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research

Embedding researchers into organisations: a study of the features of embedded research initiatives

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Background: 'Embedded research' (co-locating researchers within non-academic organisations) is advocated as a way of developing more effective services through better creation and application of knowledge.
Aims and objectives: The existing literature on embedded initiatives has largely been descriptive. There has been less in the way of analysis, for example, disaggregating the components of such schemes, unpacking underpinning logics, or comparing the diverse ways in which schemes are instantiated. We aimed to explore the nature and organisation of such schemes in health settings in the UK, with the objective of providing a systematised means of understanding their makeup.
Methods: This study uses a focused literature review combined with a systematic scoping exercise of extant initiatives. We assembled documentation on each scheme (n=45) and conducted in-depth interviews in twelve of them (n=17). Analytically, we focused on surfacing and articulating the key features of embedded research initiatives in relation to their intent, structure and processes. Findings were then tested and validated during a co-production workshop with embedded researchers and their managers.
Findings: We identified 26 'clusters' of peer-reviewed papers detailing specific embedded research initiatives, and we explored 45 extant initiatives. The initiatives were varied in intent, structure and processes, but we were able to surface ten themes representing common features: intended outcomes, power dynamics, scale, involvement, proximity, belonging, functional activities, skill and expertise, relational roles, and learning and reflection.
Discussion and conclusion: The themes uncovered can be used as a framework for guiding further systematic and evaluative enquiry on embedded research initiatives.

Key words embedded research • knowledge mobilisation • healthcare organisations

Key messages

- Embedded research initiatives come in a range of different shapes and sizes;
- Despite this variety, initiatives share a number of common features;
- An understanding of these features can promote dialogue about the design and management of embedded initiatives;
- These features can also guide systematic and evaluative enquiry of such initiatives.

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Background

Research and researchers represent a rich source of empirical, theoretical and methodological knowledge that can help organisations with pressing challenges. There is, however, a persistent and well-documented disconnect between research and practice which has challenged policymakers, academics and practitioners for decades (Contandriopoulos et al, 2010).

There are broadly two ways of conceptualising this challenge: as a 'knowledge transfer' problem, or as a 'knowledge production' problem (Van de Ven and Johnson, 2006). The first conceptualises knowledge as a product which is 'pushed' from the research community or 'pulled' by actors within organisations (Lavis, 2006). The second conceptualises knowledge as something produced when academic and organisational ways of knowing are brought into dialogue with one another to create new understandings (Gibbons et al, 1994; Cook and Brown, 1999).

In line with this second conceptualisation, there has been a surge of interest in 'embedded' approaches to research, particularly within healthcare. These focus on increasing productive relationships and social interaction between researchers and within organisations. Examples include incorporating evidence-generating organisations into the wider health-service delivery system (Koon et al, 2013), research-practice partnerships (Wolfenden et al, 2017), and local participatory research initiatives (Eyre et al, 2017).

An increasingly popular form of embedded research involves physically locating researchers within non-academic organisations. Embeddedness refers to researchers being 'in residence' within the organisation (Marshall et al, 2014), while 'research' is used to denote at least three things: the knowledge and expertise that researchers bring with them; the research-based knowledge that they broker into the organisation; and the new insights developed from gathering and interpreting data in situ. The negotiation of expertise, the contextualising of external knowledge, and the co-production of new understandings are key tenets of such initiatives, leading to their comparison with the notion of 'engaged scholarship' (Cunliffe and Scaratti, 2017; Cheetham et al, 2018; Vindrola-Padros et al, 2018).

A growing literature highlights the multiple challenges that face embedded researchers and those they work with (Duggan, 2014; Rowley, 2014). These include: establishing and maintaining relationships in the face of busy work schedules and tightly-controlled spaces; defining and adapting the scope of the work being

undertaken; and maintaining an academic identity (Vindrola-Padros et al, 2018). The literature also highlights aspects of embedded research initiatives that facilitate change: trusting relationships; shared decision making; clear communication about the focus and function of the embedded researcher's role; and negotiating different understandings of the researcher's role (Cheetham et al, 2018). This literature largely focuses on overviews of the principles of embedded research, and descriptions of individual initiatives and/or the experiences of embedded researchers. There are signs that embedded research initiatives are expressed and operationalised very differently, but there has been little analysis of this diversity. This has resulted in a lack of understanding about what initiatives look like in practice, how and why they are designed as they are, and the implications of different variants.

We present the results of a study that focused on identifying and analysing embedded research initiatives. We draw on published examples of embedded research from different disciplines, and on data collected from embedded research initiatives in health settings across the UK, to outline ten themes that encapsulate the key features of such initiatives. Our focus on health for our empirical scoping work was informed by the increasing popularity of embedded research initiatives in this setting and reflects the source of funding for this research.

Figure 1: Aspects of the CLUSTER method used in our study. Adapted from Booth et al, 2013.

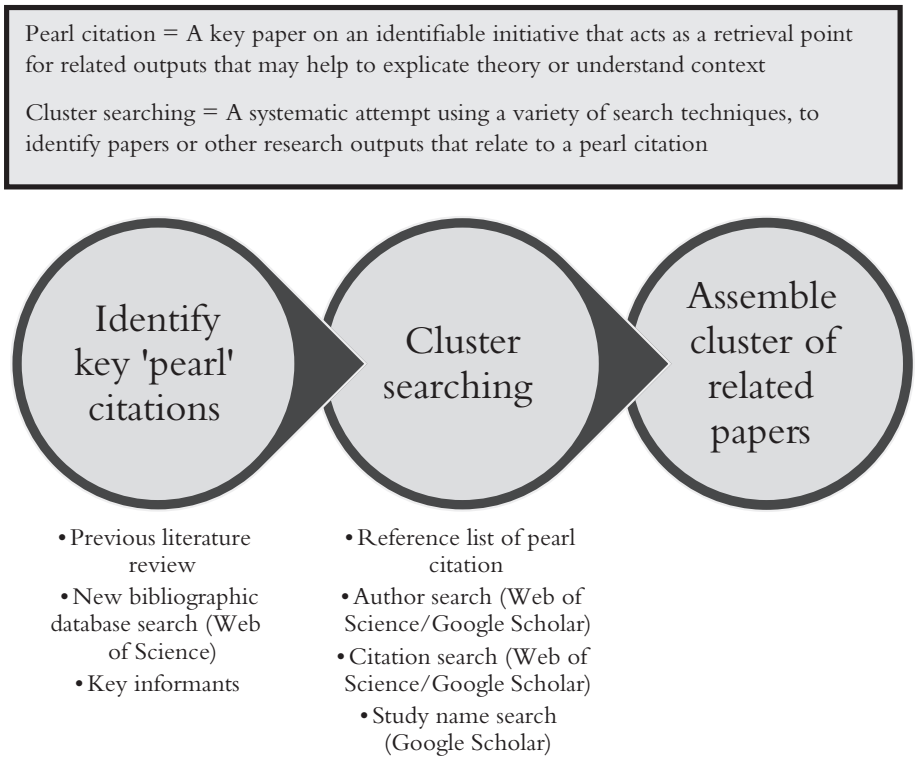


Table 1: Pearl citations search strategy

Search terms (and results)	**Embedded research* (N=49; 11 relevant)** **Research* NEAR/3 residence (N=76; 7 relevant)** **Boundary spanner* (N=130; 1 relevant)**
Search databases	Web of Science all core collection databases
Search dates	2015–January 2018
Inclusion criteria (applied to papers from earlier review, results of new database searches and papers suggested by key informants)	Articles that focus on one or more clearly identified embedded research initiative
Exclusion criteria (applied to papers from earlier review, results of new database searches and papers suggested by key informants)	Did not focus on research/researchers Researchers not embedded in non-academic setting Focus on non-academics acting as boundary-spanners/ intermediaries

Methods

Our study comprised three parts. The first was a review of the theoretical and empirical literatures on embedded research across different disciplines and settings. The second was a scoping exercise of embedded research initiatives in operation in health settings across the UK. The third was a co-production workshop with embedded researchers and their managers. The first and second parts ran in parallel, being mutually informative; the third allowed refinement and some (face) validation of the emergent findings.

Assembling the published literature

For our review of the embedded research literature we used a modified CLUSTER method (Booth et al, 2013). This approach to reviewing complex interventions provides contextual thickness (an adequate description of the intervention and its context) and conceptual richness (the theoretical and conceptual development that explains how an intervention is supposed to work). This level of detail is unlikely to be present in a single publication but may be present in a 'cluster' of related publications and materials. The aspects of the CLUSTER method which we used are outlined in Figure 1.

We began by assembling a database of 45 potential 'pearl' citations from different disciplines including education, health and urban development. We did not limit our searches to healthcare as we were aware of a range of embedded research examples from other settings and fields. In line with the CLUSTER method, each pearl citation focused on a clearly identifiable embedded research initiative (or set of initiatives) and included some description of that initiative. Pearl citations were sourced from a 2015 review of embedded research conducted by members of our wider team (N=17) (Vindrola-Padros et al, 2016); database searches between 2015 and January 2018 (N=19); and personal contact with key informants (N=9). Our aim was to gain an adequate descriptive and conceptual overview of embedded research as a specific type of intervention. Table 1 details our search strategy and inclusion/exclusion criteria.

Having discarded papers that did not focus on a specific embedded research initiative, we grouped those which focused on the same initiative and/or involved the same

Table 2: Embedded research initiatives in health settings across the UK

UK location	Health service setting	Duration	Employment arrangements
South East (N=16)	Community (N=16)	5+ years (N=12)	University (N=23)
Midlands (N=9)	Acute/secondary (N=14)	2–4 years (N=20)	NHS (N=13)
South West (N=6)	Primary (N=9)	12–24 months (N=10)	Joint (N=5)
Wales (N=4)	Multiple (N=6)	12 months or less (N=3)	Other (N=4)
North East (N=3)			
Yorkshire and Humber (N=2)	**Scale of work**	**Status (as at March 2018)**	**Timescale**
Scotland (N=2)	Individual project (N=13)	Completed (N=6)	Fixed (N=25)
East (N=2)	Portfolio of work (N=32)	Ongoing (N=39)	Open-ended (N=20)
North West (N=1)			

authors. This resulted in 26 distinct 'clusters' of papers. We then used forwards and backwards citation tracing and author searches to identify related materials to add depth to each cluster. This resulted in a total of 47 papers across the 26 clusters (see https://doi.org/10.6084/m9.figshare.14268029.v1).

Scoping extant schemes in UK health and healthcare

Our scoping exercise focused on embedded research initiatives in health settings across the UK including public, private and voluntary sector organisations with a role to play in commissioning and/or delivering health services. We used our network of contacts, requests via mailing lists (for example, the NHS CHAIN network), and Twitter posts to identify potential initiatives. We kept our definition broad at this stage to capture initiatives and researchers who defined themselves as embedded. We conducted this scoping exercise in March 2018.

We identified 90 potential embedded research initiatives and used three criteria to determine which were relevant for our study. These focused on identity (were the researchers in the initiative trained and/or experienced in research and seen as a researcher by those in the health setting?); knowledge production (was the initiative designed to produce knowledge which would have direct relevance and applicability to the organisation?); and immersion (were the researchers physically located in the health setting for a significant portion of their working week?). This narrowed our focus to 45 initiatives. While many initiatives had been instigated 2–3 years before our scoping exercise, one dated back as far as 1987 and a further nine started before 2014. A summary of the initiatives is in Table 2, with further details in Appendix B (https://doi.org/10.6084/m9.figshare.14268029.v1).

We constructed a database of documentation on each scheme (total of 236 source items), comprised of publicly available information (for example, from websites) and internal documents including role descriptions, strategy documents, and reports. To deepen our understanding of the varying types of initiative, we conducted telephone interviews with individuals from 12 initiatives, selected on the basis of diversity,

taking into account their setting, longevity, structural features and overall purpose (see Appendix B; https://doi.org/10.6084/m9.figshare.14268029.v1).

Where possible we interviewed an embedded researcher and the manager or instigator of the initiative, conducting 17 interviews in total. Interviews focused on adding depth to our understanding of the intent, structure and processes associated with embedded research initiatives, with the interview guide being developed from the evolving literature analysis.

Analysing the assembled materials

The diversity of our materials (comprising embedded research literature and scoping materials) led us to adopt a framework-based approach to our analysis (Dixon-Woods, 2011; Gale et al, 2013). We began with a detailed reading of the clusters of papers identified during our literature review, with two team members (VW and TT) extracting material relevant to three predefined categories of interest: the theoretical and conceptual underpinning of the initiative (intent); the structural features of the initiative (structure); and the processes and activities undertaken within the initiative (process). The resulting charts served as a basis for further discussion among all team members (VW, TT, BR and HD) during which we developed a series of finer-grained and provisional descriptive themes. Next, we applied these themes to materials gathered during our scoping exercise, using them to produce detailed analytical descriptions of each initiative. Responsibility for this aspect of the analysis was taken by the lead author (VW), and the emerging analytical descriptions were discussed during regular meetings with other team members. During this process we identified additional themes or merged or disaggregated others, until our analytic descriptions stabilised. Finally, we coded the interview data using the same themes, while being alert to the identification of further themes or destabilisation of existing ones. Members of the core analysis group (VW, TT, BR and HD) are researchers in knowledge mobilisation and research use, and have neither led an embedded research initiative nor worked as embedded researchers. This enabled us to maintain critical distance during the analytical process, while our connections to a larger research team (see full author list and Acknowledgements) enabled us to engage in broader sense-checking and discussions about the utility of our themes. Over time we settled on ten themes and a finer-grained set of sub-themes which represented the key features of embedded research initiatives.

Testing the emergent findings with embedded research actors

The third part of our study involved testing and validating our themes and operationalising these into an overarching framework. We held a day-long co-production workshop with embedded researchers and their managers (n=18), that made use of a range of creative activities and was facilitated by an experienced team of researchers in design and health (see Acknowledgements). Activities included commenting and adding thoughts to postcards representing each theme, discussing their relative priority, and building physical three-dimensional models of each theme. Workshop participants confirmed and validated the importance and relevance of all ten themes, but there was no consensus on their relative priority and participants did not perceive a need to rank them. Instead, participants emphasised

Table 3: Embedded research initiatives: design considerations and operational features

Category	Theme	Sub-themes
Intent	Intended outcomes	Knowledge outcomes Capacity outcomes Reputational outcomes
	Power dynamics	Control Contribution Gain Intended effect on power dynamics
Structure	Scale	Scale of work Timescale Team size and composition
	Involvement	Who is involved Scale and location of involvement Type of involvement Involvement mechanisms
	Proximity	Location Intensity Visibility
	Belonging	Boundary management Contractual arrangements Informal arrangements
Process	Functional activities	Range of activities Purpose of activities Training and support for activities
	Skill and expertise	Topic specific Methodological Interpersonal
	Relational roles	Level of interdependence Relational stance Type of input
	Learning mechanisms	Performance monitoring Formal evaluation Informal learning and reflection

the interconnections between themes. These insights were used subsequently to derive practical guidance and web-based tools for those designing and cultivating embedded initiatives (Ward et al, 2021).

Results

The themes and sub-themes are summarised in Table 3. In the following sections we describe each in some detail, providing evidence from our source materials (specific initiatives have been disguised with coded names).

The intent of embedded research initiatives

We identified two themes relating to the underlying intent of embedded research initiatives: the intended outcomes; and the nature of the power dynamics. While the former is often to the fore in discussions about embedded research, the latter often remains obscured.

Intended outcomes

The literature revealed a range of working theories and concepts underpinning embedded research initiatives, which shared a clear focus on the intended outcomes related to knowledge, capacity and reputation.

In line with definitions of embedded research in the literature, the primary intent for many of the initiatives was producing knowledge that would be beneficial within the organisation. Beyond this, we were able to identify two types of knowledge outcome pursued by initiatives: local insights (generated through local service evaluation, service improvement, or practice development activities) and more generalisable knowledge (generated through larger-scale formalised research activities). Some initiatives aimed to produce both forms of knowledge across a portfolio of different projects.

> We just call it research with a big R or research with a small r. So, Research with a big R is probably funded… the small r stuff is more clinician generated… I don't see it as a hierarchy, I almost see it as a journey, a pathway. (Embedded researcher, Crofton)

Capacity development was also a prominent intended outcome of embedded research initiatives, both in the literature and our scoped examples. While the literature shed relatively little light on the precise meaning of capacity development, our scoping materials revealed that changes to capacity were desired at an individual and organisational level and included the capacity to produce knowledge, deliver services and generate income.

> The RiR [researcher-in-residence] role supports scale-up and spread of good practice, in order to share benefits of activity improvement. (Finmoore documents)

> The role is expected to result in:
> - The building of a culture in the locality which values the contribution of participatory evaluation of complex improvement programmes;
> - The building of local capacity and capability for critical evaluation. (Goldpines documents)

Interestingly, the focus of such capacity-building activity was almost exclusively on the health-service setting and there was little consideration of how academics and their organisations could increase their capacity to produce (relevant) knowledge.

While the first two intended outcomes were most prominent in the literature and our scoped examples, some initiatives focused on the reputational outcomes of embedded research. Bate (2000), for instance, notes that investment in his embedded research role represented a hospital's attempt to retain its 'edge' as a nationally-recognised provider of high-quality care. Across our data reputational benefits were understood to stem both from being seen as part of an initiative (signifying a commitment to the production and use of high-quality evidence and knowledge), and from the knowledge generated by the initiative (that could be used to increase or maintain reputation and funding).

> They have used every bit [of evidence] that we've generated, and all of the documents that we've produced sit proudly in the CEO's office and they're given out at all of the events. So, they do really value this as a, almost like a commodity…. It raises the profile of the organisation. (Embedded research manager, Streetsville)

Power dynamics

As with many schemes that focus on the persistent gap between research and practice, many of the embedded research initiatives had an underlying intent to either address power dynamics, explicitly and proactively or, perhaps more often, implicitly and reactively. As a theme, power dynamics were evident in the published literature, such as when Duggan (2014) discusses the way in which embedded research illuminates and problematises the traditional power relationship between the researcher and the researched. Our scoped examples were also shot through with intentions related to power dynamics, even though individuals working them sometimes struggled to respond directly to questions about power.

We identified two aspects of power (who and what) attached to three facets of the initiative (control, contribution and gain). The concerns were: who is in control of the initiative, and what aspects of it are they in control of; who contributes to the initiative, and what do they contribute; and who benefits from the initiative, and what are these benefits?

The first aspect (*who* is in control, contributes and gains?) tended to be reflected in the structure of an initiative, such as employment and funding arrangements. These were usually presented in a factual manner and were not the source of reflection or discussion. The second aspect (*what* is being controlled, contributed and gained?) was the subject of some discussion in both the literature and our scoped examples, and included resources (human and financial) and knowledge.

> Successful research-practice partnerships require co-contribution of resources if the partnerships are to endure… financial and in-kind contributions made by both parties… demonstrated commitment to the partnership and the value of its outcomes. (Wolfenden et al, 2017: 9)

A further way in which power dynamics played out was in relation to the intended effect of the initiative on the 'traditional' roles ascribed to academia and practice, whereby academics are conceived of as knowledge producers, and practitioners as knowledge consumers. Across the literature and our scoped examples we found initiatives that also sought to influence the epistemic positions within healthcare practice (for example, between different groups of healthcare professionals).

> …one of the things that I've ended up being is this kind of weirdly passionate advocate revolutionary on behalf of nurses – because I just think that they're treated like shit basically. And clinical teams talk a big game about being this great high-functioning team, but they don't really mean it – they don't really treat nurses' perspectives or admin perspectives, or anyone who's not a consultant's perspective as valid as their own. And I've ended up fighting for that…. (Embedded researcher, Broderick)

> While the Board might have invited the researchers in as 'experts', the researchers were keen to renegotiate that power relationship by acknowledging the expertise and situated knowledge of all participants. (Cunliffe and Scaratti, 2017: 35)

Actively disrupting power dynamics was rarely the explicit intention of initiatives. While some sought to challenge them by bringing epistemic and other inequalities into focus, others sought to rebalance them by blurring roles and boundaries (for example, by involving healthcare staff in collecting and analysing data). Still others sought to maintain or bolster traditional roles and relationships, or simply left these unaddressed. Indeed, many interviewees found it difficult to respond to questions about power dynamics, or explicitly downplayed their relevance.

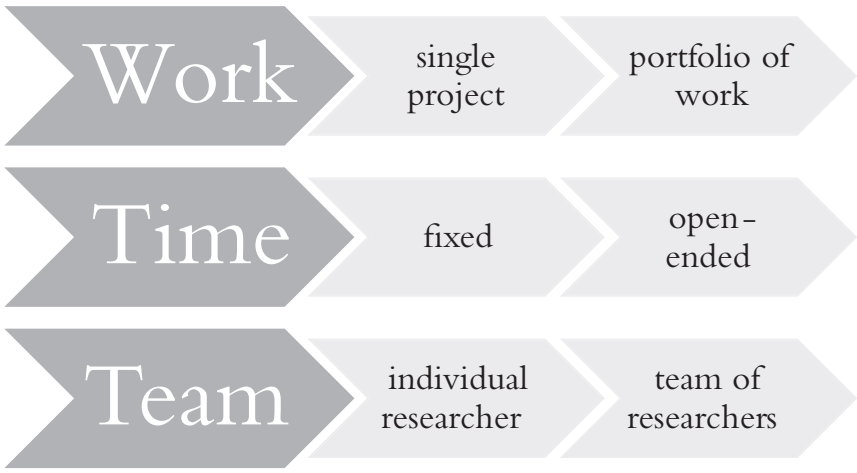
> The main driver especially for my managers is just improving clinical services.... I don't think [the power dynamics] really comes into anyone's thought processes. (Embedded researcher, Barrington)

Our workshop participants, in contrast, suggested power dynamics were an emotive and often painful issue for those involved in embedded research initiatives, using words such as 'emotion-fuelled', 'tension' and 'frustrating'. Further discussion revealed that it was precisely when power dynamics were hidden and/or unacknowledged that significant disruption and frustration was experienced by those involved in the initiative.

The structure of embedded research initiatives

As outlined in Table 2, the initiatives we identified were located in different institutional settings and were structured in diverse ways; such structural diversity was also seen in the literature. We were able to draw out four themes which represent the various structural features of embedded research initiatives: scale, involvement, proximity and belonging.

Figure 2: The operating scales of embedded research initiatives



Scale

The variable scales at which embedded research initiatives were operating was a notable structural feature. Such variation was found in relation to the scale of the work undertaken, the timescale of the initiative, and the size and composition of the embedded research team (see Figure 2).

The work undertaken in early published examples of healthcare-related initiatives was relatively tightly-bounded, mainly comprising individual projects (that is, evaluations of localised services) (Marshall et al, 2014; Eyre et al, 2015). Such initiatives also tended to take place across a well-defined time period with a specific end-date. Data from our scoped examples, however, showed that around half (n=25) had fixed end-dates, and less than a third (n=13) were examples of single projects. Instead, many comprised a portfolio of projects and activities with no fixed end-date. Indeed, many of these initiatives were deliberately emergent in nature.

> This document will not establish the scope of the work and specific project areas…. This may enable the role to be deployed in a range of settings, meeting the demands and needs of frontline services. (Finmoore documents)

Much of the literature focuses on the challenges associated with performing the role of an embedded researcher and the need for ongoing support and mentoring (Duggan, 2014; Rowley, 2014; Marshall et al, 2016). These observations reflect the nature of many of the early published examples of embedded research initiatives, which tend to comprise a lone researcher working outside their usual setting. While we found similar examples, we also identified more recent examples that comprised teams of embedded researchers (Crowe et al, 2017; Wye et al, 2019). Our workshop participants suggested that multidisciplinary embedded research teams, as well as having the potential to address the emotional and practical challenges facing individual embedded researchers, could make an important contribution to addressing the complex issues that face healthcare organisations.

Involvement

Another important structural feature of embedded research initiatives was the involvement of distinct groups of actors. Our data showed that 'involvement' encompassed four sub-themes: who is involved in the initiative; the scale and location of their involvement; the activities they are involved in; and the mechanisms for their involvement.

The very nature of embedded research initiatives meant that all initiatives involved multiple groups of actors. The most obvious groupings were those working in frontline and/or managerial roles within the health setting, and those from academic settings. Indeed, the active involvement of individuals from these groups was often an explicit part of the embedded researcher's role. Patients and members of the public, however, were rarely explicitly involved in the initiatives we uncovered, while published accounts point to dissonance between intended and actual patient involvement (Eyre et al, 2015; 2017; Cunliffe and Scaratti, 2017). Most initiatives that included patients or members of the public limited their involvement to the knowledge work being undertaken (for example, a well-bounded service evaluation or improvement project), instead of involving them in the design or operation of the initiative itself.

> We recruited a service user partner to the evaluation team…. If I'm going to be honest I don't think I would describe her as being involved in my role – more on the project. (Embedded researcher email, Goldpines)

There was a similar picture for other groups of stakeholders. While advisory groups provided a relatively well-worn path for involvement, their contribution usually related to the work being undertaken by the embedded researchers rather than the conceptualisation or operationalisation of the initiative as a whole.

Proximity

Given our focus on 'researcher immersion' as one of the selection criteria for initiatives, and the importance placed on this within the literature, researcher 'proximity' was a key structural feature across our identified initiatives. As with 'scale', we found that 'proximity' played out in three distinct ways: through physical location, intensity, and visibility. As such, this theme of 'proximity' relates to the ways in which various types of proximity are manifest in the structural features of an initiative, rather than how close different partners or settings are to one another.

While being seen as a key enabler of embedded research, the physical location of the researcher varied across initiatives and was not always a straightforward decision. Initiatives comprising a portfolio of projects, or which were more emergent in nature, faced decisions about where and with whom the researchers should be located, what spaces they would have access to, and whether they would work at a single location or across multiple spaces.

> I am evaluating the [area-wide multi-specialty] programme, a partnership of six organisations representing health, social and voluntary care…. Challenges include: where am I embedded? In a team? Or in the space between strategy and delivery? (Goldpines documents)

The contextually-dependent and complex nature of physical proximity was mirrored in arrangements around the intensity of contact between the researcher and those in the health setting. This was also highly variable across initiatives, with the documents we gathered showing that the proportion of researcher time to be spent in the health setting ranged from 20% to 100%. Regardless of these documented expectations, the intensity of contact between researchers and those in the health setting tended to vary over time. Our interviewees and workshop participants suggested a need for greater intensity towards the start of an initiative as relationships were formed and expectations agreed.

The sub-theme of 'visibility' is related to the physical location of the researcher and their intensity of contact but is not merely the result of these structural features. Visibility is more nuanced, and speaks to the profile of the researcher(s) and their embedded research work, and the extent to which they are known and well-regarded within the healthcare organisation and further afield.

> My role has changed quite a bit, so I'm becoming more visible… a lot of introductions from more senior members of staff…. (Embedded researcher, Crofton)

Visibility, then, is a function of the informal, relational work carried out by the researcher and the structural, formal features of an initiative, as well as the import or impact of their activities.

Belonging

Embedded research initiatives can be thought of as a mechanism for bringing together the worlds of research and practice. As such, we identified a number of structural features influencing belonging: boundary management, contractual arrangements, and informal arrangements.

The literature and those we interviewed emphasised the precarious nature of working in an embedded role, and the sense of liminality which can arise from the need to work across (and between) boundaries (Jenness, 2008; Lewis and Russell, 2011; Rowley, 2014). These include the epistemic and functional boundaries between academia and healthcare settings and those that arise between different organisations, professions, teams and priorities within each setting.

> If I'm really honest, this has tested me to breaking point almost, because it's not easy. The University were interested, then they weren't, and then they were – I don't belong to the teaching fraternity, I don't belong to the research fraternity. (Embedded researcher, Finmoore)

Across our data these insights were often used to emphasise the importance of managing boundaries within initiatives, and using a range of mechanisms (formal and informal) to facilitate this.

Embedded research initiatives often made use of a variety of formal, contractual arrangements to enable researchers to belong to and manage boundaries between the worlds of research and practice. Contrary to earlier literature on embedded research (Vindrola-Padros et al, 2016), the initiatives we uncovered rarely made use of joint contracts of employment between academic and health-service organisations (see Table 2). Instead, expectations and agreements about belonging were often documented in memoranda of understanding, funding agreements, and job descriptions.

> This MoU defines the relationship between the parties and sets out roles and responsibilities within this; it sets out how the group will be governed, the duration of the arrangement, principles of working together and agreed terms and conditions. (Garrick documents)

In addition to formal, contractual arrangements, embedded research initiatives made use of a range of informal arrangements to enable researchers to belong to different worlds. These included support networks, mentors and champions. While some initiatives built such arrangements into their structures, it was often researchers themselves who created, sought out or nurtured them.

> There were times when I started that I felt a bit isolated from academia…. And other than [my manager] I was the only person with a PhD, so yeah I did find that a bit isolating, so that's why I went out and asked the Senior

> Lecturer at [University] to be my academic mentor, and they have agreed that I can go and sit in their department. (Embedded researcher, Summerside)

Researchers who lacked formal, contractual links with academia often sought to maintain their links by participating in academic activities such as conferences. These researchers highlighted the importance of being given permission and encouragement to engage in these activities.

> I think it's really, really important that I make sure I keep those links with academia…. I think that's one of the biggest challenges, that if I left and someone else took up this post, I think that they would have to somehow find that academic support…. It doesn't come naturally with this, you have to find it yourself. (Embedded researcher, Bonnyville)

The processes of embedded research initiatives

Just as the embedded research initiatives we identified were structured in different ways, they made use of a wide range of processes. We were able to categorise these into four themes representing the ways in which initiatives play out on a day-to-day basis: functional activities; researcher skill and expertise; relational roles; and learning mechanisms.

Functional activities

Across our data the functional activities being undertaken within embedded research initiatives featured prominently. We were able to discern three sets of insights: the range of activities being undertaken, the purpose of these activities, and training and support for the activities.

The range of activities being undertaken within and across initiatives was varied; job descriptions gathered from our scoped examples often comprised lengthy lists of activities. We were able to discern four types of activity: relational (for example, attending meetings and facilitating relationships); knowledge creation (for example, collecting and analysing data); educational (for example, facilitating a journal club and arranging seminars); and project management (for example, planning, managing and leading individual projects). As well as speaking to the range of activities being undertaken, these categories focused attention on the purpose of activities. In practice, although job descriptions suggested that activities (and their purpose) were relatively tightly-defined, many interviewees suggested that they were fluid and emergent with new opportunities presenting themselves throughout the initiative.

> [The researcher] was attached to long-term conditions group, which was a group that had many, many challenges and many problems, and constant changing of leads. Once she was sitting in on this group, [initially] she couldn't figure out what she was going to do that was going to be helpful for them. (Embedded research manager, Battleford)

Our data showed that there was a tendency for those leading initiatives to be over-ambitious about the activities that researchers should carry out, leading to 'role strain' and contributing to boundary management difficulties (Wye et al, 2019). Our interviewees and workshop participants suggested that focusing on the purpose of activities was an important way of combatting this.

The 'training and support' sub-theme was informed by discussions with our workshop participants and some interviewees, who suggested that training and support could enable researchers to carry out the range of activities required by an embedded research initiative. We found relatively few examples of such training and support for functional activities being provided to embedded researchers, although some researchers accessed these via their informal arrangements for belonging.

> … embedded brokers benefited from allies, champions and 'chaperones' located throughout the host organisations, who… developed the brokers' skills and knowledge in research (management fellows) or commissioning (researchers-in-residence)…. (Wye et al, 2019:12)

Researcher skill and expertise

The necessary skills and expertise of embedded researchers were a frequent preoccupation across our data, and these came in three broad types: topic-specific skills and expertise; methodological skills and expertise; and interpersonal skills and expertise.

Topic-specific skills relates to the clinical or practice-related focus of the embedded research initiative, such as diabetes, neuro-rehabilitation, or childhood obesity. While many initiatives sought researchers with such specific content knowledge, some (particularly those working at larger scales, comprising a portfolio of projects or a team of embedded researchers) prioritised other, more generic, forms of skill and expertise.

> Because we've got such a diverse Trust we have to not be too precious about what subject area we work in. However I think we all have our own expertise in terms of skill set rather than subject. (Embedded researcher, Crofton)

Methodological skills support the ways in which knowledge is created within the initiative, and include the skills needed to define the focus of the knowledge creation activity, to collect and analyse data, and to produce knowledge of different kinds. For many initiatives this type of research 'know -how' was seen as particularly valuable, over and above any topic-specific skills and expertise (Wye et al, 2018: 13).

Interpersonal skills and expertise were seen as highly valuable across the initiatives we identified. All role descriptions listed a range of required interpersonal skills for embedded researchers. These included facilitation skills, communication skills, relationship-building skills and emotional intelligence, and chimed with the emphasis in much of the literature on the social skills and dispositions of embedded researchers (Wong, 2009; Marshall et al, 2014).

> And I think in essence, that sense of genuinely brokering, is being able to… have a meaningful dialogue. (Embedded researcher, Finmoore)

Relational roles

While all embedded research initiatives aim to bring research and practice into a closer relationship with one another, we found that a number of things characterised the type of role that researchers might play. These were the level of interdependence between the researcher and the health organisation, their relational stance and the type of input they provide.

Researchers in the initiatives we identified had varying levels of interdependence with the organisations in which they were embedded. This was expressed in the extent to which they viewed themselves (or were viewed by others) as insiders or outsiders in the health setting, the degree of flexibility and control they had over their work, and the extent to which they were able to access spaces within the health organisation. Their level of interdependence was often reflected in contractual and informal arrangements for belonging and was closely tied to power dynamics. The challenge of managing the boundary between insider/outsider was a common theme.

> … occupying these different spaces with people at various levels meant that I was forced to adopt multiple positions. This meant that I sometimes felt like an outsider, at other times, an insider, while sometimes both or neither simultaneously…. This constant shifting and flux was unsettling in terms not only of the manageability of my position as a researcher, but also of the ethics of how I negotiated my relationships with different participants. (Rowley, 2014: 22)

Researchers adopted a variety of relational stances towards the health setting and those working within it. The literature frequently highlights the role of an embedded researcher as a 'critical friend' who needs to maintain a critical stance towards the health setting (Marshall et al, 2014; Vindrola-Padros et al, 2016). This is usually related to the preservation of academic professional identity which depends on researchers' ability to maintain a critical distance (Vindrola-Padros et al, 2018). Researchers working in some initiatives, however, adopted roles as advocates and supporters, seeking to produce knowledge and operate in ways that would support rather than challenge the organisation. These choices were strongly related to the underlying intent of the initiative.

> … a critical friend needs to be first of all a friend. And it's easy to assume the role of a critical friend where actually your voice is seen as the voice of an outsider. And in reality, it doesn't have weight, because you're seen as someone from the outside looking in and guiding, and instructing, and criticising, and telling. Whereas if you're fundamentally part of the team, and you're seen to be part of them when they're in the trenches, you're there with them…. (Embedded research manager, Summerside)

The types of input provided by embedded researchers also varied across initiatives. Some researchers provided the health organisation with a fresh pair of eyes and a new way of seeing things, bringing insights to help catalyse change (Cheetham et al, 2018). Others provided an additional pair of hands, producing knowledge and evidence to drive the organisations' processes and activities. Still others focused on providing specialist or expert advice (methodological or topic-specific) in a more

hands-off fashion. In line with our observations about functional activities, many initiatives expected more than one type of input from researchers.

Learning mechanisms

One of our aims was to identify examples of evaluative work being undertaken within and between embedded research initiatives, in order to shed light on whether initiatives work as intended. Our data revealed that few initiatives sought to evaluate their effectiveness in achieving their intended outcomes. This gap was particularly prominent in the published literature. Our interviews shed more light on the evaluative and learning mechanisms used within initiatives with these falling into three broad approaches: performance monitoring, formal evaluation, and informal learning and reflection.

Initiatives led by those within a health-service setting tended to make use of performance-monitoring mechanisms including key performance indicators and annual performance reviews (of the embedded researchers). These mechanisms seemed to be used because they fitted into wider organisational governance arrangements that often focused on maintaining funding levels and controlling resource allocation.

> I have to report my team's work quite frequently to the Board of Trustees through my CEO. (Embedded research manager, Streetsville)

Initiatives that were funded and/or controlled by organisations with a strong research focus (for example, national research funders, academic-practice partnerships) tended to make use of formal evaluations. These usually focused on producing an in-depth understanding of how and why the initiative was (or was not) working, and made use of formal evaluation methodologies. Both summative and formative approaches were used, and these often resulted in academic publications.

> Research methods were applied to understand, inform, adapt and assess [the KM team's] impact. This paper draws on multiple sources including brokers' logs, reflective essays and exit interviews; whole team workshops; and independent evaluations of the KM team. (Wye et al, 2019: 7)

Some initiatives made use of more informal mechanisms for learning and reflection. These were usually understood to be developmental and formative in nature and included group or individual supervision, team meetings, workshops and learning sets. The main participants in such activities tended to be embedded researchers themselves, however, and there was relatively little involvement from those leading or managing the initiative.

Discussion and conclusion

The work described provides a detailed analysis of embedded research initiatives, as they are conceptualised and articulated in the academic literature and as they are playing out in UK health-related settings. The underpinning logic of these schemes lies in a wide and interdisciplinary literature that sees effective knowledge production and 'research use' as social, situated and contextually-mediated processes (Boaz et al,

2019). In that sense, embedded research initiatives have a robust and persuasive logic that underpins their conception. They are, however, in need of more systematic and evaluative enquiry, especially as their popularity grows in health and other settings. In this section, we focus on the contributions of our work to current understanding of embedded research initiatives, and discuss the implications for those funding, designing, operationalising and researching such initiatives.

We have surfaced ten major descriptive themes with multiple sub-themes, grouped under the intent, structure and processes of embedded research initiatives. Each theme was clearly seen but variably expressed in both the literature and the data from extant health-related schemes. To date, proponents and critics have tended to talk of embedded research as though it were clearly understood and homogeneous, with comparable intentions, structures and processes (Marshall et al, 2014; Vindrola-Padros et al, 2016). Our themes, however, expose a high degree of complexity and nuance within and between initiatives that has remained hidden. For those involved in the practicalities of funding, designing or running embedded research initiatives our themes reveal the myriad choices to be made at the outset and as the initiative progresses. For those researching initiatives our themes offer a more nuanced framework for description and analysis.

Much of the literature highlights the importance of agreeing and communicating the intention, structure and processes of embedded research initiatives early and clearly (Vindrola-Padros et al, 2018; Wye et al, 2019). Such calls arise from the frustrating experiences of embedded researchers, who often find themselves needing to manage competing demands and expectations and respond to the differing needs, priorities and values of different stakeholders. We suggest that many of these issues stem from the difficulty of identifying and discussing the multiple features of an embedded research initiative, and maintaining coherence across the many aspects of a scheme. Just as our themes provide a framework of choices for designing and operationalising an embedded research initiative, they could help those involved in funding, designing, leading or working in an initiative to surface and discuss their assumptions, priorities and expectations. This could help to prevent many of the tensions that arise, as well as highlighting potential areas of inconsistency. Researchers could similarly use the themes as a framework for analysing and assessing the internal coherence of individual initiatives and the extent to which the various features have been considered by those involved.

To date, the literature on embedded research from health and other settings has tended to focus on individual initiatives and the experiences of embedded researchers. We have lacked both descriptive and evaluative comparisons of embedded research initiatives, making it difficult to assess the potential effectiveness of this approach or ascertain which designs may be preferable for different settings. This is a particular issue for those seeking to commission or operationalise an initiative. One reason for the lack of comparative work is the absence of transparent, detailed and consistent reporting of initiatives. When reviewing the literature, for instance, we found scant description of how belonging was managed and facilitated, or how various actors were involved in initiatives. We suggest that our themes could help those involved in embedded research to more clearly describe their initiatives, in a way that would facilitate further comparative work and provide researchers with the conceptual scaffolding for larger-scale effectiveness studies.

Many embedded research initiatives that we identified appeared to lack clear mechanisms for learning and evaluation. It is increasingly accepted that evaluating complex social initiatives depends on the ability to articulate and link intended outcomes, activities and resources, and that this can support summative and developmental evaluation (Patton, 2011). Just as our themes provide those involved in designing or operationalising initiatives with a mechanism for developing a finer-grained description of their initiative, they provide a basis for articulating the intended outcomes, activities and resources associated with the initiative and building a coherent logic model of how the initiative will work. Armed with such a logic model, those involved in initiatives should be able to more clearly demonstrate the benefits and outcomes of the initiative to their stakeholders.

In sum, we have shown that embedded research initiatives come in a wide variety of shapes and forms. Although initiatives vary in their intent, structure and processes, we have been able to identify ten themes that characterise their features, and then disaggregate these themes to reveal further layers of nuance. These themes are likely to play an important role in further research into embedded research, by increasing clarity and transparency within and between initiatives, and enabling further in-depth understanding and comparison of the potential value of different models of embedded research. The themes also have a range of practical implications for those involved in commissioning, designing or operationalising embedded research initiatives. We address these in a companion paper (Ward et al, 2021), where we describe how these themes have been developed into materials to aid dialogue about the design and management of embedded research initiatives.

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Research ethics statement

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Contributor statement

MM & HD led on the overall project conceptualisation and design;VW led on design and data collection for this work package, with TT, BR and HD providing research capabilities and critical and reflective input throughout; VW led on the manuscript drafting, with critical input from all other Authors.

Conflict of interest

The Authors declare that there are no conflicts of interest.

References

Bate, P. (2000) Synthesizing research and practice: using the action research approach in health care settings, *Social Policy & Administration*, 34(4): 478–93.

Boaz, A., Davies, H., Fraser, A. and Nutley, S. (2019) *What Works Now? Evidence-informed Policy and Practice*, Bristol: Policy Press.

Booth, A., Harris, J., Croot, E., Springett, J., Campbell, F. and Wilkins, E. (2013) Towards a methodology for cluster searching to provide conceptual and contextual 'richness' for systematic reviews of complex interventions: case study (CLUSTER), *BMC Medical Research Methodology*, 13(1): 118. doi: 10.1186/1471-2288-13-118

Cheetham, M., Wiseman, A., Khazaeli, B., Gibson, E., Gray, P., Van der Graaf, P. and Rushmer, R. (2018) Embedded research: a promising way to create evidence-informed impact in public health, *Journal of Public Health*, 40(Suppl 1): i64–70. doi: 10.1093/pubmed/fdx125

Contandriopoulos, D., Lemire, M., Denis, J.L. and Tremblay, E. (2010) Knowledge exchange processes in organizations and policy arenas: a narrative systematic review of the literature, *Milbank Quarterly*, 88(4): 444–83. doi: 10.1111/j.1468-0009.2010.00608.x

Cook, S. and Brown, J.B. (1999) Bridging epistemologies: the generative dance between organizational knowledge and organizational knowing, *Organization Science*, 10(4): 381–400. doi: 10.1287/orsc.10.4.381

Crowe, S., Grieco, L., Vindrola-Padros, C. and Elkhodair, S. (2017) Multidisciplinary embedded research to identify solutions to emergency department overcrowding, *International Journal for Quality in Health Care*, 29(Suppl 1): 55–56. doi: 10.1093/intqhc/mzx125.89

Cunliffe, A.L. and Scaratti, G. (2017) Embedding impact in engaged research: developing socially useful knowledge through dialogical sensemaking, *British Journal of Management*, 28(1): 29–44. doi: 10.1111/1467-8551.12204

Dixon-Woods, M. (2011) Using framework-based synthesis for conducting reviews of qualitative studies, *BMC Medicine*, 9(1): 39 doi: 10.1186/1741-7015-9-39

Duggan, J.R. (2014) Critical friendship and critical orphanship: embedded research of an English local authority initiative, *Management in Education*, 28(1): 12–18. doi: 10.1177/0892020613510118

Eyre, L., Farrelly, M. and Marshall, M. (2017) What can a participatory approach to evaluation contribute to the field of integrated care?, *BMJ Quality & Safety*, 26(7): 588–94. doi: 10.1136/bmjqs-2016-005777

Eyre, L., George, B. and Marshall, M. (2015) Protocol for a process-oriented qualitative evaluation of the Waltham Forest and East London Collaborative (WELC) integrated care pioneer programme using the researcher-in-residence model, *BMJ Open*, 5(11). doi: 10.1136/bmjopen-2015-UCLSymposiumAbstracts.15

Gale, N.K., Heath, G., Cameron, E., Rashid, S. and Redwood, S. (2013) Using the framework method for the analysis of qualitative data in multi-disciplinary health research, *BMC Medical Research Methodology*, 13(1): 117. doi: 10.1186/1471-2288-13-117

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, Thousand Oaks, CA: Sage.

Jenness, V. (2008) Pluto, prisons, and plaintiffs: Notes on systematic back-translation from an embedded researcher, *Social Problems*, 55:1–22. https://doi.org/10.1525/sp.2008.55.1.1

Koon, A., Rao, K., Tran, N. and Ghaffar, A. (2013) Embedding health policy and systems research into decision-making processes in low- and middle-income countries, *Health Research Policy and Systems*, 11: 30, https://doi.org/10.1186/1478-4505-11-30. doi: 10.1186/1478-4505-11-30

Lavis, J.N. (2006) Research, public policymaking, and knowledge-translation processes: Canadian efforts to build bridges, *Journal of Continuing Education in the Health Professions*, 26(1): 37–45 doi: 10.1002/chp.49

Lewis, S.J. and Russell, A.J. (2011) Being embedded: A way forward for ethnographic research, *Ethnography*, 12: 398–416. https://doi.org/10.1177/1466138110393786

Marshall, M., Eyre, L., Lalani, M., Khan, S., Mann, S., de Silva, D. and Shapiro, J. (2016) Increasing the impact of health services research on service improvement: the researcher-in-residence model, *Journal of the Royal Society of Medicine*, 109(6): 220–25. doi: 10.1177/0141076816634318

Marshall, M., Pagel, C., French, C., Utley, M., Allwood, D., Fulop, N., Pope, C., Banks, V. and Goldmann, A. (2014) Moving improvement research closer to practice: the researcher-in-residence model, *BMJ Quality & Safety*, 23(10): 801–05, doi: doi: 10.1136/bmjqs-2013–002779.

Patton, M.Q. (2011) *Developmental Evaluation: Applying Complexity Concepts to Enhance Innovation and Use*, New York: Guildford Press.

Rowley, H. (2014) Going beyond procedure: engaging with the ethical complexities of being an embedded researcher, *Management in Education*, 28(1): 19–24. doi: 10.1177/0892020613510119

Van de Ven, A.H. and Johnson, P.E. (2006) Knowledge for theory and practice, *Academy of Management Review*, 31(4): 802–21. doi: 10.5465/amr.2006.22527385

Vindrola-Padros, C., Pape, T., Utley, M. and Fulop, N.J. (2016) The role of embedded research in quality improvement: a narrative review, *BMJ Quality & Safety*, 26(1): 70–80, doi: doi: 10.1136/bmjqs-2015–004877.

Vindrola-Padros, C. et al. (2018) Addressing the challenges of knowledge co-production in quality improvement: learning from the implementation of the researcher-in-residence model, *BMJ Quality & Safety*, 28(1): 67–73, doi: doi: 10.1136/bmjqs-2017–007127.

Ward, V., Tooman, T., Reid, B., Davies, H., Brien, B., Mear, L. and Marshall, M. (2021) A framework to support the design and cultivation of embedded research initiatives, *Evidence & Policy*, 1–15, doi: 10.1332/174426421X16165177707227.

Wolfenden, L., Yoong, S., Williams, C., Grimshaw, J., Durrheim, D., Gillham, K. and Wiggers, J. (2017) Embedding researchers in health service organizations improves research translation and health service performance: the Australian Hunter New England Population Health example, *Journal of Clinical Epidemiology*, 85: 3–11, doi: doi: 10.1016/j.jclinepi.2017.03.007.

Wong, S. (2009) Tales from the frontline: the experiences of early childhood practitioners working with an 'embedded' research team, *Evaluation and Program Planning*, 32(2): 99–108. doi: 10.1016/j.evalprogplan.2008.10.003

Wye, L., Cramer, H., Beckett, K., Farr, M., le May, A., Carey, J., Robinson, R., Anthwal, R., Rooney, J. and Baxter, H. (2019) Collective knowledge brokering: the model and impact of an embedded team, *Evidence & Policy*, 16(3): 429–52, https://doi.org/10.1332/174426419X15468577044957.

Wye, L., Cramer, H., Carey, J., Anthwal, R., Rooney, J., Robinson, R., Beckett, K., Farr, M., le May, A. and Baxter, H. (2018) Knowledge brokers or relationship brokers? The role of an embedded knowledge mobilisation team, *Evidence & Policy,* 15(2): 277–92, https://doi.org/10.1332/174426417X15123845516148.