Network management: Exploring its role, organisation and means of intervening in professional practices

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Abstract

There are growing calls for more empirical research on professional, as opposed to ordinary everyday, practices. At the same time, there are also an increasing number of calls for more research that addresses the interconnections between practices. It is through drawing on such calls and literatures that this paper aims to investigate the social organisation of network management, which represents a (new) profession that exists so as to intervene in the organisation of other professional practices. In exploring this, we draw on five in-depth semi-structured interviews with professionals involved in managing networks in varying ways and to varying extents. We found that key actors exist in defining a network's need, which alongside numerous expectations and knowledges, shape the strategic direction of network management. It was also clear that internet infrastructures play a central part of the ongoing reproduction of network management, and thus forms a central component to how it may evolve in the future. Lastly, we suggest that future trajectories of network management may include a growing set of more topic-specialist (rather than generalist) knowledges, as part of developing networks that fill unresolved niches. We conclude by drawing out the energy demand implications of how network management is organised, as well as by reflecting upon lessons for the running of the newly launched Energy in Water European Strategic Cluster Partnership (ESCP). Indeed this ESCP is a common point of reference throughout the paper itself.

Keywords: Networks; platforms; clusters; collaboration; professions; funding programmes; Europe; energy demand; Energy in Water.

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1. Introduction

There is a growing interest and recognition of the importance of energy demand management (how energy is used), as opposed to how it is supplied which has been the traditional focus (Wilson et al. 2012). As part of this, an increasing number of arguments have arisen concerning the pressing need for energy conservation as it involves a reorganisation of the doings that underpin how energy is practically consumed (Powell et al. 2015). However, energy conservation initiatives need to better account for the role and influence of professional activities. For example, the professional energy-consuming sectors of industry and services are responsible for 31% and 9% of global energy demand respectively (IEA 2014). Moreover, in addition to professionals being significant energy end-users, their actions also have the ability to shape the (energy-consuming) practices of others. Indeed, many professionals are in a privileged position by which they are able to intervene in the energy-consuming practices of society, through, for example, the policies and investment strategies that policymakers adopt, or through the infrastructural designs that engineers, planners and architects create/facilitate (c.f. Spurling et al. 2013).

Alongside these energy-related calls, there has been a resurgence in the development and application of theories of practice (Giddens 1984; Bourdieu 1977). Although there is not one all-governing theory of practice (with varying debates ongoing), all theories of practice are bound together by a shared appreciation that society and social order is constituted by the continual reproduction of social practices (e.g. driving, cooking) over space and time. In this way, the commonly debated actor-structure dualism is overcome with the proposition of social practice as a mediating concept (Røpke 2009). This resurgence of theories of practice has covered a range of empirical contexts, but there has generally been more focus on the ordinary and 'everyday' (c.f. Kalekin-Fishman 2013), as opposed to the professional and it underpinning practices. In particular,

recent years have seen a growing focus on domestic practices (e.g. Gram-Hanssen 2010a; Gram-Hanssen 2010b; Strengers 2010; Hargreaves et al. 2013; Foulds et al. 2015), which has included considering practices such as cooking, cleaning, homemaking, and managing thermal comfort. Consequently, there have been growing calls for more research on professional practices (e.g. policymaking, planning), alongside which there have also been calls for more consideration of the interconnections between practices, e.g. 'systems' (Watson 2012), 'bundles and complexes' (Pantzar & Shove 2010) or 'compounds' (Warde 2013).

This has led to more research on how everyday practice relate to professional practice and vice versa, including how professionals intervene (intentionally or otherwise) in everyday practices (e.g. Macrorie et al. 2015). However, as far as we are aware, limited research has been undertaken on the inter-relationships between different professional practices, i.e. how professional practices influence and intervene in the organisation of other professional practices. However, it should be noted that there has been much work on the inner workings of the professional interactions in the organisational studies literature (e.g. Brown & Duguid 1991), and although relevant, this is beyond this scope and framing of this paper.

This leads us to considering a profession that has emerged with the intention (whether or not it is explicitly acknowledged) of intervening in how other professional practices are organised and performed. Specifically, we investigate a new expert profession that involves the creation, organisation and/or ongoing co-ordination of networks (comprising a range of entities including small-scale working groups through to much larger clusters and EU platforms) of individuals and organisations. This network management is of course not exclusive to the energy domain though, as the profession's core activities broadly centre on bringing people together around a common purpose (e.g. to identify, share, and discuss the potential for replication and more widely exploiting 'best practice' of some kind). But whatever the exact focus, this profession essentially exists to engage and intervene in the sector and, in doing so, the practices performed by other professionals too.

The aim of this paper is to investigate the social organisation of network management as a professional practice, so as to draw out the implications of that organisation for energy demand and its implications for other sectors. Since a profession exists independent of energy, we intentionally explore the network profession more generally (across a range of different sectors, contexts and scales) before relating these findings to potential energy consequences and indeed the consequences for other sectors.

Furthermore, this paper is intended to complement and help set an agenda/direction for the newly created 'Energy in Water' European Strategic Cluster Partnership (ESCP), which aims to nurture and harness the growth and innovation potential of European Small to Medium-sized Enterprises (SMEs)[1] operating across the 'water-energy nexus'. In doing so, the ESCP will (in)directly intervene in the professional practices of a range of stakeholders within and across the discrete sectors of energy and water. The Energy in Water ESCP is one of nine newly formed ESCPs that are intended to promote cooperation across related industries as well as sectorial boundaries at the European level with the aim of modernising and exploiting emergent industries. It is thus particularly poignant to discussions regarding the role of networks and the organisation of network management, and how

[1] Small and Medium-sized Enterprises (SMEs) are defined in the EU recommendation 2003/361 as enterprises with < 250 staff and a ≤ €50m turnover or ≤ €43m total balance sheet.

these are a wider intervention in professional practices. This pilot study is thus also intended to pose questions and open up themes of relevance for (and beyond) the duration of ESCP project.

The paper is structured as follows: first, we provide some background context on networks and the institutional support that exists for their emergence, as well as also provide background on the Energy in Water ESCP which the profession-related findings will be considered in the context of. Following this, we then present our methodology, including what data was collected and how it was used. Our preliminary findings are then presented and discussed, before we finish with conclusions that reflect on the energy demand consequences of how network management is organised.

2. Background

2.1 Prominence of networks

We now provide some context on networks as a concept, which has and is continuing to receive significant institutional support at both the national (UK) and European level, as well as internationally through foundations for instance. This background also serves to set the scene, in terms of how the surrounding system is contributing to the initial recruitment of network managers, primarily via its funding landscape and associated investment strategies.

Any list of potential network funding opportunities is too long for this paper, hence we instead illustrate the range and depth of opportunities through focusing on three categories of funding:

- *Micro-scale* funding opportunities – small pots of funding to host workshops or time-limited exchanges between researchers and other stakeholders. Potential funders include RCUK and networks that have been created with the responsibility of distributing small research grants to undertake discrete projects or host workshops (e.g. examples include the Balance, ReCover and SECURE networks funded by the EPSRC).
- *Meso-scale* funding opportunities – including programmes such as EU COSME (which funds Energy in Water) and larger grants institutional links programmes funded by the British Council.
- *Macro-scale* funding opportunities – including large Coordination and Support Activities funded under EU Horizon 2020 (and previously Regions of Knowledge, under EU FP7), as well as Centres of Excellence and Grand Challenges funded by RCUK. Recently funded examples include the Centre for Understanding Sustainable Prosperity (CUSP), Tailored Water to Ensure sustainability beyond 2065 (TWENTY 65) and Centre for the Evaluation of Complexity Across the Nexus (CECAN).

All three categories of funding opportunities can be further sub-divided by their retrospective type or intended audience, for example the British Academy offers various opportunities including Newton Mobility Grants, which can be used to strengthen international relationships and build collaborative partnerships overseas as well as small research grants which can be used to develop networks and run workshops as part of primary research in humanities and social sciences.

It is therefore evident that there is considerable institutional support available for establishing new networks, or equivalently named groupings. Indeed networks, clusters, platforms, and professional associations are all variants of a similar approach and philosophy, i.e. to bring people together around a common purpose and shared vision. How exactly the form and function of this vision emerges in the creation of a network is explored as part of this paper.

2.2 The Energy in Water European Strategic Cluster Partnership (ESCP)

ESCPs are funded by a dedicated SME support instrument, and were originally launched in March 2013 following a call for expressions of interests from the European Cluster Collaborations Platform. Whilst 13 ESCP were initially created, today nine have received direct funding from the European Commission and a further 14 (some of these originally created in 2013) have not been funded. The Energy in Water ESCP is one of those nine currently funded ESCPs, and it comprises seven research-driven clusters[2] in five EU countries. The ESCP is expected to develop a common strategy for driving the international competitiveness of the European enterprises within it, as part of developing solutions to global challenges and identifying/exploiting emerging market opportunities. It will also enable the participating clusters and regions to bring together knowledges and innovation potential, through collaborating and mutual learning across sectors and countries.

The Energy in Water ESCP's work will explicitly consider, and seek to exploit, the intersections between these discrete but highly complementary sectors. Water is required in the energy sector for developing, refining and using oil, gas and others resources, while energy is needed in the water sector for capturing, conveying, treating and using water which supports the functioning of society. The strong interrelationship between these two vital resources is increasingly referred to as the 'energy-water nexus', but countless other nexi exist.

3. Methodology

Data was predominantly based on a set of five in-depth semi-structured interviews (average duration: 50min; range: 39min-64min). The interviewees were selected to represent a range of experiences in terms of network expertise, sectors, scales, and points in their respective careers. Two different types of current network projects were deliberately selected to draw out the differences and complementarities associated with network management: (1) a FP7 network project focussing on just one sector, and (2) a RCUK network that engages multiple sectors, disciplines and stakeholders. Further, two individuals (with different roles) within each project were selected, in addition to a fifth senior individual with experience of working in a wide range of single/multiple sector networks, so as to support cross-comparisons of findings and insights. The interviewees therefore represented a range of different sorts of 'network managers', here defined as any individual directly involved in the management or delivery of networks, detailed below:

- Academic who is Principal Investigator on a current RCUK network project;
- Project Co-ordinator of a current RCUK network project;
- Project Manager of a European FP7 network project, with five years' network experience;
- Project Co-ordinator of a European FP7 network project, with only five months' experience;
- Senior academic with considerable experience in participating, running and founding networks, ranging from local to global in scale, and industry, academic and mixed in nature.

For anonymity reasons, quotations used from these interviews are assigned labels (A-E) for anonymity. For confidentiality purposes, especially given that many of the interviewees knew each another personally, these A-E labels are not attributed to the above interviewee descriptions.

[2] Note that clusters and networks are often used interchangeably for the purposes of this paper because they are both, essentially, different terms for organised groupings that are similarly bringing individuals/organisations together around a shared goal or aim.

The interviews sought data on how network managers organise their day-to-day jobs, and how that organisation relates to the re-organisation of other jobs. The profession of network management is a relatively new one (compared to traditional/established professions, e.g. architects, planners), and, as such, the interviews also sought insights on where the concept has come from and how it may evolve. Much of the interviews used the 'Single Question aimed at Inducing Narrative' (SQUIN) technique as part of drawing out the stories and experiences of the network managers (Wengraf 2001; Dali 2013). As such, a series of questions that were similar to 'Tell me a story about when you…' were posed, with no additional follow-ups asked (other than repeating their own words back to them); these were helpful in tracing past/ongoing influences and in enabling the interviewee to take more of a lead in directing the narrative (c.f. Hards 2012; Greene & Rau 2016).

The textual data from the interviews were thematically coded into emergent themes. From this, the headline analysis and findings were emailed to all interviewees, with interviewees explicitly invited to comment on the findings as well as to provide further insights. The comments and email conversations that ensued also provided additional data for this paper.

We also embrace the fact that we (both authors) have participated in and been actively involved in the co-ordination of network-related projects, in both supporting and coordinator roles. As such, we have endeavoured to be as reflexive as possible in this regard, as well as sought to utilise our experience at points during the interpretation of these early project data.

4. Findings and discussion

This section is structured around five central, and indeed very interconnected, themes relating to network management which emerged from the interviews: (1) defining a network's need; (2) expectations; (3) knowledges; (4) internet infrastructure; and (5) future trajectories.

4.1 Defining a network's need

This subsection centres around how exactly the need for a network is defined. This 'need' underpins the purpose of the network, and there were commonalities in this process across the networks that were discussed in the interviews. Essentially, this need dictated what exactly it was that the network managers were actually managing; it provided a hook upon which all of their network management activities would fit onto. All this will provide context to the following sub-sections (Sections 4.2-4.5) that further delve into the organisation and performance of network management.

There were key actors who were instrumental in defining the need of (and thereby contributing to the founding of) the networks. These actors included: national and international funding bodies; senior figures in industry, academia or government who have influence/sway; and wealthy individuals who were acting as patrons. Interestingly, network members were rarely involved in defining the original network need during the initiation of the network. It is clear that certain actors are in a fairly unique/privileged position whereby they have the ability to shape the activities of network management and its direction. Specifically, these actors tended to have potential (significant) influence on the network foci and its strategic priorities (e.g. who to work with, on what terms, and covering which topic). Whilst this inevitably meant that their personal/institutional agendas could influence how network management itself was organised to some degree, this influence seemed relatively constrained and limited where it was observed/acknowledged. It

became apparent that their influence was more network-specific (e.g. in terms of topics and ideas) and less on shaping the entity of network management, in large part because network management was embedded within the wider socio-technical landscape that it formed a part – which is an implicit component of much of this section and paper.

The originally identified need was not appropriate in the long-term, but it did nevertheless serve as a catalyst to bring people together, after which the network's need (and thus overarching purpose) was usually redefined anyway without (m)any problems. For example, one network began on the assumption that "insurers are doing a lot, so let's get them together to ask them: why are they doing a lot? …[before] then realising that they are not doing that much" (A). Similarly, sometimes the officially stated need of the network actually had little to do with the real reason for the network existing in the first place. For instance, a fairly generic aspiration of one network which was to do with assisting sustainability transitions, did not reflect the underlying motivation for the funder setting the network up itself, which was instead much more to do with connecting to a high profile figure so that he/she would attend his/her wedding. In this way, the topic of the network was positioned much more as a means to a particular ends (developing personal relationships).

For the identified need to gain traction, it usually had to be topical and timely. Otherwise, it was often difficult to secure long-term commitments from network members; many stories were told about how it was much easier to get individuals/organisations to attend one event (and thereby 'join' the network) but that the real challenge was in continuing that interaction. Consequently, the origins of past networks were grounded in international events (e.g. UN Conference of the Parties) and policy launches (e.g. UK Climate Change Act) which, whilst sometimes only tangentially related, served to emphasise the timeliness of participating in the network. Indeed, in relation to the Energy in Water ESCP, one could think that a reason for it proving popular with funders was because it directly tackles part of the food-energy-water nexus, which (as a concept) is being utilised increasingly by policymakers, funders and researchers alike.

4.2 Expectations of network management

In this sub-section, we consider the social expectations that guide how, and indeed why, networks are managed in the way that they are (e.g. operational running of a network and the foci/scope of its activities). Thus, what are the implicit/explicit measures of success and how do they influence how network management is performed? In particular, what is the role of external institutional sources (e.g. funders) in shaping these expectations?

Despite a core component of network management involving working virtually through emails, Skype calls, online forums and intranets/portals (Section 4.4), there was still an embedded expectation that people would need to come together at some point to meet face-to-face (Strengers 2015). This image of network management seemed to be a clear contributor to event organisation being a key part of managing a network; every interviewee talked at length about events they had organised, and almost all examples of network management activities that they were especially proud of related to running a network event of some kind. Indeed, there seemed to be wide agreement that the most effective network activities involved "having people in the same room" (C), which is an expectation that Høyer (2010, p.227) argues underpins 'the travelling circus of climate change'.

From the network manager's perspective, other dominant images of network management were associated with being: (1) organised and efficient, e.g. responding to emails quickly; (2) very knowledgeable about the network's subject area, to the extent that sometimes they would be assumed to be both generalists and/or specialists; and (3) excellent at communicating and networking, as part of already having / establishing new links for the benefit of the network members. It was evident that these images set a standard for which network managers (and networks) were judged as being 'better' or 'worse'.

Across these commonalities, it was also clear that network managers which were working in different communities of practice (often relating to sectors) had different (usually explicit) measures of success. In part, this was due to each individual/organisation being involved in the network for different reasons, and thereby assessing 'value' of involvement in different ways. Thus, they have different reference points for evaluating success: "the policy influence of a large petroleum company is incredibly different from a hi-tech company, so that needs to balanced when considering what value they are offering and receiving" (A). This can mean that it is easier to move knowledge across organisations with shared communities, backgrounds, interests and social contexts (Brown & Duguid 1998), and is a reason why we argue that cross-sector research and industry collaboration (e.g. water into energy, and vice versa) is underdeveloped.

Network funders were also imposing their own measures of success upon the organisation and performance of network management. Although there was one example of a funder (an individual) whose ambitions to solve the global challenges acted as informal measures (e.g. a network would be a success if climate change no longer existed), most networks had clear targets that were agreed with the institution that funded the network. As such, there were numerous measures of success that were much more explicit in nature, tending to be oriented around specific outputs and deliverables. It was here that quantitative metrics would usually dominate (e.g. number of event attendees, number of website hits), although qualitative metrics did sometimes play a part, albeit mainly in the context of rankings (e.g. events being 'good', 'average', 'poor', etc.). It is in these ways that our findings especially resonate with our recent experiences of establishing the Energy in Water ESCP. For example, in the creation of the project and project proposal, we were expected to directly address and subsequently report on various quantitative performance indicators[3]. Furthermore, Energy in Water is also part of a larger a European Strategic Cluster Partnership Going International (ESCP-4i) partnership programme, which includes an ESCP-4i Charter. This Charter also has various commitments, but interestingly these are described in qualitative terms with no reference made to quantitative measures of performance[4]. However, this could simply reflect the nature of the document – a charter represents a non-legally binding commitment – thereby, from our experiences, we would argue that the on-the-ground network management is influenced much more by the funders' pre-determined quantitative measures of success, with much less space and influence formally assigned to qualitative measures. It is therefore clear that funders play an explicit role in institutionally shaping the organisation of network management. It is hence unsurprising that

[3] The ESCP's quantitative performance indicators included: (1) number of cluster organisations and business networks benefiting; (2) number of partnership agreements signed; (3) number of events organised; (4) numbers of SMEs benefiting; (5) increase in percentage turnover from international activities of the SMEs involved in the clusters; (6) number and volume of resulting cooperation projects.

[4] The ESCP-4i Charter's qualitative performance indicators include, among others, to: (1) promote cooperation across related industries and sectoral boundaries in support of industrial modernisation / emerging industries and (2) develop a roadmap for implementation with a long-term cooperation agenda to foster the sustainability of the partnership.

our interviewees talked positively about their productive experiences of managing networks when they felt network management interests closely aligned with funder priorities (e.g. when funders were also network members).

Finally, the cultural expectations specifically linked to the role of local versus national governmental institutions was also highlighted as being a driver/constraint of network management. It was suggested that the networks concept has more traction in parts of Europe where there is strong localism because then "clusters [or networks] make a lot more sense because you are interested in working in that region and that region has a specific objective and aim" (B), as opposed to the UK for instance which has much more of a national steer and thereby local networks would play a different role strategically.

4.3 Knowledges of network management

This sub-section focuses on how networks are fundamentally positioned with regard to facilitating the exchange of and/or creation of new 'knowledges' (amongst their network members, whose practices they are seeking to intervene in). But in addition we also consider, internally, what competences are needed to perform network management.

Knowledge creation and exchange was frequently raised in the interviews in relation to a core purpose of the network concept more broadly. This was usually talked about in the context of "raising awareness" (A; B; C) of an important set of issues. It was also along these lines that knowledge was discussed as a means of capacity-building, whereby the role of the network manager was quite often to provide opportunity and not necessarily to guarantee that network members act (although this was ideally encouraged). It also seemed that the knowledge primarily being discussed was more intellectual in nature, i.e. associated with understanding what exactly the situation/problem and landscape is (c.f. Ryle 1949). In these ways, network management was not necessarily about ensuring professionals acquired new and/or accumulating more practical competences that allowed them to be better at their jobs.

Although raised in the context of the academia-policy interface, Hering's (2016) discussion of boundary organisations 'brokering knowledges'[5] between different topics and different contexts is relevant here. Network organisations tend to exist in between and across different sectors, organisations, topics and contexts, and over multiple scales too. This also links to Granovetter's (1973) assertion that flows of knowledge are often best enabled by people who are loosely linked to several communities, rather than just one – thereby indicating an optimal space for network managers to operate in if trying to bring together multiple disciplines and sectors (e.g. as the Energy in Water ESCP is seeking to do). However, it was clear from the interviews that the networks aspired to do much less knowledge brokering, whereby they would be less relied upon as the reference point for all network activities. Instead, there was interest in the network members "talking to each other" (E) independently, which would ultimately also help to sustain the network over the long-term (e.g. if core funding ended). Regardless, attempts to broker knowledges more generally (and to whatever extent) requires a range of professional skills, in particular relating to communication (Phipps & Morton 2013).

[5] Hering (2016, p.365) describes knowledge brokering as being 'an iterative and bidirectional process of translation, tailoring of information for specific contexts, feedback, and integration'.

In relation to the knowledges required to *do* network management, the interviews were not an especially effective forum for identifying these. Whilst we acknowledge that people can indeed talk about practices (Hitchings 2012), we suggest that this is in part linked to network management being habitually repeated over and over again. As Orlikowski (2002, p.253) notes, repeated performance can mean that people begin to take for granted what they do and, in relation to knowledges for example, they can 'lose sight of the way in which our "knowing how" is an active and recurrent accomplishment'. Nevertheless, despite this, discussions did indicate that certain competences were needed to perform network management (well). In particular, the competences that were most commonly raised were with regard to knowing how to operate social media and online materials as tools for managing one's network – which highlights the importance of the internet in network management, which we discuss in the next section (4.4). But lastly, to reiterate, there was general agreement that through having these network management competences, a network manager does not necessarily "have to be an expert in the topic of the network...meaning that it is very possible for people [network managers] to move about different topics and different networks" (D).

4.4 Infrastructures of network management

This sub-section primarily explores what infrastructure was indispensable in performing network management. As is central to theories of practice, practices are always embedded in and are in part constituted by material (and thereby infrastructural) arrangements (Shove et al. 2015). This leads us onto considering the co-evolution of network management with digital infrastructure and, in particular, the development of an internet infrastructure. This fits into a wider discussion in the literature about the pervasive integration of Information and Communications Technologies into multiple practices and the implications for energy demand (Røpke & Christensen 2012; Røpke & Christensen 2013).

Every interviewee independently raised the role of the internet and its associated infrastructure. In particular, reflections on the history of the profession and its recent growth (in numbers), as well as what the profession could currently not do without, tended to focus on the internet and email. Although it was only explicitly raised in one interview, there seemed to be an implicit assumption that this infrastructure served to facilitate the recording, purchasing, hosting, storing, and transferring of information and data of some kind. Indeed, a network was even defined as "involving the movement of information between individuals and entities" (D).

When discussing what would happen to network management without the internet, it was generally argued that it most probably would not even have emerged as a profession, and that if, for example, they did not have the internet tomorrow then almost every network management task would change. Essentially, through more easily connecting people, the internet gives a convenience and efficiency to network management. Without the internet, network management would be considerably more laborious as one would not be able to connect with as many people as easily. It was said that "word-of-mouth is not enough and the internet is so easy" (B).

Network management is one of many practices that is a product of this material development, as well as being a contributor to more/enhanced connectivity being sought (e.g. faster download speeds, better platforms for linking to more professionals). Such material 'improvements' were regarded as potentially making network management easier to do (well). One interviewee reflected on how the internet had enabled a shift in how we are expected to remain connected and seek further connections:

> "A driver [of networks] has been the expansion in information and in the numbers of people that we are expected to keep in touch with… because it is just so normal now to have a passing acquaintance with a huge number of people, but to stay in touch through Facebook, Twitter, LinkedIn." (D)

Social expectations of connectivity were described here as a driver of networks because networks represented a method or tool, through which enhanced connectivity could be sought. Reflecting on how this relates to the running of the Energy in Water ESCP, it is clear that the internet and its associated materials are essential to achieving every single one of its core (and measurable) objectives. As Powells et al. (2015, p.9) simply puts it, 'computing practises are important to almost all businesses as part of everyday work routines'.

4.5 Future trajectories of network management

Much of the previous sections (Sections 4.1-4.4) consider the current organisation of network management and, in part, the past trajectory of network management. In this sub-section, we turn our attention to potential future directions of network management: how could it evolve, and what is likely for the future 'recruitment' of network managers?

As we have previously discussed (Section 2.1), there has been a rise in popularity of and the funding for networks. This is true more widely, as well as for the sustainability-related and energy-specific sectors. As was commonly discussed in the interviews, the array of networks and opportunities available to join can be "overwhelming" (B). In many ways, the networks are "competing for people's time" (E) which is obviously limited. Thus, whilst networks as a concept may itself be on the rise, the longevity of many new networks is certainly not guaranteed. The implication here then is that a limit on the number of networks will create a limit on the number of network management practitioners.

The past emergence and future evolution of network management was talked about in terms of iterative innovation that involved "different ways of thinking and collaborating" (C), as every new network would only come to exist as part of filling a "niche" (A; B; C; D; E) of some kind. Through the filling of these niches and the application of network management in new contexts, every new network was said to be shaping the entity of network management. However, as more and more networks evolve and emerge, this issue of network saturation arose again (i.e. where may those untapped niches lie?). It was suggested that the search for new niches for networks to fill was likely to involve the emergence of more cross-sector networks, which attempted to bring together communities that were traditionally separate. But, as raised in the interviews, there was sometimes good reason for fewer networks existing in this interdisciplinary and multi-sector space, as numerous challenges existed. It was in relation to all of this that some of interviewees discussed how network managers themselves would have to consequently change their skillset in adapting to the needs of a wider (network) community. Specifically, it was argued that network managers may have to become more specialist in the specific topic/niche that the network is situated in, "rather than just be good at doing networks" (A) which Section 4.3 suggested was predominantly the case at present.

We previously eluded to the growing interest in cross-sector collaboration and the associated interest in creating networks to facilitate this, which does also align nicely with the potential trajectory for a more topic-specialist form of network management. We argue that this reframing

exercise can shed light on existing challenges. For example, the Energy in Water ESCP (as with many other cross-sector collaborations) has the potential to enable progress and raise new questions in tackling energy and water challenges; this duality and complementarity will dictate the direction of the project and partnership, but will inevitably still be steered in various ways through its relationship with (the agenda of) individual sectors, stakeholders and funders.

5. Conclusions

The aim of this paper is to investigate the social organisation of network management as a professional practice. Through this small empirical pilot study, we hope to provide a foundation for further studies that explore how network management relates to other professional practices, in particular those practices performed by network members. After all, network management itself only exists so as to engage with and intervene in various ways in other professional practices, as part of pulling these towards a common goal/purpose.

We found that numerous actors were involved in defining the need of a network, many of whom were in privileged positions whereby they were able to significantly influence the direction of the network and subsequently the day-to-day professional tasks of network management itself. This was also one of many influences shaping what was expected of network management. In particular, expectations included a skillset relating to efficiency, communication, being knowledgeable and be able to organise good quality face-to-face network events. It was also emphasised how different communities of practice implicitly have different measures of success, as well as that the measures of success being imposed upon network managers by funders was of considerable influence too. Furthermore, knowledges emerged as a clear theme of network management, both as part of providing (usually intellectual) knowledges to network members, in addition to certain competences being discussed as crucial in doing network management. Such competences included operating social media and online materials, which further highlighted the importance of the internet (and the globally accessible infrastructure it provides) in the original emergence of and continual development of network management. In considering the future of network management, it was suggested that network saturation could very easily be reached, and thus that there would be a cap on the number of practitioners 'carrying' network management. There was also a question about whether network management would increasingly involve the accumulation of more specialist knowledges, so that the network itself (and its management) would be better positioned to support new niches/foci of emerging networks.

This better understanding of the social organisation of network management enables us to better consider its energy demand consequences. For example, it is clear that expectations of face-to-face events help sustain a (deemed) need for business travel, and that a drive for improvements to network management through more/enhanced connectivity (via the internet), both prop up and indeed contribute to growing energy demand trends. It is evident that network management is outward-looking, in that its primary concerns relate to current/prospective network members, as opposed to considering its own energy-demanding activities (even when its foci include energy). In these ways, it is somewhat ironic that networks are often promised as a means for combating large-scale, complex, interdisciplinary and multi-sector problems (e.g. to do with sustainability), yet the very concept of networks is part of what serves to sustain the reproduction of a very energy intensive system.

This then raises a broader set of questions around what would be needed for network management to be reconfigured so that it is less energy-demanding. For instance, how can the implicit/explicit measures of success, the knowledges which network managers facilitate the exchange of as well as utilise themselves, and the materials with which network management co-evolves, be changed so as to (re-)direct professions in less energy-demanding directions? These questions are interesting to reflect upon, particularly because the trajectory-related findings in this paper relate more to the likely coverage of topics and sector-specific competences associated with future network management – it was left unsaid in the interviews, but such future trajectories are not set to challenge the current (rising) demand patterns of energy.

All of this also poses interesting questions and insights for the running of the new Energy in Water ESCP. Indeed, it seems vital that the ESCP is both sensitive to the professional practices involved, as well as the wider social context (industry) that those practices are performed in. The ESCP is a product of a growing interest in cross-sectorial collaboration. Whilst it is extremely unlikely that funding can keep up considering the number of possible combinations of different (but potentially complementary) sectors[6], several broader questions remain as to the emergence and operational function of those networks and their management. For instance, how many of the numerous cross-sectorial combinations are 'worthy' of funding and who/how decides what exactly is deemed worthy? In the current climate of cuts, which areas of collaboration should be prioritised and why? And what are the actual benefits of establishing networks such as these (i.e. what are the ground-level consequences for how other professional practices are reorganised, or not?)?

During the lifetime of the ESCP, and given that it essentially represents a 'network of networks', it will also be interesting to reflect upon how the ESCP organises itself considering that it actually consists of a number of separate smaller networks. For example, how will learnings from the smaller networks shape the management of this new (network of) network(s)? Through participating in the project, what competences will be shared and learnt across network managers, and how will these contribute to the core aims of the network itself? How will this community of practice organise itself across Europe? At the end of the ESCP's two-year lifetime, how (if at all) will these smaller networks continue to work together? And how will all this compare to the envisaged plan of bringing together two sectors and two groups of professionals, as per the network funding proposal and launch meeting discussions? Finally, bearing in mind that the ESCP represents the combined efforts of 650 SMEs working in energy and water across Europe, it will be interesting to reflect upon how those professionals contribute to energy/water demand being built into their professions, sectors and the surrounding infrastructure – to what extent are such issues (un)consciously addressed, considering that they are themselves energy/water experts?

Ultimately, both energy and water occupy very important sets of complex and urgent challenges, and together they represent two core building blocks upon which all life depends. As such, energy and water are engrained in the both professional and everyday practices. Therefore the very topics that the ESCP will engage its members around (e.g. through driving technological innovation in energy/water) will have ripple effects through professional practices and onto everyday

[6] For example, let's assume 20 potential sectors (e.g. transport, renewable energy etc.), two sectors then decide come together to form a new ESCP. The total number of potential combinations which could be realised is 190. Now let's assume the ESCP model is no longer valid and we (as policymakers) wanted to increase the engaged sectors to three to stimulate more innovation (e.g. an energy-water-food nexus ESCP focussed on the potential of bio-crops). The total number of ESCPs which could then be feasibility created (assuming complimentary sectors) is equal to 1,140.

energy/water-consuming practices. But there are wider questions too regarding the form that these interventions and ripple effects will take, and what the long-term implications may be for demand and network management.

Whatever the answers to all these questions, it is clear that network management has been given less attention in research circles compared to the professions that it facilitates and/or seeks to intervene in. Given that the funding, policy and industry landscape is currently geared towards promoting collaboration and interdisciplinarity, through network management, we suggest that this relatively new profession is given much greater attention.

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