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Boundary discontinuity in a constellation of interconnected practices

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Abstract: The article uses the theory of communities of practice to explore the discontinuity of knowledge sharing across different groups co-located within a collaborative research partnership. It presents the findings of a qualitative case study conducted within one of the Collaborations for Leadership in Applied Health Research and Care (CLAHRCs) – large-scale UK-based knowledge mobilization initiatives bringing together the producers and users of health research. Focusing on the boundaries emerging between and within the research and implementation strands of the CLAHRC, the article describes how differences between communities of practice give rise to discontinuities in knowledge sharing. Its findings highlight the role of fragmented organizational design, divergent meanings and identities, and dysfunctional boundary bridges in the (re)production, legitimization, and protection of boundaries between groups. Finally, the article questions the role of research implementation as a boundary practice bridging the gap between academic research and clinical practice.

Keywords: constellation of interconnected practices; boundary; implementation; knowledge mobilization; CLAHRC

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Introduction

The theory of communities of practice conceptualizes learning, meaning, and identity as functions of groups created over time through sustained collective pursuits of shared enterprises (Wenger 1998). Initially developed (Lave and Wenger 1991) to capture the complexities of learning *within* tightly-knit, relatively homogeneous groupings, it later evolved and expanded to include the processes of knowledge sharing *between* them. Previous empirical research has mainly analysed the processes taking place either in a single community of practice or at a boundary between two adjacent communities rather than in complex *constellations of interconnected practices*, including multiple, overlapping, interdependent communities and, therefore, multiple boundaries (recent exceptions include Barrett *et al.* 2012; Mørk *et al.* 2012). This article conceptualizes constellations of interconnected practices as dynamic boundary systems and aims to explore the mechanisms of boundary discontinuity in collaborative organizational forms specifically created to enable continuity across practices involved.

To address this objective, the article uses one of the Collaborations for Leadership in Applied Health Research and Care (CLAHRCs) – a novel, large-scale UK-based knowledge mobilization initiative aiming to bridge the gap between producers and users of research – as an example of an institutionalized constellation of interconnected practices. Focusing on boundaries that acted as a major source of discontinuity in knowledge sharing and joint working, it describes how this discontinuity was enabled at the level of practice by (re)producing, legitimizing, and protecting the differences between groups. It highlights the roles of fragmented organizational structure, divergent meanings and identities, and dysfunctional boundary bridges in these interlinked processes. The article also questions the effectiveness of current policy arrangements determining the relationship between the fields of applied health research and its implementation and suggests the possibility of fragmentation and divides within the implementation field.

The findings of this article are likely to be applicable beyond the context of the English National Health Service (NHS). Its focus on implementation as a problematic boundary field is relevant for collaborative research partnerships dedicated to closing the gap between academic research and clinical practice and improving the quality of healthcare (Denis and Lomas 2003). Beyond the healthcare context, theoretical analysis presented in the article has a potential to inform inclusive management practices that involve boundary experiences, boundary objects, and boundary organizations (Feldman *et al.* 2006) and aim to cultivate ‘communities of participation’ in order to address public problems (Feldman and Khademian 2007, p. 305).

The article is structured in the following way. Starting with a review of theoretical and empirical literature on boundaries and boundary bridges in constellations of interconnected practices, it then briefly describes CLAHRCs as novel knowledge mobilization initiatives and summarizes

existing literature on barriers to knowledge sharing within them. The Case and Method section introduces the Collaboration that acted as a research setting, describes the design of the study, and outlines procedures for data collection and analysis. The findings of the study are then presented in two subsections, the first describing the boundary between research and implementation, and the second, boundaries between the CLAHRC implementation teams. This is followed by the Discussion, focusing on the role of organizational structure, systems of meanings, and boundary bridges in (re)producing, legitimizing, and protecting discontinuity across boundaries. The concluding section of the article outlines its contribution and limitations and draws a number of practical implications for collaborative management practices.

Background and context

Boundaries in constellations of interconnected practices

Organizations can be seen as complex ‘constellations of interconnected practices’ (Wenger 1998, p. 127), in which multiple practices differentiate themselves from and interlock with each other at their boundaries. Boundaries are defined as sociocultural differences between practices leading to discontinuities in action or interaction (Akkerman and Bakker 2011). This definition echoes Abbott’s (1995, p. 862) conceptualization of boundaries as ‘sites of difference’ emerging through local cultural negotiations and subsequently objectified in the form of social entities. Boundaries between practices are unavoidable, being underpinned by diverging regimes of competence, shared identities, and histories of learning represented by different communities (Wenger 1998). They are dynamic, rather than stable or static, and become the locus of activities mediating relations between inside and outside, which may include integration, differentiation, interaction, and development of relationships (Hyde 2006).

The nature of boundaries is fundamentally dual and ambiguous: they can lead to innovation, learning, and cross-fertilization between practices, on the one hand, and to separation, fragmentation, and disconnection, on the other (Wenger 2000; Akkerman and Bakker 2011). In the latter case boundaries function as relatively impermeable frontiers to the spread of innovation and new work practices (Ferlie *et al.* 2005). A number of mechanisms of discontinuity at boundaries can be identified (*cf.* Lamont and Molnár 2002). First, boundary development is closely interlinked with identity formation: on the one hand, our ability to productively deal with boundaries depends on our ability to engage and suspend our identities (Wenger 2000); on the other hand, salient boundaries are necessary for the formation of an integrated sense of identity at individual, group, and organizational levels (Hyde 2006), which includes emphasizing differences, rather than similarities, with referent individuals, groups, and entities located on the other side of the boundary (Ashforth and Mael 1989). Second, the political aspects of discontinuity at boundaries have also received strong attention in sociological literature. For

instance, Abbott (1988) argues that professional groups compete with one another for the legitimacy of their claimed expertise and that this competition usually takes the form of disputes over professional boundaries. The flexible and contestable nature of boundaries is also highlighted by Gieryn (1983, p. 781), who focuses on discursive techniques ('boundary-work') deployed by scientists to construct a boundary between 'scientific' and 'non-scientific' professional activities in order to expand, monopolize, or protect their authority and legitimacy.

Another major theme in the literature that may be useful for understanding boundary processes is concerned with negotiation of meaning across interconnected communities of practice. For instance, Gherardi and Nicolini (2002) see a constellation of practices as an emerging 'discursive community', in which multiple competing discourses co-exist and learning is mediated by comparison among different perspectives embraced by co-participants, which produces not only order and negotiated meanings ('consonance'), but also tensions and discontinuities ('cacophony'). Although members of interdependent communities of practice develop 'a common knowledge' that can be used to share and assess the 'domain-specific' knowledge of each other's practices (Carlile 2004), they still tend to experience knowledge sharing difficulties due to differences in their language, the locus of their practice, and their conceptualization of the product (Bechky 2003). In a healthcare context, previous research has identified a number of mechanisms enabling the negotiation of meaning in a multidisciplinary arena, such as organizing discussions, acknowledging other perspectives, and challenging assumptions (Oborn and Dawson 2010a), but it is not clear to what extent and under what conditions these mechanisms are able to override existing and emerging discontinuities between co-located communities.

Boundary bridges in constellations of interconnected practices

Although discontinuities are integral to any boundary system (Wenger 1998; Akkerman and Bakker 2011), there are a number of factors that connect communities of practice within a constellation. In addition to belonging to the same organization, these may include shared historical roots, related enterprises, geographical proximity, exposure to similar external conditions, and having members or artefacts in common (Wenger 1998). Continuity within a constellation of interconnected practices can be understood in terms of *boundary bridges* (Wenger 1998, 2000). These can take a number of forms.

1. *Knowledge brokers*: people who facilitate interaction between communities of practice through having membership in several communities and seeking to coordinate practice and meaning across them. In order to be successful, knowledge brokers need to develop at least a peripheral understanding of each practice they are involved in, have legitimacy as negotiators on behalf of their practices, and possess an inclination to broker knowledge (Levina and Vaast 2005).

2. *Boundary objects*: artefacts, discourses, and processes which are plastic enough to adapt to the needs and constraints of several communities employing them, yet robust enough to maintain a common identity across sites (Star and Griesemer 1989). The potential of boundary objects as boundary bridges is determined by the degree to which these objects allow coordination and negotiation of diverse perspectives, which is only possible in the presence of a 'joint field' where agents recognize and value an object in question (Levina and Vaast 2005).
3. *Boundary interactions* among people from different communities of practice: these include meetings, visits, delegations, or the creation of a new boundary practice (e.g., a long-term cross-disciplinary project) (Wenger 1998). Emergence of a new, in-between practice is accompanied by transformation of identities and meanings, which requires continuous joint work at the boundary (Akkerman and Bakker 2011).

Boundary bridges can either emerge organically or be intentionally promoted in organizations in order to connect interdependent but relatively disconnected communities of practice (Wenger 2000). Recent research, however, has shown that boundary bridges do not always lead to crossing the boundary. For instance, boundary objects can become a barrier to change when they are used to legitimize work, reinforce existing power structures, solidify status, and maintain occupational control over task areas (Bechky 2003; Oswick and Robertson 2009). Boundary practices can become communities in their own right and develop their own boundaries that can prevent these communities from functioning as brokers (Bullough *et al.* 2004). Finally, given the tendency of communities of practice to resist external influence and control (Swan *et al.* 2002), it could be assumed that boundary objects, spanners, and interactions nominated in a top-down fashion may be less successful than those emerging from within communities of practice themselves, but this area still remains empirically unexplored.

CLAHRCs as constellations of interconnected practices

CLAHRCs are five-year collaborative partnerships established in 2008 between universities and NHS organizations, aiming to create innovative ways of producing and implementing applied health research by bringing together producers and users of research (NIHR 2008). They are seen as a way of addressing the second translational gap, i.e. a gap in the translation of new medical interventions into everyday practice (Cooksey 2006). Being co-funded by the National Institute of Health Research (NIHR) and local NHS trusts, the CLAHRCs are encouraged to develop a collaborative model of ownership, with a range of stakeholders having vested interests in determining their agendas and tailoring the conduct of research to the specific needs of a particular region (Martin *et al.* 2011b). Although the CLAHRCs vary in their approaches to addressing the second translational gap, they have a common feature that was stipulated by the NIHR and is especially important for our subsequent analysis: each CLAHRC involves at least

one *research theme*, focused primarily on carrying out applied health research, and at least one *implementation theme*, whose primary aim is the implementation of research findings across the region (NIHR 2008, p. 7).

Bringing together a number of distinct domains, namely clinical practice, applied health research, commissioning, and implementation, CLAHRCs can be conceptualized as an attempt to create constellations of interconnected practices defined by the process of translating research into practice. These constellations are supposed to bridge the boundaries between various professional groups and possibly enable the formation of new multi-professional communities of practice cutting across different domains (Kislov *et al.* 2011). Indeed, in the presence of operational proximity, shared history of learning, and common values in a constellation, boundaries between interrelated practices can become permeable, leading to the formation of new multi-professional communities (Hudson 2007; Gabbay and le May 2011). At the same time, continuity of knowledge sharing within the CLAHRCs as emerging constellations of interconnected practices is likely to be shaped by a number of tensions.

First, there is an inherent tension between a linear, stage-like vision of knowledge translation still evident in the current policy domain (Ferlie *et al.* 2012) and a growing understanding that the linear process of knowledge production followed by implementation is neither efficient nor effective in closing the research to practice gap (Rowley *et al.* 2012). Second, knowledge brokering at the local level has to mediate powerful macrolevel institutional forces potentially driving research and implementation apart (Currie *et al.* 2010), which include, for instance, lack of incentives to collaborate and divergent performance management systems (Addicott *et al.* 2006; Currie and Suhomlinova 2006). Finally, tensions may arise between various communities of practice which represent different domains and may have conflicting epistemic cultures (Kislov *et al.* 2011), which can be aggravated by the inclination of professional communities of practice to protect their autonomy and status (Ferlie *et al.* 2005; Martin *et al.* 2009; Oborn and Dawson 2010b).

This article explores one of the CLAHRCs (referred to as the ‘Collaboration’ or ‘the CLAHRC’ in the subsequent sections) as an example of a novel, emerging constellation of interconnected practices. The main objective of this article is to explore the mechanisms of discontinuity that act at the boundaries between different groups within a constellation of practices and turn sociocultural differences into barriers to knowledge sharing. Whilst acknowledging the importance of institutional and political factors operating at the macro-level, this analysis will explore how the boundaries were enacted at the level of practice, describe the implications of institutionalizing a constellation of interconnected practices, and examine how organizational structure, systems of meaning and boundary bridges contributed to maintaining boundary discontinuity within an initiative that aimed, paradoxically, to improve the continuity of knowledge sharing between its constituent practices.

Case and method

Structurally, the Collaboration was divided into the *research strand*, composed of four research teams conducting applied health research projects, and the *implementation strand*, comprised of four disease-specific teams involved in the implementation of evidence in four areas of cardiovascular medicine. The implementation teams were multi-professional, each of them including a clinician, a management academic, a manager, a data analyst, and two change agents, playing a knowledge brokering role between the implementation teams and the NHS organizations into which research evidence was to be implemented. The activities of the research and implementation teams were coordinated by the Collaboration's executive team and overseen by a steering group.

Given the complexity of boundary processes as social phenomena and the need to provide an in-depth analysis of multiple boundaries in a constellation of practices, the qualitative single case study methodology was chosen for this research. Purposive sampling strategy was deployed, with 45 research participants drawn from both core and peripheral membership of the four domains represented in the Collaboration, i.e. clinical practice (doctors and nurses from the NHS organizations), applied health research (members of the research teams), implementation (management academics and other members of implementation teams), and commissioning (medical directors and chief executives of the primary care trusts). Semi-structured interviews served as the main method of data collection and were conducted in two stages.

The first stage (22 interviews) was mainly concerned with the identification of boundaries within the Collaboration, mapping out their characteristics and processes of knowledge sharing across them, and inducing a list of theoretical propositions to guide further data collection and analysis. A number of overlapping boundaries were identified at this stage, including boundaries between the research and implementation strands; between different professional groups within the implementation strand (e.g., between clinical academics, management academics, and clinical practitioners); between different multi-professional teams within the implementation strand; and between the CLAHRC teams and the commissioners of research. These boundaries differed in terms of their salience, permeability, and effects on knowledge sharing.

In the second stage (23 interviews), theoretical propositions were tested to uncover the mechanisms of discontinuity acting at those boundaries within the Collaboration that proved most difficult to bridge over the first three years of its existence. The following two types of boundaries were selected for analysis and form the empirical case presented in this article: (1) the boundary between the Collaboration's research and implementation strands; and (2) boundaries between the four implementation teams within the implementation strand. Focusing

on knowledge sharing discontinuities at these two boundaries, this case not only directly addresses the theoretical research question of the study but also has a potential for making a novel contribution to health services literature. While boundaries between researchers and practitioners (Rynes *et al.* 2001) and between providers and commissioners of researchers (Martin *et al.* 2011a) have been relatively well researched, there is a dearth of empirical evidence on the nature and potential effects of the boundaries emerging within large-scale knowledge mobilization initiatives in which implementation of research evidence becomes a distinct activity.

For the purpose of triangulation, the interviews were supplemented by direct observation (69 hours) of various boundary encounters (e.g., implementation team meetings, learning sessions, practice visits, etc.) involving the 45 interview respondents as well as other people engaged in the activities of the Collaboration. Analysis of documents and artefacts produced by the research and implementation teams (e.g., reports, meeting minutes, presentations, leaflets, etc.) was also performed. All data were collected by the author in 2010–11, in strict compliance with the procedures of ethical approval and informed consent.

Interviews were digitally recorded and transcribed verbatim; interview transcripts, observation field notes, and copies of organizational documents were coded and analysed with the aid of NVivo software. The process of coding was organized in three rounds. In the first round, template analysis (King 2004) was deployed to organize (predominantly descriptive) codes that were informed by the literature review and reflected the structure of the interview schedule. The second round of coding linked previously identified boundaries with a number of emerging categories (e.g., organizational and team characteristics, knowledge brokers, attitudes to research/implementation/the Collaboration, etc.). Finally, in an iterative process of refining codes and categories, detecting patterns and developing explanations, existing codes and categories were transformed into three main themes (fragmented organizational design as boundary (re)production, divergent meanings and identities as boundary legitimization, and dysfunctional boundary bridges as boundary protection). This process was assisted by matrix analysis (Nadin and Cassell 2004) of the datasets obtained with different methods and from different teams represented in the Collaboration. Member checking, peer-debriefing and triangulation of data obtained by interviews, observation, and documentary analysis were used to increase the validity of research findings.

Findings

Boundary between the research and implementation strands

Research and implementation strands of the Collaboration were structurally and functionally separated, which was explained by some research participants as a response to the NIHR requirements which prescribed the formation of separate research and implementation themes in the CLAHRCs. According to the initial plan, in Years 1 to 3 implementation teams were encouraged to design their own programmes of work dealing with the implementation of *existing* research evidence in the NHS organizations. Starting from Year 4, they were supposed to implement research products which would, by that time, have been developed by the research themes:

...We had a naïve linear view that somehow products would emerge from research teams and be sold by implementation teams into the NHS in some sort of linear production line model. (APH1 – RS; *the following abbreviations are used to indicate respondents who are quoted in this section: APH – applied health researcher; CA – change agent; HC – hospital consultant; MA – management academic; PM – programme manager; RS – research strand; IS – implementation strand.*)

It was expected that knowledge exchange would be taking place between the ‘researchers’ and ‘implementers’ from the very beginning, so that the transition to the more integrative phase at Years 4 and 5 could be made easier. However, communication between the two strands was perceived by many respondents as highly problematic from Year 1 onwards. Boundary discontinuity manifested in the lack of collaborative working and mutual learning between the strands, hindering the impact and credibility of the Collaboration:

It was clear that people were in two separate camps: the implementation and the researchers. (APH2 – RS)

...It’s all meant to be about putting research into practice. So the fact that there’s a huge barrier between research and implementation means the CLAHRC cannot fulfil its vision, its mission, its goal of doing that. (PM1 – IS)

There were significant differences between the researchers and implementers as to how they viewed the context of the NHS and the nature of the CLAHRC. The dominant view within the implementation strand was that the CLAHRC was a novel organization with a mission to facilitate the implementation of research in the NHS, bridge the boundaries between scientific knowledge and day-to-day clinical practice, and thus contribute to improving the quality of patient care. The implementation staff tended to view the activities of the research teams as less relevant to NHS priorities, insensitive to contextual factors, and insufficiently specified in terms of expected outcomes and their value for the NHS:

...However [the researchers] say they’ve done this in the past and they’ve done that in the past, I don’t think they actually really understand what goes on at ground level, and I think sometimes they come out with things that aren’t... they’re not very good at the context of the NHS... (PM2 – IS)

On the other side of the boundary, researchers did not seem to be interested in a more proactive interaction with the NHS organizations, seeing them as unable to innovate, and viewed the

Collaboration as a programme for funding research rather than a novel organization aiming to bridge the boundaries between the worlds of research and practice:

...It's always the wrong question and a very annoying distraction to have said, 'What's special about the CLAHRC? What about this structure? What about this way of doing research?' It's irrelevant. It's the simple fact you have long-term funding to do applied stuff that other people wouldn't fund... CLAHRC should just be a programme funding compartment for applied research, not some mystical, magic thing that no one can define. (APH3 – RS)

Incentives to participate in the collaboration were markedly different between the strands: the researchers hoped to produce high-quality research publications in top journals to advance their academic careers while for many implementers meeting the objectives of their projects was the first priority. The interpretation of 'research' and 'implementation' also significantly differed between the strands. Influenced by the traditional biomedical hierarchy of evidence prioritizing randomized controlled trials (RCTs) as the 'gold standard' of research, some of the researchers were reluctant to share their products with the implementation strand, explaining it by the need to 'ensure a robust RCT'. They argued that involving the implementation teams in their research projects may lead to RCT contamination and thus violate the validity of research findings. They perceived the implementation teams to be driven by 'management science' and tended to criticize them for being insufficiently evidence-based and inappropriate for bridging the gap between researchers and practitioners:

...The implementation themes were misconceived. They were designed as a management tool that would never really work with clinicians who understand clinical research. So they wouldn't foster a conversation between clinicians and research themes. (APH3 – RS)

There are aspects of ownership in which I think some tools are not to be handed over for implementation because the implementation is actually part of the research... (APH2 – RS)

By contrast, the implementation staff tended to prioritize service improvement and knowledge translation over research, emphasizing the importance of context in the process of implementation. Management academics working in the implementation strand questioned the usefulness of the biomedical research paradigm in relation to applied health research:

...It's obvious that a number of the... implementers felt why do we actually need to spend so much time and money on research when we could just go ahead and implement a number of these things without knowing that it's gone through randomized controlled trials? (MA1 – IS)

...Implementation can't help [the researchers], because they're only trying to find out the 'Does this work?' question – not 'How does this work?' one – and then they haven't got anything that they can go and offer universally to general practitioners. (MA3 – IS)

Disagreements regarding aims, objectives, and approaches pursued by the Collaboration reflected the co-existence of separate strand-specific identities, which were not reconciled into a form of shared organizational identity:

I don't really identify with CLAHRC the way it's constituted now, but I'm happy to be strongly identified with [one of the four implementation teams]... That's the stuff we've been working on. I'm happy to be judged on our record. I'm not very happy to be judged on the record of all of the other colleagues and their work outputs. (HC1 – IS)

Quarterly research and implementation meetings were set up as a communication channel between the strands, involving the leads of the implementation and research themes along with the CLAHRC executives. Although some factual information was indeed shared between the leads at these meetings, there was little evidence that these exchanges resulted in increased interaction, connectivity, and collaboration between the research and implementation strands:

...They were sort of polite meetings, I think, in which people sort of said, 'This is what I'm doing', and next week it'll be, 'This is what we're doing'. We knew there were issues between implementation and research but we didn't get to discuss those... (APH2 – RS)

Finally, resources were tied up in the core projects of the research and implementation strands and could not be easily reallocated to fund joint working between the strands:

There's resource committed already in the research theme, so you can't then only commit that resource... to answer the questions that have just come from... an implementation theme. Which you might like to, but you haven't got the funding. (APH3 – RS)

Boundaries between the implementation teams

Although the implementation strand was conceived as an integrated programme of work utilizing the same overarching approach to implementation, the four multi-professional implementation themes quickly developed into separate, tightly-knit groups, each of them focusing on one or more disease-specific projects:

...The team structure that I described of the two [change agents], the clinical lead, the academic lead and the project manager, where they've worked reasonably well I think have formed I think quite a tight little community – almost too tight, possibly. (MA2 – IS)

Joint working in these groups enhanced knowledge sharing between clinicians, academics, managers, and change agents, i.e. *within* the implementation teams, and helped them meet the objectives of these projects, but it created barriers to knowledge sharing *between* them:

We're lots of little silos, almost, each doing their own individual thing, and nothing being brought together for a greater benefit. (PM1 – IS)

All of the four implementation teams developed their own approaches to implementation. Co-developed by all members within their respective teams, these distinct ways of doing things formed the basis of shared team identities, became deeply engrained in their practice, and hampered knowledge sharing and joint working across inter-team boundaries:

...We have been working very isolated and very differently: we've all taken kind of our own different areas and we've focused on those, and so bringing that together as [an integrated] team when you've put a lot into your individual projects and set an idea that, 'Hmm, we're not going to be able to pursue that in the same way' – it is difficult. (HC2 – IS)

When discussed in the implementation team meetings (which were initially held separately for each of the four implementation teams), evidence accumulated by other teams and methods utilized in their implementation projects were often dismissed as irrelevant even if the respective project contexts were in fact quite similar. For instance, two of the four implementation teams were engaged in conducting audit and feedback of patient registers in primary care. One of them took an emergent approach to change, actively involved the external NHS stakeholders in developing project objectives, and did not explicitly use any service improvement or implementation models to guide the process of implementation. The other team followed a planned approach to implementation, had clearly defined goals before the start of the project, and built the whole process around a combination of theoretical frameworks. Each team were aware of what the other team were doing, but saw their own approach as the preferred option and seemed relatively reluctant to learn from external experience:

We're actually really quite a strong and confident group, so we're tending to think that it's actually better this way and we're doing it the way that it should be done. (MA1 – IS)

...We're trying to do things by consensus now [in the implementation strand as a whole]; and you've always got four [clinical leads] with quite different views on things. And what's happened is, when one lead doesn't agree with what everybody else wants to do, even though they've signed up to it, they just go off and do what they want. (PM2 – IS)

Further divergence was caused by the relative autonomy of the teams within the strand and lack of functional and operational proximity: not only were the teams working with different groups of stakeholders; they were also based in separate locations, which made informal knowledge-sharing between them problematic:

...I had so much to contend with in my own work I never felt like I could prioritize the exploration of what else was going on above what I had scheduled to be getting on with... Without the day-to-day conversation with colleagues in other teams there wasn't the frequency of contact there to build up a detailed understanding of what they were doing day-to-day. (CA3 – IS)

Although the formal channels of inter-team dialogue, in the form of fortnightly learning sessions and monthly cooperative inquiry sessions for change agents, were deployed to counterbalance

these processes, their impact on inter-team knowledge sharing remained limited, with inter-team competition, lack of trust and over-formalization of communication structures cited as barriers:

...I think there's a lot of competitive spirit between the [change agents], which could be healthy, but I think it has got to a point where it's been probably a bit more detrimental than... doing a bit more harm than good, basically. (PM1 – IS)

...We have to sell constantly, very much, that we are successful, that our projects work; and to some extent we do that internally. And I think you shouldn't do that; and I think that's sometimes not happening. And I think it's a trust issue... it's still ongoing process... (CA5 – IS)

...The communications structures within the implementation half are poor, over-formalized, not regularly supported... (MA2 – IS)

Another group that was supposed to span the inter-team boundaries was represented by management academics. Some of them acted as academic leads for the implementation teams and others were involved in training and evaluation activities conducted by the Collaboration. Their knowledge brokering function was, however, limited: all of the academics had different research backgrounds and experiences and played different roles in different teams, which was accompanied by the absence of clear, centrally defined terms of reference for the academic role:

...It was all 'define your own role' for the academic leads – they've all taken on what it is that they want to do... (PM2 – IS)

...Academic leads group... they're so different. Just the research tradition they are coming from, where they're looking at, the kind of methodologies they work with, paradigms and such: they are very, very different... (CA5 – IS)

As a result, some of the academics primarily saw implementation as a process of healthcare service improvement supplemented by critical observation and reflection; some would have prioritized 'researching implementation' over 'doing implementation' but felt that sufficient resources and support were not provided; and some struggled to conceptualize implementation at all:

So philosophically and conceptually I still struggle with whether or not what we're doing is 'quality improvement' as opposed to 'knowledge transfer'. (MA1 – IS)

...Within the implementation side, because it was an academic thing and it was a link between the university and the service, we weren't just meant to be doing the implementation; we were meant to be doing evaluation of that implementation... (MA2 – IS)

I'm not sure that at the start, even if we'd had the resources and decided to do it that way, we could have designed much of a[n implementation] research programme, because we didn't know what we were doing. ...If we do more research in implementation, which may be a good thing, it still doesn't address the issue of doing implementation. (MA3 – IS)

Discussion

Fragmented organizational structure: (re)producing the boundary

The boundary between the research and implementation strands can be interpreted as a local enactment of two generic boundaries: the gap between producers and users of research, which the CLAHRCs were expected to bridge in an innovative way, and the epistemic boundary between biomedical and social science research paradigms. The reproduction of these boundaries was enabled by the structural design of the Collaboration separating the research and implementation activities. This separation, in turn, reproduced a linear view on the research–implementation relationship, which sees research and implementation as separate activities, stages, or ‘themes’, and which the CLAHRCs, paradoxically, were meant to challenge. The structure of the Collaboration institutionalized the pre-existing gap between the activities of research and implementation strands underpinned by political (conflicting goals and incentives) and epistemic (conflicting attitudes to evidence) factors. This prevented an open conflict between the strands, but at the same time removed the need to renegotiate the boundary and develop a shared practice.

Organizational structure played an even a greater role in the formation of boundaries within the implementation strand. In contrast with the research–implementation gap, the boundaries between implementation teams were not related to any pre-existing political or epistemic differences. The emergence of these boundaries can be seen as a response to structural, functional, and geographical separation of the four multi-professional implementation teams. Each of these teams represented a shared practice-in-the-making which was developing around a joint activity. Relative isolation of the teams enabled the development of distinct and sometimes incompatible approaches to implementation, problematized cross-team knowledge sharing, and undermined organizational learning in the Collaboration as a whole. At the same time, professional boundaries between clinicians, managers, academics, and change agents within the teams were permeable for knowledge flows, which can be explained by the fact that emerging multi-professional practices-in-the making were novel, differed from the pre-existing practices of clinicians, academics, and managers in a significant way (see also Levina and Vaast 2005), and made inter-professional differences and dependencies less relevant in the new context (Carlile 2004). *Inter-team boundaries* developing in the implementation strand could thus be seen as a side effect of *intra-team integration* in the process of joint working.

Previous research has suggested that structural reorganization is likely to have a limited effect on knowledge sharing across boundaries compared to ‘soft’ knowledge management approaches, such as incentivizing behavioural change or facilitating context-sensitive leadership (Currie *et al.*

2007). This study offers a more nuanced understanding of the role played by organizational structure in emerging constellations of interconnected practices. It shows that through its ability to shape the development (or separation) of practices, the structure of a constellation can promote the reproduction of existing boundaries (e.g., the research–implementation boundary), their blurring (e.g., professional boundaries within implementation teams), or the creation of new ones (e.g., the boundaries between implementation teams). The latter case demonstrates that the formation of boundaries can be induced by organizational design and makes us question whether Abbott's (1995) generalization that social entities are secondary to pre-existing 'sites of difference' can be universally applied to organizational contexts.

Divergent meanings and identities: legitimizing the boundary

One of the most significant manifestations of the research–implementation boundary was the divergence of perspectives held by the representatives of these two groups in relation to the Collaboration's mission, the NHS context and, most importantly, the role, credibility, and value of each other's activities. The boundary between the strands can be interpreted as a collision of competing claims for epistemic authority, with both strands attempting to monopolize jurisdictional control over implementation as a disputed domain and protect their own autonomy (Gieryn 1983; Lamont and Molnár 2002). Each of the two strands had enough power to protect its autonomy but this power was not sufficient to subsume the other practice. In this context, divergence of meanings served as a mechanism of legitimizing the boundary, with cross-boundary learning being limited to *othering* (Akkerman and Bakker 2011): each of the two strands clearly delineated how it differed from the other strand and thus justified lack of knowledge sharing and joint working at the boundary.

At the inter-team boundaries within the implementation strand, divergence of meanings mainly involved approaches to implementation. Differences between the perspectives taken by the teams were, overall, less pronounced and clear cut than in the case of the research–implementation boundary, which could be explained by a number of factors. First, as the implementation teams were newly emerging practices-in-the-making, shared discourses were still at the stage of development. Second, although each team had a set of its own project-specific objectives, these were not conflicting, as all teams shared the same overarching goal of implementing evidence-based improvements in the NHS. Finally, divergence of meanings between the implementation teams did not have such a degree of epistemic incompatibility as was observed at the boundary between the research and implementation strands. However, in some cases the differences between the teams were perceived as quite significant, were clearly articulated (and possibly exaggerated) by the team members and used by them to justify lack of knowledge sharing, thus legitimizing inter-team boundaries. This was accompanied by the diversity of conceptual approaches to implementation held by the management academics. This diversity, in turn,

reflected the hybridity and marginality of implementation science as a field emerging at the interface between quality improvement and health services research (Sobo *et al.* 2008).

These findings resonate with a previous observation that co-existing competing discourses in constellations of interconnected practices tend to generate comparisons across different perspectives but do not necessarily involve the development of a shared understanding or collective action (Gherardi and Nicolini 2000). In the absence of a shared activity and in the context of authority disputes, the divergence of meanings may be perceived as so significant that it can block the process of negotiation, let alone transformation, of meanings, and become a mechanism for legitimizing the boundary and impeding knowledge sharing between co-located communities. In other words, differences between practices may be encountered, rationalized, and integrated into collective identities without necessarily overcoming discontinuities. Furthermore, the perceived desirability of maintaining the status quo on different sides of the boundary and the absence of a shared ‘collaborative’ identity may lead to *institutional non-participation* (Wenger 1998, p. 169). Members of different groups are predominantly involved in their respective group-specific practices whereas participation in the ‘shared space’ within a constellation as a whole is seen as less important. While for Wenger institutional nonparticipation is related to the low status of a practice within a constellation, this study shows that it can also manifest in a number of interconnected practices with comparable levels of power.

Marginalized boundary bridges: protecting the boundary

Regular boundary interactions between the research and implementation strands took place at the formal quarterly meetings. These meetings brought together the research and implementation team leads, who were meant to act as knowledge brokers between the teams. The knowledge brokering potential of boundary interactions, however, remained unrealized for a number of reasons. First, the meetings were infrequent, did not include other team members, and were not seen as a forum for discussing tensions and finding solutions. Second, there seemed to be very few opportunities for informal exchanges between researchers and implementers. Third, divergence of objectives, meanings, and practices across the strands meant that very few artefacts, concepts, or ideas could be utilized as ‘facilitative’ boundary objects potentially enabling boundary-crossing. Furthermore, by virtue of their conflicting interpretations across the boundary, the notions of ‘research’ and ‘implementation’ played the role of ‘inhibitory’ boundary objects blocking knowledge sharing at the boundary between the strands (Fox 2011). Finally, since all resources were committed to individual projects at the outset, no additional funds were available to incentivize cross-boundary knowledge sharing and support the development of cross-boundary projects between the strands.

In the implementation strand, numerous formal arrangements for boundary crossing were made to counterbalance the impeding effect of inter-team boundaries on knowledge flows. However, the direct impact of these interactions was limited by inter-team competition, low trust, and lack of opportunities for informal knowledge sharing. As suggested by the communities of practice literature (Brown and Duguid 1991), it could be expected that two uniprofessional (and, therefore, relatively homogeneous) groups, namely change agents and management academics, would act as knowledge brokers, spanning the boundaries between the (heterogeneous) multi-professional implementation teams. In reality, the groups of change agents and management academics did not develop into fully formed and functional communities of practice. This may be explained by the dominance of multi-professional teams as loci of emerging shared practices-in-the-making within the implementation strand, by the diversity of roles played by change agents and management academics across the implementation teams, and by the absence of a shared conceptualization of implementation. All these factors slowed down the negotiation of shared meanings and knowledge exchange within these uniprofessional groups and limited their knowledge brokering function.

These findings suggest that formal boundary spanning arrangements designed by an organization may be neutralized by overformalization and infrequency of interaction, significant divergence of meanings across the boundary, competition for recognition and resources, low trust, and lack of rewards for participation in boundary spanning activities. These factors may prevent the transformation of potential ('nominated') boundary spanners into actual connectors between the practices (*cf.* 'boundary-spanners-in-practice' in Levina and Vaast 2005) and turn boundary interactions into rhetorical devices which are unable to challenge the status quo but can create an illusion of cross-boundary knowledge sharing and thus contribute to the preservation of the boundary. Our findings also highlight an internal tension in an approach advocated in the seminal communities of practice literature (Brown and Duguid 1991, p. 54), i.e. between preserving and enhancing 'the healthy autonomy' of communities of practice in an organization, on the one hand, and simultaneously 'building an interconnectedness through which to disseminate the results of separate communities' experiments'. As this study has demonstrated, institutionalizing the constellation of interconnected practices may lead to the partial alignment of the local practices with the proposed organizational design, whereby pre-existing boundaries are willingly reproduced but nominated boundary bridges become marginalized.

Conclusion

The article has presented a constellation of interconnected practices as a complex, dynamic system of practices, boundaries, and boundary bridges with a potential for both continuity and discontinuity in knowledge sharing. It has highlighted the role of fragmented organizational structure, divergent meanings and identities, and marginalized boundary bridges in the

(re)production, legitimization and protection of boundaries. It has also demonstrated that boundary discontinuity in a constellation of interconnected practices may result in non-participation in a 'shared space' within the constellation, rather than an open conflict between the practices, if the latter have comparable levels of power and maintain the status quo. Finally, the article has contributed to the debate on multi-professionality in landscapes of practice (Ferlie *et al.* 2005; Kislov *et al.* 2011) by demonstrating that, despite professional differences among their members, multiprofessional groups operating in relatively novel and autonomous conditions may develop more effective internal knowledge sharing mechanisms than those (more homogeneous) uniprofessional groups that cut across inter-team boundaries.

Structural and functional separation of research and implementation activities in collaborative research partnerships may further deepen epistemic and political differences between these two domains and result in a significant discontinuity in knowledge sharing. In these circumstances, implementation may well be able to successfully mobilize the *existing* research evidence into healthcare organizations but its role as a boundary practice bridging the *real-time* gap between the producers and users of research is likely to be limited. Productive integration of applied health research and research implementation is further complicated by the inconsistency of policy, which tries to achieve collaboration through dividing researchers and implementers into separate 'themes', fails to incentivize the process of joint working, and lacks a unifying ideology that could be embraced by all of the CLAHRCs' stakeholder groups. Diversity of perspectives regarding the nature of implementation and its relationship with health services research and quality improvement may lead to the development of new distinct practices within the implementation field but, at the same time, create new boundaries to knowledge flows.

This study has a number of limitations. First, its findings may not necessarily apply to those CLAHRCs which significantly differ from this case in terms of structure, ideology, and interpretation of the implementation process. However, the analytical conclusions of this article could be generalized across a wide range of collaborative partnerships adopting the elements of single, hierarchical organizations and thus being at risk of reproducing old and creating new boundaries when institutionalizing the rules, procedures, and processes of collaboration (McGuire 2006). Second, this article has been informed by the analysis of the first three years of the Collaboration and does not specifically cover subsequent changes in its architecture and internal dynamics. Finally, this study may be criticized for using the term 'communities of practice' in relation to project teams but it could be argued that a clear cut distinction between them (Wenger *et al.* 2002) serves managerialist, rather than analytical, purposes and that teams and communities of practice should be seen as two ends of a continuum rather than mutually exclusive entities (Kislov *et al.* 2012). The fact that the teams described in this study developed shared discourses, identities, and practices, were separated by boundaries, and perceived themselves as 'communities' justifies our choice of Wenger's theory to analyse boundary processes between them.

Setting up a boundary organization does not automatically mean that boundary continuity is going to be achieved. Boundary organizations should actively facilitate the negotiation of concepts, approaches, and objectives that are interpreted in conflicting ways by different communities. They may need to create their own systems of incentives to support productive knowledge sharing and joint working at their boundaries. The development of shared 'collaborative' identity should be promoted by the articulation of the overarching goals and philosophy of a collaborative enterprise at early stages. This should be accompanied by creating new boundary practices, which can take the form of joint projects bringing together the representatives of separated communities. Although the development of shared boundary practices seems the most obvious solution to counterbalance the discontinuity in knowledge sharing, maintaining the equilibrium between diverse practices (such as research and implementation) co-located in the same project team may be difficult because of conflicting epistemic paradigms and competing authority claims. Future research could usefully explore the processes and outcomes of deliberate attempts to shape the permeability of boundaries between diverse but interconnected practices.

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