Developing the eHealth sector in Cornwall

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Abstract

eHealth is one way of addressing capacity and cost problems in health and care and regional development. We aim to improve the economy of Cornwall, a poorer rural UK region, by developing an eHealth innovation ecosystem. We worked with professionals, patients, and SMEs identifying nine stakeholder groups and nine engagement stages to promote ecosystem development through roadshows, workshops, webinars, and individual support. SMEs could apply to our £600,000 Challenge Fund to support innovations. We also sought ways, to sustain the ecosystem beyond the project.

Initially there was one larger company and two SMEs focussed exclusively on eHealth, some 100 software companies not involved in health or care, and many SMEs (care services) using eHealth in varying degrees. Some processes were unsuccessful including basing the team's workplace in care homes and an online region-wide forum. However, most processes 'worked'; half-way through our three-year project we have 68 SMEs registered including seven start-ups, and 700 stakeholders are forming sub-networks. Half the Challenge Fund is committed, one new product has reached market, and 40 more are developing.

A 'bottom-up approach' concentrating on awareness raising and activation, has helped achieve our funder-agreed objectives. Creating a sustainable ecosystem is more challenging but our methods provide examples for policy makers.

Keywords: realist evaluation; smart specialisation; regional development; eHealth; care robotics; implementation.

Background

Focus of our project and this report

There were a number of attempts to define eHealth 10-20 years ago (Jones et al. 2005; Ahern, Kreslake, and Phalen 2006; Oh et al.2005; Pagliari et al.2005). Iyawa's (Iyawa, Herselman, and Botha 2016; Iyawa, Herselman, and Botha 2017a; 2017b) more recent definition of digital health innovation ecosystems illustrates the breadth of eHealth in which she includes eHealth, mHealth, medicine 2.0, telemedicine and telecare, public health surveillance, personalized medicine/patient engagement, health and medical platforms, self-tracking (the quantified self), wireless health and sensors, medical imaging, healthcare information systems, mobile connectivity, social networking, sensors and wearables, gamification, electronic health records, big data, health information technology, health analytics, and digitized health systems. Iyawa (2017) presents a conceptual framework that attempts to show the relationship between these terms, but her paper gives no indication of how to develop a regional eHealth innovation system. In this report, we take a broader view still of eHealth to include digital devices, robotics, and active assistive living (Gomersall et al. 2017).

The UK Government and European Union (EU) have seen the development of eHealth as one of the 'answers' to pressures on health and social care (along with health and social care integration, shifting of costs to civil society, and evidence-based medicine) and as a means of regional development. Various initiatives have been tried from the disastrous NHS Programme for Information Technology (IT) (Justinia 2017), through whole system demonstrators of telehealth (Rixon et al. 2017), and projects funded through the Distributed Assisted Living Lifestyles at Scale (DALLAS) programme (Technology Strategy Board 2012) such as Living It Up in Scotland (Devlin et al. 2016).

This report describes the first half of a project partially funded with £2.7M from the European Regional Development Fund (ERDF) to develop the eHealth sector in Cornwall and the Isles of Scilly (CIoS), UK. The eHealth Productivity and Innovation in Cornwall and the Isles of Scilly project (EPIC), is a three-year project that started in May 2017. EPIC aims to improve the economy of CIoS by further developing the eHealth sector; this we hope will also improve the health and wellbeing of people in CIoS. We aim to learn from previous projects, to develop a sustainable ecosystem, and be 'the second mouse that gets the cheese' (Grant 2017).

The aim of our report is to draw lessons for a target audience of (i) health and social care policy makers, especially those interested in implementing digital solutions and (ii) people interested more generally in regional development. It heeds calls for an identification of the attributes of entrepreneurial ecosystems and their relationships (Spigel 2017), of what continues to be an under-researched and under-theorised area (Harrison and Leitch 2010).

Realist evaluation and hierarchical systems as the framework

The focus of the EPIC project is eHealth as an economic sector, and we view this through the idea of hierarchical systems (Figure 1) (Jones 1986). The eHealth sector is itself found in the broader context of regional development in CIoS and was chosen as a 'smart specialization'. To understand development of the sector we need to understand the 'level below' namely the need for, and development of, sustainable eHealth innovation producing new products and services. This report uses a realist approach (Pawson 2013) to evaluate the actions of the EPIC project. This will be described in more detail in the methods section.
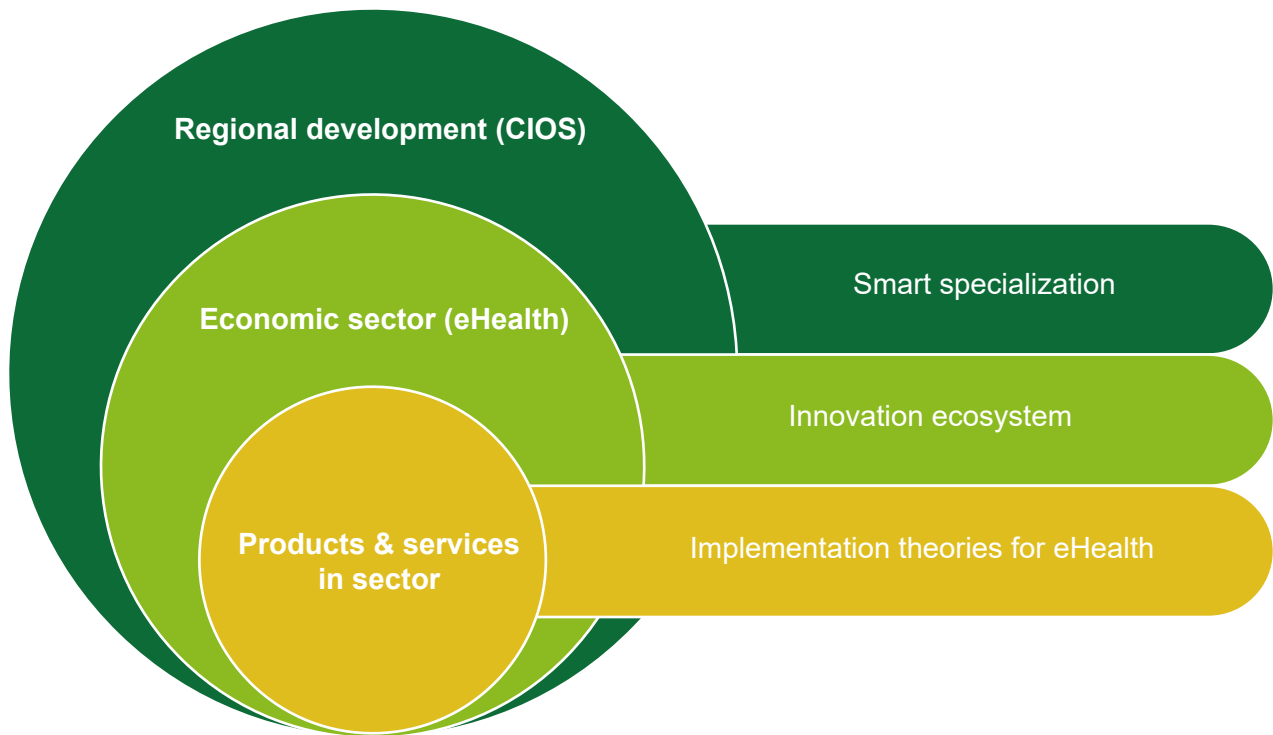
**Figure 1. Hierarchical systems of focus of EPIC and this report (left)
showing relevant theories (right)**

We are trying to develop an eHealth ecosystem that will continue to innovate in eHealth products and services and thrive beyond the life of the three-year project. Our mechanism for doing this is the EPIC project which needs to be considered in the context of regional development with outputs as new products and services in eHealth.

eHealth innovation ecosystem

Spigel (2017) suggests that entrepreneurial ecosystems have three elements: (i) cultural, i.e. attitudes toward entrepreneurship, (ii) social, i.e. resources such as risk capital, talented workers, and mentorship from experienced entrepreneurs normally accessed through social networks, and (iii) material i.e. the organizations rooted in a particular place that support high growth entrepreneurship, including universities and other support organizations (e.g. incubators or accelerators) and the strength of the local market into which entrepreneurs can sell. CIoS, being a poor rural peripheral region has a limited local market (described below); EPIC aims to explore and strengthen social, cultural and material aspects of healthcare and wellbeing to encourage the growth of the local market and to increase the potential of entrepreneurs to sell.

Regional development and smart specialization

The context for entrepreneurial innovation is important (Autio et al. 2014; Harrison and Leitch 2010). While there may be some similarities, an eHealth ecosystem for CIoS will not be the same as one in, for example, London or Houston. CIoS is a rural county at the western periphery of the United Kingdom (UK); Penzance is between 5 and 6 hours by train from London and the IoS are a 5-hour trip from Plymouth, a southwest regional hub. CIoS is one of the poorer regions in the EU and received Objective 1 funding from 2000 (Di Cataldo 2016).

CIoS has many challenges, some of which can become drivers of new products while others remain

barriers. Its rurality and sparse population mean that unlike say London or Oxford it does not have a large local market for eHealth products or services. Furthermore, it does not have a large number of existing SMEs or a continuous flow of start-ups from multiple universities or science parks (although it does have a growing software sector). It has an older population. Rurality and distance from the main metropolitan and international markets may add to its costs although delivery online could work around this disadvantage.

CIoS has an ageing population well above the national average (24% over 65 compared to 18% for the UK in 2015) at a rate that is increasing well above the national average. Local health and social care services therefore face the imperative of finding cost effective solutions to rising demand. They believe eHealth can be a key solution (Department for International Trade and Care 2016; Cornwall and the Isles of Scilly Health and Social Care Partnership 2018). If CIoS can develop services such as telemedicine and expertise it can supply these – with no travel involved – to other parts of the UK and the world. For example, there is an interest in whether this older and stable population can provide a 'testbed' for businesses to apply and develop future products and services. Furthermore, the 'Devolution Deal' (The LEP Network 2015) promised to offer CIoS a good environment to address use of technology in the integration of health and social care (HSC).

CIoS has one complete university (Falmouth) and two other university campuses (Plymouth and Exeter both have Cornish campuses). In addition, CIoS has other strengths that could work to its advantage if harnessed. The Superfast Cornwall programme (Superfast Cornwall 2018), funded by the European Union, British Telecom (BT) and Cornwall Council ran from 2011-2015, by which time fibre optic broadband had been introduced to 95% of homes and businesses. This helped in the development of a small but thriving software sector (Tech Nation 2018) and, for example, some organisations have located IT services in CIoS (King'sCollege London 2015). CIoS also has a strong sense of volunteering and community involvement and a history of student involvement with the community. Its natural heritage may also serve to attract talented individuals seeking a lifestyle change.

Despite its past strong mining and engineering traditions (Cornwall County Council, 2018), more recently the geography of CIoS has been a disadvantage and its lack of political power in Westminster has meant that UK governments prefer to invest in infrastructure that serves more voters (Chu 2015). Typically, the CIoS economy has lower unemployment, lower earnings, lower productivity and less engagement in international trade than the UK average (Economic Development and Culture Chief Executives Directorate 2014). The key issue for the CIoS economy remains its relatively weak and volatile performance on output and income per head. CIoS is in the bottom five regions for Gross Value Added (GVA) per head, 30% below the UK average (£17964 vs £25351) and spectacularly below Westminster (£221,103) in 2015 (Office for National Statistics 2015), although some argue that GVA is value extracted rather than added (Mazzucato 2018) with localities such as Westminster perhaps having concentrations of value extractors rather than being a productive producer of goods and services.

Between 2014 and 2020, CIoS will receive over £800 per person from the EU Structural and Investment Fund - similar to that received by Romania and Bulgaria (Dunford 2016) and was eligible for further ERDF funding in 2014-20 from the Smart Specialisation initiative (Amion Consulting 2016). In 2016-17, despite the UK's plans for Brexit, the ERDF funded projects in 5 smart specialization (Vallance et al. 2018; Pugh 2018) areas in CIoS: Digital Economy, Space and Aerospace, Marine, Agri-tech and eHealth. Of these, eHealth was considered the least developed - a 'nascent market opportunity' - "*eHealth represents a relatively immature market in itself – one that is based on a complex system of emerging and applied technologies that are yet to be fully understood.*" (Jump 2014). On the other hand regional poverty, rurality and an ageing population mean that CIoS, as an environment in which solutions are both needed and will be developed, represents a 'testbed' for other regions nationally and internationally.

Implementation of eHealth products and services

We also need to understand the potential for innovations in eHealth products and services (i.e. the elements within the eHealth sector (Figure 1)). There is evidence that using the internet (eHealth) can effectively support health services (Jones and Goldsmith 2009; Bergmo 2015) but many eHealth projects fail to be implemented in routine practice (Ibbotson, Reid, and Grant 1998; May et al. 2011; Maughan 2010). Systematic reviews (Mair et al. 2012; Greenhalgh et al. 2004; Greenhalgh et al 2017) suggest that for successful implementation, eHealth innovation needs: (i) a shared view among users of its purpose, to understand how it affects them personally and to grasp its potential benefits; (ii) work to engage potential users to get them to buy into the new system; (iii) collective action to re-design heath care tasks, ensure confidence in the innovation and train participants; and (iv) local appraisal to make best use of the innovation. The context, both at the eHealth sector level and the wider regional and national economy level, is important in interpreting and implementing the results of any research (McCormack et al. 2013; Rycroft-Malone et al. 2012) and particularly so for eHealth with its context of rapid technological change, legacy systems, and organisational memories of recent successes and failures (Department of Health 2000; Argote 2013; NHS Connecting for health 2013).

The barriers to developing eHealth in any setting are well recognised (European Commission 2012) and include: lack of awareness of, and confidence in eHealth solutions among patients, citizens and healthcare professionals; lack of interoperability between eHealth solutions; high start-up costs involved in setting up eHealth systems and developing eHealth products; lack of access to finance; regional differences in accessing IT services, and limited access in deprived areas. These differences particularly affect CIoS, the large regional inequalities in the UK (Davis 2014) make developing eHealth a difficult task.

Dunford (2016) states "It is clear that although the UK is good at generating ideas [in digital health] we are less successful at commercialising them." This apparent failure of implementations in the 1990s and 2000s led to Innovate UK and others investing large sums on the DALLAS programme (Technology Strategy Board 2012) to address the problems of implementation and sustainability (Devlin et al. 2016).

Sustainability, projectitis and displacement

Some would argue that much EU project funding has failed to achieve sustainable change. When the funding has gone so has the initiative. The EU recognises this problem and has produced guidance for some settings to try to address it (European Commission Directorate-General Education and Culture 2006). As a three-year ERDF-funded project, our aim is to leave a thriving self-sustaining eHealth sector that does not 'collapse' at the end of the project. Some argue that regions such as CIoS do not benefit as much as they should from EU project funding because of 'projectitis' (people becoming dependent on external funding and spending their time looking to the next external funding) (Harries et al. 1998) and 'displacement' (projects seeking to be successful and in showing their success displacing the 'natural' activity in that sector) (Hannah, Dey, and Power 2006). We aimed from the start of EPIC to plan our exit and find ways of sustaining eHealth innovation beyond the life of the project.

The DALLAS Living It Up project ((Devlin et al. 2016) identified five challenges: 1) Establishing and maintaining large heterogeneous, multi-agency partnerships to deliver new models of healthcare; 2) Resilience in the face of barriers and set-backs including the backdrop of continually changing external environments; 3) Tension between embracing innovative co-design and achieving delivery

at pace and at scale; 4) Effects of branding and marketing issues in consumer healthcare settings; and 5) Interoperability and information governance, when commercial proprietary models are dominant. However, even the Living It Up programme, with support from renowned experts (Mair et al. 2012; May et al. 2009) ended soon after funding ended (Grant and Hughes 2017). So, can we do any better?

Aim of this report

This report aims to illustrate the development up to October 2018 of an eHealth innovation ecosystem in one UK region via a large EU funded project, to see if our approach is likely to achieve its aims in the regional economy and health and social care, and to try to learn lessons for other rural poorer regions, both with respect to eHealth and to regional development.

EPIC and its design

Aim: The main aim of the EPIC project is to improve the eHealth sector in CIoS, leading to more and better paid jobs, greater innovation in this sector, robustness (i.e. changes that are sustainable), a perception out of region of CIoS being a place to work and collaborate with, improved knowledge and skills, and in general a 'thriving ecosystem' in eHealth. The longer-term aim is to improve health and wellbeing in CIoS, but this could not be assessed in this short project.

Budget: The total project value was £3.3m comprising an ERDF grant of £2.7m and contributions from University of Plymouth and the South West Allied Health Science Network. The budget included a £600,000 Challenge Fund of which £120,000 (20%) was to come from private matched funds (Figure 2).
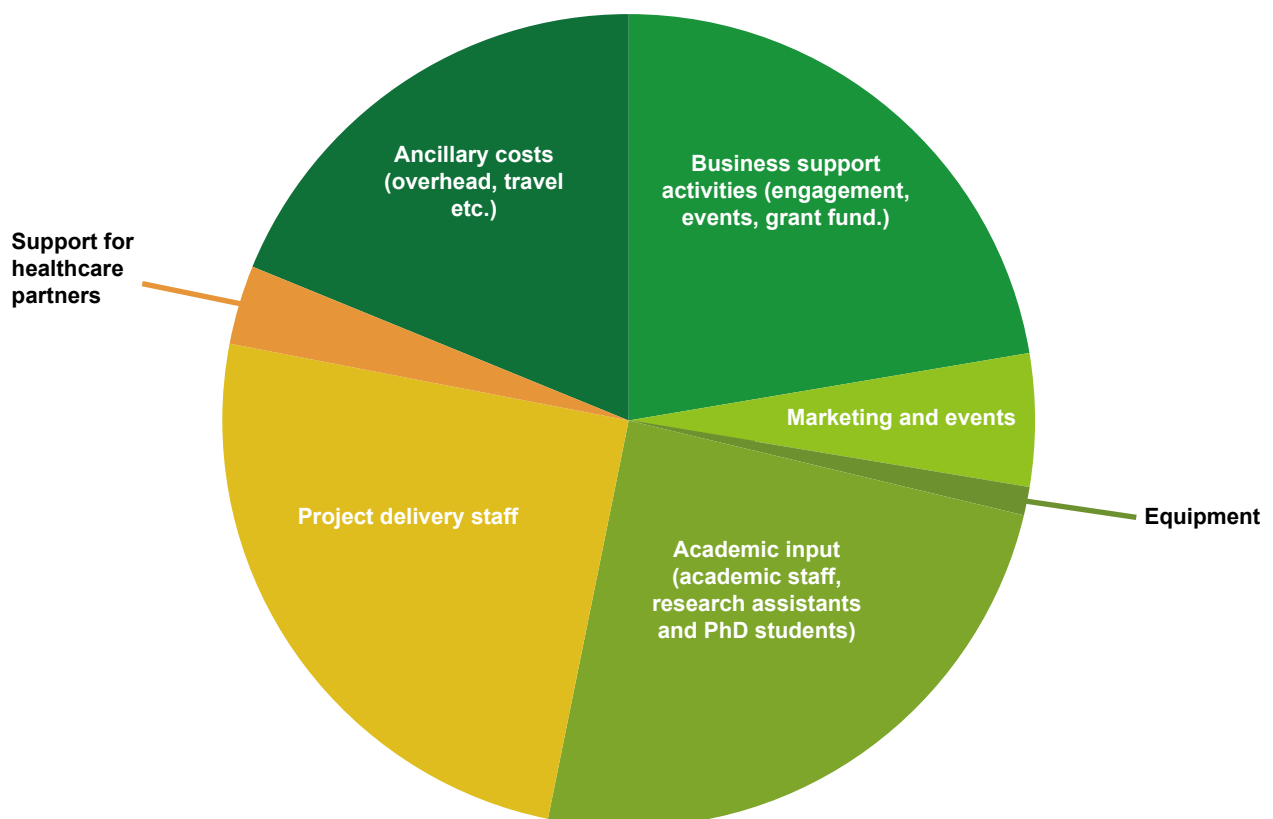

Figure 2. Distribution of costs in EPIC budget

Mechanisms: The project was to establish the EPIC team with four main components (Figure 3):

i.   a multidisciplinary academic team at Plymouth University with five main strands each comprising 2 academics and a research assistant (engagement, individual behaviour change, organisational change and sustainability, usability, and robotics), working together and with the supply side business support team. Two full time PhD studentships were to contribute to the evaluation and sustainability of the project.

ii.   a business support team at Creative England comprising a full-time coordinator and business advisor, and

iii.   'delivery partners' comprising two general practices (Liskeard and St Ives), two care homes (Liskeard and Redruth) and the Patients Association. The four local delivery partners ensured that we had bases at where we could directly engage with professional and patient end users.

iv.   an ERDF project funded through the Department for Communities and Local Government there was much administration and 'form filling' to ensure compliant use of funds, so there was a project administrator and a half time compliance officer at Plymouth University, and back office support, management of Challenge Fund, and compliance for Creative England.

v.   We also had a budget for consultancy (external experts) which initially did not have a specified recruitment target.

The mechanisms by which EPIC was designed to achieve these aims were:

1.   To develop a critical mass of SMEs and eHealth products by two main strands of work (Figure 4). On the demand side (led by the academic team) we have tried to develop greater awareness of eHealth among HSC professionals and patients, identifying innovators and innovative ideas for the development of new or better implementation. On the supply side (led by the business support team) we have been identifying and working with SMEs and some larger companies in CIoS to see if they needed business or financial support to expand their activities and possibly export.

2.   To bring together demand side stakeholders with ideas for new products or services to work with Cornish SMEs and support their application to our £600,000 Challenge Fund (Figure 4).

3.   To find ways of sustaining the nascent eHealth sector beyond the life of the EPIC project through further innovation, promotion and exporting these products outside CIoS. To do this we knew we had to develop a culture for eHealth innovation and to take a bottom up approach to identify possibilities and work with all stakeholders to share ideas to develop a common understanding. We also knew that we would need to engage patient groups and higher education as potential 'free' sources of time and energy.
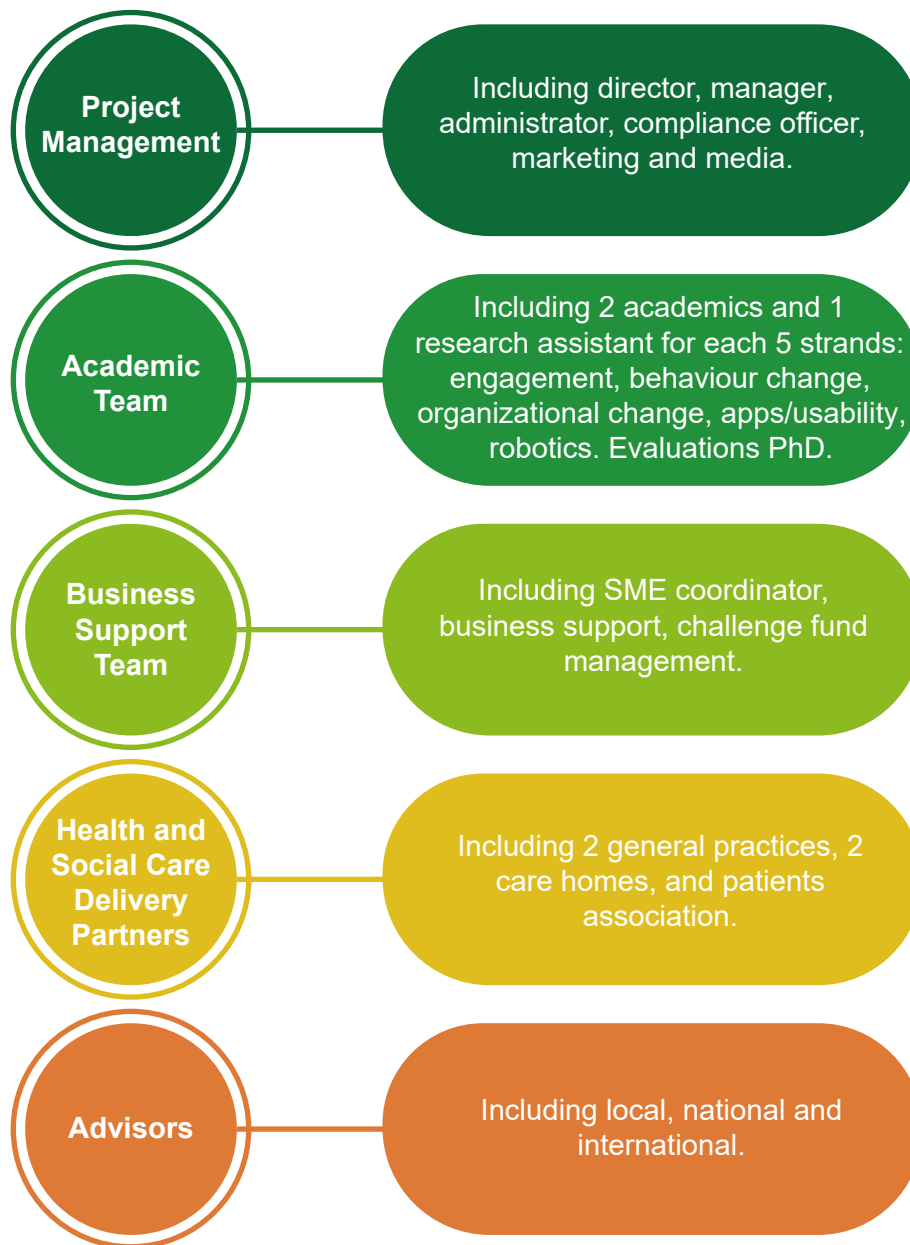
Project Management

Including director, manager, administrator, compliance officer, marketing and media.

Academic Team

Including 2 academics and 1 research assistant for each 5 strands: engagement, behaviour change, organizational change, apps/usability, robotics. Evaluations PhD.

Business Support Team

Including SME coordinator, business support, challenge fund management.

Health and Social Care Delivery Partners

Including 2 general practices, 2 care homes, and patients association.

Advisors

Including local, national and international.
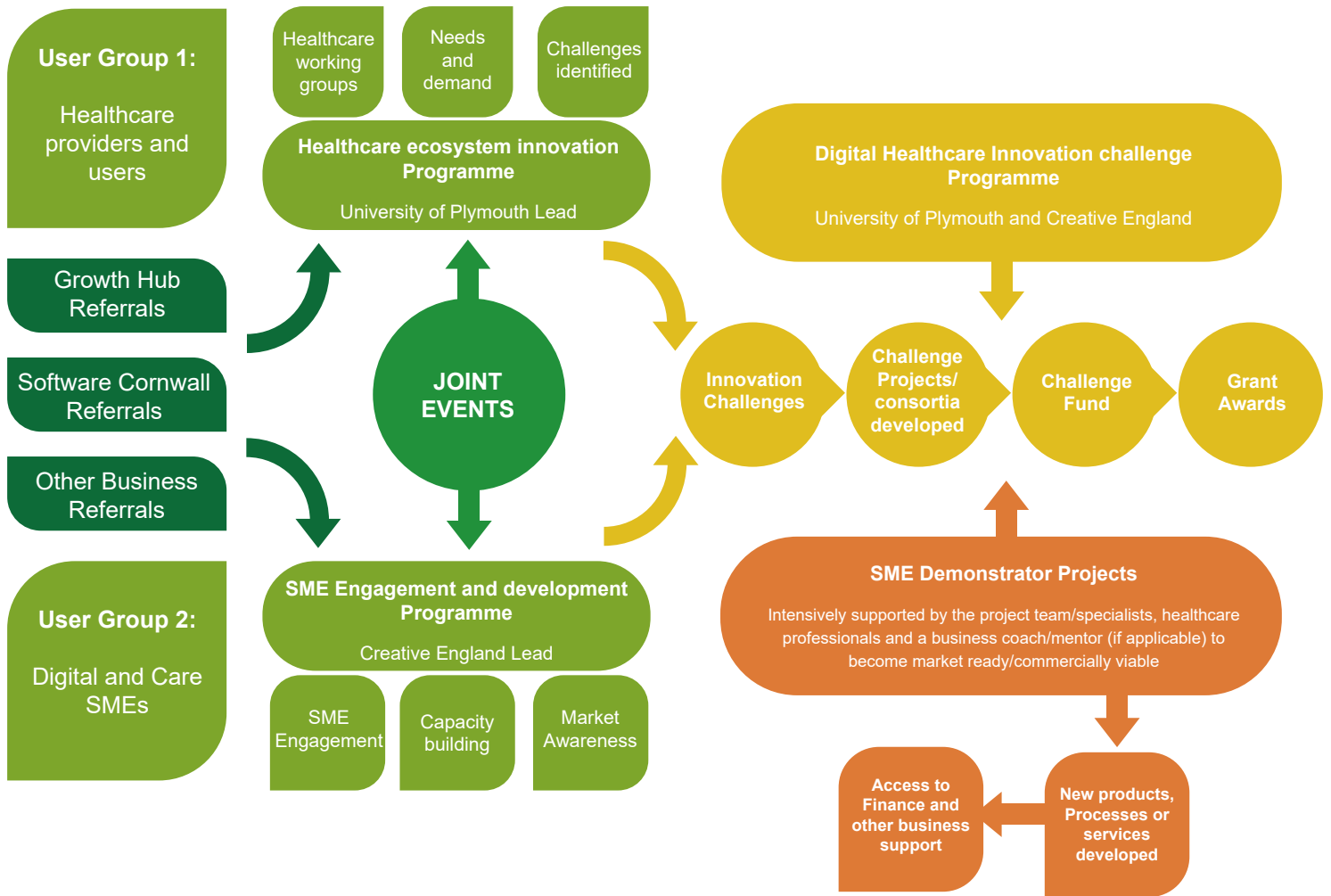
Figure 3. EPIC team.

Figure 4. EPIC model showing demand side and supply side work, bringing together stakeholders to make Challenge Fund bids leading to business growth.

Outputs: Our proposed outputs agreed by the funding-body focussed on our first two aims in terms of SMEs engaged, events, and Challenge Fund grants allocated (Table 1).

Activities and outputs planned for 36 months	To end month 18
108 HSC professionals engagement events across CIoS	3 large conferences: 8 workshops with 33 focus groups; 22 roadshows; 6 webinars; ongoing social media contacts.
Business Engagement Activities: 28 webinars and 10 events	3 webinars and 8 events
Challenge Fund: £600,000 allocated – including £120,000 matched funding. 32 grants awarded	23 applications made requesting over £300,000, 4 declined, 2 deferred, 17 grants awarded. Four applications in progress. £244,109 allocated so far, £14,400 match contracted so far.
Demonstrator Projects; To provide intensive support to 25 enterprises to develop a commercially viable product, process or service	EPIC team working with 17 SMEs awarded grants.
66 enterprises receiving support	Contact with 158 SMEs of which 60 registered
33 enterprises receiving non-financial support	18 SMEs received 12 hours of business support
5 new enterprises supported	7 of the 18 SMEs receiving business support were incorporated after start of EPIC
11 new jobs in supported enterprises	0
27 enterprises cooperating with research institutions	More than 30
5 enterprises supported to introduce new to the market products	1 new product involving two enterprises
11 enterprises supported to introduce new to the firm products	2

Table 1: Activities and outputs agreed with funding body and numbers to end October 2018 (month 18 of 36).

Research Methods

Research design: We have taken a realist evaluation approach (Pawson 2013) alongside the work to achieve the aims of EPIC. In this we aimed to test empirically the assumptions upon which EPIC was designed. EPIC is our case study and we give a framework analysis of the initial findings below. The above account of intended EPIC mechanisms provided the initial analytic framework that we revised empirically as the findings suggested. We identified contextual factors that appeared critical to the success or failure of different elements of EPIC and which therefore may be practically useful to others attempting similar projects.

Data collection: Our monthly team meetings and discussions were documented. We also had a period of reflection and discussion on what seemed to have worked or not at a practical level. Points put forward by team members were circulated as part of the production of this report to gain consensus.

Data analysis: We compared the activities that we needed to achieve our outcomes with the originally proposed mechanisms. We did this within the conceptual framework of hierarchical systems (Jones 1986).

Ethics: EPIC is a collaborative service improvement project and so does not require research ethics approval.

Mechanisms through which EPIC attempted to realise its aims

EPIC team development: Recruiting team members who were able to work together well, have good communication skills to work with stakeholders, to learn about eHealth, and were prepared to travel extensively across CIoS, and to bring both their own expertise and that of academics from a range of disciplines, was a challenge but essential for the success of the project. Additional key appointments using the consultancy budget were local and national experts to help with specific aspects of the project (such as engagement with 'leaders') as well as international advisers to give a wider commentary and feedback.

Participants and outcomes: As the project evolved we clarified and further subdivided our stakeholders into nine groups developing networking and collaboration between these groups, each group having refined group-specific outcomes.

1.   The existing eHealth sector itself: In particular that within SMEs: working directly with existing companies to expand or strengthen their eHealth activity. Here we seek evidence of whether their market expanded, set-up of new products or services particularly those related to needs identified by patients and professionals.

2.   HSC Professionals: recruiting and working with them to develop their understanding of, the potential of, and evidence for eHealth and helping them take forward their innovative ideas for use of digital technologies in their practice, improve their networks with other stakeholders; and find ways of facilitating collaboration between them. Figure 5 shows the 'pathway' of development for HSC professionals and their involvement with SMEs. Here we seek evidence of outcomes from the scale of project work and illustrative case studies.

3. Patients and patient groups: develop robust ways of sustaining networks via patients and to generate innovative ideas for sustainable SME-led projects. Here, the processes and outcomes are similar to those for HSC professionals

4. Students and academics: working with academics and students in higher and further education in the region to find ways to embed activities, to act as digital health champions and to generate innovative ideas for sustainable SME-led projects. Here we seek evidence about embedding of eHealth education and innovation in curriculum activities or promoted through course or university stated aims.

5. Start-ups: we have tried to help new companies form, particularly focussing on recent graduates and students about to graduate, to meet the needs identified by patients and professionals. Here we seek evidence as to where start-ups formed and survived.

6. Technology companies transferring-in: we have sought ways to bring existing Cornish technology (but not specifically health) companies into the health and care arena, and to encourage companies (both eHealth and other relevant technology) from out of region to open additional offices in CIoS. Here we seek evidence of new companies entering the Cornish eHealth sector as a result of EPIC.

7. Other agencies: in particular business support organisations, often themselves short term projects funded either by EU or Government, such as the CIoS Hub (ERDF 2018b), ATI (ERDF 2018a), Launchpad (ERDF 2018c). Our outcomes are if we can embed eHealth into the activities of these other agencies to help move the process of innovation forward.

8. 'Leaders': working with NHS, local authority and third sector leaders to co-create an understanding of how 'digital' fits the overall strategy and to develop an understanding that local collaboration strengthens the local economy with a positive impact on health and wellbeing. We have also worked with business and technology leaders. Here our outcomes are awareness, knowledge, activation (or knowledge mobilisation), and their links to embed more fully in HSC strategy and structure and to a lesser degree in the wider business community.

9. External relations: both developing a social media and online presence, working with other agencies to promote CIoS out of region, and to develop resources and other reasons for others to work with CIoS (e.g. testbed and usability testing). Here we seek a change in the external perception of CIoS as a place to work in eHealth, particularly from businesses as well as HSC leaders nationally and internationally.

Culture for eHealth innovation: Across all nine participant groups we aimed for another outcome: to develop a culture for eHealth innovation i.e. a 'common understanding' of the possible benefits and of areas where digital technologies can help, and of the appropriate aims and means of developing the eHealth sector. The EPIC team's major effort has been on this bottom up approach to identify possibilities and work with all stakeholders to share ideas and to develop this common understanding. This has included horizon scanning, sharing evidence through meetings and social media, and generally raising awareness of areas where digital technologies might best be used.

Figure 5. Steps towards participation in generating innovation in eHealth
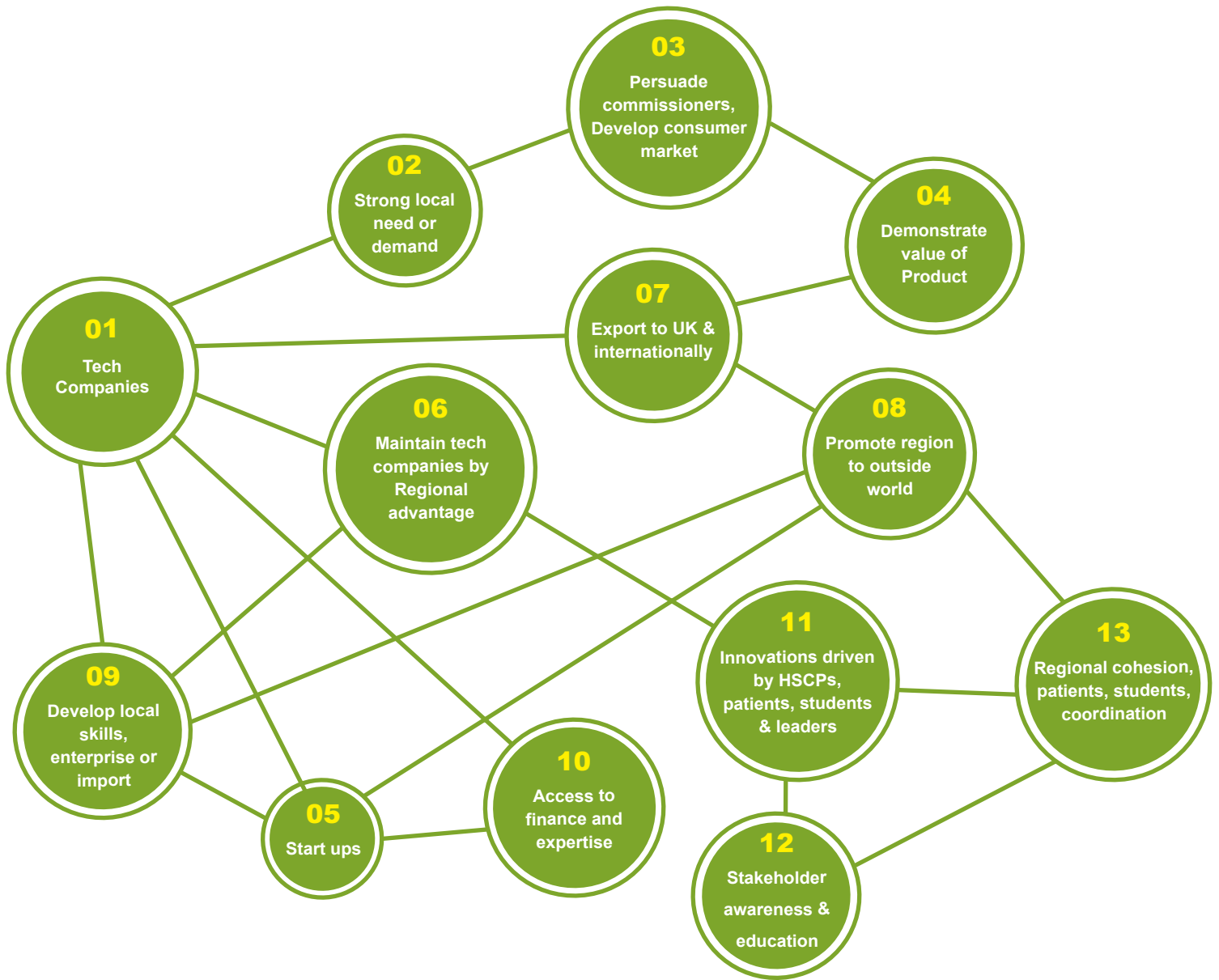
Figure 6. Example of the 'messy' relationships between sub aims and activities.

Complex relationships and activation: Although explicitly stated aims and activities focussed on helping SMEs collaborate with others to make applications to our Challenge Fund, the activities we have been undertaking were more complex and subtle and can be thought of as activation. It is difficult to represent all the multifaceted links, but Figure 6 illustrates one 'pass' through activities aimed at developing the eHealth ecosystem.

The messy relationships can be illustrated with this narrative (numbers refer to Figure 6): (1) We are trying to establish and help grow technology-based companies offering eHealth products or services. For this, it would help if there was (2) a strong local need or demand, which is helped if (3) those responsible for purchasing (whether commissioners, care providers or patients), have had (4) sufficient evidence of the value of the digital based solutions. While we need to support and help grow existing eHealth companies, the needs identified locally may not be met and we need to help get (5) new start-ups in CIoS. Once established we need to ensure that all these companies are (6) maintained through some CIoS advantages. As the local market is limited, if these companies are to expand they need to (7) export to the rest of the UK and the world so we need to (8) promote the CIoS to the outside world. We also need to do this as, although we will (9) have to develop local skills and enterprise, we may also need to try to attract these into the CIoS from outside. Furthermore, we need to ensure that these start-ups have access to (10) finance and expertise to get started. Of course nothing stands still in technology and we need to find a way for (11) a continuous cycle of innovation – best driven from the bottom up by health and care professionals, students, patients, and the leaders of organisations. And we need to ensure that both on the supply and demand side of eHealth (12) all stakeholders are aware of the possibilities through continuing education. So to find a way to drive this continual innovation and raising of awareness we need (13) a coherent approach across the CIoS, making use of 'free' resources of students and patients to help drive this forward

Engagement: The main activity in the first year was to identify through snowballing, mass and social media releases, through project partners, as many stakeholders as possible among health and social care professionals, patients, students, technology and related companies, policy makers and others. We held 22 'drop-in' roadshows throughout the county with various partner organisations such as charities and community groups (Figure 7). These informal roadshows included varied demonstrations of digital devices and software. The usability and robotics teams led the preparation of presentations and demonstrations including companion and humanoid robots, virtual reality, smart home speakers, and tablets with various software (Figure 7). We also held six introductory webinars each focussing on different areas of application (e.g. primary care, acute care, mental health), advertised through our growing stakeholder database, social media, and personal networks. For these webinars we recruited additional speakers for each to demonstrate the activities in CIoS, and to help 'widen the net'. Alongside events we ran social media, mass media, and developed videos to help explain the project.

Collaboration/networking: EPIC has involved numerous partners at different levels of collaboration. In addition to the five core 'delivery' partners and external experts (Figure 3) we had numerous one-to-one contacts and small meetings with various stakeholders. We also explored options for and then set up an online platform for all stakeholders to meet and further discuss ideas and ran 12 online meetings to try to bring people together and to get them using the online platform.

Workshops: We held eight locality-based workshops in September 2017 (Figure 7), within which we ran 33 focus groups. These involved more formal engagement of recruited individuals including discussion and identification of challenges that could be addressed by technology. Between 19 and 44 people attended each workshop (223 in total) the biggest group being 108 (48%) health and social care professionals but also 34 (15%) patients or service users, 24 (11%) students, and 57 (26%) SMEs and others. In addition, we have run meetings focusing on specific issues including

mental health and social prescribing.

SME support: Sixty of 130 SMEs in contact with EPIC had registered and 18 of these had had 12 hours of business support mostly through face-to-face meetings and SME-focussed networking events.

Figure 7. Locations of 22 roadshows (red spots), 8 workshops (blue spots), and 3 conferences (yellow spots) (top); EPIC car used for frequent trips around the county and pictures from roadshows and workshops (bottom).

Conferences: We held three one day conferences (November 2017, April and July 2018 (Figure 7)). These were more traditional days with speakers, audiences, discussions, and an exhibition area with demonstrations of products, services, and studies. For example, the November conference included presentations from the Living It Up project and exhibits from numerous local SMEs, attended by over 100 participants. The April conference included presentations from our Australian advisor Wendy Moyle on companion robots (Moyle et al. 2018) and telepresence (Moyle et al. 2017). The July conference focussed on patient and student involvement and included presentation from the Launchpad project (ERDF 2018c) offering support to start-ups.

Leaders: Aiming to explore further the evidence required by commissioners and other strategic players we ran a one-day Strategic Advisory Group discussion in May 2018 involving most local leaders alongside national figures.

Students: The other strand of work under sustainability was trying to engage and involve students as drivers of eHealth innovation. Nursing students were invited and despite the difficulties of freeing up time in a very busy curriculum and clinical placements, some attended workshops and roadshows. In addition, work has been under way, linked to Digital Professionalism and the idea of nurses as Digital Health Champions, to embed eHealth in their curriculum. Engagement of robotics and design students on specific projects has been fairly successful but we still seek ways of embedding innovation into various curricula.

	Total number SMEs	Status before 1st May 2017 in CIoS				
		Cornish eHealth SME	HSC organ-isation not major tech	Tech not major in HSC	Other	Did not exist (ie eHealth Start-ups)
Registered with EPIC	68	14	22	18	7	7
Making Challenge Fund application	19	8	2	1	1	7
Awarded feasibility grant	13	5	1	0	1	6
Awarded development grant	4	2	0	1	0	1

Table 2. Number of SMEs registering with EPIC and receiving Challenge Fund grants by October 2018

Findings

We were on course (October 2018) to meet our ERDF 'deliverables' (Table 1). In terms of our wider objectives, we have addressed our objectives for each of the nine stakeholder groups as follows:

1.   **eHealth sector:** When we started in May 2017 there were few companies clearly identified as eHealth, 1 larger company and 14 eHealth SMEs (using a very wide definition) (Table 2). In addition, there were of course numerous health and care providers such as the NHS and local authorities (i.e. hospitals, other Trusts, public health), health and care providers that are SMEs (i.e. GPs, dentists, care homes, domiciliary care, public health, and other private providers (dietitians, physiotherapists working privately). By October 2018 we had 68 SMEs registered with EPIC (Table 2). Nearly half (£263,000) of the Challenge Fund has been committed to 13 feasibility (£5000) and four development (bigger) applications. We have also worked with two SMEs in preparing applications to external funding bodies. At least one new product developed by bringing together two SMEs – has gone to market.

2.   **Health and Social Care Professionals:** We have raised awareness. Over 700 HSCPs have been in contact with EPIC through roadshows and workshops. Some of these speaking (see workshop videos (University of Plymouth, 2018) about being made aware of new technologies suggests that this awareness extends to improved knowledge of the topic. Certainly, we know that we have been able to 'activate to innovate' some 20-30 HSC professionals who have engaged in discussions to form groups or make bids. These include (e.g.) a consultant psychiatrist proposing an avatar-based decision support app for psychiatric illnesses, a behaviour therapist wanting to develop an app to support emotional coping skills, for individuals affected by personal disorder, and a mental health charity interested in developing a diagnostic app for monitoring and delivering wellbeing to individuals with mental health problems. We have also linked some 15-20 HSC professionals with other professionals, patient, patient groups, or SMEs. For example, in our first conference, the

linking of a dental practice with an SME to form a collaboration leading to the first Challenge Fund application.

3. **Patients and service user groups:** Several hundred patients, patient representatives, and members of the public have taken part in roadshows, workshops or other meetings. These discussions and demonstrations have improved knowledge and developed more favourable attitudes towards possible technology use. A number of patients have become involved in new product development, working with SMEs, or in new applications of digital, so developing expertise and self-efficacy in eHealth innovation. For example, a group of patients with respiratory problems who were initially sceptical and are now championing the potential of technology use for educational outreach purposes. Similarly, we have worked with many care home residents and their families who have become interested in the use of companion robots, with several buying devices. Other examples include a member of a patient participation group now leading the implementation of video-calls between GP surgery and a local care home, and another bringing together an SME and charity group working on social prescribing platform with a local place-based charity.

4. **Academic sector:** The EPIC team itself, comprising 5 research assistants, 10 academics, 3 PhD students, and 2 local consultants, has developed skills in eHealth innovation and are discussing the setting up of an eHealth centre of excellence in the regional university. We have also now nearly managed to get embedded into the nursing curriculum the idea of students (of which there are nearly 1500 in Devon and Cornwall) (a) acting as digital health champions (alongside community volunteers) showing people how to make better use of the Internet, and (b) helping to 'activate' patients in the future as innovators. For example, some nursing students have been involved as demonstrators of eHealth technologies to different user groups at roadshows and workshops.

5. **eHealth start-ups:** at the time of writing (October 2018) seven start-ups have so far been helped into existence either by the specification of a health and care problem currently unsolved or by the pull of the Challenge Fund. To date most robots are built elsewhere in the world, at the start CIoS had one SME developing and building robots, mainly for arts and performance. One aim, therefore, of EPIC is to develop start-ups in care robotics as well as to encourage existing software companies to expand their remit to devices. At the same time, we need to develop the market and better understand where and how robots and other devices can be used cost effectively. Three of our start-ups were in care robotics which was a major strand of EPIC.

6. **Tech companies transferred in to HSC:** By describing the market opportunities and with the added benefit of the Challenge Fund we have managed to encourage at least two local SMEs to expand into the eHealth sector from other fields.

7. **Other agencies supporting business:** We have worked with 'general' other agencies (mostly funded by the EU) including Invest in Cornwall (Cornwall 2018), CIoS Growth Hub (ERDF 2018b), Catapult (Catapult 2018), Acceleration Through Innovation (ATI (ERDF 2018a)), and Launchpad (ERDF 2018c). We have also collaborated with Smartline (Smartline 2018) (the other ERDF funded eHealth project) to ensure a coherent approach to developing the eHealth sector.

8. **Leaders:** We have raised awareness of the possibilities of eHealth among key leaders in health and social care as well as business leaders, in several meetings but in particular through a Strategic Advisory group meeting in April 2018. This event helped 'activate' leaders and reinforced a shared view that using digital was to improve services as much as to save costs, and that cross-sector working was needed to achieve this. It helped support the Digital Transformation Board (DTB) who invited EPIC to join; this will enable us to promote good links between the DTB and a wide range of stakeholders and ensure that eHealth can contribute to the Sustainability and Transformation Plan (Cornwall 2017) for re-profiling health and social care in CIOS.

9.   **External views of Cornish eHealth:** As well as promoting via social media we have made links with external companies, for example, a Swedish Company who then attended our first conference. Team members have made contact with some 15-20 companies through international conferences and other meetings. We have also promoted EPIC to the UK Houses of Parliament and government via a University of Plymouth event in the House of Lords, at professional conferences such as Royal College of Psychiatry South West and the SW care awards.

Common Understanding: We have started to develop: (i) a 'bottom up' common understanding among all the above stakeholders of possible digital health applications, (ii) an understanding of the need for collaboration between HSC professionals and SMEs. We have identified some 130 possible applications grouped together in 21 headings (Table 3) through discussions between HSC professionals, patients, leaders, and SMEs. These headings are clearly related to the context of CIoS, addressing rurality, older people, loneliness, and poverty. They were also influenced by the technology and suggestions that were 'seeded' (in the showcase) before the discussions. For example, we demonstrated technologies such as robot companions, telepresence, and virtual reality. Our workshop groups proposed uses for these, which suggested that our participants did not have many prior ideas of need or eHealth use. Nevertheless, when this list was shared with leaders and other groups after the workshops, they endorse it as representative of CIoS needs. We have found our terminology and ideas about the need to develop a sustainable eHealth innovation ecosystem reflected in conversations as the project has progressed.

Challenges identified from 8 county-wide workshops in CIoS
Rurality; Clinical workloads; Better social prescribing; Patient empowerment and home supported care; Safer medication; Phobias, fears, addictions, and anxiety; Lack of human contact; Sensory impairment and communication difficulties; Calming for people in distress; Care home staff workloads; Capturing and sharing information; Maintaining independence at home; Maintaining identity and happy memories in older age; Promoting healthy lifestyles; Workloads for mental health services; Transport and access; Poverty and malnutrition; Coastal safety; Personal safety; Staff and patient awareness; staff training and resilience.

Table 3: Health and social care challenges that might have digital solutions

What worked and what did not: The following summarises the views of team members from a series of face-to-face and online discussions.

1. **Participation.** The attendance and participation of large numbers of people at our roadshows, workshops, and conferences has been the main success and driving force of our project so far. Feedback from numerous sources has shown that we have successfully raised awareness, knowledge and levels of discussion about the use of a wide range of digital technologies in health and care. Key to this success was the hard work, enthusiasm, and personable characteristics of the team members. Appointing the 'right people' is essential.

2. **Interdisciplinary working and balance of skills.** The structure of the EPIC team has brought together different academic disciplines in the project's five strands (Figure 3) and a main partner, Creative England. Anyone who has worked in multi-university, multi-disciplinary, multi-agency EU projects will probably have experienced frictions between institutions and spent much time trying to understand the different language and conceptual frameworks. This happened to some extent in EPIC, but much less so in a single- institution inter-disciplinary project with one main partner. Having this inter-disciplinary approach was essential for success. Engagement with our stakeholders and the media through events was successful but intensive. Virement between our budget headings allowed us to appoint a media and events officer halfway through the project.

3. **Existing or start-up SMEs.** There were few specialised eHealth SMEs at the start and they were focused on their existing products and services. Although there have been some notable successes, for example, one existing company responding to new ideas from the police and mental health services, most did not have capacity to start the development of new products and services from our 'bottom up discussions'. For this reason, we have needed to focus on start-ups and 'conversions' to health within Cornish SMEs, and inviting external firms to come to CIoS. This has worked well, particularly in robotics through discussions with new graduates and students.

4. **Moving from idea to action.** The bottom up activities (i.e. workshops, roadshows) which generated needs and knowledge awareness were 'easy' and generated new ideas (although many of them were 'seeded' by the team through our technology demonstrations and presentations. However, actually driving bottom-up initiated innovation (and co-production) has been harder. Partly this was due to our timing in that we tried to get aggregation of common themes across the county and set up an online platform for county-wide discussions. This was not successful. As we have found before (Evans, Jones, and Smithson 2014; Jones, Smithson, and Hennessy 2014) event driven activity works better, as everyone is busy and having deadlines of events works better. There was also perhaps a lack of clarity in the purpose of the tasks. One-to-one matchmaking and more tailored and personal small group meetings have worked much better because individual needs can be ascertained and met, there are clear goals and the roles for different actors can be established. Nevertheless, coaching and supporting HSC professionals and patients to go from 'having an idea'

to putting that idea forward as a project or business proposition remains quite challenging.

5.   **Local 'politics and personality'.** As everywhere, but particularly in a rural region where there is not the scale to 'avoid' others, the history and politics of individuals and organisations of course influences their willingness to work together. Any project, like EPIC, needs to be able to work with varied partners and in some cases try to mediate between them.

6.   **Culture change and being 'empowered'.** Many of our stakeholders referred to the challenge of culture change, which seemed a daunting unmanageable task. So, one of the first task of EPIC has been to develop more of a ('can do') attitude as well as start to tackle the challenge of skills, knowledge, etc. We are making some progress in culture change with students and patients as digital health champions. Similarly, national initiatives can be a spur to activity but can also be a cause of inaction and planning blight if people feel they are 'left out' (and CIoS often is), or if there is no hope that CIoS can ever 'take on' more affluent, well connected, central areas. As well as developing a can do attitude we need to remind people of their power at the ballot box or through lobbying or direct action.

7.   **Staying close to our end-users.** In the development of our original application it was clear that HSC professionals and patients and patient groups in CIoS were very wary of universities and research organisations 'using them' to obtain grant funding but with little local benefit. We wanted to be sure that not only was EPIC of real practical use but seen to be so. We proposed basing our team in the two general practices and two care homes to ensure that the project was fully grounded in the health and care sector and needs of the CIoS. That would provide an opportunity for 'discussions over the kettle' and a continuous link between project and practice. However, the travel involved proved impractical. Both the EPIC team and partners felt a lack of office space and HSC professionals' and office staff workloads made this less viable than originally anticipated. Instead the extensive roadshows throughout CIOS and numerous more purposive meetings with our four delivery partners has ensured that our project has remained well grounded in the needs of CIOS.

8.   **Student engagement to help sustain innovation.** EPIC members have successfully engaged nursing students in EPIC events, which students can use for their curriculum vitae. We have also engaged technical or design students on project work. However, in both cases these were extra-curricular activity and so without an EPIC 'champion' to facilitate it, lack routine triggering and input from new cohorts of students. Although all our nursing students are on Twitter (Jones et al. 2016) and we have planned further sessions to promote 'Digital Health Champions' further work is needed to embed this into the curriculum.

Discussion

We have taken a realist approach to evaluating EPIC. The context of our work is as an ERDF funded project in a peripheral rural region of the UK with low productivity with an older population with relatively little history of input from university or research institutes. We heard reports that some SMEs and others only survived through continued EU grants. We are trying to complete our EU funded project, in the face of Brexit, so that we leave sufficient critical mass of a new eHealth sector and continuing innovation drivers from other sources, to continue beyond our project.

This report has described the 'bottom-up' approach we have taken to facilitating the development of an eHealth ecosystem in CIoS. Rather than concentrating on engagement, awareness raising and activation, could we have just shown our stakeholders what was happening elsewhere in the UK and asked them to import those solutions? It is important to learn from national exemplars such as the seven testbed projects funded by the NHS in 2017 (Galea, Hough, and Khan 2017). However, (i) we can note that none of these (like much UK central funding) were in the South West, and (ii) following the general recognition that tailored approaches are required in developing (regional) entrepreneurial ecosystems (World Economic Forum 2015; Keizer et al. 2016; Wyrwich, Stuetzer, and Sternberg 2016) our aim was to develop local solutions and the eHealth sector as a contributor to the local economy.

We are unable to provide evidence at this stage that the eHealth ecosystem will continue to be sustained beyond the end of the project. We realise that this is a difficult task, particularly given the withdrawal of EU regional funding if the UK proceeds to Brexit. Analysis of the impact of Objective 1 funding in CIoS and South Yorkshire (Di Cataldo 2016) showed that both counties had performed better than they would have done without EU funding from 2000-2006 and that when South Yorkshire lost Objective 1 eligibility in 2006 it was unable to sustain the gains obtained in previous years. Therefore, CIoS, in general, after Brexit is likely to be deeply affected by a reduced aid, and the eHealth sector therefore has a major challenge.

At this stage (May17-Oct18: half way through our three-year project) we cannot know if we will succeed. However, we are on schedule to meet all our original ERDF quantified (process) outcomes such as businesses supported and Challenge Fund grants distributed. So, at the very least, our overall EPIC approach seems an appropriate mechanism to develop an eHealth ecosystem. Against this background, we have examined the mechanisms that we have used and their outcomes to date, to decide what seems to have worked and how. We think this analysis will be of interest to similar regions and stakeholders.

Embedding innovation

From the start, EPIC included a wider range of stakeholders than Iyawa (2017) who seemed slightly 'surprised' at the inclusion of patients as stakeholders. We think this has always been obvious and that the range of stakeholders needed to sustain an ecosystem includes education (Feldman, Francis, and Bercovitz 2005; Audretsch et al. 2011) and the private sector of developers. During our project, we have refined this into nine groups with their own objectives.

It is also important to reflect upon the contexts within which stakeholder themselves are operating and to consider new opportunities for engagement. As we move into the remaining time of our grant, we need to do yet more in embedding innovative impetus from patient and student groups. We need to develop more an external market for export, attract more interest from venture capitalists and

other companies to invest in CIoS. Lastly, we need to engage with national and local politicians so that they are aware of the benefit to the region and to 'fight the eHealth corner'. These observations with respect to stakeholder identification would seem generalisable to other contexts.

Engagement

Our extensive work in roadshows, workshops, meetings, webinars, and use of the media has been key to raising awareness and getting discussion of the use of digital technologies. We had originally planned to work physically from general practices and care homes. However, this proved impractical and, through our other engagement activities, was not in any case necessary. Our attempts to take a region-wide approach for interest groups to take ideas through to prototyping or developed products lost the momentum from the initial enthusiasm generated from engagement events and was not successful. However, subsequently a more nimble and opportunistic approach has been working well.

It is important to note, however, that our ability to successfully facilitate and coordinate working networks has relied on a well-resourced EPIC team. The range of skills in the team and associates (engagement, behaviour change, organisational change, apps & interface design, robotics, patient organisations, local leadership, and business engagement) may be difficult to replicate in a less well-funded project context.

The network-centred change agent

The EPIC approach can be described in terms of knowledge mobilisation. The role of the EPIC team has been as eHealth innovation change agents – using the well-established terminology of Rogers (1983) - promoting the idea that all stakeholders should look at digital technologies to see if the adoption of existing technologies would meet health and care needs, or if there was scope to produce locally new digital technologies to meet those needs. In this, the EPIC team has needed to raise awareness, encourage exploration of evidence and work across sectors to understand the interplay between health and care outcomes, usability, and marketing of products and services. It is important to note that the EPIC team is not championing a particular product or service but a way of working in which stakeholders move from passively appreciating the potential of digital technologies into actively working towards applying them or developing new ones.

Part of this requires an understanding of why products and services from small to large have failed to be sustained before. The work of Mair et al (2012) and our own experience emphasised the importance of collective action and the idea of normalisation. For example, in prior work in care homes (Zamir et al. 2018) we had been trying to 'normalise' the use of video-calls as a step towards making them part of the routine care contacts. We were also very aware of Greenhalgh et al's. (2013) work and in particular the need for 'bricolage', a tailored approach to digital use, and often the need for some local champion to help implement and support digital use.

This implies a very fluid approach to knowledge mobilisation and has demanded interdisciplinary input, technical skills (e.g. around robotics) and soft interpersonal skills like communication, flexibility and perseverance of team members. Working across disciplines can produce tensions between different terminology, working practices, and values. However, we feel that, so far, this has been achieved. To do so has probably been easier in this project where most of the resources were in one university rather than spread across many universities, such as in Horizon 2020 projects.

There is also a sense in which EPIC has developed from a team of individual change agents to a partner in network-centred change. It has worked with a managed network of organisations, which

collaborate so as jointly to operate the mechanisms and so produce the outcomes, outlined above. EPIC's network has been the change agent with EPIC itself as the network builder and coordinator, hence a change agent by 'multiple proxy'. This is the most difficult step but one where the EPIC team has been successful as evidenced by (e.g.) an initiative to make CIoS a testbed offering outside organisations facilitated recruitment and testing of new products.

The big question is who will take on that role in the longer term? That is, who will succeed EPIC as the body to coordinate the network of organisations jointly operating the mechanisms, and so producing the outcomes, outlined above. The change agents need to understand digital technologies, health and care services, SMEs, markets, and the interaction between these stakeholders. They need to understand the reasons why eHealth technologies have succeeded or failed before and how individual products and services have been evaluated and some of the disputes about what is good or poor evidence. Knowing how the existing stakeholders within CIoS are connected and these connections can be further developed is essential. Growth of the eHealth ecosystem can be quantified as any increase in total system throughput and development can be represented by an increase of 'average mutual information' within the network (Huang and Ulanowicz 2014). We currently employ a social network approach (Sloane and O'Reilly 2013) to understand and improve network resilience and propose to measure the impact using an ecological network analysis in three to five years' time.

Being realistic

The aims of EPIC are far more modest than the aims of a comparable project like the Living It Up programme which was part of the DALLAS programme (Grant 2017). Living It Up was trying to implement a large region-wide system to integrate records and systems. EPIC on the other hand is just trying to create a better ecosystem for eHealth innovation linked with, as far as possible, health and care systems in CIoS. We intend that the better eHealth innovation ecosystem will result in better health and social care in CIoS but have not had that as our primary aim, nor do we try to link or integrate the different systems and devices of the SMEs that we work with.

This does not mean to say that regional development strategies of this kind cannot monitor and evaluate progress. EPIC seeks to build a stronger ecosystem that will continue beyond the end of the project. That ecosystem can be defined by the overlapping and collaborating networks of SMEs, health and social care professionals, patients and student groups. If suitable methods can be found to monitor the 'strength' and 'extent' of these networks, it should provide a measure of success of EPIC and other similar interventions. We continue to work in this area.

Understanding organisational culture

The crucial role culture plays in fostering organisational innovation is widely recognised (Buschgens, Bausch, and Balkin 2013; Aoyama 2009) as is its role in entrepreneurial ecosystems (Spigel and Harrison 2018) and so one of the first tasks of EPIC is to develop more of a 'can do' attitude as well as start to tackle the challenge of skills, knowledge, etc. We are making some progress in culture change with students and patients as digital health champions.

There are nevertheless challenges to building up linkage and exchange around an innovation platform in a context (health and social care) that is rich in isolated clusters in need of connectivity (Long, Cunningham, and Braithwaite 2013). HSC professionals have for many years decried the problems caused by siloed working (communication is mainly 'vertical' within uni-occupational structures and hierarchies, not 'horizontal' between them) (Bayly 2005). The trick of sustainable eHealth innovation lies in finding mutual benefits for each organisation and individuals. One of the sub-aims of EPIC

has been to try to develop a common understanding of how the different parts of the ecosystem interact and rely on each other, and how siloed working prevents innovation. This has been at a time when the need for more integration between health and social care has been in the media spotlight, and CIoS is supposed to be working towards an integrated system, so EPIC has not had to work against 'the flow'. Nevertheless, current formal structures still can create barriers. Our networking, round table and matchmaking activities have encouraged discussion and awareness of how to use digital across society. The range of working groups and Challenge Fund proposals that crossed various health and care settings is evidence that we succeeded in getting a wider perspective. The bottom up production and subsequent sharing of the report on where and how digital could be used is evidence that we also have had some success in getting a view of a common cause, although this needs continued work.

Understanding contextual enablers and barriers

Innovation requires entrepreneurs who are prepared to drive change, take risks, and disrupt current working methods where necessary (Fernández-Serrano, Martínez-Román, and Romero 2018). The innovation 'culture' of a region and the people in it are inseparable. Sometimes, despite much investment a sustainable cycle of innovation will fail to be sustained because it lacks the people to continue to drive it. Other times, one or two key individuals can transform an organisation because of their drive and knowledge. CIoS can, partly because of its geography, seem isolated from the rest of the UK and the world. Yet, its isolation means that strategic and operational stakeholders work in a range of capacities and have to collaborate pragmatically. They also move roles over time, creating legacy connections which have proved invaluable to the building of partnerships and collaboration.

Rurality may also start to work in the region's favour. With technical advances, we may have reached the tipping point when geography stops being so important. Davis in his Mind the Gap thesis (Davis 2014) claimed that 'Silicon Roundabout' was always going to beat the rest because people could meet, and have critical mass for both market and supply of talent. If CIoS could address its main barrier to progress – rurality and distance from the markets – by developing a culture of working and communicating online, it could be at the forefront of new developments. It is always likely to have cheaper office space costs (King's College London 2015) and the benefits of better quality of life can attract staff (of a certain type).

Conclusion

The view amongst our team and stakeholders is that our working methods were 'about right' in the 'bottom-up' approach, we have taken to facilitate the development of an eHealth ecosystem in CIoS. Two principles to our approach seemed key: (i) the ability to take an 'agile approach' and (ii) the involvement of both service (end) users and professionals, a prerequisite for culture change and user-centred design. We think our described methods provide examples for policy makers in other similar regions. Internationally, the ECHAlliance (European Connected Health Alliance 2018) is a network of eHealth ecosystems aiming to implement, within health and social care, innovative solutions targeting an improvement of the quality of health status and wellbeing of citizens, of the efficiency and the sustainability of the system and generating business activities growth and job creation. The experience of EPIC can be of use to others in this network. We are unable to provide evidence at this stage that the eHealth ecosystem will continue to be sustained beyond the end of the project, and that is the focus of our work in the time remaining.

Contributors for this report

All authors have edited, commented on, and 'signed off' the report. Those acknowledged have contributed to the project in various ways but were not so involved in the production of this report.

Authors	Contribution
Ray Jones	Had idea, co-developed proposal, principal applicant, directed project, wrote report. Corresponding author.
Sheena Asthana	Co-applicant, contributed to the conceptual perspective and rewriting of drafts.
Andreas Walmsley	Contributed to the conceptual development around innovation ecosystems.
Rod Sheaff	Co-applicant, contributed to the conceptual development around realist evaluation.
Jenny Milligan	Co-developed the proposal and provided cost data.
Michael Paisey	Managed project, contributed data for report.
Katie Edwards	Led on recruitment workshops and roadshows, provided data for report on recruitment numbers, team reflections.
Gabriel Aguiar	Led on provision of robotics, recruitment and development of start-ups, work with other companies, contributed map for report.
Arunangsu Chatterjee	Co-applicant, contribution to management of project, development of network analysis sub-project.
Heather Eardley	Major contribution to patient involvement in the project, provided examples for results in report.
Tracie North	Major contribution to the engagement of leaders throughout the region, provided examples for results in report.
Clare Wyatt	Contributed to workshops and road shows and has helped to develop the student/patient involvement aspect of the project.
Daniela Austin	Contributed as RA to roadshows, workshops, engagement and knowledge mobilisation.
Cito Maramba	Contributed as RA to roadshows, workshops, engagement and knowledge mobilisation.
Deb Shenton	Contributed as RA to roadshows, workshops, engagement and knowledge mobilisation.
Kim Young	Co-applicant, facilitated access to nursing students and advised on patient groups.
Jackie Andrade	Co-applicant, contribution to management of project.
Jon May	Co-applicant, contribution to management of project.
Craig Newman	Co-applicant, contribution to management of project and ideas on ecosystem approach.
Joanne Evans	Contributed to business and entrepreneur liason and support.

Acknowledgements	Contribution
Kirsty Marrs	Recently joined the project and has made a major contribution to media presence and future events.
Penny Morgan	Recently joined the project on business engagement and liaison.
Jay Amies	Recently joined as project manager.
Serge Thill	Contributed to the management of the project (line manager for Gabriel) taking over from co-applicants Cangelosi and Dahl.
Andrew Chitty	Was involved in initial discussions and provided one of the figures for the report, helped in organisation of first conference.
Kate Adam	Managed the Challenge Fund on behalf of Creative England.
Creative England staff	Management of the Challenge Fund and business support.
Yve Metcalfe-Tyrrell	Contributed to the proposal.
Lee Richards	Helped in producing tender for independent evaluator of project.
Ulrike Richards	Helped in early stages of proposal and interviews in setting up the team.
Staff at Crossroads care home	For their collaboration in events and identifying needs for technology.
Staff at Stennack surgery St Ives	For their collaboration in events and identifying needs for technology.
Staff at Oak Tree surgery Liskeard	For their collaboration in events and identifying needs for technology.
Staff at Eventide care home Liskeard	For their collaboration in events and identifying needs for technology.
Ben Bowskill	Contributed to liaison with SMEs in first year (since left).
Funders	ERDF and SWAHSN.
Anita O'Connor	Contributed to the administration and the smooth running of the project.
Zoe Doran	Full time PhD funded by the project, but currently suspended.
Hannah Bradwell	Contributed to numerous workshops and roadshows taking charge of robot companions and working on related project for her own PhD.
Toni Page	Working on related project for her own PhD which will lead to its own papers.
Torbjorn Dahl	Co-applicant who contributed to management of the project in the first year (since left).
Angelo Cangelosi	Co-applicant (since left).
Seb Stevens	Working on sub project exploring networks, which will lead to its own paper.

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