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Facilitating Public Procurement of Innovation in the UK Defence and Health Sectors: Innovation Intermediaries as Institutional Entrepreneurs

Abstract

This paper investigates how innovation intermediaries promote institutional change to facilitate public procurement of innovation (PPI). Several of the PPI implementation challenges reported in prior research originate in the institutional architecture underpinning demand articulation, and innovation procurement and adoption processes. We conceptualise innovation intermediaries as institutional entrepreneurs who seek to create new institutions or adjust existing ones to support PPI implementation. We report the results of two case studies of intermediaries facilitating PPI in the UK defence and health sectors, respectively. We contribute to PPI intermediation literature by showing that intermediaries address prevalent institutional failures through four types of institutional entrepreneurship activities: boundary spanning; advocacy; design of change; and capacity building. We elucidate, in particular, the role of individuals within intermediaries, as agents who learn about failures and adapt their institutional work over time. In doing so, these managers go beyond the remit and goals of the organisations they represent. The findings add to our understanding of how intermediaries support demand articulation for PPI by showing that their institutional work is also aimed at designing generic methods and processes to improve what is asked for, and how. We furthermore reveal conditions influencing the effectiveness of intermediaries' efforts to realise institutional change, thereby extending research on institutional entrepreneurship in PPI settings.

Keywords: public procurement of innovation; innovation intermediaries; institutional entrepreneurship; institutional change; innovation policy; public procurement

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1. Introduction

Public procurement is increasingly being used strategically to enact innovation policy. This is part of a renewed interest in demand-side policies (Edler and Georghiou, 2007) to stimulate innovation that meets public sector needs and addresses contemporary grand challenges (Schot and Steinmueller, 2018). Public procurement of innovation (PPI)¹, specifically, articulates demand for novel solutions and incentivises their development, adoption and use (Edquist et al., 2015). Research has documented successful examples of PPI and analysed key practices and enabling factors (e.g. Edler et al., 2015; Rolfstam, 2013; Yeow et al., 2015).

Yet, despite these accounts of success, and supportive rhetoric for PPI in both policy and practitioner circles (Lember et al., 2014), on-the-ground implementation remains challenging (Uyarra et al., 2020). Barriers include limited interaction between demand and supply; poor articulation of (future) needs; risk aversion; and counter-productive incentives and governance structures, amongst other issues (Georghiou et al., 2014; Uyarra et al., 2014). Many of these challenges originate in what may be termed the “institutional architecture” (Crafts and Hughes, 2013; Spring et al., 2017) of the public sector context of policy implementation. This architecture consists in institutions – the humanly devised rules, norms, routines and customs that structure incentives and define and regulate interactions (North, 1990) – and the organisations working and interacting within them. Institutional failures can impede the enactment of innovation policies in general, and PPI in particular (Rolfstam, 2013; Selviaridis and Spring, 2022). These effects may be especially strong in well-established markets and organisations (Greenwood and Suddaby, 2006), and often characterise sectors highlighted in the public procurement policy debate, such as defence and healthcare.

¹ We use the term PPI to refer to the placement of an order by public organisations to fulfil certain functional needs through a new or improved product (Edquist et al., 2015). Our research focuses on “direct PPI”, more specifically. This is procurement that directly benefits the buying organisation, as the end user of innovation. It differs from “catalytic PPI” where the need triggering the procurement process resides outside the public buying organisation, who serves as catalyst and coordinator for the benefit of end users (Edquist and Hommen, 2000).

Where the institutional architecture is perceived to inhibit innovation, altering the architecture is necessary for PPI implementation (Uyarra et al., 2020). One way to do this is to use innovation intermediaries (Howells, 2006; Kivimaa, 2014)². Researchers have begun to delineate the role of intermediaries in PPI (Edler and Yeow, 2016) and to define some of the activities undertaken by intermediaries to mitigate the effects of institutional architectures that are unpropitious for innovation (Van Winden and Carvahlo, 2019). We still know little, however, about how innovation intermediaries seek to *change* institutional architectures, and what activities and processes this entails. We therefore build on recent research on institutional entrepreneurship in support of PPI implementation (Uyarra et al., 2020; Uyarra and Flanagan, 2022) by conceiving of *innovation intermediaries* in PPI as institutional entrepreneurs (DiMaggio, 1988). We use this conceptualisation as a basis to better understand how intermediaries may transform institutions to improve the way public organisations ask for, procure and adopt innovation.

Furthermore, although recent studies have improved our understanding of institutional entrepreneurship in PPI settings (Flanagan et al., 2022; Uyarra et al., 2020), little is known about the conditions determining the effectiveness of efforts to realise institutional change and support PPI, especially through intermediation (Elder and Yeow, 2016). We address these knowledge gaps by pursuing two research questions (RQs): *1) How do innovation intermediaries seek to promote institutional change to facilitate PPI implementation?, and 2) What conditions influence the effectiveness of intermediaries' institutional entrepreneurship in PPI settings?*

² An exhaustive review of the rich literature on innovation intermediaries is beyond the scope of this study (for authoritative accounts see, for instance, Howells (2006) and Kivimaa et al. (2019)). Innovation intermediaries include both public and private for-profit organisations with varying missions and objectives (e.g. Van Lente et al., 2003; Colombo et al., 2015). They operate at the demand-supply interface and perform multiple functions such as facilitating interactions and information exchange, reducing cognitive distance between actors, shaping technological visions, providing technical and managerial know-how, and facilitating access to finance (e.g. Bessant and Rush, 1995; Klerkx and Leeuwis, 2008b; Polzin et al., 2016; Villani et al., 2017).

We study the role of innovation intermediaries in the UK defence and health sectors, each of which has a complex and deeply-rooted institutional architecture surrounding PPI. Institutional change in such settings is often desirable but also challenging. These sectors together dominate public procurement in the UK. The UK Ministry of Defence (MoD) spent over £20 billion on procurement in 2019-20, and over the next four years is expected to spend more than £85 billion (HM Government, 2021). Healthcare is the largest area of government procurement spending. In 2018-19, the UK Department of Health and Social Care (DHSC) spent just under £70 billion, most of which was on behalf of the National Health Service (NHS) in England (Institute for Government, 2020). We report on cases studies of two intermediaries, henceforth referred to as Alpha and Beta, which facilitate PPI implementation in defence and health, respectively. Alpha supports the MoD to articulate its needs and requirements and contract for solutions new to the market (Edler and Yeow, 2016), while Beta facilitates the procurement and adoption of technologies which are new to the NHS.

Our study makes three contributions. First, we show the institutional entrepreneurship activities and processes through which innovation intermediaries seek to change the institutional architecture to facilitate PPI. We elucidate, in particular, the role of individuals within these intermediaries, as agents who learn about institutional failures and adapt their institutional work accordingly. In doing so, these managers go beyond the original remit and goals of the organisations they represent. Second, the study extends our understanding of intermediaries' contribution to demand articulation for PPI by showing that their institutional work is also aimed at designing generic methods and processes to improve the way innovation is asked for. Third, we propose a framework of conditions influencing the effectiveness of PPI intermediation, specifically with respect to intermediaries' ability to realise institutional change in support of PPI implementation.

2. Literature review

2.1. Public procurement of innovation (PPI): Rationale and implementation challenges

The role of public procurement as a distinct, demand-side innovation policy instrument is well established in the literature (Aschhoff and Sofka, 2009; Edler and Georghiou, 2007). PPI is particularly well-aligned with two predominant theoretical frameworks underpinning innovation policy design and implementation: systems-of-innovation and transformative change (Edquist and Zabala-Iturriagoitia, 2012; Schot and Steinmueller, 2018). Public buying organisations, as lead customers, coordinate demand, foster interactive learning and provide direction to innovation activity (Edquist and Hommen, 1999; Mazzucato, 2021). PPI seeks to articulate demand for novel solutions that tackle societal problems and improve public services (Uyarra et al., 2020). It also involves activities to support the procurement, adoption and use of innovations (Edquist et al., 2015). Demand articulation is an early-stage PPI activity concerned with what is asked for, and how. It entails interactive learning between producers and potential users of innovations to identify unmet, latent or fragmented needs (Boon et al., 2011), and translate them into specific requirements for market solutions (Boon and Edler, 2018). Procurement tasks include specification setting, exploration of solution options and contracting. Procurement professionals can also support demand articulation and influence the shape of markets, for example by refining specifications to engage a wider pool of suppliers and defining alternative measures of value (Miller and Lehoux, 2020). The adoption stage of PPI refers to innovation implementation and any requirements for technical and organisational adaptations within the buying organisation (Edler and Yeow, 2016).

Despite the support of innovation-oriented public procurement policies internationally (Lember et al., 2014), PPI implementation is fraught with challenges. Prior research has identified several issues (Edquist et al., 2015; Uyarra et al., 2014): a) limited ability to understand and articulate (current and future) needs, b) inadequate understanding of supply

markets and supplier capabilities, c) limited interactions between buyers and suppliers to co-define problems and solutions, d) lack of contracting capabilities, e) poor coordination between different units within the buying organisation, f) risk aversion and lack of incentives for risk-taking, and g) barriers to adoption and diffusion of innovations, including routines and norms embodied in public service delivery systems. Georghiou et al. (2014) have summarised such PPI implementation challenges into four types, including “identification, specification and signalling of needs” and “incentivising innovative solutions”. They propose a framework of PPI policies designed to address these challenges, for example public procurement of R&D to demonstrate solutions and platforms connecting users and suppliers.

Intermediaries can address some of the capability and procedural challenges involved (Edler and Yeow, 2016) by supporting buyers and end-users (e.g. Bessant and Rush, 1995; Hyysalo et al., 2018) and suppliers (Kirkels and Duysters, 2010). Intermediaries contribute to demand articulation as they synthesise and assess diverse requirements through, for instance, building a business case and stimulating experimentation (Boon et al., 2011). They facilitate “conversations” (Uyarra et al., 2017) between buyers and suppliers, which help to identify the actual problems facing buying organizations, leading to refined definitions of needs (Van Winden and Carvahlo, 2019). Intermediaries can also identify and assess supply market options, assist in procurement and facilitate adoption of solutions (Edler and Yeow, 2016).

Intermediation efforts, however, may fail to address some enduring PPI implementation barriers (Edler and Yeow, 2016). Georghiou et al. (2014) conclude that many of the observed challenges are underpinned by “deeper” and “wider” problems such as prioritisation of cost efficiency over innovation, and public sector governance systems that tend to militate against innovation. These issues may explain the relatively low uptake of PPI (Uyarra et al., 2020) and associated practices such as early interactions with suppliers, advanced communication of future needs, and the use of outcome-based specifications (Uyarra et al., 2014). At the heart of

these failures lies the institutional architecture within which intermediaries must operate, and where the potential for change through institutional entrepreneurship exists. In this context, intermediaries can serve as catalysts for change (e.g. in incentives, norms and rules) rather than merely seeking to mitigate the effects of the institutional status quo.

2.2. Institutional entrepreneurship and the role of innovation intermediaries

The ability of organisations to change the institutional architecture is a critical element of the innovation process because institutions can hinder innovation (Edquist and Johnson, 1997).

The literature on institutional entrepreneurship is directly relevant here. It emphasises agency, interests and power as key elements of institutional analysis (DiMaggio, 1988). Institutional entrepreneurs are defined as agents - either organisations or individuals (Battilana et al., 2009) - with a capacity to reflect on the institutional architecture they are embedded in, and take action to adjust institutions or create new ones (Dorado, 2005). They expose problems, imagine desired future states of things and mobilise resources to transition to them (Garud et al., 2007). Institutional entrepreneurship entails institutional work, a broader concept referring to action aimed at creating, disrupting and maintaining institutions (Lawrence and Suddaby, 2006). Work that institutional entrepreneurs do involves activities such as sanctioning new practices and educating actors (Perkmann and Spicer, 2007). For our purpose, we use the terms “institutional entrepreneurship activities” and “institutional work” interchangeably.

We draw, in particular, on two studies in this vein of research to frame our approach. Perkmann and Spicer (2007) identify three types of institutional entrepreneurship activities, each linked to specific skill sets. Interactional activities involve networking, bargaining and the building of (inter)organisational structures, while technical activities entail analysing and theorising change, and designing associated solutions. Cultural activities entail framing problems and solutions in specific ways to elicit support, educating actors and helping to

implement desired changes (Perkmann and Spicer, 2007). These activities are closely associated with certain types of institutional work (Lawrence and Suddaby, 2006). The first category refers to political work, in which actors reconstruct rules, property rights and boundaries that define access to material resources. Example practices include lobbying for resources and promoting agendas, defining boundaries of membership, and creating rules that confer property rights. The second is reconfiguration of normative systems of beliefs through, for example, forming inter-organisational networks to promote and sanction new practices. The third is actions intended to change cognitive schemas e.g. by associating new rules and practices with existing ones, theorising cause and effect relations, and supporting actors to develop know-how to engage with new practices (Lawrence and Suddaby, 2006).

Taken together, the notions of institutional entrepreneurship and institutional work help explain how intermediaries seek to change the institutional architecture to improve the way public organisations ask for, procure and adopt innovation. For instance, institutional work involving problem framing, lobbying, participatory experimentation and demonstration helps to articulate demand for PPI (Flanagan et al., 2022; Uyarra and Flanagan, 2022).

Intermediaries can contribute to these processes, depending on their purposes. The innovation intermediation literature highlights various aims and activities of intermediaries including brokerage (Howells, 2006; Klerkx and Leeuwis, 2008a), knowledge provision (Bessant and Rush, 1995; Stewart and Hyysalo, 2008), end-user-driven demand articulation (Boon et al., 2011), and facilitation of sustainability transitions (Kivimaa et al., 2019; Kivimaa, 2014; Van Lente et al., 2003). Although specific studies (e.g. Kivimaa, 2014) have highlighted intermediaries' roles in disrupting institutions, this literature stops short of analysing the activities and processes through which intermediaries contribute to institutional change.

Institutional entrepreneurship, furthermore, does not necessarily result in the desired institutional change. While the former is necessary to transform the institutional architecture,

the efforts of institutional entrepreneurs can, and often do, fail (DiMaggio, 1988). To analyse the conditions under which intermediaries' institutional entrepreneurship is effective, we define two dimensions that capture underlying issues stressed in prior literature: a) *conditions internal* to the intermediary, which include the intermediary's legitimacy and its various sources (Kivimaa, 2014; Klerkx and Leeuwis, 2008a), remit and positioning (Boon et al., 2011), and resourcing and power issues (Greenwood and Suddaby, 2006); and b) *external conditions*, which refer to the institutional architecture and policy landscape within which intermediaries operate. Key issues include the degree of institutionalisation of the context in which intermediaries act (Perkmann and Spicer, 2007) and policy coherence aspects such as policy continuity and alignment with other areas of policy (Klerkx and Leeuwis, 2008b).

3. Research method

Our research setting is the UK landscape of public-sector innovation procurement, with a particular focus on the MoD and the English NHS as lead buyers and users of innovation. We chose the UK defence and health sectors as suitable contexts to study how intermediaries, as institutional entrepreneurs, support PPI implementation for two reasons. First, both the MoD and the NHS are potent R&D-intensive spenders and have very large procurement budgets. They can stimulate innovation by acting as early customers of novel technologies (Edler and Yeow, 2016; HM Government, 2021). Second, both organisations face challenges in relation to how they ask for, procure, and adopt innovation. These challenges create a need for intermediation and external support in both sectors (Edler and Yeow, 2016; Merindol and Versailles, 2020). Many of these PPI challenges originate in institutional failures in each sector, for instance, stringent defence procurement rules that restrict early engagement with suppliers (Brooke-Holland, 2019) and misaligned incentives and professional norms within the NHS that slow down innovation adoption (Selviaridis and Spring, 2022).

3.1. Case-based research design

Given the scant empirical research on how innovation intermediaries seek to realise institutional change to support PPI implementation, we employed a case study methodology to gain in-depth understanding in context (Goffin et al., 2019). Case-based research permits the exploration of contemporary phenomena and the posing of open-ended, “how” and “why” questions while accounting for the views and experiences of relevant actors (Yin, 2009). A case study approach is suitable for theory-building as it allows iteration between data and the literature in an abductive fashion (Dubois and Gadde, 2002; Ragin, 1992). This abductive approach helped us to develop theoretical insights with respect to innovation intermediaries’ institutional entrepreneurship, and the conditions influencing its effectiveness.

Following a theoretical sampling approach (Patton, 2002), we used two dimensions to select the cases of intermediaries. First, the type of PPI: “triggering” demand for innovation versus “responding” to innovation (Edler and Yeow, 2016). The former refers to solutions *new to the market* where no existing product can meet buyers’ needs. The latter concerns solutions that exist in the market but which are, nevertheless, *new to the buying organisation*. Second, the stages of the PPI process: demand articulation, procurement, and adoption (Edler and Yeow, 2016). Both the PPI type and process stage(s) influence the nature of implementation challenges and underlying institutional failures. The case of Alpha refers to an intermediary’s efforts to address institutional failures related to the way the UK MoD identifies and specifies its (future) needs and requirements and contracts for “new to market” solutions. Unlike the Alpha case where the intermediary’s support to the MoD is UK-wide, Beta assists the NHS in England only. The case of Beta concerns an intermediary’s efforts to shape institutions conducive to fast adoption of SME innovations that are new to the NHS. We selected Beta as a representative case of the intermediation role of Academic Health Science Networks (AHSNs), given their common strategic objectives, remit and operating

practices. Overall, we expected that our theoretically motivated case selection (Goffin et al., 2019) would reveal important insights regarding the rationale for, key activities and effectiveness conditions of innovation intermediaries' institutional entrepreneurship.

3.2. Data collection and analysis

We collected data through a combination of semi-structured interviews, documents and participant observation to achieve triangulation (Jick, 1979) and ensure the validity of our findings. Appendix A outlines the data we collected. We conducted 42 semi-structured interviews across the two cases. For each case, we interviewed senior and middle managers of the intermediaries spanning multiple functions e.g. Managing Director, Chief Operating Officer and Commercial Managers (see Appendix B for the list of interviewees). Buying organisation interviewees included senior managers from procurement and innovation functions. In the Beta case we also spoke to senior managers of SME suppliers supported by the intermediary. In the Alpha case we captured the suppliers' perspective by interviewing two Alpha managers who were seconded from large defence contractors and thus had in-depth knowledge of the defence industry. Our interview guide covered multiple themes (e.g. institutional barriers to PPI, intermediaries' activities and their effects) but it was flexibly used to cater for sector specificities. To triangulate and augment the interview data, we collected and reviewed 55 documents including white papers, project memos and the intermediaries' annual reports (Appendix A). These documents proved instrumental in complementing interviewee accounts of efforts to promote institutional change. For instance, Alpha's series of white papers offered rich insights regarding institutional work related to framing and theorising institutional failures and designing solutions. For the Beta case, we observed two workshops that the intermediary organised for SME suppliers, which helped us to glean detailed insights regarding the intermediary's capacity building activities.

We conducted both within- and cross-case analyses (Yin, 2009). We first analysed each case separately to understand the institutional failures related to PPI facing the MoD and NHS respectively, and to examine Alpha's and Beta's institutional entrepreneurship. Despite sector specificities and some differences in the content of institutional work linked to the type of PPI, we identified theoretically important similarities across the cases, notably four types of institutional entrepreneurship activities: "boundary spanning"; "advocacy"; "design of change"; and "capacity building". Our cross-case analysis also uncovered common conditions influencing the effectiveness of intermediaries' institutional entrepreneurship. We followed Gioia et al. (2013) to code our data. We first used open coding to produce participant-informed codes such as "brokering connections" and "fostering trust and collaboration". We subsequently applied axial coding (Strauss and Corbin, 1990) to group the open codes into a set of second-order categories such as "boundary spanning". Appendix C presents the data coding structure. In line with Gioia et al. (2013), we transitioned from an inductive (first-order codes) to an abductive approach to our coding, as we iterated between our data and prior literature on institutional entrepreneurship and on innovation intermediation (e.g. Greenwood and Suddaby, 2006; Klerkx and Leeuwis, 2008b).

4. Case analysis and findings

4.1. Alpha: Supporting demand articulation and contracting for innovation in the UK MoD

4.1.1. Institutional architecture and institutional failures

The UK MoD recognises the importance of new and emerging technologies (e.g. artificial intelligence, cyber and space) for the modernisation of UK defence (MoD, 2020a) and plans to invest at least £6.6 billion in R&D between 2021 and 2024 (Mills, 2021). The MoD's Head Office approves investment decisions and annual Equipment Plans (Brooke-Holland, 2019), which are then implemented by Defence Equipment & Support (DE&S). DE&S is an arm's-

length body of the MoD and is responsible for procurement, through-life support and decommissioning of a wide range of equipment. It serves the needs of the UK Armed Forces (Royal Navy, Army, Royal Air Force and the Strategic Command), who are the end users and budget-holders, by working closely with them to help them understand their future needs and requirements, and to source solutions accordingly (MoD, 2020b). During this process, DE&S coordinates with the Defence Science & Technology Laboratory (DSTL), an executive agency of the MoD responsible for defence R&D activity (MoD, 2020b).

Defence procurement conforms to the Defence and Security Public Contracts Regulations (PCR) 2011, which set out rules, procedures and controls to ensure competition and value for money for the MoD. Single-source contractual relationships are subject to the 2014 Single Source Contract Regulation: approximately 40% of defence contracts (by contract value) are awarded without competition, for reasons of national security (Brooke-Holland, 2019). The 2014 legislation introduced the Single Source Regulatory Office (SSRO) to manage suppliers' compliance with obligations regarding cost and profit transparency. Defence procurement is structured around the CADMID³ cycle, which covers the development, manufacture and in-service use of equipment and support services. The CADMID process defines two investment appraisal milestones ("initial" and "main" gate) which determine requirements specifications and budgeted costs for equipment procurement projects. A "scrutiny" function is also embedded in the process to review specifications and costs and ensure value for money (Taylor, 2003).

Defence procurement rules, practices and norms can slow down or even impede innovation. The multiple control and approval points embedded in CADMID, and expectations for developing detailed statements of requirements and costs early on in the process, represent a key institutional failure. These rigidities, coupled with the long time

³ CADMID stands for Concept, Assessment, Demonstration, Manufacture, In-Service and Disposal. Procurement and contracting activities typically occur during the Demonstration phase.

frames involved, leave little room to revisit specifications in line with changing technologies and MoD requirements as procurement projects proceed. They also discourage supplier-led innovation (Brooke-Holland, 2019; HM Government, 2021). The Defence and Security PCR 2011 precludes early and close interactions with suppliers, often critical for the development of well-informed specifications of requirements; even in single-source contracts, close engagement and collaboration is deterred by SSRO's focus on competition and controlling supplier costs and profits (Brooke-Holland, 2020). Investment appraisal and scrutiny practices further exacerbate DE&S officials' risk aversion and reluctance to deviate from conventional contracting processes. Procurement and other regulatory constraints (e.g. technology export controls) also contribute to the risk-aversion of defence suppliers who seek clear benefits before committing to large-scale investments. These institutional failures are acknowledged in the UK Government's Defence and Security Industrial Strategy (2021, p.28), which stresses the need to increase *“the pace and agility of the MoD's acquisition process to enable the effective pull-through of emergent technology [...] while it is still technologically relevant. As part of this, the MoD is exploring ways to involve industry partners earlier in the development and procurement processes, to ensure we benefit from innovation and new technology, with greater industry involvement in the development of requirements and end specifications”*.

4.1.2. The creation and role of Alpha

Alpha was established in 2003 by the MoD to provide an impartial, commercially neutral environment where defence supplier employees, MoD staff, DSTL scientists and academics collaborate to address important defence challenges. Alpha was created to address a key failure in the institutional architecture for UK defence procurement: lack of early and close interactions with suppliers and other experts to help articulate MoD's needs and requirements and to contract for innovation. Alpha's remit expanded over the years, from its original focus

on addressing warfighting information challenges, to providing impartial advice on requirements and possible solutions for a wide range of defence equipment procured.

Alpha was a for-profit organisation tied contractually with the MoD. It comprised multiple MoD units as a unified customer, twelve large defence suppliers as core partners, and 163 associate partners including small suppliers, consultancies and universities. The case focuses on Alpha’s activities during its latest contract term (2013-2018)⁴. During that period, Alpha had more than 20 full-time employees and an annual budget of £28 million, and delivered over 240 R&D and demonstration projects triggered by specific problems facing MoD organisations (e.g. the Royal Air Force or DE&S). Project teams were formed depending on the problem being addressed, following a “best athlete” principle (i.e. by choosing the best people in each specialism), from defence suppliers, different MoD units, academia, and other organisations. These individuals were effectively seconded to Alpha for the project’s duration (typically six months). Over the period in focus, Alpha hired almost 1,600 individuals to work on its projects, and organized 116 workshops, attended by more than 3,730 people, to ensure wide engagement with stakeholders and enable collaboration.

Alpha’s projects involved R&D, experimentation, and concept and technology demonstrators. Although these activities are akin to pre-commercial procurement (PCP), Alpha’s remit excluded PCP⁵. Alpha focused on supporting commercial procurement of innovations (PPI) when no existing solutions met the MoD’s needs. Table 1 shows examples of such innovations and explains how Alpha supported their procurement.

[Insert Table 1 Approximately Here]

⁴ The latest contract between MoD and Alpha started in 2013 and ended in March 2018, after which there was a three year pause. In March 2021, the MoD announced the award of a replacement contract to a different private-sector organisation, thereby ending a 15-year contractual relationship with Alpha.

⁵ In the UK defence context, PCP projects are initiated and executed by the Defence and Security Accelerator with the involvement of the DSTL, the MoD’s R&D arm. PCP projects are funded primarily through the UK Small Business Research Initiative (SBRI), a prominent PCP instrument internationally championed by Innovate UK, the national innovation agency (Rigby, 2016; Selviaridis, 2021).

A key operating principle of Alpha was “exploitation” of the results of its R&D and demonstration projects. These outputs were explicitly linked and fed into MoD procurement activity in three ways. First, the project results enabled the MoD to define or refine its needs and requirements and develop industry-informed specifications. This included articulating latent or fragmented needs of end-users across all “Defence Lines of Development” (DLOD), for example, integrating personnel training and logistical support with equipment procurement. The “flight simulator” example in Table 1 shows Alpha’s typical approach. The project enabled early and close interactions between suppliers, end-users and relevant MoD units to investigate a key requirement (extent of full motion) for the new technology. Alpha framed the issue differently (“do we really need sixth-degree fidelity in the flight simulator?”) and ran a concept demonstrator showing that fourth-degree functionality provided the same level of training effectiveness. These insights led to a refined need, reflecting industry expertise and user testing. The fine-tuned requirement informed DE&S’ specifications, resulting in significant cost savings. Second, Alpha’s projects helped to de-risk requirements by testing solution options jointly with suppliers and end-users. For instance, the “future aircraft refuelling” project revealed that MoD’s original operational need for high-tech refuelling vehicles was under-estimated. It resulted in revised requirements (number of new vehicles and maintenance of existing fleet) that reduced operational risk and improved affordability. Third, some of Alpha’s projects led to the adoption of alternative methods (e.g. outcome-based approaches) for specifying requirements, and contracting processes conducive to agility and supplier-led innovation. For example, the “open source intelligence” project led to the adoption of a process with periodic revisiting of system specifications to embed state-of-the-art technologies. The separation between an “innovation” contract and a “service provision” contract enabled procurement agility while ensuring efficiency (see Table 1).

4.1.3. Alpha's institutional entrepreneurship

Alpha's establishment can be seen as a policy intervention to create a new intermediary structure bringing together the MoD, defence suppliers and other expert entities to co-define (future) needs and requirements and assess possible solutions. Table 2 presents Alpha's institutional entrepreneurship and its key achievements, supported by related evidence.

[Insert Table 2 Approximately Here]

Alpha managers initially focused on *boundary spanning* activities. This is in line with the stated purpose of Alpha, that is, to enable early and close engagement between defence suppliers and relevant MoD units, which was indeed achieved through Alpha's projects. Institutional work early on was aimed at designing Alpha's structure and operating principles (see first row in Table 2). Alpha senior managers first sought to establish a membership organisation with clearly defined rights and obligations for participant organisations, including expected contributions to projects and access rights to their outputs. Early tensions included MoD staff concerns regarding the objectivity of projects' results given that suppliers contributed significantly to these projects, and suppliers' perceived risks of sharing knowledge and ideas with competitors. Alpha staff responded to these issues through additional boundary spanning work. Specifically, they developed a set of norms (e.g. "impartiality" and "deep engagement" in projects) that all partners were asked to endorse. In addition to fostering collaboration, some of these norms served to motivate engagement of MoD stakeholders with suppliers during Alpha's projects. For example, adherence to the "impartiality" norm made DE&S staff comfortable to work with suppliers on the basis of the "provision of informed impartial advice". The "deep engagement" principle, on the other hand, assured suppliers that MoD sponsoring units were taking their involvement in projects seriously. Alpha staff also created a special-purpose intellectual property (IP) rights framework to motivate suppliers to share their ideas with competitors and the MoD. This

distinguished between background and foreground IP, thus protecting supplier knowledge while allowing IP from project outputs to be assigned to the MoD. The latter feature served to justify MoD sponsors' investments in collaborative projects run by Alpha. Overall, Alpha managers' boundary spanning work fostered trust and collaboration and enabled the mobilisation of resources for projects.

However, Alpha's boundary spanning activities did little to overcome the rigidity of the defence procurement process and conservative attitudes of MoD procurement staff and potential end-users. Thus, Alpha managers subsequently engaged in institutional entrepreneurship of three types: advocacy, design of change and capacity building (see second, third and fourth row in Table 2, respectively). These occurred in parallel. *Advocacy* entailed Alpha staff lobbying senior MoD officials to adopt more agile contracting, to allow fast integration of technological advances e.g.: *"The resistant one was pretty high up in the Army, I'm just trying to think who I did manage to convince [...] he was the sponsor's boss...we got him on board, we got his boss on board, and we even got the next boss on board [...] So that was up to three star, you know, so he was the man who [had] got [his] hands on the money"* (Programme Lead 1, Alpha).

Design of change included Alpha managers' efforts to abstract and generalise from project-specific experiences to explicate "systemic problems" as institutional failures impeding demand articulation and procurement. Alpha codified knowledge about these problems by progressively grouping individual projects into "programmes" that exhibited common failures. For example, an emergent programme focusing on fast-spin, software-rich innovations emphasised challenges in specifying requirements and embedding latest technologies during the CADMID process. Key artefacts of Alpha's framing and theorisation activity were five "white papers" that Alpha managers produced between 2014 and 2017. These papers framed systemic failures due to the rigidity of the CADMID cycle hindering

supplier-led innovation, and proposed alternative approaches to specification of requirements and contracting. Specifically, the 2014 white paper “Continuous Capability Evolution” promoted three generic principles for identifying and specifying requirements: a) allow for revision of requirements to cater for evolving needs and new technologies, b) engage early with suppliers and end-users to test and de-risk requirements, and c) express requirements in outcome terms to foster supplier innovation and remove cost drivers. It also proposed a defence procurement process free of appraisal “gates” and “scrutiny” functions, to enhance agility and continuous innovation. The 2017 paper “UK Defence Innovation” also theorised on methods for specifying technologically relevant requirements and stressed the need to tackle risk aversion within the MoD. Overall, these white papers reflected Alpha’s efforts to frame institutional failures in particular ways and to argue for institutional changes supporting effective demand articulation and contracting: *It’s part of the white paper that we try to animate the defence landscape for innovation models. So the sort of characterisation that we finally came up with for understanding our models was that it’s essentially operating on [...] a continuous innovation space and with collaboration*” (Technical Director, Alpha).

Capacity building saw Alpha managers seeking to address continuing resistance within the MoD to considering the alternative processes and methods that Alpha was advocating. Alpha managers educated DE&S staff and organised pilots to help the MoD implement these alternative approaches in specific instances (e.g. “open source intelligence” solution). These activities increased MoD awareness and acceptance of these approaches.

4.1.4. Conditions influencing the effectiveness of Alpha’s institutional entrepreneurship

Alpha’s institutional entrepreneurship improved the way the MoD asks for and procures innovation. First, MoD staff became more willing and able to engage early with suppliers and use supplier knowledge and other sources of expertise to inform their specification of

requirements. Second, the MoD adopted Alpha's specification and contracting methods in certain PPI instances. These changes translated into improved MoD procurement (Table 2): better (more intelligent) specifications, reduced cost, and faster procurement and pull-through of innovations. Nevertheless, Alpha interviewees admitted that they had only had limited success in transforming MoD innovation procurement. Table 3 presents the *conditions influencing the effectiveness* of Alpha's institutional work.

[Insert Table 3 Approximately Here]

Internal conditions relate to Alpha's legitimacy and resources. We found that involving a wide range of stakeholders in its projects and being transparent about the projects' results contributed to Alpha's legitimacy. The participation of all relevant suppliers, end users and other experts in Alpha projects increased MoD staff's confidence that the results were objective and relevant. Another source of legitimacy was Alpha's ability to measure and demonstrate the positive effects of its work on procurement processes and outcomes (see Table 3). At the same time, however, Alpha's legitimacy was undermined by perceived ambiguity regarding its role. MoD procurement staff felt they risked losing autonomy and control over contracting decisions and MoD staff more widely contested Alpha's remit and relevance for defence procurement as such – in particular, Alpha's work was seen as “niche”. Overall, Alpha's role was only partly accepted within the MoD. Resourcing issues included the deep expertise and entrepreneurial drive of Alpha's senior managers and the continuity of Alpha's operations. A key factor underlying Alpha's effectiveness was its core team of competent and highly motivated individuals, who had a clear vision to transform defence procurement. Alpha managers were also able to draw on a wide range of external expertise, as required. A limiting factor, however, was the fact that Alpha's funding ceased when its latest contract with the MoD ended in 2018. The subsequent operational gap led to a loss of momentum with respect to the institutional changes Alpha managers had been promoting.

External conditions included the highly institutionalised context within which Alpha operated, and a lack of alignment between UK defence procurement policy and the MoD's innovation agenda. We found that Alpha's effectiveness was limited by persistent institutional failures underpinning defence procurement practice. Specifically, Alpha managers were unable to change rules regarding investment appraisal milestones embedded into the CADMID process, which still restricted opportunities to revisit specifications and costs as the MoD's needs evolved. Another lingering issue was the "scrutiny" rules that militated against agility. These rules explain DE&S's ongoing reluctance to endorse, at scale, the methods for specification and contracting that Alpha advocated. These rules and norms were hard to change e.g.: *"I'd say [the acquisition] process is the biggest block to change, and I actually put process ahead of culture because the process is so hardwired that there are...[it] almost doesn't matter how senior you are, you can't get around it"* (Programme Lead 1, Alpha). Alpha's effectiveness was also reduced by an apparent disconnect between defence procurement policy, where cost efficiency priorities were "baked in" (see the Defence and Security Industrial Strategy quote in Table 3), and MoD innovation initiatives. This disconnect impeded Alpha's efforts to transform the institutional architecture.

4.2. Beta: Facilitating innovation procurement and adoption in the English NHS

4.2.1. Institutional architecture and institutional failures

The NHS spends more than £1 billion annually on R&D (King's Fund, 2018). This, combined with the size of its procurement activity, makes the NHS a lead customer for innovations fulfilling unmet healthcare needs. DHSC is responsible for policy direction and funding of the public healthcare system in England. NHS England and Improvement, an independent, arm's-length body to the UK Government, sets the system's priorities and bears responsibility for health outcomes improvement (NHS England, 2021). NHS governance is characterised by decentralisation and a distinction between commissioning and provision of healthcare.

Commissioners plan and commission healthcare from providers, which include specialist and non-specialist hospitals (NHS Trusts) and general practitioners (GPs). Clinical Commissioning Groups (CCGs) plan and source hospital care and mental health services to meet population needs in their locality. Hospitals are reimbursed based on the care activity they undertake. To relieve capacity pressures in hospitals, the NHS has emphasised out-of-hospital care and embraced remote or self-care service modes which give rise to innovations such as digital apps, remote diagnostics and other med-tech solutions. Technology-based SMEs play an important role in this transition (NHS England, 2019).

NHS procurement activity is distinct from healthcare commissioning. It focuses on the sourcing of goods and services that enable healthcare delivery in hospitals and other settings. NHS Supply Chain is a national actor responsible for managing the supply of eleven categories of products and services (NHS Supply Chain, 2019). This centralised procurement route accounts for about 40% of the annual NHS spend, with the remainder attributed to NHS Trust procurement departments and regional procurement hubs (Department of Health, 2017). The fragmented NHS procurement landscape means that there are multiple entry points for suppliers, especially SMEs. The Public Contract Regulations 2015 set the rules that NHS procurement managers must follow. Decisions to adopt and use novel solutions are typically taken locally and are heavily influenced by clinicians and senior hospital managers.

The slow uptake of innovations within the NHS has long been stressed (Department of Health, 2008; King's Fund, 2018) and is related to multiple institutional failures (Phillips et al., 2007). Medical professionals' culture of organised scepticism, based on a concern about patient safety, leads to a requirement for substantial clinical evidence of efficacy before any adoption decision is made. This attitude, coupled with bureaucratic and multi-layered decision-making processes, slows down adoption (Rolfstam et al., 2011). Clinicians' risk aversion is exacerbated by SMEs' lack of market reputation. These attitudes and practices are

especially detrimental to SMEs with limited cash flow; they are also incompatible with SMEs' fast decision-making and agility to exploit growth opportunities.

NHS procurement rules, practices and norms also impede innovation uptake. The DHSC's Procurement Transformation Programme following the Carter review (2016) emphasises cost efficiency and standardisation in healthcare procurement. Institutionalised annual cost savings targets incentivise procurement teams in hospitals to optimise multi-year contracts with incumbent suppliers and disregard new suppliers and products with higher cost-to-serve. Other NHS England and Improvement rules regarding cost containment, price variation reduction and the use of NHS Supply Chain framework contracts also discourage innovation and discriminate against smaller suppliers (Selviaridis and Spring, 2022). For instance, SMEs face challenges in entering framework contracts given stringent pre-qualification rules (e.g. proven track-record) and narrow re-tendering windows.

In addition, SMEs often fail to grasp the complexity of NHS's governance structure and decision-making processes. Decentralisation makes it harder for innovations to be widely adopted and diffused, even when a novel product is proven to work locally. SMEs face significant scale-up costs since separate testing and marketing efforts are required to sell the product to NHS organisations across hospitals. Activity-based reimbursement rules in hospitals and silo budgeting (e.g. between primary and secondary care) can also disincentivise the adoption of innovations, especially those that transfer activities out of hospitals. All these failures limit the rate of penetration of SME innovations into the English NHS.

4.2.2. The establishment of Academic Health Science Networks (AHSNs) and Beta's role

In 2013, NHS England established fifteen AHSNs as regional health innovation agencies with a stated purpose to support the identification and spread of innovations within the English NHS "at pace and scale" (AHSN Network, 2021). AHSNs bring together various NHS

organisations (e.g. hospitals and commissioning bodies), industry and academia with the aim of improving patient outcomes while generating economic growth. AHSNs were created in response to an expressed need to establish “*a high quality, high value gateway for any NHS organisation needing support or help with innovation, and provide industry with focused points of access to the NHS. Acting as a lead customer, the AHSN would work with industry to scope problems and jointly develop solutions to key health challenges*” (Department of Health, 2011, p. 19). AHSNs are mainly funded by taxpayer money and operate based on a five-year NHS licensing commitment, which was last renewed in 2019.

Beta is one of the fifteen AHSNs, promoting innovation in its designated region. Beta employs more than 75 people ranging from senior managers to functional specialists on patient safety, NHS staff education and business growth. It has an annual budget of approximately £8 million. Beta raises awareness of innovative firms and their technologies, and coordinates multiple NHS organisations on the demand side (e.g. CCGs, hospitals, regional procurement bodies) to accelerate the adoption of novel solutions⁶. Table 4 shows examples of such innovations. These are typically developed by the kind of innovative SMEs Beta’s programmes support. According to our interviewees, these SME solutions are not necessarily ground-breaking but are new to the NHS context. Beta also works with other AHSNs to share best practices, support the adoption of proven innovations nationally, and promote an innovation-friendly culture within the NHS (AHSN Network, 2021).

[Insert Table 4 Approximately Here]

4.2.3. Beta’s institutional entrepreneurship

The creation of Beta and other AHSNs was a policy intervention to establish a set of intermediary entities that “*occupy a unique space outside of the usual NHS service contract*

⁶ The emphasis on innovation adoption is stated in multiple reports that Beta has produced. For instance, Beta’s Annual Report for 2017-18 states that “[Beta] is supporting the adoption and spread of innovation and improvement of healthcare in [its] region”.

and performance management structures” (AHSN Network, 2021). The main purpose was to tackle the “*fragmented, cluttered and confusing*” landscape of NHS innovation (Department of Health, 2011, p. 20) by creating a key point of reference for health innovation. Table 5 presents evidence of Beta’s institutional entrepreneurship and its key effects.

[Insert Table 5 Approximately Here]

In line with the stated purpose of AHSNs, Beta managers initially focused on *boundary spanning* activities. This type of institutional work helped to bring together NHS organisations, suppliers, universities and local authorities to accelerate the adoption of innovation. Early on in this process, Beta managers identified institutional failures specific to SME firms, notably their weak connectivity to hospitals and their limited ability to participate in NHS contracting. Crucially, the original remit of AHSNs made no explicit reference to technology-based SMEs as a source of innovation, but support of this type of firm as (potential) suppliers emerged as an important part of Beta’s boundary spanning and other types of institutional work. Consequently, Beta managers created SME support programmes and tailored their boundary spanning work to address SME-specific failures. In particular, Beta managers facilitated SME interactions with clinicians at hospitals and other care settings to explore how technologies could potentially be used or adapted e.g.: “*We see our companies [SMEs] on the patch and elsewhere developing stuff that can... based on our knowledge of the system, that can support the system and as well as getting it through traditional commissioning and procurement hurdles, and advising and supporting that*” (Assistant Commercial Director, Beta). Beta managers also brokered connections between SMEs and large, incumbent suppliers to the NHS to overcome slow adoption (Table 5). The emphasis on SME support was not intended to favour SMEs over large established suppliers, but rather to create a more level playing-field by addressing institutional failures specific to SMEs.

These progressively customised boundary spanning activities and Beta managers' increasing engagement with SME firms revealed further problems with NHS procurement practices (e.g. use of framework contracts), slow adoption decisions and clinicians' risk aversion. These emerged as significant obstacles to the adoption of SME innovations, and triggered additional institutional entrepreneurship by Beta staff; advocacy, design of change and capacity building, conducted in parallel. *Advocacy* entailed senior managers of Beta using their positions on national and regional committees to raise awareness of SME-specific challenges and lobby for procedural changes. Beta managers emphasise adoption barriers created by stringent rules related to accessing NHS framework contracts e.g.: "*Our Chief Exec sits on one of the procurement boards [...] so we have the ability to try to influence it*" (Commercial Manager 2, Beta). Beta managers' successful lobbying led, in certain cases, to relaxation of pre-qualification rules and standards to facilitate faster integration of SME products into healthcare pathways (Table 5). Beta staff also promote the nationwide adoption of innovations that have strong clinical evidence of efficacy and cost-effectiveness.

Design of change activities by Beta managers aim to overcome adoption barriers e.g. by proposing alternative procurement approaches and addressing misaligned incentives in hospitals. Specifically, Beta managers have promoted the use of the Dynamic Purchasing Systems (DPS) procedure embedded in the Public Contract Regulations 2015. Beta managers saw the DPS approach, which gives public organisations increased flexibility regarding contract awards, as a way to overcome SME innovation adoption barriers related to multi-year framework contracts with narrow re-tendering windows that too often "lock out" innovative small firms. Beta managers essentially sought to frame the use of DPS and SMEs' collaboration with incumbent NHS suppliers as consistent with existing procurement and adoption practices. In addition, Beta staff engaged closely with NHS Improvement and contributed to a project seeking to identify alternative models of hospital reimbursement that

facilitate adoption: “*We are also now working with NHS Improvement and the team that lead on the national tariff to look at why the reimbursement models in the NHS are often the blocker to adoption, because there’s no tariff for something different. If a hospital wants to change, they lose money because they get paid to do it this way and they won’t get paid if they do it the new way*” (Chief Operating Officer, Beta). Similarly, Beta senior managers helped to shape the Accelerated Access Collaborative (AAC)⁷ initiative whose aim is to fast-track the development, procurement and adoption of high-impact innovations.

Beta staff perform *capacity building* activities to tackle the risk aversion and reluctance of clinicians to consider novel products and new (SME) suppliers. In response, Beta organises workshops aimed at educating NHS staff about the process and value of innovation and fostering behavioural change. Beta managers have also invested time in coaching and mentoring SMEs, to overcome the misalignment between the NHS’s culture and operating principles on the one hand, and the mind sets and practices of SMEs on the other. Such education activities also ensure SME compliance with NHS adoption processes.

4.2.4. Conditions influencing the effectiveness of Beta’s institutional entrepreneurship

Beta’s institutional work has helped to change attitudes, within specific NHS hospitals and commissioning bodies, regarding the innovation potential of SMEs. In certain cases, adjustments to supplier pre-qualification rules and the use of flexible procurement methods (DPS) removed procurement barriers facing SMEs. Small firms, on the other hand, increased their knowledge of the NHS market context and NHS-specific adoption processes. These changes led to improved outcomes (Table 5): Beta’s activities helped to introduce 95 novel

⁷ The Accelerated Access Collaborative (AAC) scheme was set up in 2018 in response to the Accelerated Access Review (2016) commissioned by the UK Government to identify ways to improve patient access to innovative medical technologies, medicines and diagnostics products. AAC is a national partnership including the DHSC, NHS England and Improvement, AHSNs, the National Institute for Health and Care Excellence (NICE), the Department for Business, Energy and Industrial Strategy, and pharmaceutical and health industry associations. Its aim is to support the adoption and diffusion of proven innovations into the NHS. The UK Government had initially earmarked approximately £2million to support the adoption of seven ‘rapid uptake’ products relating to treating multiple conditions e.g. cancer and heart disease (AHSN Network, 2019).

solutions into the NHS. In 2019 alone, SMEs supported by Beta secured new NHS contracts worth £2.5 million. Despite these achievements, Beta managers recognised that they had been less successful in transforming procurement and adoption rules and norms so as to enable engagement of a critical mass of innovative SMEs with the NHS. Table 6 presents the *conditions influencing the effectiveness* of Alpha's institutional entrepreneurship.

[Insert Table 6 Approximately Here]

Internal conditions concern the legitimacy and resourcing of Beta. Similar to the Alpha case, Beta's participatory process of identifying and evaluating novel solutions, and its ability to demonstrate its value added, helped to build its legitimacy. Beta managers explained that their openness allowed engagement with a wide range of stakeholders (e.g. clinicians, hospital managers, commissioners and local authorities), who actively participated in assessing promising innovations and generating evidence to support their adoption. Measuring adoption outcomes and showcasing high-impact innovations with a potential for national uptake was another means for Beta to gain acceptance within the NHS (Table 6). However, limited understanding of Beta's role among NHS procurement professionals undermined its legitimacy. Procurement teams at hospitals often perceived Beta's efforts to connect SMEs directly to clinicians and senior managers as inappropriate and risky, in that such connections could compromise independence in making procurement decisions and reduce value for money. Interestingly, this perception regarding Beta's influence over procurement and adoption decisions was not shared by SME suppliers. In fact, some of the firms we interviewed questioned the rationale for Beta's existence given its weak ability to influence decisions and its lack of authority to change procurement rules and practices. With regard to resourcing, Beta's senior management team included highly skilled individuals with long NHS experience and a drive to reform the NHS innovation landscape. Such deep internal expertise, and Beta's ability to use external knowledge, contributed to its effectiveness.

Nevertheless, funding and capacity levels limited Beta's reach and impact e.g. in terms of helping SMEs to overcome procurement barriers.

External conditions included persistent institutional failures that Beta managers encountered and a dissonance between NHS procurement policy and the NHS innovation strategy. Beta's promotion of transformative change supporting large-scale adoption of SME innovation was compromised by the rules, professional norms and behaviours deeply ingrained into NHS processes and practices. Institutional failures that Beta staff did not overcome were clinicians' conservatism, "siloed" decision-making routines that slow down adoption, and NHS procurement rules (for example, regarding cost control) prioritising standardisation and short-term savings over innovation outcomes. All the procurement senior managers we interviewed acknowledged the misalignment between NHS procurement and NHS innovation policies e.g.: *"The main challenge for procurement at the moment is [...] 'a cycle of doom' because basically what happens is they constantly are battered by the fact that they can't get past this annual savings target which is - seems to be - one of the stumbling blocks"* (Assistant Director, Regional Procurement Development Agency).

4.3. Cross-case analysis: intermediaries' institutional entrepreneurship and its effectiveness

Analysis across the two cases uncovers common institutional failures underpinning PPI implementation challenges. These failures pertain to public procurement regulations, public sector governance rules, norms and incentives more broadly, as well as suppliers' mind sets and operating practices. To tackle these failures, intermediaries seek to change the institutional architecture. We identified four generic types of institutional entrepreneurship activities that intermediaries' managers perform: *boundary spanning*, *advocacy*, *design of change* and *capacity building* activities. Crucially, in both cases, such institutional entrepreneurship was not pre-determined by the original remit and goals of the intermediaries

when they had first been established. It rather emerged and evolved as specific individuals within the two intermediaries were learning about prevalent institutional failures and responding to them. For instance, Alpha's series of "White papers" illustrates how the intermediary's managers went beyond their brief to expose and tackle systemic failures related to requirements specification and contracting. Beta managers' increasing focus on SME-specific institutional failures is another example. Our cross-case findings reveal some differences between Alpha and Beta with respect to the kinds of failures they needed to address, and the content of their institutional entrepreneurship. Specifically, Alpha's institutional work targeted failures related to demand articulation and contracting, whereas Beta managers mainly concentrated on tackling innovation adoption challenges.

Alpha managers addressed demand articulation failures in two ways. First, through their boundary spanning-related institutional work, they enabled early and close interactions between defence suppliers, MoD procurement staff, end-users and other experts. The interactive learning generated through Alpha's projects helped to define or refine needs and requirements and informed the development of industry-informed specifications for the procurement of specific innovations. Second, at a more general level, Alpha staff designed and promoted alternative specification methods and contracting processes conducive to agility and supplier-enabled innovation. These were theorised by Alpha managers as generic solutions to failures impacting the MoD's ability to define requirements that reflected industry expertise and users' evolving needs. Advocacy and capacity building were aimed at convincing MoD staff to use these alternative approaches. In contrast, Beta managers focused on failures to adopt SME innovations. Their institutional work included connecting SMEs to clinicians and incumbent suppliers, lobbying for changes in NHS contracting rules and proposing alternative procurement routes, and educating both NHS staff and SMEs to help them change their behaviour.

The cross-case analysis also reveals a set of common conditions and underlying factors that influence, either positively or negatively, intermediaries' effectiveness. Internal conditions pertain to the intermediaries' legitimacy and resourcing. We found that key sources of legitimacy are open, inclusive processes for defining requirements and assessing novel solutions and the ability of intermediaries to demonstrate the value they add. At the same time, perceived ambiguity regarding the role of intermediaries coupled with perceived lack of their authority to change regulations and influence adoption decisions undermined intermediaries' acceptance by buyers and suppliers. With regard to resourcing, the deep, sector-specific expertise of senior managers within the intermediaries and their ability to operate beyond their formal remit contributed to effectiveness, although funding and capacity issues placed constraints on what could be achieved.

External conditions refer to the degree of institutionalisation and policy coherence. In both cases, we found that certain institutional failures persisted despite intermediaries' efforts. The reasons for such persistent failures differed to some extent, however, and such differences can be attributed back to the institutional architecture of each sector. Specifically, in the Alpha case the key source of resistance was the defence procurement process: the long time frames involved in CADMID entail uncertainty and create the need for robust accountability and cost control mechanisms ("scrutiny" and appraisal milestones), which are hard to supplant. In the Beta case, sources of resistance to institutional change extended beyond the ethos of NHS procurement focusing on standardisation and short-term efficiencies. They included professional norms of clinicians and the NHS's decentralised governance which means that adoption decisions are made locally and follow custom-made and rather slow procedures. Policy incoherence also had a negative effect in both cases. Key underlying issues included the misalignment between public procurement and innovation policies, and discontinuity of intermediation operations.

5. Discussion and conclusions

In this section, we revisit the two research questions (RQs) and discuss the research and policy implications and contributions of our study. In response to RQ1, we uncover four types of institutional entrepreneurship activities that intermediaries perform to tackle prevalent institutional failures: boundary spanning; advocacy; design of change; and capacity building. We thus contribute to PPI intermediation literature (Edler and Yeow, 2016; Van Winden and Carvalho, 2019) by showing how and why intermediaries, as institutional entrepreneurs (Dorado, 2005), seek to change the institutional architecture to support PPI, in addition to compensating for capability and coordination limitations of buyers and suppliers.

Intermediaries tackle institutional failures, as the deeper and wider deficiencies (Georghiou et al., 2014) underpinning reported PPI implementation challenges (Uyarra et al., 2014). We position our findings into the framework of PPI policy instruments introduced by Georghiou et al. (2014), who discuss specific policies (e.g., innovation platforms and PCP) designed to address PPI implementation challenges. Building on this framework, we argue that innovation intermediation, as an additional policy instrument, helps to address two types of PPI challenges that Georghiou et al. (2014) identify: “identification, specification and signalling of needs” and “incentivising innovative solutions”. Specifically, intermediaries and their staff address institutional failures related to the articulation and specification of needs and requirements. They also facilitate innovation procurement and adoption, for example by removing contractual barriers facing suppliers, altering incentives structures within the public sector, and seeking to shape innovation-friendly mind sets and behaviours. The exact content of intermediaries’ institutional entrepreneurship activities is determined by predominant institutional failures, as manifested in different PPI types (Edler and Yeow, 2016).

With respect to intermediaries’ contribution to demand articulation for PPI in particular, we find two ways in which intermediaries add value through their institutional

work. First, boundary spanning enables early and close interactions between buyers, suppliers, potential end-users and other expert entities. These project-based interactions generate learning that is used to articulate or refine key needs and develop industry-informed specifications of requirements. Second, through their design of change, advocacy and capacity building activities, intermediaries develop and promote *generic methods* to improve what is asked for, and how. These methods allow for revisiting requirements, de-risking them through joint testing with suppliers and end-users, and using outcome-based specifications to foster supplier innovation and remove unnecessary costs. Intermediaries also design *generic contracting processes* conducive to agility and continuous innovation. These findings extend our understanding of the role of intermediaries in demand articulation for PPI (e.g. Boon et al., 2011; Van Winden and Carvalho, 2019) by showing that intermediaries' institutional work contributes also at a *meta-level*: intermediaries go beyond (re)framing needs and supporting the specification of requirements in specific PPI instances. As the Alpha case shows, intermediaries can also use their accumulated learning across PPI projects to frame institutional failures related to articulation of needs and specification setting, and design generic methods and processes as solutions to these institutional problems.

More generally, our research contributes to innovation intermediation literature (e.g. Kivimaa, 2014; Kivimaa et al., 2019) by showing how intermediaries may seek to change the institutional architecture, and the role of agency and learning in this process. Consistent with the institutional entrepreneurship literature (DiMaggio, 1988), we elucidate the critical role played by individuals within the intermediaries we studied. While both intermediaries were originally established by policies seeking to address recognised failures of coordination and collaboration in each sector, the observed institutional work was not embedded into the intermediaries' remit from the outset. Institutional entrepreneurship thus entails more than the creation of (intermediary) organisations (cf. Perkmann and Spicer, 2007). The intermediaries'

staff went beyond the original remit and goals of their organisations. They sought opportunities to adjust rules, norms and practices, or to create new ones, as they learned about distinctive failures in the institutional architecture and how to overcome them. In both cases, initial boundary spanning activities were refined and augmented. Boundary spanning work was followed by advocacy, design of change and capacity-building activities. These occurred in parallel, in response to emerging procurement barriers and wider issues related to public sector culture and governance systems. This evolutionary account of innovation intermediation, with staff learning while interacting with the institutional architecture and developing responses, also reveals the potential role of intermediaries in compensating for policy design failures. Policy interventions can “plug in” new structures or processes which, for various reasons, may not be integrated neatly into existing institutional architectures (see Georghiou et al., 2014). In this context, intermediaries and their staff work to “correct” institutional failures and misalignments they identify as they go along.

With respect to RQ2, we revealed four conditions influencing the effectiveness of intermediaries’ institutional entrepreneurship: legitimacy and resourcing, as two conditions internal to intermediaries, and the degree of institutionalisation and policy coherence as external ones. For each condition, we identified and analysed underlying issues and causes. For example, the intermediaries’ legitimacy is linked to the use of inclusive processes to engage with all relevant stakeholders; the ability of intermediaries to demonstrate their positive impacts on PPI processes and outcomes; ambiguity regarding intermediaries’ role and activities; and limits to intermediaries’ remit and level of influence.

Building on the cross-case analysis, we propose a framework of effectiveness conditions (Table 7), thereby responding to Edler and Yeow’s (2016, p. 424) call to better understand “*the conditions that determine the effectiveness of intermediation*”.

[Insert Table 7 Approximately Here]

In addition to the distinction between internal and external conditions, the framework considers the inputs, activities, and outputs of innovation intermediation, as a policy subject to evaluation (HM Treasury, 2011). Input-oriented conditions refer to resources dedicated to intermediation, whereas process-based conditions refer to the activities through which intermediaries fulfill their roles. Output-oriented conditions refer to what intermediaries achieve and how buyers and suppliers benefit as a result. The framework offers insights about how each condition can be met. For example, we identified multiple sources of legitimacy, some of which pertain to intermediaries' activities and others to their outputs. Specifically, inclusive processes of intermediation and unambiguous positioning can help to increase legitimacy based on the way innovation intermediation policies are implemented: that is, input-based legitimacy (Boon and Edler, 2018). Legitimacy of intermediation can also be based on the social acceptance of its intentions and outcomes – output-based legitimacy (Boon and Edler, 2018). This requires defining clearly the intended roles and effects of intermediaries, to minimise perceived risks of loss of autonomy within buying organisations and misconceptions about intermediaries' statutory powers. It also requires an ability to demonstrate the value added by intermediaries in terms of PPI processes and outcomes.

In contrast to prior literature (e.g., Greenwood and Suddaby, 2006; Klerkx and Leeuwis, 2008b), we show that the effectiveness of intermediaries depends on their ability to operate beyond their formal remit, especially when lacking the statutory powers to reform relevant rules and regulations. This, again, demonstrates that intermediation policies should allow for learning and the correction of failures over time. Our findings also suggest, however, that intermediaries' institutional entrepreneurship may not fully achieve the desired change. We thus extend research on institutional entrepreneurship in PPI settings (Flanagan et al., 2022; Uyarra et al., 2020; Uyarra and Flanagan, 2022) by uncovering factors limiting intermediaries' ability to reform the institutional architecture in support of PPI

implementation. Notably, we identified persistent institutional failures and sources of resistance to wide-scale institutional change which can be traced back to the “maturity” of institutional conditions (Perkmann and Spicer, 2007) in the defence and health sectors.

Although our findings are grounded in the UK public sector, their policy implications are significant and relevant internationally, not least due to the size of defence and healthcare procurement in many OECD countries and the potential of these sectors to play a leading role in stimulating technological innovation. Intermediation structures and support activities offer a policy tool for addressing many of the PPI implementation challenges that OECD countries are facing e.g. risk aversion, resistance to change and management and coordination issues (OECD, 2017). Many of these challenges originate in institutional deficiencies of a regulatory, procedural or cultural nature. Our research offers insights regarding the role of intermediaries in tackling such institutional failures to support PPI enactment. This role is also relevant in European Union (regional and urban) policy settings, as recent research has also shown (Uyarra and Flanagan, 2022; Van Winden and Carvahlo, 2019).

Our findings show that policy interventions to establish new (intermediary) structures which are meant to fill gaps in the institutional architecture can, at least initially, fail to generate the desired effects. Institutional entrepreneurs, as agents who interact with the architecture and learn, can be instrumental in addressing failures in an evolutionary fashion. This suggests that establishing new organisational structures is not a panacea – policies targeting intermediation to facilitate PPI implementation must allow for feedback mechanisms (Rodrik, 2008), such as the ones our research highlights, to address possible misalignments in the institutional architecture. Policy makers should also reflect on how broadly (or narrowly) PPI intermediation initiatives should define the remit of intermediaries-as-new-structures, and how this relates to the roles and activities of individuals within intermediaries and to opportunities for institutional entrepreneurship.

The study also suggests that perceptions within public buying organisations and suppliers that intermediaries lack the requisite legitimacy or level of influence can compromise the effectiveness of intermediaries' institutional work. Policy makers should consider ways of reinforcing the institutional entrepreneurship efforts of innovation intermediaries and their key staff. One way could be to grant them more powers, especially in the case of public sector-affiliated intermediaries. This could include an expanded remit or even a mandate to shape and direct wider institutional changes to improve PPI effectiveness and help build capacity in the long run. For instance, the intermediaries we studied seem to be well-placed to help address some of the misalignments observed in the UK public sector e.g. between innovation and procurement policy goals. More needs to be done also to raise awareness within large public sector organisations of the intermediaries' role and activities. This is important given perceptions of intermediaries as "outsiders" who can compromise autonomy and value for money, and a limited understanding of their intended effects by buyers and suppliers. In addition, continuity of interactions between intermediaries and the public bodies they support is imperative if lasting institutional changes are to be realised.

Our empirical research focused on the UK defence and healthcare sectors, which admittedly differ in terms of governance structures and regulatory frameworks, thus potentially limiting cross-case comparability. Nevertheless, the insights we offer regarding institutional failures, institutional entrepreneurship and its effectiveness conditions were common across the two cases, which reinforces the validity of our findings. The UK sectors in focus are highly institutionalised settings. Future research focusing on sectors or places featuring less mature institutional architectures could help extend our understanding of institutional entrepreneurship for PPI. One exciting avenue is to study in detail how intermediaries help to shape markets for emerging technologies (Uyarra and Flanagan, 2022), for example by filling in regulatory voids. Further research on effectiveness conditions of PPI

intermediation is also needed to examine how resistance to institutional change can be overcome. This could help resolve an intermediation paradox: while failures in the institutional architecture justify the creation of intermediaries, the very same failures limit their effectiveness (Klerkx and Leeuwis, 2008b). We are hopeful that our study provides a sound basis for future research on how and when innovation intermediaries can promote institutional change to support PPI enactment and institutionalisation.

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Appendix A. Data collection methods and activities

Cases	Data collection methods	Data collected	Key themes covered /induced
Alpha	Semi-structured interviews	- 8 interviews with Alpha staff (e.g. Managing Director, Technical Director, Programme Leads) - 2 interviews with MoD DE&S managers (Innovation Lead and MoD Liaison Manager for Alpha)	defence procurement process and deficiencies in rules, regulations and norms; Alpha's institutional interventions and support to implement new approaches; effectiveness and impact of Alpha's work; MoD's view of Alpha role and value added
	Documents	25 documents including Alpha's series of white papers, Alpha project memos, Alpha's performance review reports, MoD case studies of Alpha's work and DE&S presentation regarding R&D exploitation and innovation procurement	Alpha staff's theorisation regarding institutional failures; framing of failures and proposed solutions; development of new approaches and working methods for specification and contracting; Alpha's impact on procurement performance and extent of institutional change realised; persisting issues and challenges
Beta	Semi-structured interviews	- 7 interviews with Beta staff (e.g. Chief Operating Officer, Assistant Commercial Director, Commercial Managers) - 5 interviews with NHS procurement professionals (e.g. Procurement Directors at NHS Trusts and Assistant Director at Regional Procurement Development Agency) - 20 interviews with small suppliers /innovators (founders and chief executives)	Institutional barriers to innovation adoption in the NHS; failures related to procurement rules and practices; Beta's activities to support innovative SME suppliers; Beta's institutional interventions to facilitate procurement and adoption; SME suppliers' and NHS procurement managers' perceptions of the role and impact of Beta
	Documents	30 documents including Beta's annual performance reports, AHSN Network impact reports, NHS procurement policy reports, documents on procurement practices used by NHS Trusts, supplier presentations, and reports on NHS innovation adoption challenges	Effectiveness of Beta's work regarding procurement and adoption of SME innovations; Beta's involvement in developing new processes and incentive structures; persisting institutional barriers and Beta's workarounds
	Participant observation	Two Beta workshops (two hours each) targeting SME suppliers were observed. The workshops focused on "NHS governance structure and key priorities" and "NHS procurement overview and how to sell into the NHS", respectively. Detailed field notes taken and complemented by memos written by the first author.	Beta's education and coaching activities for innovative SMEs; Beta managers' efforts to frame new approaches as being consistent with existing processes (e.g. SMEs selling their novel products via incumbent NHS suppliers); SME suppliers' perceived barriers to procurement and adoption of their novel solutions

Appendix B. The list of interviewees per case study

Case study	Organisation	Interviewee role	# Interviews
Alpha case	Alpha	Managing Director	2
	Alpha	Delivery Director	1
	Alpha	Technical Director	1
	Alpha	Programme Lead 1	2
	Alpha	Programme Lead 2	1
	Alpha	Project Manager	1
	MoD DE&S	Innovation Lead, DE&S Technology Office	1
	MoD DE&S	MoD Liaison Manager for Alpha	1
Beta case	Beta	Chief Operating Officer & Associate Commercial Director	1
	Beta	Commercial Manager 1	2
	Beta	Commercial Manager 2	1
	Beta	Commercial Manager 3	1
	Beta	Commercial Manager 1 & Business Engagement Manager, University A	1
	Beta	Commercial Manager 1 & Health Innovation Project Manager, University A	1
	NHS Trust 1	Procurement Director	1
	NHS Trust 2	Head of Procurement & Commercial Finance	1
	NHS Trust 3	Head of Procurement	1
	NHS Trust 4	Deputy Finance Director	1
	Regional (NHS) Procurement Development Agency	Assistant Director	1
	SME 1	CEO	1
	SME 2	Chairman & Head of Innovation	1
	SME 3	Managing Director	1
	SME 4	Operations Manager	1
	SME 5	Managing Director	1
	SME 6	Sales Manager	1
	SME 7	Project Manager	1
	SME 8	Chief Technology Officer	1
	SME 9	Chief Executive	1
SME 10	Healthcare Director	1	
SME 11	Managing Director	1	
SME 12	Managing Director	1	
SME 13	Managing Director	1	
SME 14	Head of Sales & Business Development	1	
SME 15	Managing Director	1	
SME 16	Managing Director	1	
SME 17	CEO	1	
SME 18	Co-founder & Director	1	
SME 19	Managing Director	1	
SME 20	CEO	1	
Total number of interviews			42

Appendix C. The data coding structure

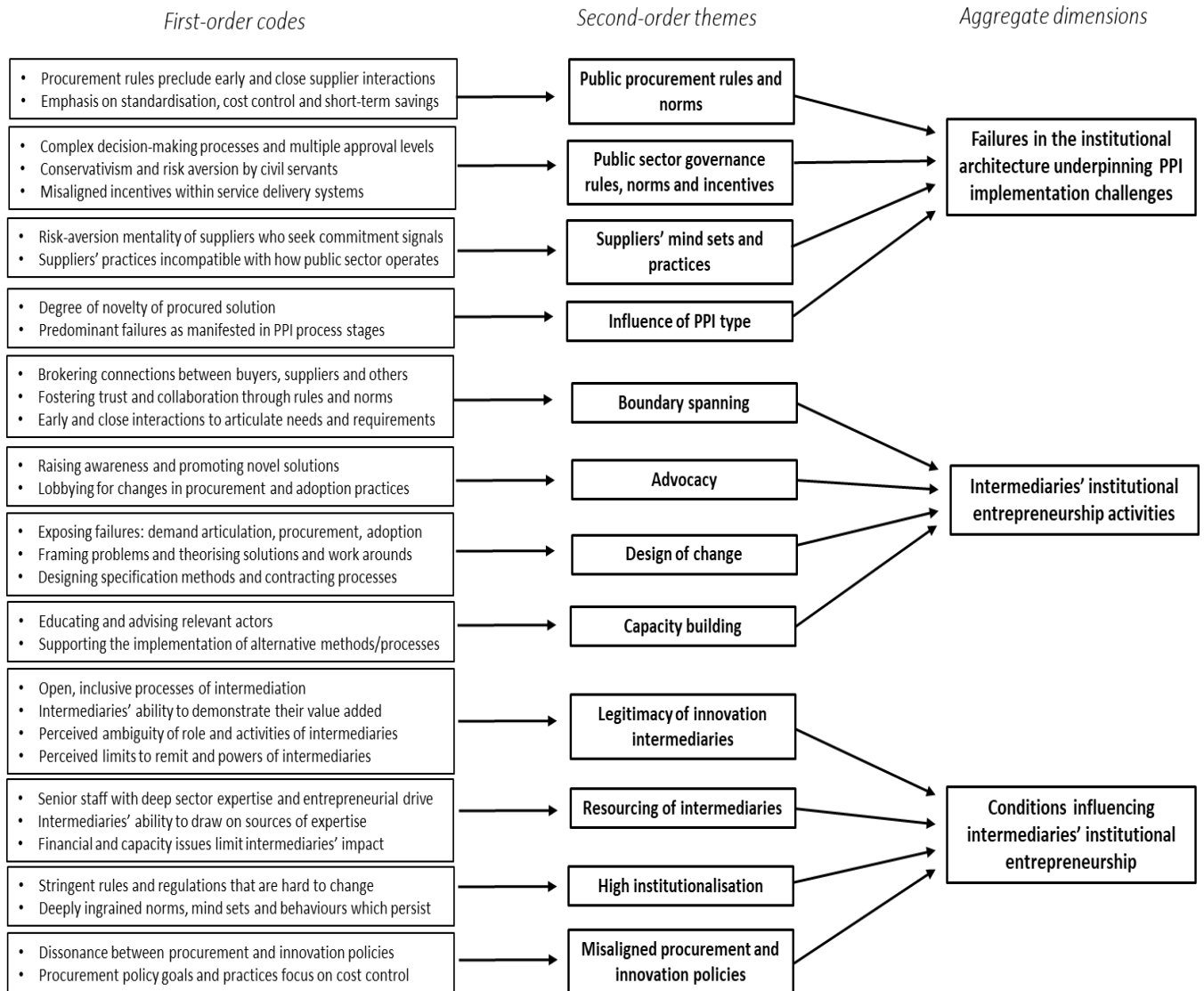


Table 1. Examples of innovative solutions whose procurement Alpha supported

Innovative solution	Stakeholders involved in Alpha project(s)	Brief description of Alpha project(s) and support activities
<p>Open source, cyber intelligence solution: technology allowing for the collection and analysis of publicly available (cyber) information to support counter-terrorism and other security operations</p>	<p>Relevant suppliers</p> <p>Experts from UK intelligence agencies (as possible end users)</p> <p>MoD Informations Services and Systems unit (end users and sponsors)</p> <p>MoD DE&S (procurement)</p> <p>Academic experts</p>	<p>Alpha ran a capability concept demonstrator to help articulate technical requirements for an open-source solution, and to explore technology options. The Alpha project team researched the functionality of the system and set key requirements, considering the needs of the intelligence and MoD user communities. The demonstrator used experimental ‘sprints’ and technology ‘scrums’ to identify and assess key technology options, which would also cover system maintenance and upgrade aspects.</p> <p>Alpha also advised the MoD on how to revisit specifications and contract for the new solution, distinguishing between a ‘service provision’ and an ‘innovation’ contract (with flexible use of budget). It engaged closely with industry experts and end-users to assess the operation and upgrading of the system over time.</p>
<p>Flight simulator solution: helicopter pilot training technology with new full motion platform capabilities</p>	<p>Relevant suppliers</p> <p>Joint Helicopter Command; Air Command; pilots (end users)</p> <p>MoD DE&S (procurement)</p> <p>Academic experts</p>	<p>Alpha’s project investigated how many “degrees of freedom” (extent of full motion functionality) the new flight simulator should have in order to offer sufficient sensory experience and effective training for helicopter pilots. Alpha conducted R&D and a capability concept demonstrator proving that 4 degrees of freedom (reduced functionality of motion cues embedded in the simulator) provided the same level of training effectiveness, thereby questioning the assumption of the conventional approach of using full motion platforms with 6 degrees of freedom.</p> <p>The results were subsequently used by the MoD to refine its requirements and fine-tune the specifications, leading to significant cost savings.</p>
<p>Future aircraft refuelling capability: technology to replace current vehicle-born aircraft refuellers with a next generation aircraft refueller system</p>	<p>Relevant suppliers</p> <p>Air Command (end users)</p> <p>Air Investments Approval Committee (end users and sponsors)</p> <p>MoD DE&S (procurement)</p>	<p>Alpha’s project sought to articulate updated requirements for refuelling capability and generate and assess solution options (e.g. new pumping equipment) and their costs, in collaboration with vehicle manufacturers and service providers. The results showed that the original MoD plan to procure high-tech refuelling vehicles would leave an operational gap, as the need was higher (335 vehicles) than originally defined.</p> <p>The revised requirement was accompanied by proposed changes in business models and contracts for service provision of the existing fleet. Alpha’s work reduce financial and operational risks and helped to avoid (capital equipment) costs.</p>
<p>Mission-critical training capability: technology for mission-specific training to support “command and control” capabilities of brigades on operation in foreign lands</p>	<p>Relevant suppliers /service providers</p> <p>MoD Army unit (end users)</p> <p>Army officers (end users)</p> <p>MoD DE&S (procurement)</p>	<p>The project included simulation to articulate key requirements for the training environment e.g. operation room layout and links to training documents. Concept demonstrators were used to assess two possible technology options: virtual and web-based solution. End-user feedback led to the selection and further development of the web-based option.</p> <p>These activities helped to develop industry-informed, “pan-DLOD” requirements and led to the development of outcome-based specifications.</p>
<p>Development of cyber security capability: technology for step-change improvement in MoD’s cyber operations and cyber security capabilities</p>	<p>Relevant industry experts and suppliers of cyber solutions</p> <p>MoD cyber capability community (end users)</p> <p>DSTL</p> <p>MoD DE&S (procurement)</p>	<p>Alpha conducted technology demonstrator projects to help inform and define the needs of MoD’s cyber operations, and to develop and de-risk possible solutions. The projects led to articulation of key requirements such as MoD cyber skills and competences; quantification of cyber attack risks that would justify MoD investments; technical aspects of cyber operations; and performance metrics for assessing supplier provision of cyber.</p> <p>The demonstrators helped to assess solutions and resulted in refined specifications and a new approach to procuring cyber capability.</p>

Table 2. Institutional entrepreneurship of Alpha’s managers: Activities and key achievements

Institutional entrepreneurship	Alpha’s activities / key achievements	Example technologies /projects /artefacts	Indicative interview quotes /document excerpts
Boundary spanning	<p>Alpha managers enabled, through their projects, early and close engagement between defence suppliers, end-users and relevant MoD units. They established an organisation with clearly defined rights and obligations and a two-tier membership: ‘Partners’ (12 firms including all major defence suppliers) and ‘Associates’ (163 organisations including SMEs, defence specialists, and consultancies).</p> <p>In response to early tensions and concerns, Alpha created:</p> <p>a) A set of norms of conduct: Impartiality, Deep engagement in projects, Exploitation of project results, Quality and Independent assurance of work.</p> <p>b) A special-purpose property rights framework (“foreground IP” vs. “background IP”) that offered full protection of suppliers’ ideas to motivate them sharing knowledge with competitors and with the MoD.</p>	<p>All Alpha projects were designed to foster early and close interactions with suppliers and other experts to inform requirements specification and contracting e.g.:</p> <ul style="list-style-type: none"> - Developing cyber security capability project - Future aircraft refuelling capability project - Flight simulator technology project 	<p><i>“The [Alpha] patnership consists of more than 170 organisations including MoD, DSTL, major defence contractors, SMEs, technology specialists, consulting companies and academic institutions [...] engagement of the whole partnership on every project is vital. This engagement is critical in the [Alpha] approach to providing impartiality in its three key services: 1) generation of evidence for decision makers, 2) advice on applying industrial experience within the defence context, and 3) practical innovation” (excerpt from the document “[Alpha]: Collaborate, Innovate, Accelerate”, p.2)</i></p> <p><i>“One of the key principles of the [Alpha] way is exploitation. We’re able to support that because the foreground IP is owned by MoD. And there are mechanisms to preserve background IP and people can bring background IP to the table. It’s all within an existing framework, so we understand the rules that are going to be applied to handling their own IP [...] what you end up with is a quite effective, efficient way of doing things that has its own properties (Technical Director, Alpha).</i></p>
Advocacy	<p>Alpha senior managers lobbied MoD officials regarding the required changes in defence procurement and contracting norms and practices.</p> <p>Advocacy efforts focused on the need to adopt a more agile and innovation-friendly approach to procurement which allows for quick adaptation and upgrading of solutions in line with changing MoD requirements and technological advancements.</p>	<p>Open source (cyber) intelligence project</p> <p>Mission-critical training capability project</p> <p>Development of cyber security capability project</p>	<p><i>“So we had to take MoD and different stakeholders to MoD to that point of completion without being involved in [procurement]. So part of the clue about where we thought this could go was services based mentality and creating the dynamism through a spaced operation” (Programme Lead 2, Alpha).</i></p> <p><i>“We ended up saying [to DE&S] “what we think you need to do is think about having one contract which is a service provision contract”, which is governed by the normal measures of success...quality of service, availability, downtime...responsiveness. And you might then also want to have another contract which is for what we call an innovation partner” and the innovation partner’s job is solely to go out and look for what you might call disrupters. New technologies” (Delivery Director, Alpha)</i></p>
Design of change	<p>Alpha managers sought to abstract and generalise from project-specific experiences regarding challenges facing the MoD in demand articulation and procurement processes. Alpha designed solutions to tackle systemic problems related to lack of agility and innovation in the defence procurement cycle.</p> <p>Alpha wrote and published a series of “White Papers” as key artefacts of such theorising. These papers framed problems in particular ways (see above) to expose key institutional failures</p>	<p>Alpha’s “Continuous Capability Evolution” approach to defence capability acquisition</p> <p>Alpha’s series of “White papers”:</p> <ul style="list-style-type: none"> -“Continuous capability evolution” -“Holistic complex system intervention evaluation” -“Styles of architecting: A smarter approach to architecting the defence enterprise system” 	<p><i>“Problems with traditional defence acquisition and technology development: [...] the standard lifecycle [CADMID] is clearly a long drawn-out process with many stages and many opportunities for things to go wrong” (excerpt from the Alpha white paper “Continuous capability evolution”, p. 8-9)</i></p> <p><i>“[The white papers] got people to accept that there was a bigger picture, a strategic systemic picture to address [...] it changed the way that the Alpha partnership board related to the MoD. It started to become much more about change as opposed to projects...it was heading in the right direction of encouraging people to think “actually,</i></p>

	<p>(e.g. rigidity of defence procurement rules and norms) and to theorise on required change and propose solutions accordingly.</p> <p>Alpha managers abstracted from project-specific experiences to develop and promote generic methods and processes for requirements specification and contracting.</p>	<p>-“Defence capability coherence” -“UK defence innovation: Design and implementation of a system to realise value through exploitation of novelty”</p> <p>Alternative methods for identifying and specifying requirements: a) periodic review of requirements, b) use of outcome-based specifications, c) joint testing of requirements with suppliers and end-users to de-risk them, and d) consideration of requirements across all DLODs.</p>	<p><i>we can change things; we can do things differently.” (Managing Director, Alpha)</i></p> <p><i>“[...] in having learnt that lesson...we went for outcome-based [specifications], and the advantage of that in talking to industry is “yes you tell me what you want to achieve, and I’ll tell you how to do it. I can then innovate to my heart’s content, and if you give me a contract which says ‘maintain this service over five years’, then when I’ve got a better technology for you, or a more cheaper technology for me to maintain.” (Programme Lead 1, Alpha)</i></p>
Capacity building	<p>In certain cases, Alpha managers convinced relevant MoD stakeholders to test alternative, novel procurement and contracting approaches and supported their implementation</p> <p>Alpha managers provided advice and educated DE&S and other MoD staff regarding the use of these approaches.</p>	<p>Open source (cyber) intelligence project</p> <p>Mission critical training capability project</p> <p>Development of cyber security capability project</p>	<p><i>[...] one of the things really [Alpha] does is help us understand how the industry sense is on how something would work [...] you have much more of a collegiate view on how would you do this; how would you take this forward; is there a market for it; is there a supply chain for it? (Innovation Lead, DE&S Technology Office)</i></p> <p><i>“So we were able to persuade the acquisition people down in Bristol that, actually, we weren’t just a bunch of swivel eyed venal industry players. That we had worked extensively with this customer. We’d proved the hypothesis and we’d done a lot of the work that they would normally have wished to do to prove their acquisition strategy was not too risky” (Delivery Director, Alpha)</i></p>
Effects of institutional entrepreneurship	<p>Increased willingness and ability of the MoD to engage early and closely with defence suppliers to inform MoD’s definition of requirements and development of specifications.</p> <p>Improved specifications of requirements: informed by industry state-of-the art knowledge and addressing pan-DLOD requirements of end-users.</p> <p>MoD adoption of agile procurement approaches and novel contractual models in certain procurement instances.</p>	<p>Documented effects on MoD procurement process and outcomes (2013-2018):</p> <ul style="list-style-type: none"> - Improved specification statements in 163 Alpha projects - Estimated cost avoidance benefits for the MoD in the order of £1.89 billion - Accelerated procurement and adoption of innovations in 131 Alpha projects 	<p><i>“The level of ambition, innovation and programme agility from [Alpha] and its aggressive pace of delivery and support has ensured that the MoD knows what it wants and how to acquire it. The real value that has been added by [Alpha] has been the ability to draw on subject matter experts from across the partnership, who have brought not only technical expertise, but a willingness to fully immerse themselves in the relevant areas, sometimes to our initial discomfort, but always to our benefit” (MoD report on its contract with Alpha, March 2018).</i></p> <p><i>“We were recommending in that case [open source intelligence solution] a service delivery contract which was incentivised to deliver the service, a separate contract to provide an innovation function that was embedded effectively within the capability in order to, if you like, separate the day-to-day operations from the innovation function [...] it was implemented” (Technical Director, Alpha).</i></p>

Table 3. Conditions influencing effectiveness of Alpha’s institutional entrepreneurship

	Effectiveness conditions	Underlying issues	Indicative interview quotes /document excerpts
Conditions internal to intermediary	<p>Legitimacy of intermediary</p> <p>Resourcing of intermediary</p>	<ul style="list-style-type: none"> Alpha’s inclusive approach enables involvement of all relevant stakeholders to define or refine requirements and assess solutions Alpha able to measure and demonstrate its positive effects on MoD procurement process Fear of loss of autonomy by MoD procurement staff due to limited understanding of Alpha’s role and activities Perceived limits to remit and relevance of Alpha’s activities (“niche”) Alpha core team consisted of highly skilled, experienced individuals with a vision to drive change Alpha’s ability to draw on external expertise as and when needed Alpha funding ceased after contract end 	<ul style="list-style-type: none"> “We feel one of the things which [Alpha] does is it’s a much more objective view [...]you’re not getting one person’s opinion...of how they would do it if they were asked to supply it. You get much more of an objective and industry-wide view” (Innovation Lead, DE&S Technology Office) “We have been able to show results such as shortening the procurement cycle by five years and improving requirements and solutions through early engagement with suppliers. Procurement people [MoD DE&S] accept that our approach works and were convinced to go with it in many cases” (Managing Director, Alpha). “We have very recently undertaken a sort of assessment project to, after a year or so, see how [the new contracting model for the procurement of the open source intelligence solution] was going [...] that went all the way through from an idea to an implemented system that MoD acquired through its normal acquisition processes but structured in a way that was a little bit unusual” (Technical Director, Alpha). “I go to [DE&S] and I say ‘right, hello I’m [Alpha] and we’ve been doing this’ and he [procurement officer] says, ‘who are you? I don’t need you to tell me... you’re industry’, because he doesn’t really know what [Alpha] is, which is another communications thing” (Delivery Director, Alpha) I wouldn’t be at all surprised if there are people in software related projects [...] who certainly are making more use of [agile procurement methods] and some of the [Alpha] white papers in that kind of spiral incremental sense to build a bit, test a bit, see where it gets you and those kinds of things are brilliant, but they’re still perceived as probably something of a niche model” (Innovation Lead, DE&S Technology Office). “We pick quite broadly-versed people. So they might have expertise in several areas, in fact. So they’re very capable people” (Technical Director, Alpha) I think it is this separation of milk and cream, and I think that the MoD acquisition system today delivers the milk. So, it is new, it is innovation but it’s not the cream and what we’re striving for was the generation of the cream” (Managing Director, Alpha). “I would normally go out to industry and find the best ninjas, and I use that word a lot. I’d go and find the best people to make this project team [...]and when I was trying to deliver one of these sprints in a very short time I needed the best people available to be able to work on the task” (Project Manager, Alpha). “The [Alpha] contract ceased in accordance with the original contract timetable on 31 March 2018 [...] The MOD remains fully committed to the benefits of the partnership and pan-industry approach. The requirement for an [Alpha] replacement [contract] has been endorsed by the Front Line Commands and Defence Equipment and Support (DE&S) is working to deliver a successor core service as soon as possible, although this will be later in the financial year” (MoD DE&S communication).
External conditions: institutional architecture and policy landscape	<p>Degree of institutionalisation</p> <p>Policy coherence</p>	<ul style="list-style-type: none"> Persisting rules and regulations (e.g. rigidity of CADMID process and associated control mechanisms) Conservative attitudes and norms of conduct within MoD hard to change Disconnect between defence innovation initiatives and defence procurement policy – the latter focuses on cost control at the expense of innovation and agility Significant delay to re-tender for intermediary contract and lack of operational continuity 	<ul style="list-style-type: none"> “The MoD has a tendency to bring its immune system into play, and it sort of self-heals and goes on its own way. Which might seem critical but that’s my observation after 40 years of working in defence on and off. So, it’s not job done by any stretch of the imagination and we’re just a small example of how you can help make things work” (Delivery Director, Alpha) “Commercial managers [at DE&S] are risk averse and follow the procurement process guidelines, which is understandable given the costs involved and the need to control these costs” (Alpha Liaison Manager, MoD) “Through this package of change we will ensure that we will have acquisition systems[...] that stimulate innovation and exploit technology through procurement to unlock value from new suppliers, increase responsiveness to technological change and enable our [military] capabilities to remain current whilst they are in service” (Defence and Security Industrial Strategy 2021, p.25). “I think within certain individuals we will have either directly or indirectly influenced their thinking on innovation. However, because of the nature of MoD, in other words the continuous churn of people, skills and competences, then we didn’t embed it and it will very rapidly be lost and revert to norm, I think, is the risk. So, no I don’t think we’ve made a permanent shift in behaviour” (Managing Director, Alpha).

Table 4. Examples of innovative solutions whose procurement Beta supported

Innovative solution	Stakeholders involved in Beta project(s)	Brief description of Beta project(s) and support activities
<p>3D-printing medical solutions: technology applicable to different areas (e.g. limb prosthetics and heart surgeries) to improve care delivery and reduce operating costs</p>	<p>SME 3 (supplier)</p> <p>NHS Trust 3 (buyer)</p> <p>Clinicians within NHS Trust 3 (end users)</p> <p>Other NHS Trusts (as potential buyers)</p>	<p>Beta supported the SME supplier by connecting them to several NHS Trusts. It supported financially (through match funding) the organisation of clinical trials in joint with a specific hospital (NHS Trust 3) to evaluate the technology’s potential and to generate clinical evidence in support of solution adoption.</p> <p>Beta managers organised events showcasing the technology and produced case studies and written articles on the benefits of 3D-printing use, with the aim of accelerating adoption at regional level.</p>
<p>App for real-time information and remote diagnosis: focused on ailments of young children</p>	<p>SME 9 (supplier)</p> <p>Several Clinical Commissioning Groups in the region</p> <p>Clinicians (end users)</p> <p>NHS England Innovation Accelerator</p>	<p>Beta helped the SME supplier to secure funding for the testing and evaluation of the technology, which reduces the need for A&E visits in case of minor ailments of young children.</p> <p>Beta advised the SME supplier in the development of bids for relevant NHS contracts. Beta raised awareness of the solution in multiple regional and national fora to facilitate adoption. The managers of the SME attended multiple Beta’s educational workshops and networking events.</p>
<p>Latex-free surgical gloves: for use in operating theatres; designed to avoid latex-related allergies</p>	<p>SME 1 (supplier)</p> <p>Several NHS Trusts in the region (buyers)</p> <p>Surgeons at NHS Trusts (end users)</p> <p>Regional Procurement Development Agency</p>	<p>Beta raised awareness of the solution in multiple fora and in NHS Trusts, and helped to connect the supplier with clinicians (surgeons) and NHS decision makers to accelerate adoption. Beta also worked with the company and the Regional Procurement Development Agency to produce a ‘case study’ regarding the use and benefits of the gloves.</p> <p>Beta managers successfully lobbied for the adjustment of pre-qualification standards and related requirements (e.g. proven track record) to enable the inclusion of the SME supplier and the product in NHS framework agreements.</p>
<p>Portable ultrasound device for use in primary care: technology used in GP clinics to speed up the patient diagnosis and referral times, reduce waiting times and improve patient experience</p>	<p>SME 6 (supplier)</p> <p>Several Clinical Commissioning Groups in the region (as buyers)</p> <p>Several GP practices in the region (end users)</p> <p>University A (partner)</p> <p>Other universities (as influential actors)</p>	<p>Beta connected the SME supplier with regional primary care networks (GP clinics and CCGs). It worked with the supplier to assess the technical and economic feasibility of the use of the device in GP clinics, including an evaluation of changes to existing care pathways and associated adoption hurdles. Leveraging Beta’s network, the SME participated in NHS “Test Beds” to assess and validate the idea of using mobile ultrasound devices in primary care.</p> <p>Beta worked with the company to identify ways of influencing change in care pathways. A key element was lobbying universities in the region to include at their medical science curricula training for the use of portable ultrasound devices. Beta identified universities as key actors which can influence and institutionalise the use of portable ultrasound in primary care settings.</p>

Table 5. Institutional entrepreneurship of Beta’s staff: Activities and key achievements

Institutional entrepreneurship	Beta’s activities / key achievements	Example technologies /projects /artefacts	Indicative interview quotes /document excerpts
Boundary spanning	<p>Beta managers seeking to connect innovative SMEs with clinicians or senior managers at hospitals to explore how SMEs’ solutions could be used or adapted to fulfill identified care needs.</p> <p>Beta managers also connected SMEs to existing NHS suppliers, as a more viable and faster route for the integration of novel solutions into existing care pathways.</p>	<p>Multiple examples of SME innovative solutions that Beta supported e.g.:</p> <ul style="list-style-type: none"> - 3D-printing medical solutions - Portable ultrasound device in GPs - Remote diagnosis of swallowing problems 	<p><i>“If you’re a small business and you’re looking to sell into the NHS, if you’re new to the NHS it’s difficult to get access to key decision-makers, whether they’re clinicians or commissioners [...] we speed up people getting through the system (Commercial Manager 1, Beta)</i></p> <p><i>“I had a meeting a couple of weeks ago with [NHS supplier] who are the leading provider of the patient records system for GP practices, so they’ve got like 60% of the market, so what we can do and look to be doing with them is linking the ultrasound image of the patient directly into the patient care record [...] they [NHS supplier] are very interested in doing that” (Sales Manager, SME 6).</i></p>
Advocacy	<p>Beta’s Chief Executive and the Chief Operating Officer participate as board members in relevant national and regional NHS fora and lobby senior NHS executives and policy makers regarding the challenges facing SMEs e.g. access to NHS contracts and innovation finance. In certain cases, successful lobbying led to relaxing pre-qualification standards to enable the inclusion of SME products into NHS framework contracts.</p> <p>Beta, in coordination with other AHSNs, promotes locally-proven innovations as candidates for nation-wide adoption.</p>	<p>Latex-free surgical gloves solution</p> <p>Digital app for remote diagnosis of ailments for children aged up to 5 years-old</p> <p>Hospital data management solution</p>	<p><i>“[...] we will work with the procurement team to sort of say that okay, this company only has one product and you’re putting out your invitation to tender, or your pre-qualification question there you’re saying you’ve got to have two products and we will work with them to say well that’s grossly unfair, you’re penalising SMEs [...]. Our Chief Exec sits on one of the procurement boards [...] so we have the ability to try to influence it; I don’t see that we always do” (Commercial Manager 2, Beta).</i></p> <p><i>“they [Beta] managed to have that clause removed from the documents [NHS framework contract], and that came as a result of [Beta] lobbying NHS England and the Department of Health. So that’s a great success to [Beta] and they’ve heralded it on the basis that they have been able to leverage their network to direct real change for SMEs” (CEO, SME 1).</i></p>
Design of change	<p>Beta collaborative project with NHS England and Improvement to identify alternative models of hospital reimbursement (vs. the current activity-based payment model) that could facilitate adoption of new technologies and products.</p> <p>Beta senior managers (along with other AHSNs) were actively involved in the design and development of the Accelerated Access Collaborative (AAC) initiative, whose aim is to fast-track high-impact innovations and accelerate their integration into the NHS.</p> <p>Beta managers promoted the use of Dynamic Purchasing Systems (DPS) at hospitals to bypass NHS contracting rules and</p>	<p>Review of hospital reimbursement models in collaboration with NHS England and Improvement</p> <p>Involvement in the set up and implementation of the AAC initiative</p>	<p><i>“We are also now working with NHS Improvement and the team that lead on the national tariff to look at why the reimbursement models in the NHS are often the blocker to adoption, because there’s no tariff for something different. If a hospital wants to change, they lose money because they get paid to do it this way and they won’t get paid if they do it the new way.” (Chief Operating Officer, Beta)</i></p> <p><i>“Our Chief Executive represents the AHSN Network on the board of the AAC, and we are involved in its implementation [...] There will only be between four and ten products a year that get that level of support but the premise [...] is that if they don’t quite have their evidence base they get support from NIHR to get that evidence base, and the clinical trials, and through the clinical research networks to really bolster the evidence base [...] NHS England will then wrap</i></p>

	<p>procedures (e.g. regarding multi-year framework contracts locking out SMEs) and enable faster adoption of SME innovations. Beta managers framed the DPS procedure and SME connectivity to incumbent NHS suppliers as consistent with existing practices so as to legitimise alternative procurement and adoption routes.</p>	<p>Beta project to promote the use of DPS procedure at specific NHS Trusts</p>	<p><i>around a reimbursement model to fund the adoption and the AHSNs would do that local-level adoption” (Chief Operating Officer, Beta).</i></p> <p><i>“There is work going on to develop a dynamic procurement methodology to enable the easier access to the purchase of proven innovations identified through national programmes” (Assistant Commercial Director, Beta)</i></p>
Capacity building	<p>Beta managers run educational workshops targeting clinicians and NHS staff at hospitals to foster a climate of innovation and openness to working with innovators. The aim is to effect cultural and behavioural change within the NHS with respect to attitudes towards innovation.</p> <p>Beta managers organise workshops for SMEs and offer one-to-one coaching and mentoring sessions. The purpose is to educate SMEs about how the NHS works (e.g. NHS procurement landscape and governance) to ensure supplier compliance with NHS processes and to help reduce the cognitive distance between innovators and clinicians.</p>	<p>Beta’s “Coaching academies” and other related educational events targeted at NHS staff (clinicians and decision makers)</p> <p>Beta’s series of workshops targeted at innovative SMEs on topics such as: - “NHS procurement and how to sell into the NHS” - “NHS structure, governance systems and key priorities”</p>	<p><i>“What do you actually do when you buy this technology, this innovation, this point of care? What do you actually do with it, how do you integrate it into the service and how do you feel comfortable doing that? It’s not necessarily just the commercial team it’s other parts of the organisation but there is that sort of cultural and behavioural challenge that gets in the way of doing stuff differently, that might be advantageous, and as an organisation we try and challenge that” (Assistant Commercial Director, Beta)</i></p> <p><i>“Procurement people tend to talk about cost savings and efficiencies rather than benefits you can bring into the system, so make sure that the cost-related benefits are emphasised. It can be difficult for SMEs to sell directly to the NHS in cases where framework contracts are already in place, so the best option seems to be partnering with large suppliers and trying to sell new products via them” (Notes from observing Beta’s workshop on NHS procurement and how to sell into the NHS)</i></p>
Effects of institutional entrepreneurship	<p>Adjustments to pre-qualification rules and standards of NHS framework contracts and endorsement of flexible procurement methods (DPS) helped innovative SMEs, in certain cases, to overcome procurement process-related barriers.</p> <p>Shift in perception of NHS staff about the contribution potential of SMEs, as a source of innovation.</p>	<p>Documented effects on NHS procurement outcomes (2014-2019):</p> <ul style="list-style-type: none"> - 95 novel solutions introduced into the English NHS as result of Beta’s work - SMEs supported by Beta secured NHS contracts worth £2.5 million in 2018-19 alone 	<p><i>“Do [NHS procurement staff] have a DPS [dynamic purchasing system] instead of a framework [contract]? If they’ve got a DPS with a sat requirement standard for access, then SMEs can go at that and that’s the way forward.” (Head of Procurement and Commercial Finance, NHS Trust 2)</i></p> <p><i>“We are incredibly thankful to [Beta] for the help that they’ve provided [...] in gaining access [to] nationwide procurement frameworks and providing introductions to clinical leads across the region.” (CEO, SME 1)</i></p>

Table 6. Conditions influencing effectiveness of Beta’s institutional entrepreneurship

	Effectiveness conditions	Underlying issues	Indicative interview quotes /document excerpts
Conditions internal to intermediary	<p>Legitimacy of intermediary</p> <p>Resourcing of intermediary</p>	<ul style="list-style-type: none"> • Beta uses an open, participatory process to assess novel solutions and their adoption potential • Beta able to show its value added for the NHS (adoption outcomes) and for SMEs (NHS contracts and sales) • Perceived risk of loss of independent decision-making by NHS procurement staff due to lack of understanding of Beta’s role and influence over procurement and adoption • Beta lacks mandate and power to change procurement rules and practices • Beta’s senior managers have deep NHS expertise and a drive to reform and NHS innovation landscape • Beta uses external experts on <i>ad hoc</i> basis • Funding and capacity levels limit the reach of Beta’s activities 	<ul style="list-style-type: none"> • “We have a really good helicopter view of not just the NHS but also the wider health and care sector, local authorities, academia, the voluntary sector as well. That ability to bring together different voices and different thinking to basically do problem solving, it ensures that the innovators, the people in the businesses are then developing things that are perhaps most relevant to the health and care needs” (Chief Operating Officer, Beta). • “We measure adoption and spread [of SME innovations]. If things have been bought by the NHS and we capture the number of organisations or sites that are buying these innovations and the number of patients that have access to [them]” (Assistant Commercial Director, Beta). • “[AHSNs introducing SMEs to clinicians] is a perceived conflict of suppliers talking to consultants, which becomes, which was the usual approach to the NHS, carrying with it that perceived conflict, that procurement tends to be a little bit guarded about” (Head of Procurement and Commercial Finance, NHS Trust 2). • “I’m afraid to say it because I think they have somewhat of a poisoned chalice as a mission at [Beta], but I think unless [Beta] has any teeth in terms of being able to, you know, force issues with NHS procurement and to force through change, then its existence comes into question” (Managing Director, SME 1). • “We can’t force people to change. We are not the commissioner, we are not the provider, we’re not the decision maker, we’re not the procurement team. We cannot make people use things. End of [story], really. We can influence, we inform, we can engage, we can broker but if ultimately that end user or customer doesn’t want something we don’t have any power and nor would we really want any” (Chief Operating Officer, Beta). • “We can talk NHS and we understand the system and we understand the nuances (Assistant Commercial Director, Beta). • “[Beta’s Commercial Manager 1] has been our primary contact and he’s been able to give us some advice about getting the manufacturing costs down, getting away from the current manufacturer. And introducing us to a variety of people just to get their views on would it be suitable or is it not suitable. And if it is suitable would you like anything doing to it that would make it more suitable? (Managing Director, SME 5) • “My team is just me [...] resourcing is becoming increasingly an issue...also our time is taken away from doing the day job to things that I would say are more administrative” (Commercial Manager 3, Beta).
External conditions: institutional architecture and policy landscape	<p>Degree of institutionalisation</p> <p>Policy coherence</p>	<ul style="list-style-type: none"> • Persisting regulations (e.g. procurement rules regarding standardisation and cost control) • Professional norms and routines within NHS difficult to change e.g. clinicians’ risk aversion and slow adoption • Dissonance between NHS procurement policy goals and practices on the one hand, and NHS innovation initiatives on the other 	<ul style="list-style-type: none"> • “They [hospitals] all have a repeat order culture, the static supply in there is inertia in the system, including NHS procurement. I think the cards are largely stacked against a lot of those innovative products and ideas” (Procurement Director, NHS Trust 1). • “If you’re a doctor the first thing you get taught in med school is do no harm [...]and you are risk-averse therefore because you want to do the right thing for the patient. Actually that’s slightly at odds with innovation because it makes you [...] stick to what you know rather than actually look at what the art of the possible might be” (Assistant Commercial Director, Beta). • “[...] with most of the [NHS] frameworks being something of multiple term contracts, two, three, four years, you’ve got an opening and you’ve got a limited window of opportunity for the market entrants to get on a framework and then for two, three or four years the market is locked out.” (Head of Procurement & Commercial Finance, NHS Trust 2) • “I think the big problem here is that the NHS just isn’t set up to procure [innovation], no matter how pushed we are within the system, no matter how well AHSNs or someone else suggests our products or services, how good they are” (CEO, SME 3).

Table 7. A framework of conditions influencing the effectiveness of intermediaries' institutional entrepreneurship in support of PPI implementation

	Inputs of innovation intermediation	Activities (process) of innovation intermediation	Outputs of innovation intermediation
Conditions internal to the intermediary organisation	<p>Highly competent senior staff with deep sector expertise and entrepreneurial drive</p> <p>Intermediary's ability to draw on external expertise, as and when required</p> <p>Sufficient funding</p>	<p>Open, inclusive intermediation processes for articulating needs and requirements and assessing possible solutions</p> <p>Clear positioning and unambiguous roles and activities of intermediary</p> <p>Intermediary managers' ability to operate beyond formal remit of their organisation</p>	Intermediary's ability to demonstrate the value added by intermediation activities
External conditions: institutional architecture and policy landscape	<p>Financial sustainability of intermediary</p> <p>Operational continuity of intermediary</p>	<p>Intermediary's authority and power to reform the institutional architecture</p> <p>Alignment between sector-specific public procurement and innovation policies</p>	Intermediary's ability to overcome persistent institutional failures (relates also to willingness and ability of buying organisations and others to change behaviour)