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practice

A framework to support the design and cultivation of embedded research initiatives

Vicky Ward, vlw4@st-andrews.ac.uk
Tricia Tooman, trt@st-andrews.ac.uk
Benet Reid, bglr@st-andrews.ac.uk
Huw Davies, hd@st-andrews.ac.uk
University of St Andrews, UK

Breid O' Brien, breid.obrien@nhs.net
Health Innovation Network, the Academic Health Science Network for South London, UK

Liz Mear, e.mear@leeds.ac.uk
Leeds Academic Health Partnership, UK

Martin Marshall, martin.marshall@ucl.ac.uk
University College London, UK

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Background: Embedded research involves co-locating researchers within non-academic organisations to better link research and practice. Embedded research initiatives are often complex and emergent with a range of underlying intents, structures and processes. This can create tensions within initiatives and contributes to ongoing uncertainty about the most suitable designs and the effectiveness of different approaches.

Aims and objectives: We aimed to devise a practical framework to support those designing and cultivating embedded research by operationalising findings from an extensive study of existing initiatives.

Key conclusions: The underpinning research on embedded initiatives – a literature review and scoping exercise of initiatives in health settings across the UK – showed that such initiatives share ten common sets of concerns in relation to their intent, structure and processes. We used these insights during a co-production workshop with embedded researchers and their managers that made use of a range of creative activities.

The workshop resulted in a practical framework (and associated web-based tools) that draw on the metaphor of a garden to represent the growing, emergent nature of embedded research initiatives and the active work which individuals and organisations need to put into planning and maintaining such initiatives. Each of the aspects is represented as a separate area within the

garden using relevant visual metaphors. Building on this, we also present a series of reflective questions designed to facilitate discussion and debate about design features, and we link these to the wider literature, thereby helping those involved to articulate and discuss their preferences and expectations.

Key words embedded research • design framework • knowledge mobilisation

Key messages

- Embedded research initiatives are becoming increasingly popular across public sector organisations.
- There are many choices to be made when designing an embedded research initiative, and fresh challenges and tensions emerge as initiatives unfold.
- We present a structured, multilayered framework to support those designing, analysing and managing embedded research initiatives.
- The framework can support transparency, dialogue, agreement of expectations and ongoing learning within and between initiatives.

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Background

'Embedded research' is increasingly advocated as a powerful way of linking research and researchers with practice and practitioners (Marshall et al, 2014). This is particularly evident in the sphere of health and social care, where greater interaction and dialogue between researchers and those responsible for planning, evaluating and delivering services is seen as a way of developing more effective service delivery (Marshall et al, 2014). While embedded research comes in different forms (ranging from research-practice partnerships to participatory research initiatives), we focus here on initiatives that involve physically locating researchers within non-academic organisations. In this form, embeddedness refers to researchers being 'in residence' within the organisation (Marshall et al, 2014), while 'research' encompasses 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 overall emphasis of such initiatives is the production of knowledge and insights that are relevant, applicable and actionable within the fast-moving and pressured organisations in which the researchers are embedded (Cheetham et al, 2018; Vindrola-Padros et al, 2018).

Despite becoming increasingly popular, designing and managing an embedded research initiative is far from straightforward. Previous research (including our own scoping of embedded research initiatives across the UK) has demonstrated that there is no single model of embedded research, but that initiatives instead come in a wide variety of shapes and sizes and are usually both complex and emergent in nature (Vindrola-Padros et al, 2016; Ward et al, 2021). Those wishing to establish a new embedded research initiative, therefore, face a range of dilemmas and challenges

including the extent to which researchers should be embedded in the non-academic organisation, who should employ them, how to manage the boundaries and (sometimes conflicting) interests of different parties, and how best to respond to the knowledge needs of organisations grappling with complex and changing hinterlands (Duggan, 2014; Rowley, 2014; Vindrola-Padros et al, 2018). Consequentially, those involved in setting up initiatives can find themselves struggling to fully articulate and consider the range of design options which are open to them. This, in turn, can lead to tensions within initiatives due to, for example: the differing (and often unexamined) expectations of different parties (that is, those initiating, funding, managing or working in an initiative); the difficulty of evaluating and demonstrating the value of initiatives (especially to those investing time and/or money); the need to respond to changing internal staffing and external influences; and the difficulty of reconciling diverse and potentially discordant aspects of an initiative with one another (Vindrola-Padros et al, 2018; Wye et al, 2019).

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Table 1: Features of an embedded research initiative

Category	Feature	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

In this paper we present a framework to support those designing, managing and evaluating embedded research initiatives. The framework is based on extensive research that enabled us to tease apart and map the various features of an embedded research initiative (Ward et al, 2021). We begin by outlining that research before describing how we turned our research-based insights into a useful and practical framework. We then present the framework in the form of a visual representation of an embedded research initiative and accompanying materials, including a series of reflective questions. We conclude by drawing on our experiences of being involved in designing and managing embedded research initiatives to discuss the potential utility and value of the materials for others seeking to initiate and cultivate embedded research initiatives.

Developing the framework

As we have documented fully elsewhere (Ward et al, 2021), our research comprised a review of literature on embedded research across different disciplines and settings, a scoping exercise of embedded research initiatives in operation in health settings across the UK, and a co-production workshop with embedded researchers and their managers. In the following section we outline in brief the findings of our research and then describe how the practical framework for designing and cultivating embedded research initiatives was developed.

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The features of an embedded research initiative

During our research we identified ten themes representing the key features of an embedded research initiative. We grouped these under three categories relating to the underlying intent of an initiative, the structural features of an initiative, and the processes and activities involved in an initiative. We also identified a number of sub-themes that teased out the various aspects of each feature. The features and their sub-themes are summarised in Table 1 below, and the genesis and evidencing of these are articulated more fully elsewhere (Ward et al, 2021).

Our research highlighted the ongoing uncertainty about the outcomes and effectiveness of embedded research initiatives (due to a lack of evaluative activity in this area), leading us to conceive of the features as descriptions of the conceptual and operational components that characterise embedded initiatives, rather than prescriptions or recommendations for action. Since each feature describes and illustrates the complexity and nuance of embedded research, we began to see them as a resource for surfacing, describing and discussing aspects of embedded research that sometimes fail to be acknowledged, disaggregated or given due regard. We therefore set about exploring how they could be turned into a set of tools for those involved in designing and cultivating embedded research initiatives, that could facilitate more thorough and reflective planning – and with greater specificity – than is usually the case.

Co-design workshop

Having developed the ten features (and associated sub-themes) of an embedded research initiative, we held a day-long co-design workshop with individuals directly involved in embedded research initiatives in health settings across the UK (n=18).

Participants included those involved in setting up and managing initiatives and the embedded researchers working within them. The purpose of the workshop was twofold. First, we aimed to test, validate and (if necessary) amend the features. Second, we aimed to understand how best to communicate the features and operationalise them into a practical framework for those designing and cultivating an embedded research initiative.

The workshop was designed and facilitated by an experienced team of researchers in design and healthcare (see acknowledgements). The workshop aimed to draw on the expertise of the participants gained through their personal experience of setting up, managing or working within an embedded research initiative. We did not focus on drawing out the personal narratives of our participants, but instead on helping them to explore and interpret their collective experiences, with the explicit aim of producing practical materials for others stepping out on similar embedded research journeys. According to Aldridge (2015), this requires bespoke approaches to facilitating voice through varied media, and the embodying of people's experiences, thoughts and expression in tangible forms (Langley et al, 2018).

Before the workshop, we held and recorded a short webinar to introduce the embedded research features we had identified through our research. Workshop participants were sent a link to the recording and asked to watch it prior to the workshop in order to familiarise themselves with the features. At the start of the workshop we gave a brief five-minute presentation that recapped this material. This was to ensure that we could spend the majority of the workshop engaging in creative co-design activities. After the presentation, participants were asked to add comments, thoughts and questions to postcards which depicted each of the features with a simple icon (for example, a location icon for proximity, a house for belonging). These thoughts were then discussed within small groups before being summarised and fed back to the rest of the group. The aim of this activity was to enable participants to assess and begin to make sense of each of the features. We also asked small groups to explore the relationships between the features and discuss whether some were more of a priority than others, by assembling and reassembling the postcards into different forms (for example, to represent hierarchies, processes or categories). These initial activities resulted in a number of new insights on the features and their relationships including: the emergent and oftentimes under-articulated nature of intended outcomes; the central (yet usually hidden) nature of power dynamics; the sense of 'homelessness' often felt by embedded researchers; the need to consider when and where to involve others in an initiative; the idea of proximity as a *journey* as much as a set of locations; and the need to manage expectations about researcher skills, expertise, roles and activities. In exploring the relationships between the features, participants did not perceive some to be more of a priority than others.

The next section of the workshop focused on visualising the features, drawing on arts-based participatory research approaches. Such approaches typically involve making artistic representations of concepts, ideas and experiences, enabling participants to move towards a deeper shared understanding of those concepts (Younie, 2013; 2014) and to co-create new insights (Langley et al, 2018). While such arts-based approaches are rooted in common childhood experiences of drawing and making, they are largely considered alien in such research settings. This serves as a strength (in that they are equally strange to all) and potentially a weakness (in that they are unfamiliar to all as ways of expressing knowledge). To address this, participants were encouraged to

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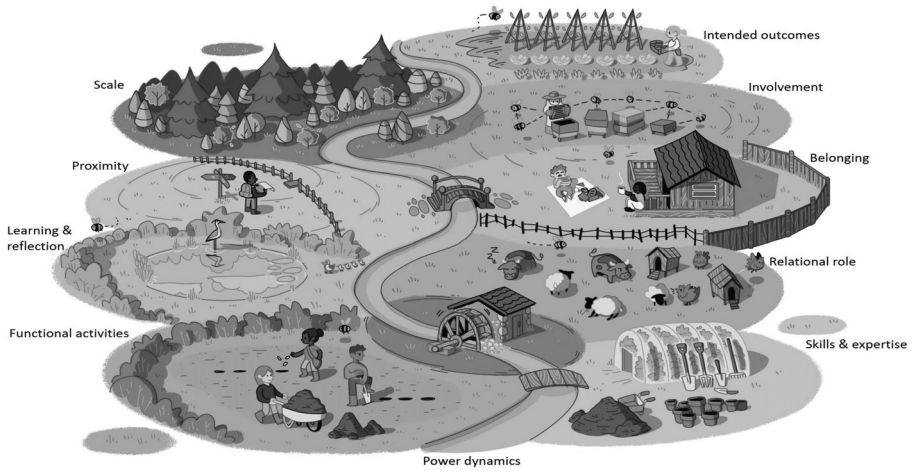
engage in a 'warm-up' activity that involved creating a simple model of a 'nightmare' colleague. This activity was designed to quickly build participants' familiarity with the creative approach and give them a chance to practice visualising their understanding and interpretation of a concept.

Drawing on the principles of Lego® Serious Play® (James, 2015), participants worked individually and then in small groups to produce physical three-dimensional models of the features. Lego® was substituted for other materials (for example, pipe cleaners, card, sponge) that would be more familiar to the majority of our participants and did not require such a high level of manual dexterity. Since our overall aim was to produce practical materials that could be shared widely with those designing and cultivating an embedded research initiative, we also asked participants to create a two-dimensional picture of their model. At the end of the workshop participants displayed their physical models and pictures on tables around the room and described the meaning of these to the rest of the group. We took photographs of the models and drawings and made extensive notes on the descriptions that accompanied them. Recurring metaphors were from the natural world (for example, trees, ferns, ponds, waves, soil), with many participants focusing on ideas of growth, tending and nurturing.

Developing the practical resources

During the workshop described above, we set out to co-design a set of practical resources for those involved in designing or cultivating an embedded research initiative that would help them to understand the different features of embedded research and consider how best to design an initiative to meet their needs. While the workshop validated the features identified during our research, provided us with some powerful metaphors that can be used to describe the features, and coalesced a group of people involved in embedded research initiatives, we nonetheless still needed to do some further work to operationalise the features into a practical framework to support the design and cultivation of embedded research initiatives. This additional work comprised three main activities: first, working with a professional illustrator to develop a single visual representation of the features; second, developing a series of

Figure 1: A visual landscape of the features of an embedded research initiative



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reflective questions to help unpack the features and sub-themes; and third, providing a rich and evidence-rooted explanation of the features and sub-themes that would allow interested parties to track back to the published and grey literature.

To develop the visual representation of the features, we shared photographs and materials from the co-design workshop with a professional illustrator (see acknowledgements) before holding a number of telephone and email discussions. These focused on how to adequately represent the features in a coherent single image that captured both our research findings and the insights from participants at our co-design workshop. Between interactions with the illustrator we discussed draft illustrations and metaphors with members of the wider team and sought further feedback from some of our workshop participants.

To support this visual representation of the framework we also developed a series of reflective questions for each feature, and we constructed more detailed and technical accounts of the features and sub-themes, drawing on our wide range of study materials. These additional materials drew on extensive discussions with members of our wider team and workshop participants, and collectively they provide accessible material on open view at the project website (https://www.embeddedresearch.org.uk).

In the following section we introduce and describe the practical resources in more detail.

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A framework to support the design and cultivation of embedded research initiatives

The process outlined above allowed us to operationalise the insights from our research (that is, the core features of embedded research initiatives) into a three-part practical framework to support the design and cultivation of embedded research initiatives. The framework consists of: a visual representation of the features of an embedded research initiative (Figure 1); descriptive accounts of each of the features (see Table 2 for a truncated version); and a series of reflective questions to help those designing or cultivating an embedded research initiative to consider and discuss these features in more detail (Table 3). A fuller version of the descriptive accounts is available on our project website (https://www.embeddedresearch.org.uk) so that readers can 'drill down' into the nuance, substance and evidencing that supports each feature. Since our workshop participants – and our own research and practical experience – had alerted us to the often emergent and dynamic nature of embedded research initiatives, the potentially complex relationships between the features, and the limited evidence to date on the outcomes of initiatives, we did not seek to create a prescriptive or instructional manual for embedded research initiatives. Instead, the materials are designed to provide a structured way of engaging with the complexities, nuance and multiple choices involved in designing and cultivating an embedded research initiative.

The visual representation of the features of an embedded research initiative is shown in Figure 1. Table 2 provides a descriptive account of each of the features. Drawing on the insights of our workshop participants, we selected a garden as an overarching metaphor to represent the growing, emergent nature of embedded research initiatives, and the active work which individuals and organisations need to put into planning and maintaining such initiatives. Each feature is represented as a separate area within the garden, with relevant visual metaphors as follows:

Table 2: Descriptive accounts of the features of an embedded research initiative

Feature	Description
Intended outcomes	This feature concerns the intended outcomes or benefits of the embedded research initiative. These outcomes are of three broad 'types': knowledge outcomes, capacity outcomes, and reputational outcomes. Knowledge outcomes refer to the types and scale of knowledge to be produced within the initiative. These include insights from local practice and more generalisable knowledge which can be applied to different settings or organisations. Capacity outcomes include the capacity to produce knowledge, to deliver services and to generate income, and can accrue to individuals, organisations or systems. Reputational outcomes are markers of prestige and credibility for the organisations involved in the initiative, and could include increased or continuing funding for research and/or service delivery, involvement in large-scale change or research projects or the number of publications.
Power dynamics	This feature concerns the power dynamics which surround the embedded research initiative, with four elements to consider: control, contribution, benefit/beneficiaries, and the effect of the initiative on roles and relationships. The first three concern the 'what' and the 'who' of an embedded research initiative: which aspects of the initiative will be controlled, and by whom; who will contribute to the initiative and what will their contribution be; who will benefit from the initiative and what will the benefits be. The fourth element refers to the range of intended effects of an initiative on current roles and relationships. These include disrupting/reversing, challenging, rebalancing/equalising, and maintaining current roles and relationships.
Scale	This feature concerns the scale at which the initiative will operate, with three elements to consider: the scale of the work, the timescale of the initiative, and the composition and size of the team. The scale of the work refers to the number and configuration of projects that the embedded research initiative will encompass, while the timescale refers to the length of time needed for this work. For both there are additional questions to consider about the extent to which the work and timescale should be fixed or adaptable/emergent. Team size and composition focuses on the number of researchers who will need to be involved in the initiative and the range of methodological, topic/subject, and interpersonal skills and expertise which will be required.
Involvement	This feature focuses on the involvement of various actors in an embedded research initiative, covering four areas: who to involve in the initiative, the scale and location of their involvement (for example, how involved will each group be, when will they be involved, and for how long), the types of activities they will be involved in, and what mechanisms or approaches will be used to involve them in the initiative.
Proximity	This feature focuses on the embedded researcher(s) and their proximity to the practice context or organisation in which they are to be embedded. There are three aspects to consider: location, intensity, and visibility. Location refers to the physical location of the researcher(s): where (and with whom) they will be located, what physical spaces they will have access to, and how their location will enable their work. Intensity refers to the time which the researcher(s) will spend in the context in which they are to be embedded, and whether this will vary across the duration of the initiative. Visibility refers to the extent to which the researcher(s) and their work will be visible to the organisation and to others working within the practice context, and how this will be facilitated and maintained.

(*Continued*)

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Table 2: *(Continued)*

Feature	Description
Belonging	This feature focuses on how the embedded researcher(s) will belong to the worlds of research and practice, and the arrangements which will support their belonging. It covers three areas: boundary management, contractual arrangements, and informal arrangements. Boundary management refers to the boundaries that embedded researcher(s) will need to cross during an initiative, and how these will be managed. Contractual arrangements formally express the communities and organisations that the researcher will belong (and be accountable) to such as job descriptions, contracts of employment, and governance arrangements. Informal arrangements are those which will support the embedded researcher(s)' sense of identity and belonging during their day-to-day practice, such as a support network of embedded researchers, 'champions' within their host organisation, or opportunities to engage with others within their own academic discipline.
Functional activities	This feature focuses on the specific activities which the embedded researcher(s) will undertake within the initiative. It includes three areas: the purpose and focus of activities, the range and scope of activities, and training and support for activities. Determining the purpose and focus of activities is an important way of narrowing the range of activities which embedded researchers will undertake within an initiative (avoiding the tendency to be over-ambitious about what a researcher can do). The range and scope of activities focuses on considerations around the feasibility, scale and scope of activities, and the extent to which these are emergent or tightly defined. Activities include relational activities (for example, attending meetings, linking people together), knowledge creation and sharing activities (for example, collecting data, facilitating research seminars) and project management activities (for example, managing and leading individual projects). Training and support focuses attention on how embedded researchers will be supported to undertake activities that may be relatively new or unfamiliar to them.
Skill and expertise	This feature focuses on the range of researcher skills and expertise needed to bring about the intended outcomes of the embedded research initiative, and covers three types of skill and expertise: methodological, topic specific, and interpersonal. Methodological skills and expertise include how to define and refine a research question or problem statement, how to design a project, how to collect and analyse information, and how to produce knowledge of varying kinds. Topic-specific skills and expertise refer to knowledge about the topic or problem which the initiative will focus on (for example, neuro-rehabilitiation, childhood obesity). Interpersonal skills and expertise include facilitation skills, communication skills, relationship building, and emotional intelligence.
Relational roles	This feature focuses on how the embedded researcher(s) will relate to the organisation in which they are to be embedded, and the role that they will play within that context. There are three aspects to consider: level of interdependence, relational stance, and types of input. The level of interdependence refers to the relationship between the researcher(s) and the organisation and how they will be seen: as an insider, an outsider, or somewhere between the two. Relational stance refers to the relational position the researcher(s) will adopt: a friendly, safe sounding board, an advocate, critical friend, or evaluator. Types of input refers to the active role of the researcher(s) and what they will provide to the initiative: a new way of seeing things, another pair of hands, specialist or expert advice.
Learning mechanisms	This feature focuses on the mechanisms for monitoring and learning about an embedded research initiative: performance monitoring, formal evaluation, and informal learning and reflection. Performance monitoring refers to mechanisms used to assess how well an initiative is meeting its targets, such as key performance indicators, annual performance reviews, and other governance mechanisms. Formal evaluation focuses on producing an in-depth understanding of how and why an initiative is (or isn't) working. Informal learning and reflection refers to a more emergent type of learning, focused on reflecting on and adapting various aspects of the initiative such as group or individual supervision, team meetings, shadowing, or learning sets.

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Intended outcomes are represented by the range of desirable produce emerging from the garden as a whole.

Power dynamics are seen as a river flowing through the whole space, with the scope to both power initiatives (the water wheel) but also (implicitly) to overwhelm (for example, flooding).

Scale is hinted at by the idea of a wood containing trees of different size, species and maturity.

Involvement uses ideas of the hive (honey bees) to suggest that collective engagement is needed to produce more than individuals can in isolation.

Proximity hints at ideas of distinct choices (the signpost), purposeful navigation (the map) and boundaries to be negotiated (the fence).

Belonging is represented by both a summer house (a structural space for belonging) and a picnic (reflecting informal social spaces for belonging).

Functional activities suggests the range of activities needed for success, their interconnectedness, ideas of investment for the future, and the sometimes toilsome nature of some of the tasks.

Researcher skills and expertise are represented by gardening equipment and tools.

Relational roles playfully suggests that actors from very different backgrounds and abilities may need to find ways to get along!

Learning mechanisms points towards growth (the baby birds), maturity and stillness (the wise heron), and calm reflection (seen here literally but intended metaphorically).

The integrated nature of the overarching metaphor draws attention to the complex interconnectivity of all the aspects; yet disaggregating the overall picture into its constituent parts (as in Table 2) also has value in allowing the teasing out of distinct features and ensuring focused consideration of these. Table 3 goes one step further and lists a series of questions designed to prompt contemplation and discussion of each feature. These questions are designed to be used by those involved in designing or managing embedded research initiatives to prompt further enquiry, articulation, and discussion of key design and/or management issues, both at the outset and as an initiative unfolds.

Clearly, the questions as laid out in Table 3 do not present the last word on how to explore the features. As new or extant collaborations grapple with the concerns laid out, new ways of digging deeper will emerge specific to that initiative. To help this process, the web-based support materials are presented in a multilayered way. First, the overarching visualisation (the garden) is used to introduce the complexity, multifacetedness and interconnectivity of embedded research initiatives. Then individual

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Table 3: Reflective questions to aid discussion and consideration of the features of an embedded research initiative

Feature/theme	Questions for consideration
Intended outcomes	• What type and scale of knowledge will the initiative produce? • What is the scale of the problem which the initiative will tackle? • Whose capability and capacity will be increased? • What types of capability and capacity will the initiative support? • What markers of credibility or prestige will the initiative generate?
Power dynamics	• Which aspects of the initiative will be controlled by whom? • Who will contribute to the initiative and what will their contribution be? • Who will benefit from the initiative and what will they gain? • How will the initiative affect the traditional roles of those who are involved?
Scale	• How many projects or pieces of work will the initiative encompass? • How long will the initiative need to last to accomplish the intended outcomes? • Does the timescale need to be fixed? • How many researchers will be involved? • What methodological, topic/subject, and interpersonal skills are required?
Involvement	• Who is affected by the issues being addressed and/or activities being undertaken within the initiative? • How involved should each group of people be? • When should they be involved and for how long? • What activities will people be involved in? • What mechanisms will be needed to involve people in the initiative?
Proximity	• Where (and with whom) will the researchers be located? • What physical spaces will the researchers have access to? • What proportion of their time will the researchers spend in the healthcare organisation? • Will the intensity of their contact vary across the initiative? • How visible will the researchers be to different parts of the healthcare organisation?
Belonging	• What boundaries will the embedded researcher need to cross? • How will the researcher be supported to cross these boundaries? • What contractual arrangements will be used to facilitate belonging for the researcher? • What informal arrangements will be used to facilitate belonging for the researcher?
Functional activities	• What type of activities will the researcher need to undertake? • Is the proposed range of activities feasible? • Will the activities be fixed or emergent? • What is the purpose and focus of the activities? • What training and support will the researcher need to receive?
Skill and expertise	• What topic specific skills and expertise will be required? • What methodological skills and expertise will be required? • What interpersonal skills will be required?
Relational roles	• How interdependent will the researcher and the healthcare organisation be? • How much flexibility and control will the researcher have over their work? • What stance will the researcher need to adopt and how will they be supported to maintain that stance? • What type of input will the researcher be required to provide?
Learning mechanisms	• What mechanisms will be required to monitor the initiative's performance and targets? •What methods will be required to evaluate whether the initiative has achieved its outcomes? • How will learning and reflection take place within the initiative? • What approaches will be required to develop and adapt the initiative?

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aspects of the garden (the features and sub-themes) can be explored in more detail through the descriptive, evidence-based accounts. Finally, the features and sub-themes can be explored dialogically through use of questions, such as those set out in Table 3.

In the following section we reflect further on the different ways in which the framework could be used, drawing on our engagement with those involved in embedded research initiatives and our own experiences designing and leading such initiatives.

Reflections and discussion

As researchers and leaders of embedded research initiatives we have seen that interest in developing this approach has increased in both the UK and overseas. In UK health and related services alone we identified almost 50 such schemes (Ward et al, 2021), and enquiries we have received from people in health-service settings interested in setting up an initiative show no sign of slowing. Many of those contacting us for advice about setting up an initiative cite their frustration with the often-limited utility and impact of academic research, their desire for better situated and 'useful' knowledge to help them address service delivery issues, and their desire for closer interactions with researchers. While those contacting us recognise embedded research as a promising approach for addressing some of these issues, they often remain unclear about the various possible components of an embedded research initiative, and how to go about designing an initiative to meet their own particular needs. This is compounded by the largely ad hoc and somewhat opaque nature of many of the embedded research initiatives that have been developed by others. We are told that this makes it difficult to see exactly how existing schemes have been designed and developed, for what purposes, and with what obstacles and success.

Recognising these challenges, we have extended our work on the common core components of embedded research initiatives (Ward et al, 2021) to create a multilayered practical framework to guide the design and cultivation of embedded research initiatives. In the following section we discuss how the framework could be used by those wishing to design or cultivate an initiative.

Published experience, as well as our own extensive interactions with embedded research teams, have highlighted the need for clarity within initiatives. A clear and common understanding of the purpose and goals of an initiative, as well as the activities to be undertaken within it, are crucial for all those involved (for example, funders, leaders, managers, and embedded researchers), and can help to avoid many of the tensions that arise when those involved have divergent assumptions (Vindrola Padros et al, 2018; Wye et al, 2018; Wye et al, 2019). The framework we have developed provides a structured way of developing such clarity, as an initiative is first designed and set up. We suggest that the materials can be used to support dialogue and discussion between those involved, and to record decisions taken about the various aspects of the initiative. As well as enabling clarity, using the materials at this stage of an initiative also has the potential to deepen shared understandings, highlight divergent assumptions, and reveal potential (and often hidden) tensions in the proposed design of the initiative. The framework also has value as a tool for revisiting and revising various aspects of an initiative as it matures, and for communicating about the initiative with new partners and stakeholders.

Many of those who have been aware of or involved in our research on embedded research (as participants, co-investigators or interested parties) have told us of the

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difficulties they have faced when trying to recruit embedded researchers to initiatives they have set up or managed. They have reported a number of difficulties, including the challenge of articulating and clearly explaining the purpose of embedded research in recruitment materials, and the difficulty of deciding and articulating precisely what is expected from an embedded researcher. This is often compounded by the view among some researchers that such hybrid or in-between roles can be tantamount to 'career suicide', since embedded research is often not well-aligned to the norms or incentives of academia, and is demanding of time and skills. We suggest that the framework we have developed could also help to address some of these challenges, by enabling those seeking to recruit a researcher to systematically consider and subsequently articulate the purpose of their embedded research initiative, the activities and roles a researcher will need to perform, and the skills that they will need within recruitment materials (for example, adverts, job descriptions and person specifications). A clearer articulation of these elements of an initiative could also help individual researchers to better understand the risks and benefits of being an embedded researcher. To support this use of the framework, we have created a pack of open-source resources for organisations wishing to recruit an embedded researcher (https://www.embeddedresearch.org.uk). The pack consists of template job adverts, job description and person specification, all of which are designed to provide useful pointers for those recruiting an embedded researcher, and to be adapted as necessary.

A final challenge that our framework could help to address is that of evaluation. Embedded research initiatives are often funded by organisations on a relatively short-term, or trial basis, with those leading or managing initiatives facing the challenge of demonstrating the value of embedded research in order to secure ongoing funding. Despite the need for such evaluation, we found that many initiatives did not include clear mechanisms for learning (Ward et al, 2021). Our framework is designed as a tool for determining and articulating the intent, processes and activities involved in an embedded research initiative – all of which are crucial when identifying how best to evaluate an initiative (that is, what to measure and how to measure it) and communicate its value to funders and other stakeholders (Patton, 2011). As such, we suggest that the framework is likely to provide a useful tool for leaders and managers of initiatives needing to report the value of an initiative and its various components.

Finally, it is important to note that we do not conceive of the framework or supporting materials as fixed. While they are intended to convey the main insights from our research, we fully expect that those using them will adapt and amend the materials as necessary to support their embedded research endeavour. Our hope is that these materials will support the careful consideration of how best to design and cultivate an embedded research initiative, both at the outset and as the initiative develops over time.

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Research ethics statement

Research ethics approval was granted through the UCL Research Ethics Committee (dated 8 November 2017; Project ID 11793/001; Title: Optimising the impact of health services research on the organisation and delivery of health services. A study of embedded

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models of knowledge co-production in the NHS ('Embedded')). Health Research Authority (HRA) and Health and Care Research Wales (HCRW) approvals were also granted (updated 1 August 2018; IRAS project ID 241442; Protocol number 11793/001).

Contributor statement

MM and 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; BO'B, LM and MM provided critical review and reflections at all stages of project unfolding;VW led on the manuscript drafting, with critical input from all the other Authors.

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Conflict of interest

The authors declare that there are no conflicts of interest.

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