*, Columbia University Press, New York, NY.

Rotmans, J., Faaij, A., van Egmond, K., Leemans, R. and Vet, L. (2019), "Klimaatakkoord tijd voor politiek leiderschap", available at: https://t.co/fWuEb2oMR2 (accessed 14 April 2019).

Scientists for Climate (2019), "Veersterk de klimaatambities", available at: http://uahost.uantwerpen.be/s4climate/ (accessed 14 April 2019).

Scientists4Future (2019), "The concerns of the young protesters are justified", available at: http://scientists4future.org (accessed 14 April 2019).

Serrao-Neumann, S., Coudrain, A. and Coulter, L. (2018), "Science and knowledge production forclimate change adaption: challenges and opportunities", in Serrao-Neumann, S., Coudrain, A. and Coulter, L. (Eds), *Communicating Climate Change Information for Decision-Making, Springer Climate Series*, Cham, pp. 3-11.

Shannon, C. (1956), "The bandwagon", *IRE Transactions Information Theory*, p. 3.

Shannon, C. and Weaver, W. (1965(1949)), *The Mathematical Theory of Communication*, University of Illinois Press, Urbana.

Soe, S. (2018), "Algorithmic detection of misinformation and disinformation: gricean perspectives", *Journal of Documentation*, Vol. 74 No. 2, pp. 309-332.

Terranova, T. (2004), *Network Culture: Politics for the Information Age*, Pluto Press, London.

Vosoughi, S., Roy, D. and Aral, S. (2018), "The spread of true and false news online", *Science*, Vol. 359 No. 6380, pp. 1146-1151.

Vostal, F. (2015), "Academic life in the fast lane: the experience of time and speed in British academia", *Time and Society*, Vol. 24 No. 1, pp. 71-95.

Vostal, F. (2016), *Accelerating Academia: The Changing Structures of Academic Time*, Palgrave Macmillan, London.

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