Department for Business Innovation & Skills

LONG-TERM CARE IN THE UNITED KINGDOM

A case study for the OECD TIP System Innovation Project

JUNE 2014

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June 2014

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Executive Summary

The transition in long-term care

The long-term care system provides support for those with long-term health conditions. It is undergoing a transition as the focus shifts from residential care in hospitals, nursing homes and care homes to treating and supporting people in their own homes. This is being driven by both a desire amongst older people for greater independence and choice in later life, and a need to manage the increasing financial pressures an ageing population creates. The challenge to society is enormous, the commercial opportunities are large, and a significant policy response is emerging. This transition is being facilitated by new assisted living technologies and associated changes in how the care system operates.

Long-term care is changing in two distinct ways. Firstly, the nature of treatment and support is changing focus from residential care to assisted living. Secondly, the way treatment is delivered is shifting from patients taking what the NHS and local authorities provide, to patients having greater choice and flexibility with the option of procuring directly from suppliers.

The transition is currently between the 'gestation' and 'break-through' phases identified by the OECD paper *System Innovation: Concepts, dynamics and governance*. Assisted living technologies have some commercial success, but the market has not been growing recently.

There are several critical barriers to transition. These range from a lack of awareness of assisted living options holding back demand, to the fragmentation of public procurement and difficulties coordinating the multitude of actors in the system.

These barriers have implications for the theory of system innovation. Firstly, evidence is found that validates each of the system innovation failures hypothesised in the OECD paper. Secondly, evidence suggests that other failures deserve greater prominence than they are currently given. These are (i) the culture of the system and the acceptability of novel technology, and (ii) the risk of exogenous shocks derailing or blocking the transition process. It is also speculated that monopsony could play a key role in the early stages of transitions such as long-term care by supporting supply chain development.

Thirdly, the classic market failure of asymmetric information is identified as particularly important in this case study because of the central role raising awareness plays in building demand. Finally, the barriers identified in long-term care are closely interconnected. This means that they cannot be viewed in isolation but rather must be viewed as a complex network of interlinking obstacles that often compound one another. Supported by BIS research into further innovation areas, this is a key feature of any comprehensive understanding of system innovation.

There are numerous policy actors spanning multiple layers of government with an interest in assisted living technologies. The Assisted Living Innovation Platform (ALIP) brings together and coordinates key stakeholders, and it supports this with a combination of

policy instruments. Its set-up allows it to be interpreted as a response to both conventional market and system failures, and to system innovation failures.

Policy insights

The ALIP presents two key lessons for successful policy responses to system innovation.

Firstly, the policy response needs to be holistic in order to address interconnected failures; the various barriers should be treated in a comprehensive and coordinated way.

The barriers to system innovation in long-term care are both numerous and interrelated. For example, technical limitations, restrictions to diffusion of innovations through health and social care, and uncertainty regarding the evidence of the effectiveness of assisted living technologies all combine to restrict demand and 'buy-in'. Policy needs to recognise these relationships and address barriers as a whole in order to be effective. Similarly, an exclusive focus on technology which omits the provision of appropriate environmental conditions in which the technology can develop will prove ineffective. Not only does this imply the need to draw on a variety of policy instruments, but it also means that engaging with and coordinating stakeholders is of central importance because it is unlikely that one body can address all barriers single-handedly.

Secondly, the policy response needs to be adaptable and to learn about the transition it addresses. This is because of the uncertainty that accompanies system innovation.

It is not always clear what applications novel technologies will have, nor what barriers will emerge to frustrate their development as transitions progress. This is clear in long-term care where initial impressions focused on technical limitations rather than broader constraints on demand. Additionally, unforeseen developments such as the health and social care reforms can have widespread implications for the transition.

Policy needs to respond to this in two ways. Firstly, it must learn from its experiences of what barriers are being encountered and what interventions are working, and it must proactively research the system in transition. Secondly, it must prove adaptable and flexible so that it can shift in response to both shocks and an improving understanding of the barriers and priorities.

The experience of the ALIP is encouraging in respect to both lessons. The focus of the Platform is delivering a coordinated response by engaging stakeholders. This is critical for addressing complicated and interrelated barriers to assisted living technologies and system innovation more broadly. Additionally, the ALIP has built its understanding of both what the critical barriers are and how effective its interventions have been.

Finally, there are numerous methodological difficulties for policy-makers examining system innovation, and certain lessons can be learned. Survey and polling data is a potentially valuable tool for measuring the acceptability and awareness of novel technologies. Surveys of awareness of assisted living technologies are a good measure for this important barrier to its uptake. Additionally, contributors are discouraged from reflecting on 'systems' and 'transitions' because of their highly conceptual nature – they stick to their specific programmes and activities.

Introduction

The purpose of this study is to investigate research hypotheses regarding system innovation as set out by the OECD Working Party on Innovation and Technology Policy. This is achieved through a real-world case study of system innovation in the UK.

A system is a set of actors, institutions, infrastructure, and connections – spanning researchers to end-users – that share a common societal function.

One such system is long-term care. This is constituted by a variety of actors from across society (academics, businesses, local and national government, health professionals, carers, and users – ultimately everyone ages) that collectively fulfil society's need to treat and support those with long-term health conditions.

In *System Innovation: Concepts, Dynamics and Governance*, system innovation is defined as[1]:

> *a radical innovation in socio-technical systems that fulfil societal functions, entailing changes in both components and architecture of related elements.*

'System innovation' in this context is used to describe a system undergoing a transition from one method of delivering it's societal function to another. These transitions include innovations in actor activities and also changes in the wider environment in which these actors operate and interact with one another.

The long-term care system in the UK is undergoing just such a transition. The architecture of the system is changing as care for those with long-term health conditions is shifting in focus away from residential care in hospitals, nursing homes and care homes to a new emphasis on treating and supporting individuals in their own homes.

The core driver of this transition is demographic change. As the population ages, the demand for support for those with long-term health conditions will rise. In order to meet this burgeoning demand and keep health and care services at a high standard, the UK needs to develop innovative methods for delivering cost-effective care solutions. Additionally, there is recognition of the need to offer individuals both greater independence and greater choice in their old age.

The transition is being facilitated by the development of assisted living technology: this is an umbrella term which covers a wide range of technologies that allow patients to maintain their independence and rely less on traditional models of care provision.

This case study is based on extensive desk research of policy documentation, evaluation evidence and interviews with key stakeholders including policy-makers.

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[1] OECD, *System Innovation: Concepts, Dynamics and Governance*, DSTI/STP/TIP(2013)3, p.8

1. Rationale for Case Study Selection

Long-term care is a rich resource for this OECD project because the challenge to society is enormous, the commercial opportunities are large, and there is a relatively large-scale policy response emerging. Also, demographic challenges are a common issue which affect a wide range of countries and have stimulated a variety of responses internationally.

The transition is important because of the challenges posed by an ageing population:

- The working age population pays taxes which in part pay for care as well as state pensions for the elderly. In the UK, the old age support ratio (the number of working age people per retiree) is expected to fall from 3.2 in 2012 to 2.8 in 2032[2]. This will put significant strain on public finances against the context of the UK economy recovering from the global financial crisis.

- There is a need to adjust the economy and workplaces to suit an ageing work force and to safeguard productivity.

- There is a need for trained professionals to meet increased demand for healthcare services. This represents a chance to enhance the skills and quality of the workforce.

The fall in the old age support ratio and the consequences for public finances are significant and wide-reaching. Raising the retirement age is a prominent measure to address the pension implications. In the UK, this will rise from 65 to 66 by 2020, as well as being equalised between men and women. However, this measure will only go so far in addressing this challenge.

The financial strain is particularly acute for health and social care. The Nuffield Trust estimates that the National Health Service (NHS) in England will face a funding shortfall of £54 billion by 2021/22 if funding remains constant in real terms, efficiency does not increase, and trends continue in hospital use by people with chronic conditions[3].

Shifting the focus of long-term care from hospitals and care homes to the patient's own home is seen as a key response to the need for more cost-effective care. There is a wide range of policy activity seeking to develop assisted living technology spanning the national government, devolved regional administrations, and the European Union (EU). These different layers provide rich evidence for considering how different approaches to policy – as well as how it is governed and coordinated – influence system innovation.

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[2] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels – Annex A*

[3] Nuffield Trust (2012), *A Decade of Austerity? The funding pressures facing the NHS from 2010/11 to 2021/22.* Chronic care treatment accounted for 70% of total spending in 2010.

The Assisted Living Innovation Platform (ALIP) policy response proves particularly interesting from a systems transition perspective and warrants focus. The ALIP brings together and coordinates stakeholders to achieve a specific goal. This means that the ALIP can be viewed as a policy response both to the traditional innovation systems view of the importance of network failures and to the hypothesised system innovation failures identified in *System Innovation: Concepts, Dynamics and Governance*, particularly surrounding demand articulation and coordination. Also, the evolution of the platform is a good demonstration of how policy responses learn from their experiences.

2. System Transition Profile

Section 2 provides more detail on the transition process. The transition is currently between the 'gestation' and 'break-through' phases as described in the OECD template. Assisted living technologies have some market success, but they are niche and require significant policy support in the face of critical barriers.

What is assisted living?

Assisted living – or 'independent living' – is the treatment of patients in a way that allows them to maintain independence; it allows them to live independently in their own homes for longer. This is an umbrella term that covers a wide range of technologies. While it is most obviously related to care for the elderly – i.e. enabling them to continue living in their homes as they develop medical conditions – it is applicable to any form of long-term or chronic health condition.

Large sub-components of assisted living are 'telecare' and 'telehealth'. Telecare utilises a range of both personal sensors (e.g. movement sensors) and environmental sensors within the individual's home (e.g. carbon monoxide detectors, door sensors) to monitor an individual. Should any unusual readings emerge, the system sends a message to a control centre which automatically triggers appropriate action - such as phoning the individual to check up on them, or sending their next of kin or a nurse round[4].

Telehealth involves the measurement of the patient's vital signs - such as blood pressure and glucose levels – and gathers data frequently. Clinicians then analyse the data to identify what is typical for that individual and whether interventions are required.

Both telecare and telehealth use communication technologies so that those monitoring and those being monitored do not need to be in the same place. This enables individuals to remain in their own home for longer, thereby enabling them to maintain independence.

In order to illustrate these concept more clearly, a few rough and ready examples can be offered:

- A personal alarm that can be pressed to alert a monitoring centre that will respond to the call

- A sensor that activates when the individual gets out of bed at night. Preset timings allow the monitoring centre to be alerted if the individual has not returned to bed within a given period of time

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[4] All sensors are connected to a hub which in turn is connected to a standard telephone line. In the event of a sensor being triggered a signal is sent to the hub which then automatically dials a 24 hour monitoring centre. The monitoring centre will then follow a procedure to establish what has happened and what type or response - if any - is required. The hub is a two-way communication device and the monitoring centre can speak directly with the user - depending on what sensor was triggered - to establish the best response. The monitoring centre will hold details of named contacts - typically family, friends or carers - and will contact them directly to physically check on the user.

- Motion sensors that can identify whether an individual is moving around and active, or whether they have had a fall

- The monitoring of vital signs of patients with chronic long-term conditions that alerts the care team if those vital signs diverge from safe levels identified by the patient's clinician.

Transition profile

Mapping the system: before and after

The way in which long-term health conditions are treated is shifting in two dimensions:

- Treatment/support – there is a shift away from treating and caring in hospitals, nursing homes and care homes, toward treatment and support in the patients' own home utilising assisted living technologies

- Delivery – a growing private market, and a shift in the public-provided care toward greater patient choice

In the 'old' system, frail, elderly adults and others with care needs – such as certain disabilities – are placed in residential or nursing care homes depending on their health status and level of dependency. This is both expensive and the lack of independence damages the individual's quality of life.

In the 'new' system, there is much greater emphasis on supporting independent living for the frail and elderly and those with long-term conditions in their own homes. This means fewer visits to hospitals, doctors' surgeries and clinics, shorter hospital stays, and fewer individuals being moved to nursing and care homes as independence can be maintained for longer.

In terms of delivery, the 'old' system – although it is still the norm - is a statutory service provision model. This involves firms supplying to NHS bodies and local authorities generally on the basis of cost and volume. The public bodies in turn provide treatment and care to users, patients and carers. Figure 1 gives a diagrammatic representation of this delivery model[5].

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[5] It is worth noting that the research base is involved in this process by inputting into firms. Examples of research base involvement include an ESRC-sponsored Growing Older Programme, the EPSRC-funded SPHERE IRC programme, the New Dynamics of Ageing programme, the role of UK academics in the European Research Area in Ageing programmes, the Research Councils UK funding of the ALIP, and individual university involvements in ALIP projects.

Figure 1 Long-term care delivery pre-transition

This mode of delivering treatment is rooted in a long tradition of public sector procurement where the key market is a 'business-to-business' market in which statutory bodies purchase from firms.

The delivery model is also changing as the wider health and social care system undergoes a transition motivated by the desire to give users greater choice. It is shifting to a new set-up where users primarily purchase services (increasingly assisted living services) from firms using a personal budget provided by local authorities with NHS bodies providing separately procured services as required. Figure 2 represents this diagrammatically. In this change of system architecture, the original statutory market remains, but it is supplemented by a business-to-consumer market in which users purchase services from firms. This combines two elements: firstly, pure private sector healthcare, and secondly a new role for local authorities. That is, public sector support for healthcare remains, but rather than just receiving treatment from the authorities, patients can be provided with a personal budget by the local authority. The local authority then acts as a sign-poster to provide users with sufficient information about care options to ensure they are well-placed to choose their own treatment.

Figure 2 Long-term care delivery post-transition
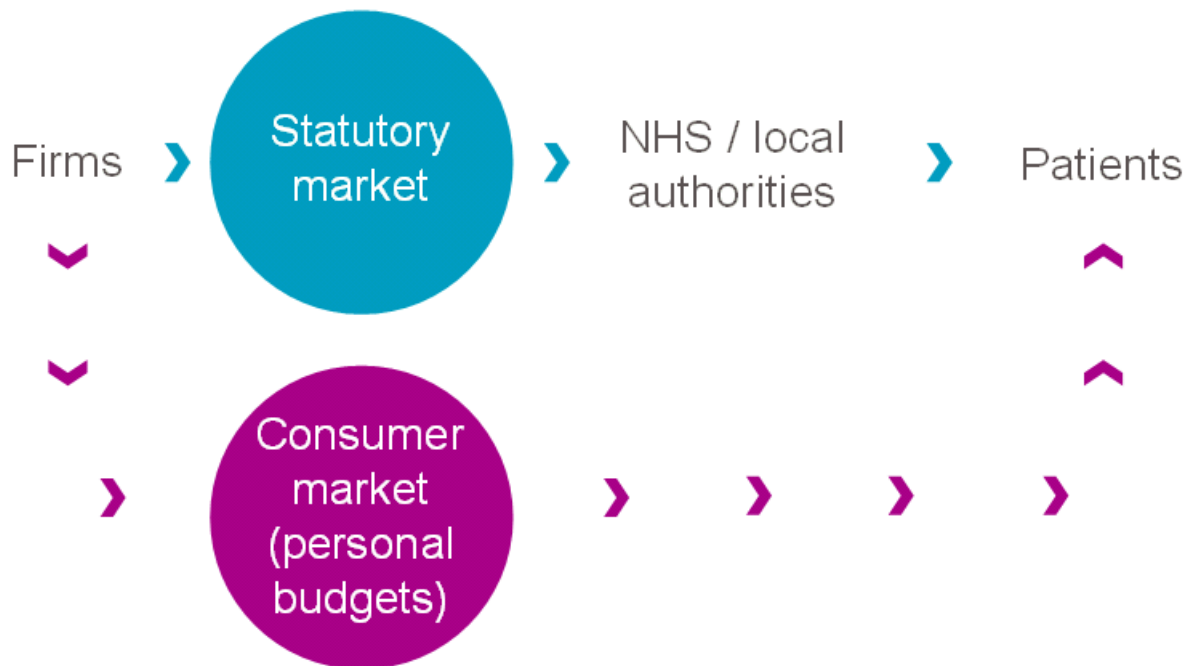
As with the transition in treatment and support, these changes have not been fully realised; they are the new models to which the system is currently in the process of shifting.

Broader health and social care reform

This transition is happening within the context of large-scale reform to the broader UK health and social care system (which provides care for all conditions). The way in which clinical conditions are treated is undergoing significant change with a broad drive toward user-centred health care. By empowering users to make their own care choices, they are to be afforded greater independence as well as care tailored to their specific needs. This manifests itself in particular in changes to the resource-allocation structure in England: the abolition of primary care trusts (PCTs) and the creation of smaller clinical commissioning groups (CCGs) shifts a large part of the role of deciding which care services to provide to medical practitioners. This rests on the view that health professionals are best placed to know the needs of their patients. Similarly, the voice of patients in the care system is being strengthened with local authorities and Healthwatch England championing patient views. The health and social care system in the UK is thereby becoming more user-centric. This is outlined in more detail in Appendix A.

Transition dynamics

Figure 3 summarises the transition in long-term care in terms of the characterisations of system transition outlined in the OECD paper. This focuses on the technological transition to assisted living – and the diffusion of the technologies - rather than the change in delivery model.

Figure 3 Transition profile

Gestation	Take-Off	Breakthrough	Stabilisation
Technical barriers prevent delivery at scale and make products unappealing to customers	Development makes products user friendly and deliverable at scale	Demonstrated success leads to public sector 'buy-in' and raises awareness among users	Wide-spread use makes assisted living socially acceptable
Policy recognises potential	Large-scale adoption by certain NHS/ local authorities	Personal budgets build complementary consumer markets	Increase in proportion of elderly living at home and decrease in public cost of long-term care

The *pre-development/gestation* (or 'embryonic') phase is characterised by the technology not being commercially viable due to poor performance and high cost. In long-term care, this is reflected by firms and researchers having proven the concept of assisted living technologies and their potential to deliver cost-savings to the NHS and local authorities, but they are not deliverable in a user-friendly way, or at scale, thereby restricting demand. Additionally, the cost of technology is high and it cannot be delivered as a comprehensive and scalable service.

The *take-off* (or 'early') phase arises when development produces a commercially viable product that begins to make in-roads into the market. In long-term care, this arises when firms begin to successfully sell assisted living solutions to certain public sector partners at significant scales.

The *breakthrough* (or 'middle' and 'advanced') phase is where the innovation enters the mainstream market and competes directly with established products and firms. In long-term care, the breakthrough for assisted living technologies will arise when they have been demonstrated to deliver cost-efficient, large-scale, and user-friendly services to certain NHS bodies and local authorities. Once the technologies are proven, they will be adopted more widely. This buy-in from the public sector will raise awareness of assisted living technologies among users. This will generate greater user demand within the newly created consumer market.

The *stabilisation* (or 'front-runners') phase arises when the innovative technology becomes the new norm. In long-term care, this will occur when assisted living technologies are sufficiently wide-spread to make treatment at home the default care provision. This will

feed through to outcomes in terms of the number of patients treated in residential care and the cost of treating long-term conditions to the public sector.

Historical development and the current position of the long-term care system

The transition is currently between the 'gestation' and 'break-through' phases. Assisted living technologies have some market success, but they are niche and face critical barriers, and the markets have not been growing.

Significant progress has been made in refining the technology, but development is still needed to show that the technology works on a large scale and to improve the compatibility of different systems. This is outlined in section 3.

The statutory market has traditionally dominated care provision. While assisted living providers have made some in-roads into this market, significant barriers restrict growth. Technical limitations, fragmented public procurement, the slow diffusion of innovations through the public sector, and broader cultural issues all present obstacles. These are presented in Section 3.

The consumer market is not yet developed, but discussions with stakeholders reveal that this significant consumer demand for assisted living technologies is yet to materialise. As outlined in Section 3, this is largely a product of a lack of awareness among potential users.

3. Transition Mechanisms and Bottlenecks

Sections 1 and 2 explained how the transition in long-term care is of great importance to the UK. Nonetheless, the transition is still in its early stages. This is due to several key barriers:

1. Technical limitations and high cost

2. Fragmented public procurement makes it difficult for businesses to grow and comprehensive services to be offered

3. Innovations face obstacles to their diffusion through the NHS and care system

4. The awareness of and culture surrounding assisted living technologies restrict demand

5. The fragmented policy environment makes coordinating a broad approach to assisted living difficult

6. Wholesale reform of health and social care introduced temporary hiatus in longer-term planning and has ambiguous long-term impacts on the system

Crucially, these barriers are related to one another and generate a complex network of interrelated obstacles rather than a series of problems that can be considered in isolation.

As discussed at the end of this Section, these barriers and experiences in long-term care have implications for the theory of system innovation. Firstly, evidence is found for each of the system innovation failures hypothesised in the OECD paper *System Innovation: Concepts, dynamics and governance* in long-term care. Secondly, evidence suggests that other failures perhaps deserve greater prominence than given in the literature. These are (i) the culture of the system and the acceptability of novel technology, and (ii) the risk of exogenous shocks derailing or blocking the transition process. Based on the experience of long-term care, it can also be speculated that monopsony could play a key role in the early stages of certain transitions. Thirdly, the classic market failure of asymmetric information is found to be particularly important because of the central role raising awareness plays in building demand. Finally, the relationships between barriers is a key element to a complete understanding of system innovation.

Transition drivers

1. Pressure on public sector budgets

The NHS and wider government structure has a clear incentive to push toward assisted living as a way of treating long-term health conditions.

In the long term, the ageing population – partly driven by improving clinical outcomes elsewhere in the health service enabling people to live longer – creates a pressure on public budgets as explained in Section 1.

In the short term, the broader fiscal context has also created more immediate pressures for efficiency: even though the health budget has been shielded from nominal cuts during this Parliament, inflation has eroded the budget in real times at a time of increasing cost pressures whilst general demands on healthcare grow.

2. Commercial opportunities for business

Commercial opportunities incentivise businesses to develop assisted living services.

Growing public sector interest in assisted living technologies feed through to creating potential demand in the business-to-business market.

At the same time, there is potentially significant commercial opportunity in the business-to-consumer market. On the one hand, there is an existing private healthcare market which may well grow as the broader 'silver economy' expands. Half of adults would be willing to pay for services that enable them to stay active longer in their old age and there is evidence of increasing numbers of self-funders who buy direct from suppliers[6]. Additionally, findings suggest the 'baby boomer' generation has higher expectations than older people from previous generations: they expect to remain active citizens, to enjoy life and live independently in their home for as long as possible[7].

On the other hand broader policy reforms are also a key driver of this market[8]. There is a shift in procurement policy with local authorities moving away from their bulk purchaser role. Instead, in some cases, they are to provide individuals with personal budgets and then operate as market-makers by sign-posting to service providers.

Transition obstacles

1. Technical limitations and high cost

Providers of assisted living services have not yet achieved the technical capability or the standardisation needed to make assisted living products compatible with one another and hence interoperable; that is, while different providers address certain aspects of assisted living requirements, no provider yet is capable of delivering a comprehensive package on a large scale to many consumers. In order to achieve this outcome, the products of different providers need to be capable of operating together. At present, partnerships are necessary to bring these systems to market and significant technical challenges remain[9].

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[6] Down, DeAth, & Hope, (2013), *Growing the Assisted Living market using managed service framework supply chains*
[7] House of Lords (2013), *Ready for Ageing?*
[8] Down, DeAth, & Hope, (2013), *Growing the Assisted Living market using managed service framework supply chains*
[9] HaCIRIC (2012), Developing the capacity of the remote care industry to supply Britain's future needs

Interoperability is also important for efficient 're-procurement'. Remote care technology tends to need replacing every three to five years when it reaches the end of its lifecycle. However, service providers have raised concerns about the difficulties they face trying to change supplier at this stage – due to the inability to integrate different suppliers' products, changing supplier often requires changing the whole infrastructure being used[10]. This creates significant expense.

Currently, the provision of assisted living services is costly because the underlying technology is expensive[11] and the fragmented supply chain requires purchasing from numerous suppliers and the coordination of their products[12]. Appendix B provides a map of the assisted living supply chain and reveals its complexity.

2. Fragmented public procurement

The concept of 'governance' applies at two levels in this case study. Firstly, there is the governance of the Assisted Living Innovation Platform – the policy response to system innovation. Secondly, there is the governance of the long-term care system in which the Platform operates. The latter connects several barriers to system transition in long-term care.

The governance structure of the long-term care system is large and fragmented. Figure 4 provides an overview of the different public bodies involved in long-term care and Figure 5 reveals how many there are.

Figure 4 Long-term care governance structure

International	European Commission
National	Department for Business, Innovation & Skills, Technology Strategy Board, Department of Health
Regional	Scottish, Welsh, & Northern Ireland administrations, regional National Health Service bodies, regulators
Local	Clinical commissioning groups, local authorities

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[10] Barlow et al (2012), *Developing the capacity of the remote care industry to supply Britain's future needs*, Health and Care Industries Research and Innovation Centre
[11] Databuild (2013), *Final Report: Dallas baseline economic evaluation*
[12] Down, DeAth, & Hope, (2013), *Growing the Assisted Living market using managed service framework supply chains*

Figure 5 Long-term care governance structure: number of actors

Note: the diagram only includes local actors within England, and these are broken down by CCGs (red) and upper tier local authorities (yellow).

Procurement in the long-term care system is primarily delivered at the local level. As seen in Figure 5, there is a vast number of procurement actors. This makes it challenging for businesses to secure the large volumes of sales needed to grow.

Additionally, this fragmentation means there is no single procuring body that can take an overview of assisted living needs and deliver a comprehensive package.

As identified, the supply chain is complex and – while some firms can provide end-to-end services for specific aspects of assisted living - no single supplier can provide a complete service that combines the different types of technology[13]. 'Supply chain owners' are one way of overcoming this complexity and delivering a comprehensive service. A 'supply chain owner' is a demand-side organisation that can take an overview of the supply chain and commission the various components needed to deliver a comprehensive assisted living service from the separate providers. This is distinct from a situation where suppliers specialise in specific components that a demand-side organisation then assembles; such a scenario is the product of efficiency. Rather, a supply chain owner becomes important when suppliers *cannot* provide the complete product rather than *choosing* not to in order to specialise. An example of this comes from the space sector. No single supplier can provide, for example, a space station because of the enormous cost and complexity

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[13] Down, DeAth, & Hope, (2013), *Growing the Assisted Living market using managed service framework supply chains*

involved; instead, a space agency needs to coordinate suppliers. Other examples come from large-scale infrastructure projects.

At present, such an owner does not exist for assisted living technologies. This is in part due to the lack of a comprehensive push behind assisted living on the part of the public sector, and in part due to risk aversion: the nascent nature of the technology means it hasn't been demonstrated at scale, thereby posing a risk that there may be problems relating to safety, effectiveness and reliability of the technology. In response, low-risk options are provided by suppliers initially.

While this fragmented public procurement structure may pose difficulties for the development of assisted living technologies, this comes from a narrow 'assisted living system innovation' perspective; the structure fulfils other key needs such as delivering care tailored to local needs.

3. Innovations face obstacles to their diffusion through the NHS and social care

Concerns have been raised about the functional specialisation and distinctness of NHS and social care services. The lack of integration of services has been identified as a significant barrier to the diffusion of innovative products and processes throughout the NHS[14]. This fragmentation of actors restricts the dissemination of knowledge and evidence.

This relates to current procurement practices as well. Discussion with stakeholders indicated that suppliers often do not have an incentive to innovate and consequently procurers are not exposed to new and innovative ideas. It has been suggested that an outcomes-based commissioning system – as opposed to the current focus on cost and volume - would incentivise innovation.

4. Awareness and culture as restrictions to demand

A lack of awareness of assisted living options represents an information failure that severely restricts demand[15].

Among patients, a recent polling exercise found that 85% of those individuals surveyed over 65 years of age were not sure what telecare is and only 7% said they would use it. However, once the concept was explained to them, the share of respondents who said they would use the service rose to 85%[16]. This shows clearly that assisted living technology is attractive to users but that there is a distinct lack of awareness.

There are significant cultural obstacles. Firstly, there is a culture of expectation in the UK that the state both selects and provides treatment when one is ill or old, thereby leading to a restriction to demand for private sector healthcare. Related to this is a possible lack of trust on the part of consumers in the ability for businesses to provide unbiased

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[14] NHS (2011), *Innovation, Health and Wealth: accelerating adoption and diffusion in the NHS*
[15] See for example http://www.carersuk.org/newsroom/item/3271-switched-on-generation-switched-off-to-care-technology
[16] Carers UK (2013), *Potential For Change: Transforming public awareness and demand for health and care technology*. http://www.carersuk.org/media/k2/attachments/Potential_For_Change___Carers_UK.pdf

recommendations about treatment and care needs. Consumers sometimes perceive public sector health and care professionals as having their best interests in mind while businesses have strong incentives to recommend further and inappropriate treatment to generate more sales[17]. Coupled with a preference for face-to-face contact and the need to develop trust and comfort for technology-based care – as reflected by the survey above which found that 43% of respondents said that technology was the last thing they'd consider as a support if caring affected them[18] - this could slow down growth in the private consumer market.

Secondly, policy-makers learnt that assisted living products should not be labelled as being for older people but rather for specific needs – in fact, the very phrases 'assisted living' and 'independent living' are stigmatised to an extent.

Related to this is the need to ensure that assisted living products are designed with attractiveness to the user in mind to address these perceptions. This is particularly important given the growth of the business-to-consumer market and the increase in patient choice. Previously, when selling only to NHS and local authority bodies, suppliers were incentivised to make products appealing to public procurers rather than end users.

Among health and social care professionals, there is a perceived lack of robust evidence on the cost-effectiveness and value of telehealth and telecare technology.

There have been plenty of studies focusing on telecare and telehealth, particularly in the UK and US, and generally they show positive results both in terms of improvement to clinical outcomes and the cost-effectiveness of the policy[19]. However, this uncertainty among health and social care professionals stems in part from disputes surrounding the validity of the most high profile such trial in the UK. The Whole System Demonstrator randomised control trial concluded in its initial findings that these technologies reduce accident and emergency admissions by 15%, bed days by 14%, and – most strikingly – mortality rates by 45%[20]. This led to claims that assisted living technologies could lead to £1.2bn of savings for the NHS[21]. However, further analysis of the trial in a series of journal articles called the robustness of these claims into question.

This uncertainty about the evidence – combined with scepticism among health and social care professionals about using technology as a substitute for face-to-face care – meant that many primary care trusts and local authorities felt the need to prove their own business case for telehealth and telecare in order to adopt the technology rather than accept findings elsewhere, thereby slowing down the diffusion of the technology[22]. It remains to be seen how clinical commissioning groups will view the evidence when they

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[17] COMODAL (2012), *Unlocking the potential of the younger older consumer: consumer preferences and the assisted living market*

[18] Carers UK (2013), *Potential For Change: Transforming public awareness and demand for health and care technology*. http://www.carersuk.org/media/k2/attachments/Potential_For_Change___Carers_UK.pdf

[19] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels – Annex A*

[20] Department of Health (2011), *Whole System Demonstrator Programme – Headline Findings – December 2011*.

[21] http://www.careindustrynews.co.uk/2012/03/nhs-can-save-1-2bn-from-technology

[22] Clark & Goodwin (2010), *Sustaining Innovation in Telehealth and Telecare*, WSDAN Briefing Paper

have become established, but for the time being there is still uncertainty regarding the true value of this technology among health and social care practitioners.

The difficulty in convincing public sector bodies to buy-in to the technology and the absence of NHS/local authority 'endorsement' for assisted living (by adopting at a large scale) add to the culture and awareness obstacles among patients[23]. On the one hand, this undermines the efforts to establish both user awareness and also 'trust' in assisted living options, thereby impacting demand. On the other, this restricts the realisation of the full potential demand for assisted living technology in the business-to-business market. This also relates to the concerns some procurers face about the quality of the evidence and their consequent desire to prove the business case themselves: broader endorsement might help to overcome this barrier.

5. Fragmented policy environment

The policy response to these barriers is key to enabling the transition. However, the policy environment itself is heavily fragmented, as seen in Figures 4 and 5, and it is unclear with whom the responsibility for raising awareness of and building support for assisted living technologies lies. This makes policy coordination extremely difficult.

There are numerous actors spanning all levels of government. These actors tend to have their own agendas and mandates to pursue, and they are not always aware of developments elsewhere. Additionally, they are not forced to work together in delivering results in this area. These obstacles make it difficult to develop a unified policy response.

6. Health and social care reform

As explained in Section 2 and in Appendix A, the UK health and social care system has undergone a wholesale reform.

In the short term, this has created uncertainty and hiatus in longer-term planning as actors have focused on establishing themselves in their new roles. With the creation of CCGs and their capacity to procure according to their local needs, there is uncertainty as to the level of demand for assisted living that will arise. At the same time, the reform has required significant restructuring and reorientation of the system. This process – and the resource and attention it has required from the actors involved – has compounded the policy coordination difficulties generated by the fragmentation of the policy environment: the multitude of actors are preoccupied with establishing themselves in their new roles. There is also an extent to which 'change fatigue' among public bodies – i.e. a desire to reach a situation where they can deliver services without upheaval – risks restricting public sector buy-in and support for assisted living technologies as that would mark a further change in the way services are delivered.

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[23] Databuild (2013), *Final Report: Dallas baseline economic evaluation*

In the long term, the increase in the number of public procuring bodies (with almost twice as many CCGs as there were PCTs[24]) compounds the public procurement fragmentation and creates a more challenging environment for businesses.

However, there are two long-term effects that might aid the transition:

- The reforms – through the NHS Mandate explained in Section 4 – have significantly bolstered the business-to-consumer market

- The reforms included a Strategy for Health Innovation and Life Sciences which notably charges clinical commissioning groups with leading innovation using the Commission for Quality and Innovation payment framework to incentivise innovative providers.

Future outlook for drivers and barriers

The core drivers of the transition can be expected to continue into the future. In fact, they will become more acute as the threats to public budgets posed by demographic change become a reality.

It is also possible that a new driver will emerge. In 2014, the Marmot Review estimated that inequalities in mortality rates and life expectancy by gender, geography, and socio-economic grouping have an annual cost to the public sector of £36-40 billion rooted in foregone tax revenue, welfare payments, and additional NHS costs[25]. The identification of this new opportunity for efficiency gains within the health and social care system could provide an additional impetus for adoption of assisted living technologies.

As the health and social care reforms stabilise, this will have key consequences for the transition. In theory, the hiatus in longer-term planning that has acted as a block to development over the past few years will be removed. Additionally, innovations may diffuse through the NHS more easily. However, it remains to be seen whether CCGs will turn to assisted living technologies.

In terms of the fragmented policy environment, this is likely to be less acute when the health and social care reforms have settled down and the new actors are established in their roles. However, the multitude of relevant actors and their differing mandates will persist.

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[24] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels – Annex A*
[25] Marmot (2014), *Fair society, healthy lives – the Marmot Review*

Relationships between barriers

Not only are the barriers to transition in long-term care both significant and numerous, but they are also interlinked in crucial ways. The barriers underpin and compound one another leading to a complex network of obstacles that hold back transition.

Several barriers are linked by the governance structure of the system. The multitude of different actors, their different roles and priorities, and the restrictions to the dissemination of knowledge between actors are key causes of:

- Fragmented public procurement: there are hundreds of different health and social care procurers operating in long-term care

- Slow diffusion of innovations: the restrictions to knowledge spreading between actors means there is sometimes a failure to learn from and share the experiences of bodies elsewhere in the structure

- Fragmented policy environment: the volume of actors with their different goals makes coordination difficult

In turn, these barriers impact other obstacles. The fragmented public procurement precludes large 'supply-chain owners' from coordinating the fragmented supply chain. Consequently, assisted living is constrained until the technical barriers that prevent suppliers offering a complete and comprehensive service are overcome.

The barriers to the diffusion of innovations compound the restricted demand. The slow spread of knowledge about innovations undermines the awareness of assisted living solutions among health and care professionals and procurers, while the cost and volume-based procurement norm which undermines the incentive for innovative procurement also undermines the incentive to make assisted living solutions as attractive to the end-users as possible, thereby contributing to the lack of user-led demand. Additionally, the slow diffusion of innovations is in part generated by the same suspicion of the role of technology in care as has been identified as a restriction on demand.

The technical barriers are interlinked with the restricted demand. Firstly, demand among procurers is held back by the current relatively high cost of assisted living technologies. Secondly, the current inability to deliver interoperable services at scale – in combination with 'cultural' suspicions about the role of technology and disputes regarding key evidence – adds to the uncertainty about how effective and cost-efficient assisted living really is. The lack of public sector 'buy-in' to and endorsement of the technology – in part rooted in the fragmented policy environment making it difficult to establish a shared direction – makes it more difficult to raise awareness and demand among users.

As identified, the NHS reforms impact several of these barriers. Fundamentally, it increases the number of actors in the system governance structure, but it also includes measures to try and improve the diffusion of innovations as well as to significantly boost the consumer market for assisted living technologies.

Finally, the fragmented policy environment makes it more challenging to address each of the separate barriers identified above.

Lessons learned: implications for system innovation

The barriers identified in this case study have implications for the theory of system innovation.

Evidence is found for all the system innovation failures hypothesised in the OECD paper. The critical role of the fragmented structure of the public sector in the long-term care system is a key lesson that can be learned. The fragmented governance of the long-term care system generates three of the system innovation failures hypothesised. Firstly, it leads to a policy coordination failure where organising and coordinating the multitude of actors within long-term care proves very challenging. Secondly, the tendency for different actors to sit in silos without responding to and coordinating with developments elsewhere in the system generates the hypothesised reflexivity failure: some components to the system are bad at responding to signals from elsewhere. This manifests itself in the slow diffusion of innovations through the system. Thirdly, the fragmented governance generates the directionality failure: it is very hard to generate a shared vision and goal among such a range of actors with different roles and agendas. As will be discussed in the next section, this has been a particular challenge for the Assisted Living Innovation Platform policy response.

The importance of the classic market failure asymmetric information is also reinforced by this case study. Information asymmetries severely restrict demand from end users. As identified, one survey found that only 15 per cent of those over 65 claimed to know what telehealth and telecare were, and only 7 per cent would use them, but that – once the concepts were explained – the fraction who said they would consider using the technologies rose to 85 per cent. This reinforces the importance of the failure hypothesised by the OECD paper regarding the lack of information about commercial opportunities and about new technologies among users.

The experience of long-term care in the UK suggests that there are also two other important system innovation failures that may deserve greater prominence in the literature:

- Firstly, the culture in the system needs to be conducive to the adoption of novel technology. Related to this is the need for novel technology – and change more generally – to build acceptability within the system. In long-term care, the tendency for innovation to diffuse slowly through the NHS, and the scepticism many health and care professionals have regarding assisted living technology, have slowed down transition. Evidence of the technology's value is very important for convincing sceptics, and this is shown clearly by the uncertainty generated by the dispute surrounding the Whole System Demonstrator results.

- Secondly, system innovation is an inherently dynamic process that takes place over time. Consequently – as demonstrated clearly by the health and social care reforms – there is plenty of scope for 'exogenous shocks' that threaten to stall or derail the transition process. For example, changes in demographic pressures or macroeconomic shocks.

The case study provides strong evidence that barriers to transition are closely interlinked with one another, and that this leads to a complex set of compounded obstacles. The system governance structure connects several barriers, while technical difficulties, the slow diffusion of innovations, and restricted demand among procurers all build on one another to hold back large-scale public sector 'buy-in'. A recent research project commissioned by BIS finds similar results in a whole range of innovation areas - from low carbon vehicles to energy storage - where failures interconnect[26]. This finding reinforces the need to view system innovation failures collectively rather than in isolation, and this has consequences for policy investigated in the next two sections.

Related to this are two points that ought to be remembered when discussing barriers to system innovation. Firstly, technology is only one part of the picture. Technology is important in enabling and driving a transition, but in order to succeed in doing this, vital accompanying conditions must hold. For example, there must be a culture in the system that will accept the new technology, the design needs to be appropriate for end users, and suitable standards and regulations need to be in place.

Secondly, features of a system that act as barriers to transition may well be important means to further other social objectives. In long-term care, while the fragmentation of public procurement and the NHS reforms can be seen as barriers, this comes from a narrow 'assisted living system innovation' perspective; they serve other key goals such as delivering treatment tailored to the needs of the local population. System innovation is only one of potentially multiple competing social objectives.

A final observation is that the challenges posed by a fragmented procurement environment could lead to an interesting – albeit entirely speculative - implication that a degree of market power on the demand side – approaching monopsony – could be helpful. At least at the start of the transition, and at least in transitions where there is a strong government incentive to drive the change, a monopsonist could perhaps enable a unified procurement strategy that delivers comprehensive services with sufficient volume of sales and coordination across the supply chain to provide a stable impetus for the further development of more complete services. Similarly, a procurement model where a contracted lead provider adopts responsibility for delivery and then subcontracts the different necessary components could achieve similar results.

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[26] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels*

4. Describing Policy

Having outlined the core barriers to the transition, Section 4 presents an overview of the policy response before going into more detail on one key element, the Assisted Living Innovation Platform.

There are numerous policy actors with an interest in assisted living technologies. These span multiple layers of government.

The Technology Strategy Board – the UK's innovation agency – introduced the Assisted Living Innovation Platform (ALIP) to tackle the challenges to innovation in this area. The ALIP brings together and coordinates key stakeholders, and it supports this with a combination of traditional policy instruments. Its set-up allows it to be interpreted as a response to both conventional innovation market and system failures, and to system innovation failures.

A key feature of the ALIP is its ability to adapt in response to a changing environment and a greater understanding of the barriers faced by assisted living technologies. The ALIP governance structure and the review of activities after five years of operations contribute to this adaptability by encouraging the gathering of evidence on both the effectiveness of the intervention and assisted living itself.

Overview of policy responses

Key actors

Policy interest in assisted living and the transition in the long-term care system spans multiple levels of government. Table 1 identifies the key actors and their interest. This is distinct from Figure 4 because it shows actors with a specific policy response to assisted living rather than all the actors involved in delivering long-term care.

Table 1 Policy interests in assisted living

Governance Level	Organisation	Interest
National	Technology Strategy Board	UK 'innovation agency' funded by the Department for Business, Innovation and Skills (BIS).
		The TSB supports businesses in commercialising new ideas. It targets technologies and areas with the greatest scope to improve business, the economy and society.
		Developing the capacity of assisted living technology to meet the demands of an ageing population is of interest to the TSB because it involves innovation by businesses in an area of major societal impact.

	Department for Business, Innovation & Skills	The Department for Business, Innovation & Skills (BIS) has an interest in assisted living – separate from innovation policy - for several key reasons. Firstly, it represents a significant commercial opportunity for UK business. Secondly, the UK research base – for which BIS has policy responsibility – is involved in developing the technologies. Thirdly, and more broadly, the ageing population means an ageing workforce from which UK businesses can recruit.
	Department of Health	A key policy area for the Department of Health (DH) is improving the quality of life for people with long term conditions[27]. This includes support for telehealth and telecare.
Regional	Devolved administrations	While the Department of Health and TSB have interest in assisted living at the national level, health and social care is a devolved matter in Scotland[28], Wales[29], and Northern Ireland[30]. This means that the devolved administrations of those regions have powers in this area. Their interest in assisted living stems from much the same sources as for the UK government.
International	European Commission	As part of the Europe 2020 strategy, the 'Innovation Union' has created European Innovation Partnerships. These bring together private and public actors across the EU to tackle big societal challenges with an aim to give the EU first-mover advantage in the related markets and commercial opportunities. The ageing population is just such a challenge[31].

Assisted Living Innovation Platform

The focus of this case study is the Technology Strategy Board's (TSB) policy response to the required transition in the care system: the Assisted Living Innovation Platform. This is of particular interest because it can be interpreted as a direct response to system innovation failures even if this was not the explicit rationale for the intervention.

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[27] https://www.gov.uk/government/policies/improving-quality-of-life-for-people-with-long-term-conditions, access 26/02/2014

[28] http://www.scottish.parliament.uk/visitandlearn/25488.aspx accessed 26/02/2014

[29] https://www.gov.uk/devolution-settlement-wales accessed 26/02/2014

[30] https://www.gov.uk/devolution-settlement-northern-ireland accessed 26/02/2014

[31] http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=key accessed 27/02/14

The TSB has created a number of 'Innovation Platforms'. These are mechanisms that bring together and coordinate key stakeholders – and draw on and combine the variety of policy tools at the TSB's disposal - in order to address a particular societal challenge with support sustained over time. Platforms bring together key stakeholders in government, industry, and academia in the pursuit of the same goal. Societal challenges are in areas of significant systems complexity with a range of actors and complicated supply chains; crucially, these are undergoing a disruptive change which is creating a global business opportunity to be realised through innovation.

In November 2007, the TSB created the Assisted Living Innovation Platform (ALIP).

The original ALIP specification was to run a five year programme with £50 million of funding. This was to be spent developing technologies and building business/social infrastructure before then funding a large-scale demonstrator to establish scalable assisted living technologies.

An overview of the instruments used to achieve this is given by Figure 6.

Figure 6 Assisted Living Innovation Platform Instruments
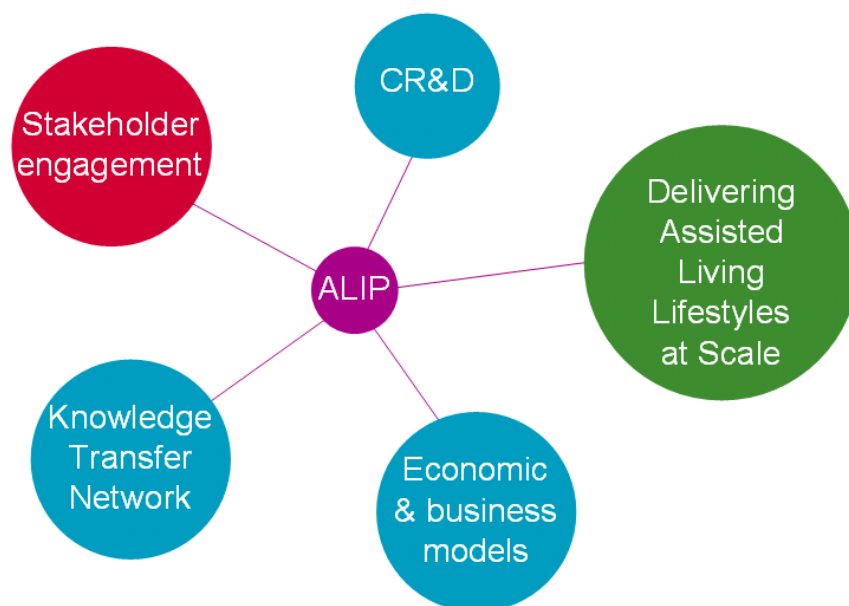
Collaborative Research & Development (CR&D) schemes encourage businesses and researchers to work together on innovative projects. By co-funding projects involving partnerships between businesses and between business and academia, CR&D reduces financial and technical risk and encourages knowledge exchange, supply chain development, and parallel working on complex challenges.

By 2013, 13 CR&D competitions had been run by the ALIP involving 200 organisations and resulting in 60 projects; 40 of these participants were SMEs, 15 from the 'third sector', 20 universities, and 15 NHS/local authority bodies, with the remainder coming from other industry actors.

Health Tech and Medicines Knowledge Transfer Network. Knowledge transfer is critical to enable UK businesses to compete successfully at the forefront of global technology and innovation. Knowledge Transfer Networks (KTNs) are one of the Technology Strategy Board's key tools for doing this – facilitating the UK's innovation communities to connect, collaborate and find out about new opportunities in key research and technology sectors.

As a single overarching national network in a specific field of technology or business application, a KTN brings people together to stimulate innovation – from businesses of any size, research organisations, universities, and technology organisations, to government, finance and policy.

Currently, the Health Tech and Medicines KTN and the TSB's other 14 KTNs are being brought together into a single community. The heart of this is an online networking platform. This is where 'open innovation' happens and innovators use free, online tools in a secure and confidential setting to explore some of the challenging projects and issues they face together.

Stakeholder engagement. Engagement with industry bodies to develop standards for telehealth systems and the provision of services. These bodies included Continua Health Alliance (a coalition of healthcare and technology companies) and the Telecare Services Association (telecare industry body).

Economic & business models. The ALIP launched a series of research projects to support the implementation of assisted living technologies and to understand the barriers and enablers to their use on a large scale. These research projects were collaborative endeavours led by a mixture of universities and businesses.

Delivering Assisted Living Lifestyles at Scale (dallas) is a project that aims to demonstrate the scalability of assisted living services. It ties together work done on assisted living technology, standards, business models, social studies, and the Department of Health Whole System Demonstrator. Starting in 2011/12, this is a £37.1 million investment in four communities aimed at improving the lives of 169 000 people by the summer of 2015. An on-going activity, this can be interpreted as the central activity of the ALIP to-date.

Dallas fits under the *Small Business Research Initiative* (SBRI). SBRI provides innovative solutions to challenges faced by the public sector, leading to better public services and improved efficiency and effectiveness. It generates new business opportunities for companies, provides small and medium-sized enterprises (SMEs) a route to market for their ideas and bridges the seed funding gap experienced by many early stage companies. It supports economic growth and enables the development of innovative products and services through the public procurement of research and development (R&D).

By 2013, the £50 million of TSB and partner funding had leveraged a further £34 million from other public sector bodies (including National Institute for Health Research, EPSRC, ESRC), as well as £5 million from the Scottish Government specifically for dallas, and funding from the EU Ambient Assisted Living Joint Programme.

The range of participants demonstrates the ALIP's role in bringing together varied stakeholders. Notably, the ALIP does not just engage with industry and care professionals, but also with the research base. The ALIP has received funding from Research Councils

UK, research establishments have partnered with industry in specific projects, and they have also been contracted to carry out research for the ALIP.

The ALIP is currently near the end of its original plan and the TSB is reviewing its experiences to-date.

The explicit rationale and motivation for Innovation Platforms is that society faces certain significant challenges and these need to be addressed. However, while not the stated aim, implicit within this reasoning is a response to the failures identified by the innovation systems perspective. The precise failures addressed vary by Platform and challenge need, but the key unifying feature of the Innovation Platforms is the bringing together and coordination of the various actors in a particular innovation system in recognition that poor communication and cooperation can hold back successful innovation; consequently, addressing network failures – an innovation systems failure - is at the heart of this policy approach. Additionally, the Innovation Platform acknowledges that systems often face multiple, interrelated market failures concurrently and a separate focus on each is not necessarily the most effective approach to policy.

While the TSB may not use the terminology of 'system innovation', the Innovation Platform approach is also a response to system innovation challenges. As outlined in Table 2, the ALIP either directly or indirectly addresses the hypothesised failures of system innovation. This makes the ALIP of particular interest to this case study.

Table 2 ALIP as a mechanism for addressing system innovation failures

Failure	Description	Assisted Living Innovation Platform
Directionality failure	Lack of a shared vision/goal, and lack of coordination among actors.	Brings together the various stakeholders under a common purpose.
Demand articulation failure	Demand restricted by insufficient information about user needs, a lack of public procurement signalling to shape demand, and a 'lack of demand articulation capabilities' (the ability to signal the level/nature of demand)	Brings together industry and health and care professionals with the possibility of exchanging information regarding consumer needs. Emerging recognition of the need to use public procurement and other mechanisms to build demand
Policy coordination failure	Lack of coordination between policy actors at different levels.	Brings together representatives from different policy actors.
Reflexivity failure	Lack of monitoring, learning from, openly debating, and consequently adjusting	Provides a forum in which to debate activity, plus is accompanied by reviews that

	policy support.	engage various stakeholders.

Broader context: policy by other actors

As made clear by Table 1, the TSB is not the only actor with an interest in assisted living. It is important to view the ALIP in the context of the activities of other actors as this often influences the nature of the ALIP and what it seeks to achieve.

It is clear that there is a large number of policy measures in place to develop assisted living technologies as part of the transition in long-term care. These have received significant funding with one estimate placing the figure at approximately £260m since 2006[32]. This is funding for developing assisted living technologies specifically; there are several other sizeable expenditures on broader but related initiatives.

Department of Health

The Department of Health (DH) has engaged in multiple activities relating to assisted living:

- Preventative Technology Grant, 2006-07. This was an £80m investment to initiate change in the design and delivery of health and social care and housing services. The funds were allocated to Local Authorities with the explicitly stated expectation that they would invest in telecare. The aim was to help an additional 160 000 older people live at home with safety and security, and to reduce the number of avoidable admissions to residential care and hospital[33].

- Whole System Demonstrator 2009-10. This was a major randomised control trial that researched the potential impact of telehealth and telecare. It is the largest RCT of telehealth and telecare anywhere in the world and involved over 6000 patients and 200 doctors' practices across three locations. The concerns surrounding the findings of this trail have been outlined above in Section 3.4[34].

- 3millionlives, 2012-17. Following the Whole System Demonstrator, DH estimated that three million people could benefit from assisted living technology. To realise this potential, DH launched a collaboration between industry and government. DH is to reward organisations that adopt and integrate these technologies into their services, while industry is to work with the NHS and other stakeholders to simplify procurement and commissioning processes for telehealth and telecare services. It

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[32] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels – Annex A.* Comprising £80m for the Preventative Technologies Grant, £31m for the Whole System Demonstrator in England, £9m for the Telecare Capital Grant programme in Wales, £8m for the Telecare Development Fund in Scotland, £46m in Northern Ireland's telecare investment programme, £46m for the ALIP, and £37.3m for the related Dallas programme.
[33] Department of Health, http://webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/Browsable/DH_5464107 accessed 27/02/2014
        Department of Health (2005), Building Telecare in England
[34] Department of Health (2011), *Whole System Demonstrator Programme – Headline Findings – December 2011.*

is anticipated that this will help put the NHS and UK industry at the forefront of global telehealth and telecare[35]. It is expected that this policy will shortly shift in emphasis toward a greater focus on developing outcome-based commissioning and more flexible procurement with a long-term view. This is in response to challenges identified by the Stakeholder Forum.

- NHS Mandate, 2013-15. Agreement between DH and NHS England that sets out ambitions for the health service over the two year period. One specific task for NHS England is to provide the option of a personal health budget to patients who could benefit from making their own care decisions. This is subject to the evaluation of a pilot, but it has the potential to significantly develop the business-to-consumer assisted living market[36].

- Accompanying the personal budgets, the Department of Health announced in 2012 an additional £100 million in 2013/14 and £200 million 2014/15 in joint funding between the NHS and social care to support better integrated care and support[37].

Devolved Administrations

In Scotland, there is a Telehealth and Telecare Delivery Plan for the years 2012-15 which builds on three separate strategies for the years 2010-12. These are the Strategic Framework for Telehealth, the Telecare Action Plan, and Telehealthcare in Scotland (an initiative aiming to address training needs of professionals who use these services).

In Northern Ireland, a Telemonitoring NI service has been contracted out to a provider and has to-date benefited over 1500 patients in the region by introducing telehealth services[38].

In September 2013, the Welsh Government published its Framework for Action on Independent Living[39]. This involves assisted living technology as a way of helping those with disabilities.

European Commission

The first European Innovation Partnership – announced in 2011 – is the Active and Health Ageing Partnership[40]. This aims to increase the average number of healthy life years at birth within the EU by 2 years by 2020.

Three specific objectives are identified:

- Enable EU citizens to lead a healthy, active, independent life while ageing

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[35] 3millionlives, http://3millionlives.co.uk/ Accessed 27/02/2014
[36] Department of Health (2013), *A mandate from the Government to the NHS Commissioning Board: April 2013 to March 2015*.
[37] Department of Health (2012), *Caring for our future: reforming care and support*
[38] http://www.telemonitoringni.info/news/transformational-telemonitoring-ni-service-celebrated-by-northern-ireland-health-minister/ accessed 26/02/2014
[39] http://wales.gov.uk/consultations/equality/frameworkforactionconsultation/?lang=en accessed 26/02/2014
[40] http://ec.europa.eu/research/innovation-union/index_en.cfm?section=active-healthy-ageing&pg=home accessed 26/02/2014

- Improve sustainability of social and healthcare systems

- Boost the competitiveness of and markets for innovative products and services that respond to the ageing challenge.

To achieve these objectives, the Partnership provides a forum in which the various stakeholders can operate with the idea of improving the framework conditions in which innovators operate.

In 2008, the Ambient Assisted Living Joint Programme was established to cultivate ICT-based products, services and systems for ageing well, as well as to create related commercial opportunities. This initiative – co-funded by EU Member States, Associated States, and the European Commission – funds projects (involving at least three countries) with involvement from SMEs, research bodies, and user and stakeholder organisations. The Joint Programme has been extended to 2020 to continue applied and close-to-market research and it is believed that alignment with the Active and Health Ageing Partnership could further boost the deployment of these technologies in Europe. The UK has involvement in 75 projects that receive support from the Joint Programme.

Other actors

The World Economic Forum has set up a Global Agenda Council on Ageing (2012-2014) which is working on developing guidelines for age-friendly businesses, an index of ageing preparedness and preparatory discussions to ensure that population dynamics are included within the next set of UN development goals[41].

At an international level, a series of agreements made by a set of governments was convened and known as the Madrid International Plan for Ageing 2002. This identified measures needed to tackle an ageing society. Advancing health and well-being into old age was are core priority.

Policy strategy

Original ALIP strategy

The original aim of the ALIP was to support UK businesses and the health and care sector to develop innovative, cost-effective, user-centred technology and services for independent living.

The priorities identified were:

- To transfer and share knowledge between different actors (industry sectors, health and care professionals, users etc.).

- To tailor assisted living services to the needs of the end user.

- To design technologies that are desirable and affordable.

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[41] http://www.weforum.org/content/global-agenda-council-ageing-2012-2014

- To design technologies that are interoperable.

These original priorities are clearly heavily focused toward technological development. This would remain a theme for the ALIP for the first years of existence before the policy response would adapt and the focus would shift.

The technologies focused upon were: (i) communications (interactions between individuals and systems); (ii) data gathering and mining processes; (iii) sensors and devices; and (iv) cross-cutting issues such as security, reliability, and interoperability.

The TSB identified its priorities by holding consultations and workshops with stakeholders, and it drew upon market sizing estimates and market forecasts. These included a BCC estimate that the global telemedicine market would grow from $5.8bn to $13.9bn by 2012, and a Datamonitor estimate that global telehealth would grow by 56% and thereby exceed $8bn by 2012.

Alignment with broader policy context

TSB Innovation Platforms have coordination with other government departments built into them more or less by definition. They tackle broad societal challenges for which departments other than the Department for Business, Innovation and Skills are responsible and make the key decisions on how to address them.

With overall responsibility for the health and social care system, and with policies directed at both innovation in care and improving the quality of life for those with long-term conditions[42], the TSB was keen to align the ALIP with broader Department of Health policy. DH became a key sponsor of the ALIP. The DH Long Term Conditions Team provided a strategic view to ensure the ALIP complemented the Whole System Demonstrator randomised control trial. The DH National Institute for Health Research provided additional funding.

The desire to align with other policy initiatives is demonstrated by ALIP involvement in European Commission programmes and the Department of Health's 3millionlives campaign.

Evaluation mechanisms

TSB Innovation Platforms are given a fixed five year lifetime. At the end of this period, the TSB Governing Board reviews the programme. As a result of this set-up, the ALIP was designed from the start with developing the evidence base in mind.

This involved two components. The first was the economic and business models research strand to the intervention itself. This built understanding of the area. The second was the evaluation of the policy intervention.

The largest single evidence gathering exercise undertaken by the ALIP is evaluating the impact of the dallas programme. This is to be evaluated to see the impact on: (i) the individual; (ii) systems; and (iii) the economy. The TSB commissioned external bodies to

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[42] https://www.gov.uk/government/policies?departments%5B%5D=department-of-health. Accessed 08/04/2014

undertake these evaluations. The University of Glasgow will cover (i) and (ii), while Databuild will cover (iii). Both bodies have devised evaluation strategies tailored to the specific nature of the dallas programme.

The TSB also carried out assessments of the reports produced upon completion of the various ALIP-funded projects.

Development of the ALIP over time

The scope of the ALIP was expanded when the UK participated in the EU Ambient Assisted Living Joint Programme. This focused on near to market ICT solutions to support older adults. This has a clear implication for assisted living which relies on the elderly having telecommunications access.

This responsiveness of the ALIP to the broader policy context and agenda demonstrated its flexibility and it was a key step in expanding the ALIP away from a technology focus toward more broader goals or 'social innovation'.

This broader context was also reflected in the dallas programme. The dallas 'market' expanded to a wider agenda that included patient and personal health records, as well as general health and fitness. Managing this expanding scope was identified by the policy-makers as a challenge the dallas programme encountered.

Additionally, the TSB joined the Department of Health's 3millionlives campaign. The stated purpose of this was to look for common outcomes arising from dallas – which also started in 2012 – and to offer dallas as an "experimental laboratory" for the campaign. Sharing the lessons learned and early outcomes would minimise the duplication of effort.

It became apparent that the market size forecasts that informed the original specification of the ALIP were not realised. The UK markets did not grow as expected within the timescale in question due to the critical barriers identified in Section 3.

While the growth was not coming as fast as originally forecast, the expectation was still that the markets would grow and this is apparent by the Deloitte estimate from 2012 that the combined global telecare and telehealth markets would grow from £6.2 billion in 2010 to £14.3 billion by 2015, while the UK telecare market would be worth £7.15 billion by 2020.

Lessons learned

As the ALIP approaches the end of its initial 5 year programme, it is currently in the process of reviewing its experiences, and this provides an opportunity for the Platform to adapt in response to its improved understanding of the challenges faced.

The ALIP recognised the importance of evaluating the intervention to-date in order to learn lessons and refine the future direction of the initiative and ensure it becomes more effective in pursuing its goal and has responded to the changes to the broader context.

Several core lessons from the initial ALIP programme were identified by the TSB entering the policy review process:

- The need for user involvement in the technical design process to deliver a good customer experience.

- There is insufficient demand for assisted living to stimulate interoperability and more sophisticated services.

- The need to raise the profile of assisted living among wider stakeholders in care, business, and the public, and influence these where system-wide change is needed.

- The need for sensitivity to emotional responses of target customers

This is accompanied by a SWOT analysis of the UK assisted living sector.

The TSB organised a series of stakeholder engagement events in 2013 to discuss the achievements of the intervention to-date and its future direction.

In July 2013, 65 representatives across a range of stakeholders participated in a consultation event. This was followed by a second engagement in September 2013 with public sector stakeholders (TSB, research councils, UKTI, DH, DWP, Devolved Administrations) to discuss the priorities for the ALIP and how it can align with partner organisations' activities.

Initial considerations of the dallas demonstrator programme have confirmed the presence of the key barriers it is seeking to address. These include the lack of awareness and interoperability, as well as more specific barriers to market entry for SMEs who struggle to secure statutory contracts[43].

Gathering new information

In response to the apparent failure for previous market size forecasts to materialise in reality, the TSB commissioned research to improve its understanding. This research found[44]:

- There is a strong policy drive to promote non-residential care, but this is having a slow effect.

- Cuts in spending have affected non-residential care providers (i.e. those related to assisted living technology) more than residential care providers.

- While the residential care market is expected to continue growing, the private non-residential market (i.e. the market the ALIP seeks to build) will not grow significantly until after 2020.

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[43] BIS (2014), *The Case for Public Support of Innovation: At the Sector, Technology, and Challenge Area Levels – Annex A*
[44] Frost & Sullivan (2013)

- However, broader spending on social care and continuing health care for older people in England is set to rise from £9.3 billion in 2010 to £12.7 billion in 2022.

In addition to this market sizing research, a key component of the ALIP was the Economic & Business Models research; this sought to build understanding of the barriers to and enablers of assisted living technologies uptake. This research included a proposed shift toward a business-to-consumer model as the business-to-business faces significant barriers[45]. Such a shift fits well with the broader policy context of the NHS Mandate and the option for local authorities to provide appropriate patients with personalised care budgets.

Policy implementation and governance

The concept of 'governance' applies at two levels in this case study. Firstly, there is the governance of the long-term care system. Secondly, there is the governance of the Assisted Living Innovation Platform. The ALIP is the policy response to system innovation and operates within the former governance structure.

Governance of long-term care

Long-term care has a heavy state involvement. As identified in Section 3, this is central to both the devising and implementing of policy, and the interactions within the system as it undergoes transition.

There are a multitude of different actors in the policy environment. There are national ministerial departments (Department of Health, BIS), local authorities, regional devolved administrations, executive agencies such as the TSB, NHS England, HealthWatch England, and Public Health England, 211 local clinical commissioning groups, local authorities, and regulators such as the Care Quality Commission and Monitor. Outside the public sector, there are businesses, industry bodies, third sector organisations, and academics.

All of these have different roles and mandates - or different circumstances (e.g. variation in local areas between CCGs) - which feed through to differing needs and objectives.

Additionally, as identified in Section 3, the large-scale reform of the health and social care system led to a significant restructuring of the policy environment. This generated a degree of hiatus in longer-term planning as actors adapted to now roles.

Governance of the Assisted Living Innovation Platform

The Technology Strategy Board (TSB) is the UK's 'innovation agency'. It is an operationally-independent, non-departmental public body funded primarily by the Department for Business, Innovation and Skills (BIS).

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[45] Down, DeAth, & Hope, (2013), *Growing the Assisted Living market using managed service framework supply chains*

While BIS provides core funding, the TSB allocates that funding across policy instruments it designs according to priorities it decides. There are certain programme exceptions where BIS has greater involvement or provides programme-specific funding.

Broadly speaking, the TSB both develops policy goals and instruments, and it manages and implements the schemes.

Consequently, BIS – the ministry responsible for innovation – has taken an arms-length approach to long-term care; the ALIP is devised, developed, managed, and administrated by the TSB.

There are two points of interest regarding ALIP governance. Firstly, the ALIP is accountable to the Governing Board. This Board reviews the scheme after its initial five years. Consequently, the ALIP needs to monitor and evaluate its activities. This review process also introduces a mechanism for enabling versatility in the policy response: it presents a natural opportunity to shift the priorities of the intervention and alter the selection of tools used.

Secondly, the ALIP must operate within the challenging structure of long-term care outlined above. The problem faced is that there are a multitude of different actors with different roles, needs, and objectives. Consequently, while building consensus behind a need for change is relatively straightforward – few would deny the threats demographic change poses – establishing agreement as to how to deliver change, and then coordinating activities to achieve this, is particularly challenging. This is compounded by the way assisted living cuts across different policy areas (i.e. health/social care and innovation policy).

The response to this challenge has been to emphasise cooperation between stakeholders. However, bringing together stakeholders and engaging and coordinating them to drive forward the development of assisted living technologies is particularly difficult with such a multitude of actors and no tools at the TSB's disposal to influence the system governance structure itself.

Cooperation requires the alignment of objectives, so understanding what goals the actors in the system are motivated by and how they pursue these is important. This allows for the creation of a suitable incentive structure in the policy response. A key issue faced here is that of self-selection. Engagement in these cooperative enterprises is voluntary, so the actors that will get involved are ones that already have similar interests and objectives; often, however, other actors need to be engaged as well but they do not voluntarily do so.

5. Analysing Policy

Section 4 outlined the policy response to the long-term care transition. This section will draw out tentative conclusions regarding the effectiveness of the ALIP. It then identifies two key lessons that can be learned about successful policy responses to system innovation. The policy response needs: (i) to be holistic in order to address interconnected failures (i.e. treat them in an integrated and comprehensive way); and (ii) to be adaptable and to learn from its experiences because of the uncertainty that accompanies system innovation.

Effectiveness of the ALIP

As the dallas intervention is still on-going, a full assessment of the ALIP would be unreasonable. However, there is emerging evidence to suggest that the ALIP was effective in meeting its original aims centred around technological development.

The TSB has found that collaborative R&D projects funded by the ALIP enabled a number of companies to stay in existence and continue innovating, thereby preserving UK capability and expertise as the knowledge base expands and during a challenging macroeconomic period. Additionally, there are claims that the CR&D projects had a positive impact on inward investment with certain large multinational corporations citing the ALIP as a reason for expansion or consolidation in the UK.

However, as identified in Section 3, technical capabilities are only one of several barriers to the development of assisted living in the UK, and these barriers interconnect. The Innovation Platforms approach of tackling barriers together in a unified way is a key strength of the ALIP as it enables it to respond to these complex interactions. However, the initial ALIP specification was focused on the supply-side requirements; this was rooted in a lack of certainty regarding which barriers would prove critical, and it meant that the intervention to-date has been unable to unlock large-scale growth in assisted living.

Section 4 explained how the ALIP has adapted over time with a shift in priorities that reflects a better understanding of the other barriers faced by assisted living. This has been driven by the policy governance structure: the need to review the experience after five years created both an impetus to build the TSB's understanding of the challenges faced by assisted living and of the lessons that could be learned from the original intervention, and also a natural opportunity to change the focus of the Platform.

A fundamental challenge faced by the ALIP is how to drive a coordinated approach to developing assisted living in the changing and heavily fragmented policy environment outlined in Section 4. Bringing together stakeholders, building networks and exchanging information are all key components to the design of Innovation Platforms. However, identifying who to engage among the multitude of actors is a challenge, as is getting actors to coordinate their activities without having any means to compel them to act in any particular way at the same time they face other work pressures and incentives. The health and social care reforms exacerbated these difficulties.

Lessons learned: policy implications

Two key lessons can be learned from long-term care in the UK for understanding the appropriate policy response to system innovation.

Firstly, the policy response needs to be holistic in order to address interconnected failures; that is, it needs to address the various barriers in a coordinated and comprehensive way.

As outlined in Section 3, the barriers to transition in long-term care in the UK span technical difficulties, fragmented procurement, the restrictions to the diffusion of innovations through health and social care, 'cultural' suspicion of the role of technology in care, a lack of awareness regarding assisted living options among end-users, as well as uncertainty regarding the effectiveness of assisted living technologies undermining large-scale 'buy-in'. Crucially, these barriers reach much further than a simple technology focus. As argued in Section 3, new technologies require appropriate conditions in order to enable or drive a transition.

Not only are these barriers numerous and significant, but they reinforce and compound one-another to create a complicated network of failures. For example, the long-term care system governance structure underpins several barriers, while suspicion of technology in care, technical difficulties delivering at scale, and incentive structures in procurement combine to result in a lack of large-scale demand for assisted living services.

Consequently, a policy response that focuses on each barrier in isolation will miss the relationships between barriers and therefore key ways the transition can be frustrated. Similarly, an exclusive focus on the role of technology will prove ineffective without an accompanying focus on building the appropriate conditions for the technology. Rather, the response needs to be holistic to deliver effective solutions.

The key policy implication is that the policy response needs to coordinate and build consensus among the various stakeholders. As seen with long-term care, the diversity of barriers and the fragmented policy environment mean that no single actor can be expected to successfully address each and every failure. Additionally, as seen in long-term care, key transition barriers can be rooted in the system governance structure. Those that make and implement policy are unlikely to have sufficient tools or authority to tackle a challenging governance structure head-on because they will reside *within* the structure. Consequently, they must rely on coordination, cooperation and shared direction.

Cooperation requires the alignment of objectives, so understanding what goals the actors in the system are motivated by and how they pursue these is important. This allows for the creation of a suitable incentive structure in the policy response. A useful starting point for this exercise is an analysis of the drivers of and barriers to transition as laid out in Section 3 as these are often rooted in incentives. For example, the need for cost savings in care and the profit motive are two incentives that can be harnessed by the policy response, while the procurement processes that prompt risk-aversion can be identified as a disincentive to innovation.

The Technology Strategy Board's Innovation Platforms recognise these needs and deliver a more joined-up policy response. This is observed in the Assisted Living Innovation Platform's recognition of the need to address the variety of barriers to assisted living

technologies together by engaging with and coordinating the various actors in long-term care. This is then supported by the coordinated deployment of a variety of policy instruments. More broadly, the TSB is increasingly working closely with other innovation organisations in the UK - such as the Intellectual Property Office and the British Standards Institution - to improve the coherence of the innovation ecosystem.

The second lesson is that policy needs to be adaptable and to learn from its experiences because of the uncertainty that accompanies system innovation.

As identified in Section 3, there is a large amount of uncertainty regarding system transitions. It is in the very nature of novel technologies in the early stages of development that all the applications and consequences are not known from the start. Similarly, it is not always clear from the beginning of a transition what the key barriers will be as it develops. Additionally, there is scope for unforeseen 'exogenous shocks' to jeopardise transition.

While the idea of uncertainty is nothing new, the experience of long-term care in the UK reinforces its central importance for the policy response to system innovation. The original specification of the Assisted Living Innovation Platform was oriented to supply-side development as technical limitations were identified as they key barrier. However, as the intervention developed, the ALIP built a better understanding of the critical barriers to assisted living that reach much further than the supply-side. Additionally, the wholesale reform of the health and social care system was a significant development not foreseen when the ALIP was being designed in 2007.

Policy needs to respond to this in two ways. Firstly, it needs to reduce uncertainty by building knowledge and understanding about the transition. While learning from its experience of both what barriers are being encountered and what interventions are working is of great importance, central to this is actively building understanding through research; that is, the policy response needs to learn proactively about the system in transition rather than only learning reactively through feedback from policy activities. Nonetheless, a robust feedback, monitoring, and evaluation arrangement is key.

Secondly, policy needs to ensure the knowledge generated is captured and acted upon. In order to do this, it needs to be adaptable and flexible.

The Assisted Living Innovation Platform has performed particularly well in this regard. As outlined in Section 4, the need to review the intervention after five years meant that the ALIP had a focus on information gathering from the start. Research aimed at developing the understanding of the barriers faced was commissioned as part of the intervention. Additionally, the ALIP is committed to evaluating its key interventions – such as dallas – and has held workshops that bring together varied stakeholders to share impressions of what interventions work. Consequently, the ALIP has been able to learn lessons from its experiences and arrive at a better understanding of the transition.

The focus on engaging and coordinating actors in long-term care has also meant that the ALIP has had a role in disseminating knowledge throughout the system. Not only does this mean that the ALIP has been able to learn from experiences elsewhere, but also that the other actors will have also benefited from an improved understanding of the transition and barriers. This reflexivity is a key element to the Assisted Living Innovation Platform.

6. System Innovation Methodologies

A key component to the OECD System Innovation project is the attempt to develop indicators for tracking system innovation. This Section outlines the methodology underpinning the case study before considering the lessons learned.

Case study methodology

The over-arching approach to the case study was to combine desk-research into qualitative and quantitative sources (where appropriate) with stakeholder interviews. At the outset, specific research questions based on the case study template were identified, but the process was undertaken in repeated iterations in order to give the research the versatility required to explore interesting findings – this is a new area where the precise objects of interest are uncertain.

The first phase involved planning the research and conducting initial desk research into the research hypotheses. Sources included publically available documents, as well as internal and confidential documents.

The second phase consisted of commissioned research. On behalf of BIS, a research contractor investigated the Assisted Living Innovation Platform. A theoretical framework and logic model for the intervention were created, while interviews with key stakeholders were carried out. The main focus was on barriers and drivers of transition, with some policy evaluation and description involved. This input takes the form of a supporting document. Additionally, a wider piece of BIS research investigating market and system failures in a range of innovation areas helped to validate and cross reference the findings in this study.

The third phase involved supplementary research. Having synthesised the initial desk research and contractor contribution, gaps and points of further interest were identified. These were then pursued with further contact with stakeholders.

Input through comments, feedback, and interviews was received from BIS, the TSB, the ALIP, the European Commission (both from the AALJIP and EIP AHA), Carers UK, and Imperial College London.

Lessons learned: implications for system innovation

The contractor identified two key methodological challenges when investigating this system in transition.

Firstly, much of the written evidence and oral contributions focus on their specific programme or action while offering only limited and cautious reflections of the state of the system as a whole. This stems from the highly conceptual nature of the notion of a 'system' making it difficult to grasp, and from an unwillingness to draw links between

actors' specific activities and broader, more 'macro' systemic shifts in long-term care and the consequences for the UK.

Secondly, there are numerous data limitations. Data are often patchy, inconsistent and contentious. Contention regarding the true potential of this relatively novel assisted living technology makes identifying the actual state of play and future trajectory of the transition quite difficult. This is reflected most clearly in the disagreement about the true impact of telecare and telehealth technologies, the Whole System Demonstrator randomised control trial, and the tendency for PCTs and CCGs to remain unconvinced as to the value of assisted living technologies.

This case study also identifies the importance of polling and survey data for measuring systems in transition. As argued in Section 3, a key issue is awareness and public perception of the novel and emergent technology. Some of the most useful evidence – the survey of attitudes towards and awareness of assisted living technologies - comes from polling data. Such data are extremely valuable for tracking the changing cultural, acceptability, and awareness developments identified as key factors to these transitions; that is, how aware the population is of the technology and how socially accepted it is. Understanding these factors will greatly improve policy-makers' understanding of the system transition.

A key challenge faced when designing metrics for system innovation is that many of the key motivations are benefits that are hard to quantify. In long-term care, the greater independence elderly individuals obtain from assisted living technology is just such a benefit. A useful recent development that could be deployed here is the growing field of wellbeing measurement. Recent advances in this field succeed in quantifying and highlighting the importance of traditionally unquantifiable benefits such as mental life-satisfaction in old age[46].

It is worth keeping in mind that a focus on developing indicators to measure the stage of a transition may be misplaced. In the context of 'mission-oriented' policy, measuring the variable policy is seeking to have an impact on is useful to take stock of the bigger picture, but the focus ought to be on the specific policies. Policies have aims and objectives, and logic models can be used to trace out the way they will have an impact on the end goal. This can then be evaluated using qualitative and quantitative methods.

Applied to long-term care in the UK, a measure of the 'end goal' - the uptake of assisted living technologies and the reduction of residential care usage – is important, but trying to identify metrics that somehow capture the stage of transition is an entirely secondary matter; the important point is to evaluate specific interventions such as the ALIP with an eye to ultimately identifying their impact on the end goal. The key point is that measuring how the motivating variable behind the system transition develops over time, and evaluating policy interventions are important focuses; doing this doesn't require addressing the more abstract and tricky question of measuring system transition stages.

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[46] See Legatum Institute (2014), *Wellbeing and Policy*, http://www.li.com/programmes/the-commission-on-wellbeing-and-policy

Appendix A: Broader health and social care system

The assisted living system is only one part of the broader health and social care system. This provides the societal function of maintaining the health of the population.

On 1st April 2013, the Health and Social Care Act 2012 came into force, bringing with it significant structural reform to health and social care in the UK.

Government believes reform is essential for the health service to be efficient and meet future challenges. NHS costs are rising above inflation due to factors such as an ageing population, costs of new drugs, and treatments and lifestyle factors, such as obesity . Additionally, the Government wants to empower patients by putting them at the centre of the system with both a greater say and a great choice in care services.

Under the old system, the Department of Health provided funding to ten Strategic Health Authorities who oversaw and funded in turn 151 Primary Care Trusts throughout England. These Trusts were responsible for funding allocation decisions across the care system (GPs, dentists, hospitals, care centres etc.). Oversight was provided by the Strategic Health Authorities and regulation was carried out by the Care Quality Commission – responsible for care provision – and Monitor – responsible for monitoring providers. Crucially, the commissioning resource allocation decisions were carried out at the Primary Care Trust level.

Under the new system, Strategic Health Authorities and Primary Care Trusts have been abolished. They have been replaced by a new single oversight body – the NHS England – and 211 doctor-led Clinical Commissioning Groups (CCGs) in charge of a significant part of the NHS budget. CCGs are empowered to decide how to spend funds on local services, from hospitals to community-based clinics. The underlying idea is that local health professionals know the needs of their local communities best.

Local Authorities have been given responsibility for public health; i.e. promoting healthy lifestyles (as opposed to treating specific conditions). This responsibility was previously held by Primary Care Trusts. The motivation for this move is that Local Authorities are well placed to influence the lifestyles of local residents due to their powers over everything from schools and planning to leisure services. Additionally, they have a broader role through new health and wellbeing boards which aim to coordinate local hospital, community health, social care, and public health services.

Across the health and social care system, it is now CCGs and Local Authorities who decide the majority of service provision

The reform is also intended to increase private sector involvement in the NHS through the provision of services. Prior to the reforms, 5% of spending in the NHS went to non-NHS providers.

Regulation is carried out by the Care Quality Commission and Monitor. The former is charged with ensuring services meet the required quality standards, and the latter is responsible for licensing healthcare providers, regulating prices of NHS services, and restricting competition where required by patients' interests.

Patient views are now championed by Healthwatch bodies. Each Local authority has its own Healthwatch body representing local patients, while there is a Healthwatch England equivalent at the national level.

Appendix B: Assisted living supply chain

Supply chain map

Market access supply chain elements

Promoter	Identifies need on a population basis. Raises awareness of AL services.
Identifier	Identifies the trigger points of need for an individual.
Service commissioner	Sets out options for how needs can be met. Sets outcomes to be met by the AL service. Markets / recruits people onto the service.
Managed Service boundary?	
Managed Service Owner	Overall owner of the AL service: sets detailed specification, manages risk and liability, undertakes QA, audit, bank rolls the build.
Builder/ designer	Identifies technical architecture and systems and components. Manages service build.
System and component providers	Provides individual and clustered components (systems) into the AL service.
Billing aggregator	Manages finance flows between multiple clients and supply chain.
Logistics	Arranges physical movement of systems/ components.
CRM	Owns the communication relationship with the client. May be linked to the monitoring
Managed Service boundary?	
Channel agents:	Wholesaler: sells services, systems or components in bulk. Retailer: sells under wholesaler/ own label to individuals. Reseller: sells under own label.

AL system supply chain elements

Software	Data interpretation/ data presentation, data translation, etc.
Info Management & storage	Data retrieval, quality, integration, security, continuity, etc.
Connectivity	Data transmission to/from and around home and when mobile
Installation	Survey, install (and fit), integration, acceptance test, approve and snag.
Client support, training, customisation.	Support to client to identify requirements, familiarise with technology, customise preferences, etc.
Technical support & maintenance	Technical queries and response, planned maintenance, remote upgrades, etc.
Monitoring	Monitoring of data: health trends, frequency of transmission, etc. Owning responsibility for interpretation of health (direct or via algorithyms) and care data and information flow in care plan. Identifying requirement for and monitoring use of services .
Response	Providing a response, whether f2f, change in care plan or other communication.
Services and content	Any content service e.g. video clips on self management, telecoaching, meals, etc.

Source: Down, DeAth, & Hope, (2013), Growing the Assisted Living market using managed service framework supply chains