Provisional title: Science communication and public relations: beyond borders

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Abstract:

This chapter applies an overall communication constitute organizations (CCO) perspective to explore the relationships between science communication and public relations. In the context of increasing institutional interest in public relations and science communication, the chapter asks whether public relations from research institutions should be seen as a subset of science communication or a discrete role. It argues that communication is essential to the constitution of organizations and challenges ideas of science communication as value free and neutral. In doing so, it considers the rise of institutional public relations and considers how these 'new' players in science communication serve the interests of the scientific community. Finally, the chapter considers the implications of taking a CCO perspective on how we understand the relationships between scientific organisations, scientists and the public.

Key Words: Public Relations, Science Communication, Organizational Communication

1. Introduction

> Many science communicators may not [...] recognise their role in public relations. However, they are in the business of building relationships through communication and they are the guardians and promoters of their organisations' reputations. That, in my opinion, all makes them far more complete public relations practitioners than some who use the title but who only carry out basic publicity functions - Sue Wolstenholme, CIPR President, 2014[1]

For more than a century news media have been the central arena where people learned about new developments in science, making news media a natural habitat for communication about and with science. This context provides good reasons for science communication scholars to focus attention on media and over the years, research has shed plenty of light on

[1] From 'Science Public Relations and Communication, Summary of key findings' (2014). Chartered Institute of Public Relations. Available from: https://www.cipr.co.uk/sites/default/files/SCIENCEPR_KEYFINDINGS.pdf (Accessed 24 January 2018).

relations between scientists and journalists and likewise on relations between science and society, as these unfold in contemporary medialized society (Hjarvard, 2008). Nevertheless, one key actor remains underexposed and under-researched in the science communication equation: namely the organization. Where social scientists from various perspectives in the last decade have discussed the impacts of larger scale societal changes (globalization, marketization etc.) on universities and science in general (e.g. Mazza et al. 2008; Whitley and Gläser 2007), only a few have paid attention to these changes with regard to how science communication is practiced by different actors. When we ask whether communication of new research findings in academic press releases should be labeled as science public relations (PR) or as science communication, we struggle to find answers that illuminate our understanding of this growing contemporary science communication practice, at least as long as we see these two labels as inherently contradictory and stick to the perspective that scientists and journalists as individuals are the key participants in mediated science communication. If, however, we consider that organizational communication is comprised of these individual communication efforts, and that the organizational perspective is an inseparable part of individuals' communication, we see the distinction between science PR and science communication blur. Thus, we argue that a focus on the role of research organizations as communicators will deepen our understanding of the ways that research emerges from the academy and the role organizations do and could play.

From the perspective of this chapter, we focus our attention on public facing communication of science emerging from universities and other research based institutes (i.e. the non-commercial organisations) and the academic journals that facilitate dissemination of research amongst the scientific community. As such, we are primarily interested in communication activities that are initiated by scientists, research organizations and academic journals. Further, we are interested primarily in web-based activities that are designed to generate media or social media coverage, rather than outreach activities aimed at formal education (for example). Both media and outreach activities typically form part of scientists' public communication and engagement activities: activities which fall under the umbrella of Broader Impacts (in the US), Pathways to Impact (in the UK) and Expected Impacts (in the EU).

Society's expectation of scientists regarding public communication of their research is nothing new. What has changed though, is the context that frames these expectations. Over the past few years, there has been growing pressure on researchers to undertake public engagement and to consider ways to generate impact from their research. This emphasis on identifying the impacts of research places pressure on scientists to create and share such impacts and this might be seen as yet another driver of institutional commitment to and support

for public engagement. Critiques of the focus on impact highlight negative consequences for scientific research and scientists, including reward systems for scientists and universities who undertake media activities (e.g. Marcinkowski and Kohring, 2014). Weingart (2017: 114), for example, argues that current reward systems are "putting a premium on attracting attention" and this in turn may encourage scientists to "hype" research findings. We do share concerns about the public's ability to learn about, discuss and influence what goes on in science, and we acknowledge the complex and intertwined relations between the different incentives of different actors to communicate. However, we argue for a more thorough look at the organization to better our understanding of the reasons why scientists choose to communicate their research achievements in public and the means that they use to do so.

2. A communication constitutes organizations perspective

We adapt Krücken and Meier's (2006) idea of an "organizational turn" in higher education to account for how we see organizations emerging as key participants in science communication and then apply the concept of organizations being constituted in communication (Schoenenborn and Vasquez, 2017) as an overall perspective which can usefully inform analysis of science communication practices that includes scientists and their respective employers (universities) as actors, not least the dialectic interplay among these. This line of thought has come to be known as communicative constitution of organizations (CCO); it takes a constructivist position and builds on the assumption that: "communication is the key process for the emergence, perpetuation, and transformation of organizations" (Schoenenborn and Vasquez, 2017: 1). This means that communication is foregrounded as the essential modality that constitutes organizations (Taylor and Van Every, 2000) and communication is further understood as the primary mode of explaining social reality at large (Craig, 1999). This position opposes a longstanding conceptualisation of universities as organizational shells hosting researchers from different disciplines (see e.g. Weingart and Maasen, 2007: 84) and instead understands the university as continuously constituted in communicative events performed by various actors, including the actor that comes to be constituted as the organization itself. Davies and Horst point to science communication as essential to the construction of "identities for science, scientists, and scientific organizations" (Davies and Horst, 2016: 57) and argue that

any particular communicative event may be a mix of different purposes and take part in the identity constitution of the scientist and the scientific organization at the same time.

To understand the role of research organizations in communication, Krückner and Meier suggest that organizations such as universities should be ascribed organizational actorhood and therefore must be considered as key players with their own and distinct reasons and means for communication. To Krückner and Meier, an organizational actor is an "integrated, goal-oriented entity that is deliberately choosing its own actions and that can thus be held responsible for what it does" (2006: 241). Universities are ascribed organizational actorhood as a way to explain how universities adapt to the current era of globalization processes by turning "into organizational actors, which are able to act strategically and position themselves with regard to their competitors" (2006: 242). As pointed out by Weingart and Maasen (2007), who drew on Krückner and Meier's concept of organizational actors to investigate elite universities in Germany, this means that we will see universities think and act like competing companies in two markets: "one is that of students, the other is that of knowledge" (2007: 79). Thus, research findings and especially the communication of research findings are the primary commodity for universities and "have the potential to influence the university both financially and in terms of its research ranking" (Wilkinson and Weitkamp, 2016: 6).

As a theory of communication, CCO can help us shed light on how research organizations such as universities come into being and how they come to exist across time and space in communication. If we adapt the idea of organizational actorhood, then communication of research findings becomes essential, not just to the constitution of the individual research organization but to the constitution of science as a social institution; the scientist becomes a central actor in both contexts. In CCO, the unit of analysis is always actual communication events (e.g. a press release, a website text) situated in local practices that enable the researcher to "consider the larger space-time framework in which the communication events are inscribed" (Schoenenborn and Vasquez, 2017: 4). Instead of asking what kind of communication a text generated by a university is, a CCO perspective asks how the actual text is talking the organization that communicates into being. This gives us new opportunities to explore relations between researchers, their universities and the public communication of research without having to decide beforehand how we understand reasons, means and roles in the communication we analyze.

3. Changing contexts of science communication

Although there is a long history of public communication of science and technology, external pressure on scientists to communicate about research findings largely springs from the influential Royal Society Report commonly known as the Bodmer Report (1985). In the intervening 30 plus years, we have seen a move away from so called "deficit" approaches to science communication which employed a unidirectional approach to transfer information from science to society, to a multitude of approaches which seek to facilitate multiway communication. This emphasis now includes the entire research and innovation chain, under the umbrella of Responsible Research and Innovation (RRI), which seeks to ensure that the public is not just informed about scientific research, but able to participate in research governance and to influence the direction of research and innovation and associated policies (Owen, Macnaghten, Stilgoe, 2012). While there is still much science communication that takes place in venues outside research organizations (such as museums) this shift in focus from a one-way to a multi-way approach to communication (where there is an explicit assumption that the public will contribute in meaningful ways to governance and policy) has been accompanied by considerable discussion about the role of both scientists and institutions in communicating to and with public groups (Holliman and Jensen, 2009; Jensen and Holliman, 2016), the roles of publics themselves within science communication (Barnett et al., 2012; Sturgis, 2014) and the rationales for promoting public engagement with science (Stilgoe, Lock and Wilsdon, 2014). Regardless of how the role of the scientists' is conceptualised (or that of the public or intermediaries in the communication process), it is clear that there has been a growing pressure on scientists to communicate their work with the public (and increasingly to do so in ways that allow some sort of interaction).

While much current debate about how scientists should engage the public focuses on dialogic approaches, the role of the media and mediated science communication has not escaped scrutiny (Peters, 2012; Dudo, 2015; Yeo and Brossard, 2017). Weingart (2001) (cited in Peters, 2012: 217) introduced the concept of "medialization of science" which Peters describes as comprising two parts: "first, the increasing media attention for science, and second, adaption to or even anticipation of media criteria within science as a response to the increasing necessity of legitimating science by means of public communication". Within the context of medialization of science, Franzen (2012) points to high profile science journals

including media attractiveness as one of the criteria for publication acceptance, suggesting that such motivations may lead scientists to overstate findings.

Within the broader literature on science media studies, research points to a tricky relationship between scientists and science journalists, one in which the rise of professionalised institutional public relations may be seen as shifting the balance of power toward scientific institutions, accentuating the need to understand organizational actorhood in science communication. As Peters et al., (2008: 271) observe: "Overall, the strategic component in the self-presentation of science has grown, and science probably controls its media image more effectively than ever before." Peters et al. (2008) argue that scientists communication with the media has become institutionalised, something also seen by Wilkinson and Weitkamp (2013) who found a majority of researchers worked with press offices to disseminate research findings to the wider public. Marcinkowski et al. (2014: 75) find a series of feedback loops, whereby scientists active in the media sphere become "attractive addressees", sought out by journalists and university press offices in search of "publishable statements". This points to a cadre of scientists who are both willing to engage in media activities and have become skilled in doing so.

Both Marcinkowski et al. (2014) and Peters (2012) highlight an increasing institutionalisation of media interaction. This is driven, in part, because universities are under increased pressure to attract positive media coverage while at the same time minimising negative coverage (Marcinkowski et al., 2014), leading to provision of public relations support. Professionalisation and introduction of formal structures (e.g. press or PR offices) are central elements of the emergence of global organizational actorhood and follow according to Krückner and Meier (2006) from the organization’s need to pursue self-defined goals and external demands for accountability.

Zooming further in on the role of the organization and its need to communicate, we find that the emergence of universities as actors in science communication inevitably generates new internal demands for scientists to communicate to support the organizational business. Organizations like universities need acceptable framework conditions (funding, legislation etc.) to thrive. In creating, and not least, securing such conditions, management is exposed to various kinds of external pressures that the organization must address through communication. Here the role of scientists and their research achievements become central. In conducting their research, scientists become owners of the university’s most valuable storytelling content, the organization's primary commodity, knowledge. So, when a university needs, for example, to

argue against government cutbacks this can be more easily done on the basis of a reputation as a strong research organization.

The need to build and maintain a good reputation will inevitably put pressure on scientists to communicate to help maintain, protect and strengthen the organization. However, since, at the organizational level, it is mostly management that experiences these external pressures, the pressures to communicate are not as visible to scientists as the demands put directly on them as part of the public discourse surrounding science communication. As such, the organization's need may not be recognized or accepted by all scientists. As Weingart and Maasen (2007:85) state, for most scientists: "Loyalty to and interest in promoting the image of the entire university is limited". To them, the department and scientific discipline will often be a context to which they relate more readily. However, a key point arising from the CCO perspective is that an individual scientist's perceptions and motives to communicate "makes no difference" when it comes to the constitution of the organization. When a biology professor is quoted in relation to a new research finding in a university press release, this communicative event brings this university into being (yet another time) regardless of the scientist's perception of the role he or she played in the communication. Likewise, journals that disseminate research and quote researchers are continuously constituted in the peer reviewed articles they publish as well as in the press releases they issue. Schoenenborn and Vasquez (2017: 17) explain that "It is through communication that organizational members will (or will not) negotiate and create consensus on who (or what) is authorized to speak on behalf of the organization".

That the constitutive role of a communicative event may not be recognized by the scientists that communicate can sometimes lead to competition and conflict between press offices at universities and journals with regard to who gets to frame the press coverage of a new finding, the university that employs the researchers or the journal that publishes their findings. The individual scientist might be fully satisfied with or even prefer a press release issued by a journal representing the scientist's field of research, though this is unlikely to satisfy the university. On the other hand, organizations and scientists that do recognize the market value of a specific communication event can use this to control who is entitled to speak on behalf of a collaborative research project or organization and who must remain silent, at least as long as the research finding has what resembles journalistic news value. Good reputations are built step by step through communication about, for example, research findings and scientists are the only authentic communicators a research organization can use to do this. It is therefore important to note, that an enhanced focus on the research organization as a distinct actor in science communication, as argued for here, by no means removes the equally important focus on the

scientist as central actor. Research is still conducted by scientists who speak for themselves as well as on behalf of their research projects and organizations and as Davies and Horst (2016) point out, many and parallel purposes will co-exist in public communication.

In a study of scientist's different perceptions of the roles they play when they represent research in public communication, Horst (2013) identified the well known role of scientists as experts and as educators representing specific fields of knowledge and the science as social institution, respectively. Horst (2013) however, also identified a less well-recognized role emerging, namely a role where scientists purposefully represent the organization they are affiliated with when they represent research in public communication. That we now see a different and more strategic communications role gradually entering the stage of science communication corresponds well with the need for communication to position the organization in the marketplace as reflected in the organizational actorhood ascribed to universities, proposed by Krückner and Meier (2006).

Critics of PR prefer to maintain an arm's length between the scientific organization and the public when it comes to communication of science and will argue against the emergence of a role for scientists as organisational actors. Among the arguments against such a role is that organizations that conduct the science will not scrutinize their own business when undertaking science communication and by making strategic choices to promote certain research areas they may turn out to be tainted by vested interests. In this context, communication initiated by news media and independent science journalists is typically viewed as most likely to offer critical and independent communication of science; a position also increasingly seen as problematic. The changing media ecosystem, for example, puts pressure on journalists to produce more content for more channels (Macnamara, 2016; Williams and Clifford, 2010), reducing the time available for critical reporting. Furthermore, studies highlight a problematically close relationship between science journalists and both their subject and sources (Schäfer, 2011), with most studies pointing to the challenge science journalists face in maintaining their independence (e.g. Nelkin, 1995; Williams & Gajevic, 2013). Gandy (1982: 86) goes so far as to label this a 'convenient fiction of journalistic objectivity'.

In such an imperfect world, we argue that considering the organization as an actor in the science communication space, and thereby embracing the public relations function, allows a fresh perspective on what stands out as an intricate, contemporary practice within science communication where it is increasingly difficult to separate the means and motivations of science communication actors. It is a perspective that can add to the rich picture already developing of the roles and motivations of scientists in an increasingly mediatized society.

Further, we do not wish to argue that this stance implies that all science communication is mediatized nor that all communication from organizations necessarily is marketized. As outlined below, we argue that the CCO perspective offers new ways to conceptualise the role of public relations within organizations, opening up new spaces where organizations can contribute meaningful and socially valuable science communication, though this does not imply that scruity of such behaviours is not required.

4. Rise of institutional public relations

Cornelissen defines public relations as: "The function or activity that aims to establish and protect the reputation of a company or a brand, and to create mutual understanding between the organization and the segments of the public with whom it needs to communicate" (2017: 292). As has become the case for science communication, public relations is both a practice and a field of research and the interaction between theory and practice in both fields raises challenges about how best to act when relating to different publics. Grunig and Hunt (1984) introduced a four model typology of public relations, that has become the dominant paradigm in public relations theory. Even though this typology to some extent reflects a historical development, where the norms of public relations activities (much in line with norms in science communication) over the years have moved from linear one-way communication towards two-way symmetrical relations, later studies have shown how successful companies tend to combine different types of public relations activities (one-way as well as two-way communication) to achieve their goals (Grunig et al., 2002, Grunig and Heath, 2001).

The emergence of the different types of PR activities and thinking (as expressed by the four models) has not led to replacement of one by another, but for them to exist in parallel. At least this goes for activities informed by the linear public information model and the two-way models (the asymmetrical and symmetrical, respectively): in other words, they are not mutually exclusive. In contrast, organisations adopting public relations informed by the earliest PR model, the press agentry/publicity model, find it hard to also undertake activities informed by the three other models because it has very different underlying values. The press agentry model values publicity over complete truth; it seeks media coverage regardless of the price and is therefore typically perceived as propaganda. In contrast, the public information model values truth and "the purpose is the dissemination of information, not necessarily with a persuasive intent. The public relations person functions essentially as a journalist in residence, whose job it is to report

objectively information about his organization to the public" (Grunig and Hunt, 1984: 21). Definitions of public relations that focus on mutual understanding and two-way exchange of information as in Grunig and Hunts two other PR models, are not unlike the aims espoused in science communication, which seeks to engage in discussion, involving the public in a two-way dialogue, so that understanding is mutually developed (Trench, 2008). The definition of public engagement provided by the National Coordinating Centre for Public Engagement in the UK highlights how closely related the vocabulary of public relations is to that of contemporary science communication:

> Public engagement describes the myriad of ways in which the activity and benefits of higher education and research can be shared with the public. Engagement is by definition a two-way process, involving interaction and listening, with the goal of generating mutual benefit. NCCPE[2]

Taking a CCO perspective to focus on the role of organizations in the science communication equation though, brings us beyond the dominant paradigm in public relations. Where Grunig and Hunt's four model typology is helpful for our understanding of the many different means of communication seen in contemporary science communication, its instrumental focus and the fact that it springs from an american historical context also limits its use. Critical public relations scholars (e.g. L'Etang 2005, 2008) talk about a discursive turn in public relations and argue for a better understanding of public relations as a social practice. This implies that: "public relations practitioners, need to learn to cope with ambiguity and to understand sense-making processes" (L'Etang, 2005: 524). To us this is an important reminder regarding the function of communication. Whether we choose to understand communication from the academy as science communication, public relations or journalism, this can never be neutral or value free.

When we discuss institutional public relations in science, academic press releases are the most visible output. However, the growing number of press releases (Serong et al., 2017; Autzen, 2014, 2018), which are often seen as a synonym for science PR, are in fact just one of several dimensions of public relations in science that should be considered (which would also include, for example, public lectures, community events and even activities linked to RRI). Furthermore, to build relationships through communication, organizations must establish and

[2] https://www.publicengagement.ac.uk/about-engagement/what-public-engagement (accessed 2 February 2018)

maintain identities to which others can relate. From a CCO perspective, we find that as organizational texts, press releases not only speak on behalf of an organization already existing, they also talk the organization into being and in that sense play roles much more intrinsic to the research organization than just "selling science" and promoting universities in mass media, the aspect of science communication (and public relations) practice which is both most recognized and criticized.

As a means of communication, press releases were developed at a time when news media were the primary way to reach broader publics: as a tool to "transfer news to journalists so that it can be made public" (Cornelissen 2017:165). But as recently pointed out by Anhäuser and Wormer (2016), press releases issued by academia seem to have gradually transformed from a "for the press" release to a "for all" release. Trench (2007) points to the Internet as crucial to explain how research organizations have become more independent of traditional news media when it comes to science communication. For example, universities and journals can now create their own newsrooms on institutionally controlled websites and make science news stories available online to everyone, including important stakeholders, without having to ask journalists and news media for help by means of a press release. However, this does not imply that science news stories posted on organizational websites are no longer posted as press releases on news sites for journalists (e.g. EurekAlert!, AlphaGalileo, Informationsdienst Wissenschaft) or sent directly to journalists by email. This just means, that these texts do more than one thing and that these different purposes coexist in public communication (Davis and Horst, 2016).

Examining academic press releases further, we find that the "for all" should be understood literally in that they also reach internal publics. Alongside other organizational texts posted online, these "for all" releases also help make sense of the organization, that is to say, constitute the organization in communication. As noted by Trench: "For research centres, a web presence is essential – without it, the centre in some sense does not exist" (2009: 167). The continued telling of stories about research and related matters on organizational websites constitute research groups, centres, departments and whole organizations (over and over again). We do not imply though, that organizations did not exist before the Internet and that organizations are closed circuits where only (positive) communication by organizational members is part of the constitutive game. It is rather a reminder of the fundamental changes in means of communication brought about by the Internet that affect organizational communication including science communication. In the present conditions, universities can use science communication to promote themselves and build brands by means of well planned strategic

corporate communication. However, this does not take place unchallenged, in that organizations are also exposed to online phenomenon such as social media "shit storms", where critiques (external as well as internal) can attempt to alter the reputation and may succeed if the self-presentation of the organization turns out to be problematic or does not reflect how the organization is otherwise acting. "Obviously, an organization that describes itself as a responsible corporate citizen does not emerge as such simply by talking this way" (Christensen et al., 2013: 375) which reminds us of the close relationship between talk and action. The point made by Christensen et al. is that when we take a CCO perspective, we see that:

> “the ways organizations talk about themselves and their surroundings are not neutral undertakings, but formative activities that set up, shape, reproduce and transform organiza-tional reality. Communication, thus, is not something an organization does once in a while, in between other important activities, but is constitutive of all organizational life and sense making” (2013:375).

Research organizations increasing interest in public relations and science communication is watched with some concern both from science journalists and social scientists, and whenever we talk about science PR, the prevailing understanding is that public relations in science is somehow problematic. We find this PR sceptical stance problematic, in part because it seems to rely on a rather narrow understanding of public relations as primarily propaganda. Following Grunig and Hunt’s typology, a view of science PR as propaganda corresponds to a type of public relations where hype, exaggerations and downright lies are all legitimate means to gain attention, things that in an internal scientific context would otherwise be labeled as flaws or even misconduct. This type of public relations activities may take place in science, but it cannot lead to sustainable public relations for science and scientific organizations in the long run, nor does it correspond well with scientific norms such as objectivity and truthfulness. By choosing to focus on propaganda, PR sceptics seem to imply that public relations is something that research organizations could (and should) choose to avoid. This is a paradox, since scientific organizations and science as such have no choice other than to relate and build relationships through communication.

In the case of science, Borchelt and Nielsen talk about the PR function as "managing the trust portfolio" (2014: 62) and in line with Cornelissen (2017) stress that PR must be understood as "a function of entire organizations, not just science communicators or scientific officers" (Borchelt and Nielsen, 2014: 67). This corresponds particularly well with the idea of ascribing

organizational actorhood to universities (Krückner and Meier, 2006). Borchelt and Nielsen further unfold the PR function at four different levels (programme, functional, organisational and societal levels) that need to be managed in accordance with each other in order to contribute to a successful organization. In this context, successful means being trusted and being able to achieve acceptable framework conditions (funding, legislation, collaborators, etc.) to conduct research and teach. To repeat Cornelissen, an important point here is that this has to be achieved "in mutual understanding" which is quite different from propaganda.

When taking a closer look at the four levels of the PR function described by Borchelt and Nielsen, we find explicit science communication activities such as academic press releases and media relations to be at the programme level, and "the overall communications and PR function of the institution, typically including all of the individual programme-level units" (Borchelt & Nielsen, 2014: 66) is found at the functional level. These two levels are also where the organizational intermediaries (Public Information Officers (PIOs), in-house science journalists etc.) enter the equation. At the (upper) organizational level, PR is a management function and seen from that point of view, activities should contribute to the running of the business, not just to gain press coverage. This means that science communication professionals must plan and conduct PR activities at the programme and functional level that identify and relate to strategically important stakeholders in ways that are meaningful to stakeholders as well as to the organization at the management level (mutual understanding). PR at the societal level can be seen as the individual organization's contribution to the eternal (re)-negotiation of society's license to operate for science as a social institution. It is at this meta-level of science PR that it becomes highly relevant to talk about trust in science as such and where society's engagement, dialogue and RRI agendas are rooted. The two upper levels in science PR (organizational and society) are where organizational actors respond to external pressures exerted on institutions from governments, funders etc. How well the PR function on the upper levels is managed and how well aligned it is with the actual communication activities planned and executed at the two lower levels (programme and functional), will both depend on the status and skills of the communications functions in the organization as well as the management function's views on communication and public relations in general. If we accept the role of science communication as sense and identity maker for the organization itself and that communicative events have multiple purposes, a better understanding of how research organizations apply and combine different types of PR for different tasks might further discussions about how science could and should be shared with and negotiated in society.

5. Implications for scientists, science PR and society

A CCO perspective brings new insights to the ways that we might think about the relationships between scientists and society. It allows us to consider how and why current drivers for public engagement have led to a growing science PR industry (Autzen, 2014) and to consider what the effects of this trend might be on scientists, their employers and wider society. Pressure from funders to produce research with impact, necessarily leads to communication, but this communication can take a wide range of forms. The CCO perspective suggests that all these forms, whether a conversation with stakeholders or a planned media activity, can be seen as constituting the organisation and contributing to its success. Everything you say on behalf of the organisation, builds (or diminishes) that organisation's reputation: every employee, through their communicative acts, creates the organisation and scientists are no exception. In this context, science PR is not solely confined to interactions with journalists, but might be seen as any communication which links the speaker to their employer.

In this situation, a public relations team able to help craft a media-friendly message and facilitate its dissemination to journalists could be seen as crucial to organisational success in a highly competitive research environment. However, in contemporary large scale science projects, scientists from different organizations collaborate. If media coverage of new research findings is seen as important by research organisations, feeding into the scientific business, then who is entitled to speak on behalf of a project or organisation becomes important. Here science PR becomes tricky not just for society but for science itself, raising questions about whose voice is heard (senior or junior researchers as well as prestige levels amongst collaborating institutions), how those decisions are made and whether this process is transparent to the researchers involved, the organisations they represent and society at large.

From the perspective of society, press releases and other short news articles published on institutional websites are an important source of scientifically produced knowledge. Not only are they used by science journalists, but they may also be an important source of information for wider publics. An increasingly important role of PR professionals will therefore be to act as quality controllers, producing press releases of good quality that can almost stand on their own. Good, in this context, might mean, for example, placing new research into its wider scientific context as well as supporting interaction throughout the RRI process with a view to brokering mutual understanding between researchers and stakeholders. Furthermore, social media has

enabled research institutions to combine different activities into one united communicative effort. Whether academic press releases are understood as science communication or strategic communication, an increasing number of research institutions are present on diverse platforms to maximize their return on investment by reusing content from science news stories (press releases) on all channels possible. As already pointed to, online technologies (internet-based communication of any kind) have made research organizations indepent of journalists and traditional news media, so that these are now seen as ‘just one of the channels’ through which institutions can reach relevant publics.

The rise of science PR, alongside the emergence of a wide range of digital channels that allow institutions and scientists direct access to the public (e.g. via social media), suggest a need to consider what constitutes ethical science communication. Weingart (2017: 116) quotes German guidelines for good science communication which stress the need to be "true to fact" and not to "exaggerate" findings or success, nor to "play down or conceal risks of technologies known to it". In a call for an ethical turn in science communication, Medvecky and Leach (2017) ask where science communication should look for a code of ethics. Is it to science? To journalism? Or to communication fields more broadly? In the context of public relations, science PR can (and arguably should) consider the ethical codes applicable to public relations more generally. For example, the Public Relations Association of America has a code of ethics[3], emphasises honesty (including accuracy and truthfulness in communication) and responsibility to the public interest, but recognizes that PR professionals work on behalf of organizations and as such urges that members act as "responsible advocates for those they represent". But for those working in science PR within universities, research institutes and for the professional associations and journals involved in the dissemination of scientific information, a broader range of ethical considerations might be appropriate, such as those raised in journalism codes of conduct which include consideration of potential ‘public harm’ from making information available or aspects raised in the study of communication ethics which consider how communication can be a force for good (Medvecky & Leach, 2017).

[3] https://www.prsa.org/ethics/code-of-ethics/, accessed 26 January 2018

6. Future research directions

Despite the observed and criticized institutionalisation of media interaction and increased interest in strategic use of science communication from research organizations our knowledge of how well science communication activities at the programme and functional levels of PR contribute to success at the organizational and societal levels is still limited. As pointed out by Borchelt and Nielsen, the extreme focus on media relations has not shed much light on how media coverage and online communication of science actually contribute to the running of a contemporary university business and even less light on how well such activities are operated by a typical research organization. Knowledge about how research organizations select and frame the science they choose to communicate publicly on websites, in social media channels and as press releases, might further discussions about this increasing practice and its effect on public understanding, involvement and trust in science.

Thereto, our knowledge about the role of public information officers is limited. Up to this point, PIOs (or PR practitioners) have mostly been thought of as intermediaries (boundary spanners) between individual scientists and journalists. But as addressed by Cardwelll et al. (2017): “public relations practitioners often must navigate complicated internal communication processes before, during and after developing and executing strategic external communication plans”. To gain more insights into how management and PIOs influence or perhaps even take part in decisions of which content scientists communicate publicly on behalf of the organization, it might prove useful if we also think of PIOs as acting as internal boundary spanners between the scientists and the "organizational actor".

Finally, we propose that future studies of relations between science communication from research organizations and independent science journalism might benefit from the CCO perspective. Rather than seeing journalism as objective and value free communication, and as such the untainted ideal when it comes to communication of research from the academy, investigations of science journalism and news media through the lens of CCO might open new avenues of research much needed in these times of blurring boundaries and changing media ecosystems.

7. Conclusions

The CCO perspective adds a formative and a strategic dimension to scientist's public communication that goes beyond public legitimacy and gives the individual research organization an increasingly significant role in science communication. Such a role should not be ignored when we aim to understand different practices of communication and the roles these play in contemporary society. Polino and Castelfranchi (2012) take this a step further and talk about a "communicative turn" in science communication where communication can no longer be separated from scientific knowledge production. "Public communication of science and technology (S&T) has transformed into a structural value within the core axiological pluralism of contemporary technoscience: journalistic values, persuasion, publicity, opinion etc. converge within the axiological core of techno-science" (2012: 3). This view fundamentally challenges what science is and should be, i.e. the values of science and who should define such values. To see public communication of science as "a structural and structuring feature" (Polino and Castelfranchi, 2012: 7) in our view bridges the needs for communication experienced by organizational actors (Krückner and Meier, 2006), multiple purposes of communicative events (Davies and Horst, 2016) and the more classic role of science communication as providing information to and for society.

To gain mutual understanding in matters of science remains a tricky challenge though. To engage in dialogue still requires that often complex and complicated matters are first made understandable. Scientists can do this job themselves or they can communicate with help from intermediaries, either internal staff (PIOs) or external journalists. The one-way public relations model, "the public information model" is in many ways familiar to science communication, even though this may not be acknowledged by critics of science PR. For example, Weingart (2017) argues that universities have shifted from information provision to public relations and marketing and that such marketing and PR has become an industry in its own right (implying that public relations necessarily has propagandist tendencies). The purpose of one-way PR models is to provide information and in that sense it mirrors deficit model thinking, which is still prevalent in much science communication.

In his critique of science PR, Weingart also highlights that PR advances the organization's interest. But all organizational communication advances an organization's interest, including information provision. To that end, science PR has been present as long as the academy has told science stories in public and we might dare ask whether we should turn the picture upside down and begin to perceive science communication as public relations rather

than to see public relations as a subset of science communication. At first sight, this position might seem rather radical, but with organizations emerging as key actors in science communication, this might prove to be a fruitful approach to study science communication initiated by scientific organizations.

8. Further Reading

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