

Balancing interests between freedom and censorship: Organizational strategies for quality assurance in science communication

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Abstract

While science communication is increasingly being discussed as a third mission alongside research and teaching, there is little research on how universities and research organizations deal with issues regarding the quality of science communication. This article examines, from an organizational perspective, which new forms of quality assurance processes scientific organizations in Germany apply when addressing quality risks for science communication such as exaggeration in press releases or in the online communication of individual faculty members. Six focus group discussions were conducted with 22 participants (rectors or presidents of universities, heads of communication, ombudsmen, and high-impact researchers). Based on the results, proposals were developed to extend central as well as decentral organizational structures to assure good scientific communication practice. Their possible implementation was discussed in a workshop with representatives of all abovementioned groups. In conclusion, recommendations for future institutional policy are presented.

Key words: science communication; science policy; quality research; organizational studies; strategy as practice.

1. Introduction

For the last three decades, science policy in Germany, as in most other Western countries, has promoted various strategies to foster the interaction of science with society. Only recently, the Federal Ministry of Education and Research (BMBF) has called for a fundamental cultural change whereby public engagement should become a central criterion of scientific reputation (BMBF 2019). In view of overall international developments, it is to be expected that the effect and reach of science communication—as additional indicators for impact—will continue to be in the focus of science policy (for an overview, see Gascoigne et al. 2020). As a consequence, and against the backdrop of the rising competitiveness in the (German) academic sector (Meier 2019a), universities and research organizations have adapted their strategies (Schäfer and Fähnrich 2020). They have responded to the political trend by investing in science communication—e.g. in recent years, there has been a considerable increase in staff, budget, and overall outreach activities of German universities (Marcinkowski and Kohring 2014; Rödder 2020; Entradas et al. 2020). Moreover, subunits such as departments or institutes (e.g. in the context of third-party funded projects)

have started to conduct their own communication activities (Entradas et al. 2020). In addition, interaction with the public seems to have turned into a ‘normative feature’ of academic work with more and more researchers participating in various forms of science communication (Bauer and Jensen 2011). This has been further amplified by the digital transformation of public communication. Although this acceleration of science communication might be politically welcome, it has turned into an increasing challenge for science and its public perception. Against the backdrop of the constitutional freedom of science and speech, the science communication of the multilevel system of universities and scientific organizations has developed into a cacophony that is almost impossible to oversee, let alone control.

Overall, these developments raise concerns for the quality of science communication in different perspectives: firstly, and in conjunction with a weakened (science) journalism, the rise in (direct and digital) university communication has enhanced the role of press releases, social media posts, and similar formats that are more frequently finding their way, completely unfiltered or only moderately so, into public discourse (Heyl et al. 2020; Lloyd and Toogood 2015;

Göpfert 2007). As exaggeration in news has been shown to be strongly associated with exaggerations in academic press releases (e.g. Sumner et al. 2014), warnings of a resulting risk for the credibility of science and the trust based on it have become louder in recent years. Especially, the blurring of boundaries between primarily information-focused communication and rather pure university PR/marketing ('reputation communication') has been criticized as a violation of the norms of science (Peters 2019; acatech—National Academy of Science and Engineering, Union of the German Academies of Sciences and Humanities, & German National Academy of Sciences Leopoldina 2017: 9; Vogler and Schäfer 2020). Secondly, scholars and organizational subunits who engage increasingly on social media platforms independently from their scientific organizations challenge organizational strategies and objectives (Jünger and Fähnrich 2020; Entradas et al. 2020). Previous research has provided initial evidence of decoupling between researchers and central communication units (Fecher and Hebing 2021). Furthermore, developments such as Open Science, which have emerged in the course of digital scholarly communication, pose new challenges as intra-scientific debates that have been nonpublic in the pre-digital age but now move into the public eye (Fecher and Friesike 2014; Irwin 2002; Silvertown 2009).

Scientific institutions not only engage more intensely in science communication, they also face new risks that they have to cope with in their organizational strategies. However, in the 'organizational anarchy' of the scientific organization (Cohen et al. 1972), these strategies rely heavily on negotiation and collaboration of its diverse members. Despite its relevance, quality promotion, and control of science, communication in organizational contexts has, so far, received only limited scholarly attention. Existing research has most often dealt with quality standards of science communication content (e.g. Olesk et al. 2021). But, to evaluate the quality of science, communication is not just an issue of contents (product quality) but just as much one of organizational structures and processes (process quality) that help to promote quality standards on all levels of the scientific organization. Against this backdrop, the central aim of this paper is to better understand the strategies, practices, and processes underlying the quality control of science communication in scientific organizations in Germany. Three research questions guide our research:

- (1) How is the quality assurance of external science communication organized in universities and research organizations and what strategies and measures of quality assurance can be identified?
- (2) What risks and challenges do scientific institutions face in ensuring the quality of science communication without jeopardizing individual academic freedom?
- (3) What could be new forms of quality assurance for external science communication from an organizational perspective?

Addressing a research gap in the field of organizational quality assurance of science communication, we present the results of a study, which was based on six focus group discussions with members of German scientific organizations. Participants included university leaders, heads of communication units, high-impact researchers, and ombudspersons. Building on the interim results, we conducted a collaborative workshop including further focus group discussions with actors from all

of the six organizations and other experts in order to develop recommendations. The study has been rooted in a conceptual approach that has linked science communication evidence with theoretical approaches of organizational sociology and has applied the strategy-as-practice approach established in management research as well as in media practice to science communication research. We consider our research to be of high practical relevance, especially for the development of strategies at scientific organizations and in science policy. If science is to engage more intensely in a dialogue with societal actors, it should be clear under which conditions this can and should happen.

2. Literature review

In recent years, science communication has received growing scholarly interest. With the development of the research field, different perspectives and approaches have been developed that are also mirrored in different definitions of the fields' object. Schäfer et al. (2015): 13; own translation) define science communication as 'all forms of communication focused on scientific knowledge or scientific work, both within and outside institutionalized science, including their production, content, use and effects'. With this broad definition, the authors acknowledge the changes in the societal order of knowledge in the digital media ecosystem where not only scholars and communication professionals but also a huge variety of societal actors contribute to the public communication about and perception of science (Neuberger et al. 2021). This broad conception is thus helpful to illustrate the overall communication context in which scientific organizations maneuver. However, as this paper focuses on science communication from an organizational perspective, we decided to apply a narrower definition. Following Davies and Horst (2016: 5), science communication is understood here as 'organized actions aiming to communicate scientific knowledge, methodology, processes or practices in settings where non-scientists are a recognized part of the audience'.

As pointed out above, we focus on the quality assurance of knowledge-based science communication, in contrast to primarily self-promotional forms of communication by research institutions (such as marketing). Two strands of research appear to be of particular importance: the scientific discourse on the quality of science communication from the perspective of *content* standards (section 2.1) and the research on the *organizational* forms and standards of science communication (section 2.2). This is in line with an approach commonly used in research on media quality and media performance (for an overview: Meier 2019b; Neuberger 2004) where two aspects of quality can be distinguished:

- (1) *product quality*, which means content-related aspects of quality (e.g. use of concrete quality criteria/content standards).
- (2) *process quality*, which means the necessary conditions for the realization of quality criteria on an organizational level (organizational standards; the organizational structure that ensures compliance with such criteria, e.g. in an editorial process).

In this study, we focus on the latter of the two by asking what quality assurance strategies and practices have emerged at research institutions and how these can be developed

further. However, since the organizational structures in turn also imply the development and application of certain quality standards in terms of content, these should also be briefly described.

2.1 Quality standards for the contents of science communication

A prominent perspective expects science communication to adhere to similar quality criteria as those prevalent in science (Olesk et al. 2021). Central to this discourse are key words such as accuracy, objectivity, facticity, and the reliability of sources and evidence (van der Bles et al. 2019; Hall Jamieson and Hardy 2014; Singer 1990). Some guidelines explicitly demand to apply criteria of good scientific practice to good science communication practice, for example, in the sense that exaggeration in the public presentation of research results must be considered a violation of good scientific practice (acatech—National Academy of Science and Engineering, Union of the German Academies of Sciences and Humanities, & German National Academy of Sciences Leopoldina 2014: 18). Furthermore, numerous scholars have discussed the transferability of journalistic (Arnold 2008; McQuail 1992; Neuberger 1997; Meier 2019b) or science journalistic (Lilienthal et al. 2014; Moynihan et al. 2000; Rögener and Wormer 2017; Schwitzer 2008) quality criteria (such as correctness, actuality, relevance, diversity of sources, understandability, and attractive presentation) to other fields of science communication. Meier (2019b: 5) summarizes that ‘criteria such as clarity, attractiveness, and usefulness are basically applicable also to other types of publishing, such as public relations, content marketing, advertising, and everyman postings’, and in some cases, the transferability of such criteria has been explicitly demonstrated (Serong et al. 2015). The journalistic conception of quality informs the practical understanding of quality in science communication, especially in cases of mediated communication (e.g. press releases). Referring to dialogical forms of science communication, Bucchi (2019) has emphasized that openness to scrutiny, independence, and fairness should be more strongly considered when dealing with the quality of science communication. The relevance of critical and dialogic approaches is also mentioned by Davies (2021) and is regarded as particularly important in the context of social media and disintermediated communication in general (Delicado et al. 2021; Mannino et al. 2021; Neuberger et al. 2021; Taddicken and Krämer 2021).

In this paper, we follow the understanding of quality along the above quality dimensions, which are based on both scientific and journalistic criteria. However, it has to be pointed out that definitions of quality vary depending on the perspectives of actors involved (Lacy and Rosenstiel 2015). Researchers, spokespersons, journalists, or users sometimes hold different views of what ‘good’ communication actually is. Moreover, the understanding of quality is context-driven in that it depends on where the communication originates from and in which setting it takes place (Rödter 2020). Nevertheless, there is a large overlap between quality criteria in (science) journalism and in other areas of science communication and a number of catalogs and guidelines have already been developed for researchers or press officers in the media (Social Issues Research Centre, & Royal Society (Great Britain) 2001, Wissenschaftsrat 2021, Stempra 2009, Stempra 2017), often along such journalistic criteria. However, hardly

any structured handouts on organizational quality assurance processes for the external science communication of research institutions as a whole could be found.

2.2 Organizational quality of science communication processes

Scientific organizations occupy a special position as they are obliged to meet the politically fostered societal objectives of science communication while also promoting their organizational interests (Schäfer and Fähnrich 2020). They are confronted with sociopolitical demands that are described as their ‘third mission’ in addition to research and teaching (Henke et al. 2015; Meier 2019a; Roessler et al. 2016). These external demands may in some cases contradict the genuine interests of the organization (Raupp 2017; Rödter 2020). They may also contradict scientific quality standards and compromise standards of scientific and media integrity. These potential contradictions notwithstanding, university leaders and researchers regard media attention for their institutions as increasingly important (Marcinkowski et al. 2014; Peters 2013). However, how to ensure the quality of science communication organizationally in the midst of this tension is largely an open question.

Existing approaches for analyzing quality tend to have a narrow focus on certain fields of science communication such as science journalism (Olesk et al. 2021). This seems to be even more true for organizational aspects of quality assurance. If, however, as stated in the introduction that science journalism is weakening and, at the same time, direct communication of scientific content by research institutions is increasing, it makes sense to examine well-described processes of quality assurance from journalism now also for these forms of science communication. Although they do not fulfill the prerequisite of an external observation of science as journalism does, they could, in the best case, take over a part of the lost information tasks in the media system. In newsrooms, a differentiated system of internal checks and balances is very common. It can be described by the quality management model of Wyss (2016) that is based on a structuration-theoretical perspective and on standards of the International Standards Organization as well as quality management concepts (Total Quality Management [TQM] models such as European Foundation for Quality Management (EFQM) www.efqm.org/efqm-model; Saner and Wyss 2019: 151). Due to its combination of generally recognized standards for quality management and the elaboration of specific requirements for the media sector, this model appears to be particularly interesting for the communication processes of research institutions, which, in their external communication, can be regarded as a special form of media organization. Wyss’ proposals follow a structure that has also been proposed by other authors for quality assurance in editorial organizations, namely a division into *preventive*, *production-accompanying*, and *corrective* measures (cf. Meier 2019b; Saner and Wyss 2019). One advantage of Wyss’ model is that it is already available in a very detailed form and that it is very practice-oriented, which fits well with our ‘strategy-as-practice’ approach. We also start from the observation that many press offices of research institutions are staffed with former science journalists who are familiar with such editorial quality assurance processes.

Similar structures for the organization of quality assurance can be found in science, from guidelines for good scientific

practice ('preventive') to reviews in the scientific publication process ('production-accompanying') and procedures to deal with scientific misconduct through ombudspersons, etc. ('corrective'). A further look at mechanisms of quality assurance in science publishing seems to be useful for two other reasons: first, in the age of Open Science and preprints, it can be assumed that the barrier between researchers and laypersons barrier has become partly perforated so that some internal journal editorial processes become visible to the general public. Secondly, the high degree of organization of review processes securing the quality of specialist publications (e.g. by peer review) may help to improve quality assurance processes for the communication of science to the public. In general, the peer review system is not limited to intra-scientific procedures of quality assurance (Reinhart 2012). For example, auditing companies conduct peer reviews of projects or companies, which have a certain structural similarity to the same procedures in science.

In contrast to the well-described processes of quality assurance in journalistic as well as in scientific publishing, the process dimension of quality assurance has hardly been researched for the communication of scientific organizations. This is astonishing as the organizational features of universities have different and potentially far-reaching implications for the quality of science communication in organizational contexts. On the one hand, the increasing relevance of science communication for scientific organizations is related to professionalization, which includes more attention to ethical concerns and quality standards (Schwetje et al. 2020). Professional communicators take on roles as advisers within universities with the aim to foster better science communication. On the other hand, organizational goals related to public legitimacy and reputation (Marcinkowski et al. 2014; Roberson 2020) might trump concerns of scientific accuracy, and exaggerations already in the abstracts of studies or in press releases find their way into the media (e.g. Sumner et al. 2014, 2016). In addition, the science communication differs in different types of organizations: a recent survey among researchers in Germany showed that researchers at nonuniversity research institutions are more active than researchers at universities in almost all areas of science communication and that satisfaction with institutional communication units varies greatly between researchers of different types of scientific organizations (i.e. universities, universities of applied sciences, and nonuniversity research institutions) (Fecher and Hebing 2021).

An analysis of the state and the quality assurance of science communication, respectively, must take into account the contextual factors of scientific organizations. In contrast to other types of organizations, universities are described as 'loosely coupled systems' (Weick 1976), 'organized anarchies' (Cohen et al. 1972), or 'peculiar organizations' (Eaton and Stevens 2020). These concepts have in common that they emphasize the autonomy of the organization's members and the limited possibilities of control by a central management. For this reason, also science communication often takes place in organizational settings that are not necessarily conducive to quality control (Besley 2020). This is not only true for those forms of science communication that emanate from the researchers themselves but also for the management level whose external communication is not subject to editorial control. Given the greater policy focus on societal impact, tensions between organizational and individual interests are to be expected.

Thus, the organizational characteristics of universities present particular challenges for the quality of science communication. They have to be regarded from a central as well as from a decentral perspective and quality assurance processes should be considered on several levels:

- (1) the level of individual researchers
- (2) the level of units responsible for science communication
- (3) units responsible for different kinds of quality assurance (with regard to compliance, good scientific practice, etc.)
- (4) the level of management, which is ultimately responsible for the external presentation of the institution as a whole.

3. Empirical study

3.1 Conceptual approach

Our study follows the strategy-as-practice approach, which has emerged as a distinctive approach in management and strategy research since the early 2000s. Strategy-as-practice can be linked to a broader turn in contemporary sociology, which focuses on practices as a key conceptual hinge to understand both agency and social structure (Golsorkhi et al. 2015). The approach is characterized by an 'activity-based view' (Johnson et al. 2003) on strategy and thereby a focus on 'those who do the actual work of making, shaping and executing strategy' (Whittington 2006). Strategy is no longer regarded as something an organization has; instead, it is seen as something that is practiced across different levels, from the level of individual actions to the institutional level. This implies a multilevel perspective on organizational behavior. Hence, we examine the practices of quality assurance of science communication at different levels of scientific organizations by group discussions with different actors involved. We assume that this approach is particularly suitable to do justice to the above-described process-based view on quality in science communication and the specific organizational conditions of research institutions.

3.2 Research design and methodology

We apply the approach of strategy as practice in that we focus on representatives of those levels of scientific organizations that shape and conduct science communication and shape its quality. These are researchers themselves, the heads of communication units (hereafter communication managers), members of the management/leadership, and ombudspersons ($n = 22$). Between July and December 2020, we conducted six focus group discussions at German universities and research organizations. When selecting cases, it was our aim to approximate the diversity of the German research system.

The German research system is characterized by the two pillars of university and nonuniversity research (cf. Wernitz 2015). Among universities, a distinction can be made between universities and universities of applied sciences, with researchers at universities of applied sciences generally having a stronger focus on applied research and a higher teaching load. Nonuniversity research is mainly carried out by research organizations within the Fraunhofer Society, the Max Planck Society, the Leibniz Association, and the Helmholtz Association. Nonuniversity research institutions often have a clearly defined research profile and no teaching obligations (Höhn 2011). Nevertheless, they differ in terms of their organizational structure, their positioning on the scale

between basic and applied research, and the size and structure of their budgets available for research. Government research institutions that are subordinate to or associated with federal or state ministries must be considered separately from these since they have an advisory mandate and do not fully enjoy the academic freedom typical of academically organized science (Barlösius 2010). Considering these features, it can be assumed that the organization and quality assurance of science communication differ between these organizational types of the German science system. Thus, we included two nonuniversity research institutions that represent a type of research organization that is typically focused on a specific discipline or field of research and not involved in teaching (Hohn 2010). One of these is a departmental research institute ('Ressortforschungseinrichtung'). The other is an institute of the Leibniz Association. The other four focus group discussions were held with members of four German universities, one of which has a technical focus and one has a focus on arts.

In order to steer the conversation but leave enough space for discussion, an interview guideline was used that mirrors the overall research interest. The interviewers asked questions along three broad themes: understanding of quality assurance, practices, and processes of quality assurance, as well as perceived risks and challenges for quality assurance. In order to approach the main research questions, the interviewees were informed that the focus of the interview should be on the communication of scientific content to the general public (and not, e.g. to specific sub-publics or on internal communication). A definition of the quality of science communication was not provided, but rather this question about the respective understanding of science communication and especially 'good' science communication was used as an introduction to the conversation. Due to the crisis situation around COVID-19, all but one of the focus groups was conducted online. The focus groups were held in German. The quotes used in the results sections have been translated to English.

A follow-up discussion was conducted in a collaborative workshop in June 2021 with a panel consisting partly of participants from the previous groups, partly of further experts from pertinent organizations (29 participants in total). The guideline for this discussion was based on the interim results of the six focus group discussions held previously. Due to the large number of participants, this discussion was organized in three parts—a first presentation and discussion of interim results in the plenary, then five separate in-depth discussions (breakout sessions) with five to seven participants each, and a final presentation of the results of the smaller groups and general discussion.

The six focus group discussions were recorded and the recordings subsequently transcribed and analyzed using a qualitative data analysis software. To analyze the textual data, we deployed a structuring qualitative content analysis drawing on Gläser and Laudel (2010) and Kuckartz (2014): starting from broad categories, i.e. codes along the research questions, the textual data were then processed through open coding, an inductive process with the aim of sorting the material (Kuckartz 2014, par. 23 f.). Over the course of the analysis, these codes were condensed to a finer category system that structured the assertions in the transcripts with regards to distinct practices of quality assurance and the challenges of quality assurance of science communication. The system of codes and subcodes was described in a codebook with

code descriptions and quotations. In iterative cycles, these codes and coded segments were discussed within the team and refined until they reached the state presented in the result section.

4. Results

In the following, we present the main findings of the study along the three research questions, where section 4.1 addresses RQ1, section 4.2 addresses RQ2, and section 4.3 addresses RQ3.

4.1 Quality assurance strategies for science communication

We find two different strategies to promote and assure the quality of science communication within scientific organizations: The first strategy refers to science communication activities that originate from an institution's central communication unit (hereafter 'central strategy'). The second strategy refers to science communication activities that are initiated decentrally by researchers (hereafter 'decentral strategy'). Each of these strategies implies different rationales for organizational quality assurance, with regards to the subject matter they relate to (i.e. science communication practices), their objectives (i.e. aims of quality assurance), and legitimation logics (i.e. justification for quality assurance). Interestingly, the communication units fulfill different roles in each of the strategies: in the central strategy, they manage the interface between the institution and the public by filtering requests and setting an agenda and act as an audit unit for organizational interests. In the decentral strategy, they serve as a service infrastructure for researchers and take on an advisory and supportive role. In the following, we delineate the strategies and the associated quality assurance practices. We categorize these practices according to Wyss' classification (Saner and Wyss 2019) into production-accompanying, corrective, and preventive measures.

4.1.1 Central strategy

The central strategy refers to science communication activities by central communication units of scientific organizations. In the focus groups, these communication activities are mostly limited to press relations and the institutions' presence in social media. Quality assurance of this strategy prioritizes organizational interests such as brand building, crisis prevention, or agenda setting. In general, quality assurance practices of the central strategy comprise editorial processes as they are known from journalism, filtering and agenda building mechanisms, and monitoring activities. This illustrates that quality assurance of science communication here is manifested in practices of control. The quality assurance practices of the central strategy are listed in Table 1.

In the discussions, it was primarily the heads of the communication units that refer to *editorial quality control* practices. For instance, they referred to fact-checking processes involving researchers, different quality checks in sequential production steps (e.g. the four eyes principle for content creation), or editorial conferences to review press releases and other institutional communication such as blog posts. It is noticeable that the discussants use quality criteria relating to knowledge

Table 1. Quality assurance practices in the central strategy.

Practices	Description	Type	Example quote	#Codes
Editorial quality control	Using quality control mechanisms known from journalism	Production-accompanying	'And ultimately, we then use the instrument that is also commonplace in editorial offices, namely the paper critique. In other words, the reader's verdict on whether it's a success or not. [...] Our own standard is accuracy, comprehensibility, and of course brevity and relevance. The criteria that are also well-known from the debate about journalistic quality [...]'. (Communication Manager, Uni1, par. 77)	25
Filtering & agenda setting	Selecting topics relevant to the organization	Preventive	'We are sorting out with whom we are communicating. This is a very important exercise. Saying that I don't communicate here, I don't do that. And I don't have to justify that, I reject that. And of course, there are a few standards, so you have to be familiar with them'. (Communication Manager, Uni2, par. 95)	12
Monitoring activities	Assessing the effects of communication measures	Corrective	'But if we are now talking about social media, when a posting is published, we don't say, bye, that's it now, but we also have a monitoring and look and track, how is it reacted to'. (Communication Manager, Uni2, par. 86)	8
Implementation of guidelines and standards	Developing and setting standards for communication activities	Preventive/corrective	'So, these guidelines [from the German Association for University Communication] are part of the trainee qualification we offer in our university communication department [...]. I discuss them with the trainees'. (Communication Manager, Uni1, par. 87)	5

(e.g. transparency and accuracy) in addition to criteria of reception (e.g. comprehensibility). Thus, being based on science is generally understood as the basis for science communication and furthermore journalistic conceptions of quality inform central quality assurance practices.

In addition, the discussants mention *filtering and agenda-setting* practices. Filtering relates to the selection and coordination of press inquiries and agenda setting to the spotlighting of topics. These practices are intended to create an institutional profile and to control the public image, which corroborates that organizational interests play a major role in the central quality assurance strategy. This is illustrated in a quote from a director of a nonuniversity research institute, according to which the selection of topics on which to comment should be strategic and backed by in-house expertise:

In which areas do we actually want to be a permanent dialogue partner, so that we have scientific expertise on hand, because we expect people to ask us about these specific areas.[...] So that we manage this even more strategically and think about fields in which we always want to be able to comment on and others where we communicate in depth only if we ourselves have done research on it. (Leadership, AUF1, par. 73)

Generally, it is the leadership of an institution management that decides on topics to focus on, whereas the execution of the institutional communication strategy is the responsibility of the communication managers. In one case, the director of a nonuniversity research organization describes the head of communications as 'knowledge manager' who manages the interfaces with society on behalf of the institution (AUF1, par. 25). This illustrates that the communication department is seen as a central body of the organization, with the capacity to represent organizational interests and to assess the expertise of its researchers. However, the freedom to decide on

the strategic issues of science communication is limited in the departmental research institute:

And, of course, the first thing that happened was that the directorate came to an agreement with the project management and told me what our strategic goals were for external communications in this area. Then, of course, it was a matter of coordinating these activities with the Federal Chancellery, that is, finding out whether they were feasible.

Control is an important principle of the central strategy, which becomes evident in widespread practice to *monitor and evaluate* science communication activities. Here, discussants name internal monitoring processes to assess communication success as well as external evaluations. This is particularly important for a nonuniversity research institute in our sample, which is evaluated every 7 years as part of the Leibniz Association. Some participants report that forms of external evaluation have increased in recent years, mainly due to third-party funding and the burgeoning practice of impact assessment.

Some communication units have implemented *guidelines* for science communication based on the guidelines for university public relations published by the German Association for University Communication (*Wissenschaft im Dialog, & Bundesverband Hochschulkommunikation 2016*) or the guidelines for good scientific practice of the German Research Foundation (*Deutsche Forschungsgemeinschaft 2019*). However, many discussants express a need to adapt and extend these.

4.1.2 Decentral strategy

The decentral strategy refers to science communication activities of individual researchers or organizational subunits. In contrast to the central strategy, where control is an essential

Table 2. Quality assurance practices for decentral science communication.

Practices	Description	Type	Example quote	#Codes
Group reflection	Discussing communication activities within research teams	Preventive	'[...] I had just noted this internal reflection as a key point. We don't do it systematically, as speaker D said, but I can remember debates in our research colloquium or via mailing lists, for example, when some of our working papers were critically discussed in a different context or in a social media context'. (Researcher, AUF1, par. 27)	19
Standard setting and compliance	Applying standards for communication activities	Preventive/ corrective	'So, in the institute it is actually very strongly regulated when the communication department is notified about certain processes, so to speak, because we are included in certain, we call them control slips, checklists for third-party funding, for accompanying communicative activities and so on. So, this area I consider to be very much regulated'. (Communication Manager, AUF2, par. 40)	18
Training and continuing education	Building capacities for researchers to communicate	Preventive	'And I think it is important for the university to have opportunities to support the people, the researcher, to do [science communication] better. So, for example, [...] to offer training, how should I position myself in front of a camera; to offer media training'. (Researcher, Uni4, par. 36)	14
Advisory services	Supporting researchers in their communication activities	Preventive	'So this is not done in half a day, to quickly write something up, but this is actually a different form of processing knowledge and I think we also need more professional support from people, for example, like speaker D [head of communication department], who help us to do this translation correctly'. (Researcher, Uni4, par. 10)	7
Peer control	Observing of communication activities in one's own research field	Corrective	'So, I think the community, including the scientific community and the community that is perhaps important to us in this context and gives us recognition, will develop mechanisms to decide what is good and what is bad. But there is no standard yet, I think that still needs to be developed'. (Communication Manager, Uni4, par. 31)	6

motif, this strategy focuses rather on empowerment and organizational culture. Most quality assurance practices are preventive, aiming at creating favorable conditions for direct science communication, for instance, through training, advisory services, or guidelines (see Table 2). The relevance of the decentral strategy is explained by the discussants with the complexity of topics (i.e. the opinion that only researchers themselves can assess the scientific quality) as well as, more fundamentally, with the value of scientific freedom. Most discussants understand the latter to be a privilege of every researcher to communicate, without formal control by central communication units or management.

It is noticeable that the decentral strategy largely relies on inner-scientific forms of quality assurance. Here, many of the discussants refer to *group reflections* as an intraorganizational quality assurance practice. Typically, these take place in the context of colloquia or research group meetings. They are often event-driven, for example, when a paper has been criticized in social media or prior to a researcher's TV appearance. In rare cases, review processes comparable to scientific articles take place for blog posts or newspaper articles:

Process quality means that you also stop a process and say, this doesn't happen and doesn't appear in this form here. Well, that's what we have with the papers, we have the peer review process, of course we also do that in a certain way. (Researcher, Uni2, par. 47)

In one of the nonuniversity institutions studied, there is a research group that deals with issues in the broader context of science and society and whose findings, according to the head of the institute, also lead to adjustments in the communication strategy of the entire organization:

We recently had a very interesting presentation [...] in a research colloquium, which then led to a discussion of our own concept of science communication. And of course we are also privileged to be able to quickly transfer the insights gained there into our own practice. I find that extremely helpful. (Leadership, AUF1, par. 95)

Peer control, on the other hand, describes extra-organizational observation patterns within research communities that influence the science communication behavior of researchers. Researchers in particular refer to this type of quality assurance in our study.

Science communication training is offered at most of the universities and research institutions we surveyed. Participants in the focus groups report, for example, seminars for students, media and interview training for researchers, and specific training in preparation for third-party funding applications with a focus on transfer. Generally, it is noticeable, however, that most of the described training and education offers aim at translating research for the general public rather than for specific stakeholders.

Communication units play an important role in the decentral strategy, too—mostly as a service infrastructure for science communication. In that role, they offer advisory services to researchers on the use of communication formats or support the dissemination of results through institutional channels. Some discussants report that communication units protect researchers, for example, in the case of ‘shitstorms’ on social media or in cases of misrepresentations of results.

Standard setting and compliance mechanisms play a prominent role in the decentral strategy. It can be observed that guidelines for science communication are employed as a soft instrument. Hence, institutions rarely have hard compliance rules that lead to sanctions. Some point out that adequate rules, such as the DFG’s (“Deutsche Forschungsgemeinschaft—German Research Foundation”) rules of good scientific practice, would not yet exist for external science communication by researchers. In recent years, nearly all institutions have implemented ombudspersons who advise researchers and university leadership on ethical issues. Typically, science communication has not been in the focus of ombudspersons who rather deal with internal rules of good scientific practices and scientific misconduct. Lately, however, the quality of science communication has received more attention, and at least, in one institution, science communication to a broader public is explicitly mentioned in the advice for good scientific practice.

4.1.3 Interplay of central and decentral

While the dichotomous description of central and decentral strategy is useful to structure quality assurance practices applied in scientific organizations, it also represents a simplification. In reality, the two strategies occasionally overlap. Moreover, the quality assurance strategies and related practices concur and interact depending on the context of the communication process. In some cases, this can have unintended effects, for example when a single researcher or research group coins the organizational image, as one university leader explains:

[...] if we have a group within the university that is very strongly involved with a topic and permanently communicates the topic to the outside world, at some point it represents the entire university. It takes on a kind of sovereignty of meaning. And in the end, we also have to say, does this media-perceived sovereignty of meaning correspond to the substantial consistency of the university itself? (University Leadership, Uni3, par. 23)

In these cases, the organizational interests might conflict with the interests of individual researchers. However, members of the university leadership emphasize that they are not able to prevent individual researchers from communicating because such an intervention would be regarded as a violation of academic freedom or even as a kind of censorship. But in most cases, the interplay between central and decentral quality assurance is described as mutually beneficial. Many state that communication units and individual researchers must enter a dialogue, in order to safeguard the organizational science communication.

4.2 Challenges for quality assurance

Four distinct challenges for the organizational quality assurance of science communication have been identified: public discourse dynamics, crisis management, collaboration dilemmas, and shifting role expectations. For the central strategy, challenges are above all seen in the limited controllability of organizational communication regarding issues such as online attention dynamics and crisis situations. For the decentral strategy, challenges are seen first and foremost in shifting role expectations and collaboration dilemmas. Table 3 summarizes the identified challenges for the quality of science communication.

4.2.1 Challenges for the quality assurance of central communication

The code *public discourse dynamics* subsumes references to the limited controllability of online communication. This is explained by the discussants with the sheer speed of online communication and the multitude of channels and feedback opportunities. In the focus group discussions, communication managers occasionally describe this as a source of stress. In some cases, the attempt to control online discourses (e.g. through search engine optimization) is described as ethically problematic. At the same time, social media are perceived as a possibility to bypass traditional gatekeepers and to actively influence public opinion.

In the code *crisis management*, we include references to situations that are described as crises as they pose a reputational risk to the organization. These crises are often described as a challenge in that there is no predefined program for how to behave in these situations, but rather they are characterized by their uniqueness and limited possibilities for standardizing options for action. Organizational differences can also be identified here; a researcher from the artistic university, for example, sees it as the task of the researchers at art schools to communicate provocatively, even if this leads to conflicts. Crisis management is often associated with public discourse dynamics on social media, which are perceived as a catalyst in crisis situations. Those crisis situations that the discussants referred to in the focus groups became intensified when the science communication touched on societally controversial topics.

Online public discourse dynamics and *crisis management* can be seen as challenges for the central strategy, as they imply limits to the controllability of science communication. They are predominantly addressed by the leaders of the institutions and by communication managers, which underscores the observation. Given that editorial procedures of quality assurance can only be effective to a limited extent in these cases, they pose a potential threat to the public perception of an institution.

4.2.2 Challenges for the quality assurance of decentral communication

The code *shifting role expectations* refers to situations in which researchers communicate in an unfamiliar environment with actors from different societal groups that each has specific expectations regarding format and content of the conversation. In the discussions, researchers perceive these situations as sometimes overwhelming. Many discussants

Table 3. Quality assurance challenges.

Challenge	Description	Example quote	#Codes
Public discourse dynamics	Dealing with the speed, multiplicity and attention dynamics in online communications	'We are confronted with plurality and speed. And we can't control either of them. [...] We experience it from time to time, that within hours a piece of information, which seems to be trivial, travels through the internet and something, which you place consciously, may travel only very hesitantly. So, I think that's quite a challenge [...]'. (Leadership, Uni2, par. 37)	14
Crisis management	Handling conflictual situations in public communication	'The [event] was packed, there were various, really interesting, loud discussions, in the course of which people also stood up and said, more or less, the university really has to decolonize itself. That's really harsh when you stand there in the front and think, that's what I've been trying to do here and that's what I'm working on. Nevertheless, I can perhaps say that this conflict, which is manifesting itself in this perception of what we are doing, is highly political and is really going on'. (Leadership, Uni3, par. 21)	10
Shifting role expectations	Dealing with new roles of research in public, demarcating from other (e.g. political) actors	'We are having an ongoing discussion regarding the point at which one actually crosses the line into wanting to actively influence political processes. So where does the intention (to explain the facts) turn into an active role? At any rate, as an institute we try to avoid being identified with certain policies. [...] That can't always be avoided, because sometimes the position that from our perspective is the only one that conforms to the constitution is also one that is associated with certain political camps'. (Leadership, AUF1, par. 29)	10
Collaboration dilemmas	Coordinating communication in collaborative arrangements	'So, it becomes altogether extremely difficult, when one is just not alone as an institute, but has a cooperation partner from the field or other scientific institutes, which collaborate'. (Leadership, AUF1, par. 53)	4

emphasized that science communication has only emerged as an explicit task for researchers in recent years. Accordingly, some researchers feel unprepared for this task or think that it is not always optimally handled by colleagues, for example, when younger colleagues are active on social media, even though they have hardly any research of their own to speak of. A typical conflict arises with the institute's leadership when researchers express political opinions that run counter to the organizational image, as becomes obvious in a statement by the head of a nonuniversity research institute:

We are having a constant discussion about where one actually crosses the line into wanting to actively influence political processes. So where does the intention, 'I just want them to better understand what the situation is, what the facts are', turn into an actor role? At any rate, as an institute we try to avoid being identified with certain policies. That is an important aspect for us and we talk about it relatively often. (Leadership, AUF1, par. 29)

Collaboration dilemmas refer to conflicting interests in collaborative arrangements. Two different cases are mentioned in the discussions: Either a partner promotes results that have emerged in the team as his or her own or a partner misrepresents a result in public communication. The second refers in particular to transdisciplinary collaborations with partners, not from academia (e.g. Non-governmental organizations or private companies). Some communication managers in the focus groups state that it is often unclear which institution holds the primacy of communication.

4.3 Workshop on new forms of quality assurance

Building on the results of the six focus groups, a collaborative workshop with representatives from all organizations involved and further experts was used to reflect upon new forms of quality assurance. In the following, we refer specifically to the results of the five breakout sessions in which the appropriateness and feasibility of new quality assurance practices were discussed.

4.3.1 Extension of committee responsibilities

The starting point of the first breakout discussion is the observation that German universities and research institutions already have a large number of bodies to monitor and control organizational behavior, e.g. senate and senate commissions, university councils, faculty councils, appointment committees, and ombudspersons. Accordingly, it was discussed to what extent their competencies could be expanded to contribute to the organizational quality assurance of science communication.

In the six previous focus groups, it had been observed that the boundaries between strategic and science communication can blur in central communication and that communication control is only possible to a limited extent in decentral communication. Therefore, the respective commissions could act as independent parties to ensure the quality assurance of organizational science communication. There was a critical discussion about the extent to which such bodies could take on a controlling function, especially with regard to both the freedom of science and freedom of speech granted to researchers. Discussants furthermore saw difficulties for the central strategy, for example, for internal committees to question strategic directives from management. However,

there was consensus among the discussants that committees, and in particular ombudspersons, can act as advisory bodies that have the capacity to reconcile individual researchers' and organizational interests. There was agreement that the central strategy could benefit from a formative quality control by committees. They should not only react to issues of quality shortcomings but advise management and communication units strategically. In the decentral strategy, committees should not have a controlling but rather a guiding function, for example, by consulting on guidelines and highlighting best practices. In addition, ombudspersons could be called in for cases of misconduct in the sense of the established guidelines.

4.3.2 More competencies for communication units

Communication units at universities and research organizations are primarily tasked with managing the interface between the organization and its public. The range of activities has increased in recent years, due to, on the one hand, the advent of social media and online communication and, on the other hand, the increasing dependence on third-party funding and the increased relevance of societal impact.

Against this backdrop, the focus group participants discussed whether professional communicators would need to be given extended competencies in order to anticipate the complex science communication environment. In the discussion, communication units were described as 'places of quality discourse' and professional communicators as 'knowledge managers'. On the one hand, they should work internally and create awareness for science communication and its quality assurance at the different levels of the organization. In this context, the communication unit is seen as having an initiating role in the formation of an organizational culture, for example, through guidelines for science communication. However, the participants remarked that these should be developed in dialogue with researchers and the institution's leadership. On the other hand, communication units should work externally by controlling the flow of communication between the organization and its public, for example, by selecting topics and filtering requests. This corresponds to the quality assurance practices already identified. Peer review procedures for the central strategy were discussed, too, although they were primarily seen to be suitable for linear formats in the central strategy. It was noted that quality criteria in dynamic communication situations can only be standardized and controlled to a limited extent and that a quality-conscious communication culture must therefore be created at all levels of the organization. It was critically noted that although the range of tasks is growing, communication units themselves have only limited resources to fulfill these tasks.

4.3.3 Strengthening scientific quality assurance measures

A further observation was that central communication units have only limited capabilities to assess the institution's research output. In addition, researchers have a greater obligation to communicate than in the past, which implies that internal scientific quality assurance must be intensified. The extent to which scientific forms of peer review could be conducive to the quality of science communication was discussed in that context.

There was agreement that intra-scientific observation patterns are essential for quality assurance since it is primarily peers who can judge the quality of the underlying results.

However, there was agreement that these are difficult to institutionalize as an instrument of the central strategy due to, among others, the dynamics of public communication. Moreover, in view of the plurality of goals, functions, and motives of science communication, it would not be clear which criteria of peer review should apply or which competencies would be required. In the decentral strategy, this quality assurance procedure was given increased importance by the discussants. It was stressed that research communities need to develop discipline-specific monitoring and review procedures, for example, through discussions and coordination at the research group level. There was general support for closer contact between academics and professional communicators at the institutions. It was discussed, for example, that researchers could be involved in a critique of the central strategy.

4.3.4 Training opportunities for researchers

The discussion also dealt with training as an opportunity for quality promotion in science communication. As a significant share of public science communication originates from individual researchers (e.g. via social media) and is protected by freedom of science and freedom of opinion against any kind of censorship, the organization can only indirectly promote quality assurance by offering appropriate training.

There was general agreement that the integration of science communication into scientific education and the implementation of continuing education programs could contribute to quality assurance. However, training should go beyond common media training and also focus on communication with specific groups (e.g. politicians and business representatives). There was consensus that there is no one-size-fits-all model for science communication training. Instead, offers should take different disciplinary cultures within the organization into account. Possible training contents included formats of communication, potentials and risks, impact assessment and evaluation, as well as strategies on how to cope with criticism and hostility. It was pointed out that academic organizations as such should generally not display a political stance but that researchers could be empowered to engage in knowledge-based policy assessment and advice. In this respect, roles of individuals and institutions should be reflected and made clear. Training opportunities were seen as an essential contribution to strengthen the decentral strategy and thus the communication of scholars.

4.3.5 Quality assurance through external actors

The starting point for this discussion was the observation that traditional actors and their means of quality assurance (e.g. in scientific print journalism) are losing influence, while at the same time institutional science communication is gaining momentum online. In this regard, it was discussed if and how extra-organizational measures could contribute to the quality assurance of science communication.

There was agreement that in principle new forms of external monitoring can be beneficial to the quality assurance of science communication. The reasons given were a greater focus of policy on the societal impact of research and new forms of science communication in the digital sphere. These allow the research process to be opened up (e.g. through data sharing and preprints) and to facilitate new forms of engagement and thus external observation. This development implies that science communication does not only take place once a

research project is finished but that it is a continuous process alongside the research process. It was emphasized that while an external form of quality assurance (as it is known from journalism in its gatekeeping role) can be beneficial, there is often a lack of legitimacy or expertise to provide criticism. Regarding the decentral strategy, there was agreement that researchers should be properly prepared for Open Science and that there should not be a general obligation to participate in social media communication. According to the discussants, there is great potential in involving external actors in internal committees, creating protected forums for exchange between different groups of actors, and creating and involving independent intermediaries who are responsible for interface management between science and other stakeholders.

5. Discussion & conclusion

The increasing (formal or informal) relevance of science communication for scientific reputation poses a number of challenges to the governance and organizational structure of research institutions. External science communication can take place decentrally, at the level of individual researchers, and centrally, by the central communication management (e.g. through press offices or communication units set up specifically for this purpose). The need for quality assurance of external science communication at both levels is regarded as indisputable. Following the strategy-as-practice approach, we consequently identify a central and a decentral strategy for the quality assurance of science communication. In the central strategy, it is primarily the management and the communication units that are responsible for quality assurance. In the decentral strategy, it is researchers themselves who are responsible for quality assurance; however, the communication units are assigned a supporting role (e.g. by fostering a quality culture within the organization). Scientific merit is considered as the basis for quality assurance in both strategies; however, the central strategy is more concerned with the organizational interests and the decentral strategy with the interests of individual researchers, their progress, and reputation.

We furthermore find variations in the results that suggest that the two strategies should be conceived in a context-specific way, i.e. depending on the type of organization. For example, in the departmental research institution in our study, direct science communication of researchers is limited due to the affiliation to a political body (i.e. academic freedom and the right of freedom of expression are constrained). In cases like this, it seems sensible to put more emphasis on the central strategy. At universities, the coupling of decentral and central strategy is less pronounced, possibly due to the larger size of universities compared to nonuniversity research institutions. For universities, a stronger emphasis on decentral strategy seems sensible, considering previous research indicating a decoupling between university press departments and research staff, and universities' increased investment in PR and marketing.

Many quality assurance practices of the central strategy refer to editorial processes as they are known from journalistic mass media. This confirms our assumption that the proposals of Wyss might be especially useful for the central strategy, for example, in order to implement concrete elements of checklists on editorial quality management in journalism (e.g. Wyss 2016; Saner and Wyss 2019) also in communication units.

These include written quality criteria based on existing codes, binding editorial quality assurance and approval processes (e.g. four eye principle) for external communication, training and further education concepts for staff, as well as user monitoring and regular feedback from the audience. Complaint management and corrective measures (e.g. by appointing contact persons and ombudspersons) are also recommended in corresponding checklists on editorial quality management. Since such concepts of media quality management derive from more general self-evaluation models, e.g. from the EFQM following the TQM philosophy (Saner and Wyss 2019), they should be applicable in many respects to improve organizational quality control of science communication in research institutions.

While parallels and a possible transfer of such quality assurance mechanisms are seen primarily for the central organizational level, results of our study indicate that it is hardly possible to control the public communication of individual researchers centrally by the management or the communications unit. There is a shift toward more decentral science communication in the digital age. In contrast, earlier surveys still indicated that consulting their superior is 'always required' by many scientists before talking to a journalist (Peters 2013). However, decentral communication is also in line with academic freedom and the right of freedom of expression guaranteed in Germany and many countries. As this decentral communication can put organizational objectives at risk, universities and research organizations use possibilities to respond to or deal with the communication of individual researchers. For instance, central communication units have the option of working with the individual (e.g. social media) communication of individual researchers and amplifying it on official channels (via press release, on Twitter, etc.). They can also ignore it or even publicly correct it.¹ One possibility to strengthen quality control could therefore be to strengthen the role of press units of universities and research organizations, which—wherever possible—take on editorial control tasks. A stronger role of press officers has been known for a long time from the USA. In the abovementioned study, almost every second respondent stated there that consultation with the unit responsible for press relations was mandatory before any communication with the media, which may suggest a 'higher professionalization of media interactions in the Anglo-Saxon countries' in comparison to Germany (Peters 2013), referring thus to a stronger filtering and gatekeeping function. From the perspective of research ethics, a strong role as responsible 'knowledge managers' would require that communication units and press officers feel primarily committed to scientific and communication quality standards and skills and, in case of doubt, put on hold short-term strategies to attain attention and publicity for their organization (which, however, are sometimes even demanded by the leadership of the research institution itself; cf. Schwetje et al. 2020). On the other hand, it is precisely a restrained communication that can have positive effects on the reputation and trust in the organization in the long run. Publicly visible quality assurance measures and correction cultures have a strong influence on the perception of the organization in wide reach journalistic media. These journalistic media, in turn, continue to be perceived as an important external observation and quality assurance system for the science communication of an organization as well as of individual researchers as pointed out

by a paper of the German Council of Science and Humanities (Wissenschaftsrat 2021).

On a decentral level, further education and training are seen as an important quality assurance mechanism for individual scientists. At the same time, the need for diversified offers that take an understanding of context-dependent quality into account (and, e.g. also the varying needs at different stages of the academic career) is considered important. An inward expansion of competencies seems advisable in order to initiate a dialogue about quality and to develop a culture of science communication based on it. This would be beneficial for both central and decentral strategies of quality assurance.

There was consensus among the discussants that committees, and ombudspersons in particular, can act as advisory bodies that have the capacity to reconcile individual researchers' interests and organizational interests in communication. There was agreement that the central strategy could benefit from a formative quality control by committees, whereby an extension of the competencies of already existing ombudsman committees was favored over completely new commissions. To this end, the rules of good scientific practice would also have to be extended to science communication practice with the general public (cf. [acatech—National Academy of Science and Engineering, Union of the German Academies of Sciences and Humanities, & German National Academy of Sciences Leopoldina 2014](#)). One of the institutions surveyed has already explicitly anchored this in its guidelines for good scientific practice, i.e. the principle of the individual researcher's responsibility for scientific honesty and self-criticism also applies to communication with the public. That entails, for example, that exaggeration of results beyond what is covered by data or evidence is considered a violation of the rules of good scientific practice. This implies that the role in which researchers take part in public debates (as scientific expert in the field or just as a citizen) has to become clear (cf. [acatech—National Academy of Science and Engineering, Union of the German Academies of Sciences and Humanities, & German National Academy of Sciences Leopoldina 2014](#)).

Additionally, it was stressed in our focus groups that researchers themselves need to develop discipline-specific monitoring and peer review procedures to establish quality assurance procedures on a decentral level. Such external quality assurance mechanisms would benefit both the central and the decentral strategy of universities and research organizations. Although the establishment of such scientific review processes for assessing the quality of science communication—in addition to the communication itself—represents an additional time burden for researchers, it appears unavoidable given recent tendencies in science policy: if science funders want to increasingly fund science communication measures within the framework of research projects, robust discipline-specific review processes for funding decisions must be introduced here as well. Otherwise, this would mean that science would completely abandon its own standards in the area of public communication and its funding.

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Note

1. One example is the already mentioned case of the so-called 'study' of a nonspecialist professor of physics on the 'origin of the coronavirus pandemic'. The fact that the press office had given undue weight and additional attention to the contribution by issuing even a press release (www.uni-hamburg.de/newsroom/presse/2021/pm8/pm-8-21.pdf) was criticized by scientific experts from its own university (Coronavirus Structural Task Force 2021; <https://insidcorona.net/opinion-wiesendanger-study-lab-wuhan/>).

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