-

farrpoint
SEE THE WAY AHEAD

Scottish Centre for Telehealth & Telecare

jit joint improvement team
creativity, collaboration and continuous improvement

Feasibility Study: Telecare in Scotland Analogue to Digital Transition

Product 2 and 3 Report

April 2016

NHS 24, Scottish Centre for Telehealth and Telecare

Revision	Description	Author	Checked	Reviewed	Authorised	Date
1.0	Initial draft for comment	RP/AP	AM	AP	RP	18/03/2016
2.0	Updated following client comments on initial draft	RP	AP	AP	RP	20/04/2016

CONTENTS

1. Executive Summary

The Scottish Government, via The Scottish Centre for Telehealth and Telecare, has commissioned FarrPoint to undertake a feasibility study to investigate the transition of telecare within Scotland from analogue to digital technology.

In completing this feasibility study, a number of products were agreed as deliverables:

- Product 1 - Evidence Base and Profile;
- Product 2 - Implementation Guide;
- Product 3 - Pilot Site Design.

It was agreed that Products 2 and 3 should be combined. This report details the findings of the combined Products 2 and 3.

Digital Telecare Implementation

It is assumed that Digital Telecare will be deployed in Scotland, given the likely decommission of analogue telephony services at some point in the future, and because digital technology is required to support increased numbers of telecare users and evolution of the telecare service offering. These issues were examined in more detail in the Product 1 report.

It is recommended that the implementation of Digital Telecare is completed in two phases: a **Rollout Phase** and a **Consolidation Phase**.

Recognising that a shift to Digital Telecare is a significant undertaking in terms of cost, effort, and operational change, the scope of the initial **Rollout Phase** is limited to shifting existing analogue telecare services to a digital platform **on a like-for-like basis**. For planning purposes, it is assumed that **the Rollout Phase is likely to take around 5 years** to move all Telecare Alarm Receiving Centres (ARCs) and users to digital technology.

During the Rollout Phase, digital ARCs will be established and service users' equipment will be replaced by digital equivalents. Given the large amount of deployed equipment in users' homes the process of migrating this to digital is likely to take some time to complete meaning that **there will be a period of 'dual running' where ARCs have a mix of digital and analogue users**.

As the Rollout Phase is focussed on shifting existing telecare services to a digital platform on a like-for-like basis, **only a subset of the identified Digital Telecare benefits** (detailed in Appendix B) **will be delivered by this phase**. The phase should be viewed as **putting a scalable, flexible, digital platform in place that future proofs telecare services** and has the potential to deliver significant further benefits. These further benefits are obtained during the **Consolidation Phase.**

The **Consolidation Phase is where the full benefits of Digital Telecare are obtained.** The phase is, in reality, likely to take the form of **a continual incremental development process** where new Digital Telecare offerings are added over time to the scope of the services provided to users. Services will be added to the Digital Telecare offering once it is established that they offer a benefit to service users and/or service providers. The process of developing and evaluating potential new Digital Telecare services over time is likely to be completed through small scale pilot projects, similar to the approach being undertaken via a number of initiatives presently.

The transition of telecare to digital technology means that the current distinction between telecare, telehealth and other areas of Technology Enabled Care (TEC) will become increasingly artificial. In the longer term it is likely that the different areas of TEC will converge to a single digital platform in service users' homes. This platform will be used to deliver a wide range of health and care applications, of which telecare will be only one.

Digital Telecare Deployment Model

The implementation approach detailed above is independent of the model used to deploy Digital Telecare. Three deployment models are examined in this report:

- **No Migration to Digital:** The "do nothing" option where the existing analogue systems are retained. This approach is included as a benchmark against which other options can be compared.
- **Standalone Digital:** The existing number and location of ARCs is unchanged but each is individually migrated over time to a Digital Telecare solution.
- **Clustered Digital:** ARCs are 'clustered', offering services for a number of organisations. Each of the clustered ARCs is migrated to a Digital Telecare solution. There are a number of ways of clustering ARCs; the approach examined is the 'Shared Agent' approach where an existing ARC provides

alarm/call answering services on behalf of a number of others. Existing response service arrangements remain unchanged.

Both digital models put in place a scalable, flexible, platform that is able to scale to cope with increased user numbers and offer a range of new and innovative services.

Both digital models also have associated benefits and issues. The clustered option has lower costs, is more efficient and is better able to offer a full range of advanced and shared services. However, the standalone model involves the least operational change and may be more palatable at a local level.

The deployment of Digital Telecare can be used as an opportunity to standardise telecare technology, telecare services, and to ensure high quality service standards and robust reporting / management information arrangements. Although this potentially delivers significant operational benefits, it is a change to the more localised arrangements currently in place and it will take political will, time and effort to develop these standards.

The estimated annual costs for each of the deployment approaches for all existing public sector ARCs in Scotland are as follows (cost models are at Appendix C):

- No Migration to Digital: £ 14,231,060
- Standalone Digital Deployment: £ 21,477,700
- Clustered Digital Deployment: £ 18,614,800

These costs are for the running costs of the ARC and all equipment, including equipment in user's homes. The costs exclude response services and any income to service providers through charges to service users.

Both digital deployment options have a higher estimated cost than that for delivering existing analogue services. This additional cost is almost wholly associated with providing digital connectivity to service users' homes. This connectivity is assumed to be delivered using mobile telephone networks during the Rollout Phase. The clustered digital deployment model has lower costs that the standalone model as a result of the efficiencies associated with the sharing of ARCs. The model assumes that three existing ARCs merge into a single clustered ARC.

The choice between the digital deployment models is not going to be made on a technology basis as technology is equally able to support either approach. Instead,

the decision will be based on a financial basis and the willingness and ability of existing telecare service providers to adopt a clustered approach. **For this reason, this report does not recommend which digital deployment approach is most suitable and instead provides supporting information to allow a decision on the most suitable approach to be made**.

Pilot Projects and Next Steps

This report contains a series of suggested next steps to progress the planning and implementation of Digital Telecare. These next steps include the establishment of a series of Pilot Projects.

Pilot projects are required to validate the benefits of Digital Telecare and the proposed implementation approach. Four objectives for the pilot projects are defined:

- Validate the benefits to service user and care provider from 'Standard' Digital Telecare Services;
- Demonstrate the potential benefits to service users and care providers from 'Advanced' Digital Telecare Services;
- Validate and inform guidelines on the Digital Telecare implementation approach;
- Demonstrate the viability and benefits associated with ARC clustering.

It is noted that it is unlikely that a single pilot will be able to test/prove all of these objectives and so multiple projects are likely to be required. It is also noted that a number of the pilot objectives may be met by projects being funded as part of the existing TEC programme.

Pilot projects should be completed over a period of at least six months and be regularly reviewed by the TEC team throughout their duration in order to gain early feedback and to provide the opportunity to adapt the projects as required.

In addition to the pilot projects, a number of key issues and questions have been identified that will influence the definition and implementation of Digital Telecare. Arrangements should be put in place to further understand and address / monitor these key issues/questions:

Clustering: The viability of the clustered ARC approach needs to be established as does the extent of clustering that is achievable and optimal.

Standardising Telecare Services and Service Levels: A decision is required on whether a more standardised approach is to be taken to the scope of telecare services and associated service levels and reporting.

International Standards: Scotland should become an active participant in the work currently commencing to develop European standards for Digital Telecare to ensure that they ultimately reflect the needs of Scotland.

Equipment Availability: Engagement with Digital Telecare equipment manufacturers and service providers is required to fully understand the equipment/services currently available and to demonstrate demand to stimulate the market to develop further.

Connectivity: Liaison with Scottish Government, Highlands and Islands Enterprise, Smart Cities and Community Broadband Scotland intervention projects should be maintained to ensure that developments in broadband coverage are monitored and that demand for services from Digital Telecare are factored into rollout plans.

2. Introduction

2.1 Background

The Telehealth and Telecare National Delivery Plan from the Scottish Government, CoSLA and NHS Scotland, sets out the vision and direction for a Scotland in which the use of technology will be integrated into healthcare development and delivery, to transform access and availability of services in our homes and communities.

Technology-enabled care is vital to the successful delivery of this vision. In support of this, the Scottish Government has launched a three-year Technology Enabled Care Development Programme. Year 1 of the TEC programme comprising five related workstreams:

- **Workstream 1: Expansion of home health monitoring** as part of integrated care plans to move beyond the small/medium scale initiatives that have been introduced in a small number of areas to substantial programmes across Scotland, building on the United4Health programme;
- **Workstream 2: Expanding the use of video conferencing** using the experience of the NHS video conferencing systems to enable partner organisations across all health and social care sectors to participate and benefit, as well as growing its use for clinical/practitioner consultations;
- **Workstream 3: Building on the emerging national digital platforms** of Living it Up and ALISS to expand supported self-management information, products and services for Scottish citizens. This will include direct access to advice and assistance for the public through use of home and mobile technology as well as 'second line' support for clinicians and staff who need to use complementary technology and who access and share information from telehealth and telecare devices;
- **Workstream 4: Expanding the take up of telecare**, with a particular focus on upstream prevention, support for people at transitions points of care and people with dementia and their carers;
- **Workstream 5: Exploring the scope and benefits of switching current provision of telecare from analogue to Digital Telecare**.

FarrPoint was awarded the contract for Workstream 5.

2.2 Scope of the Workstream 5 Feasibility Study

The purpose of Workstream 5 under Year 1 of the TEC Programme was to explore the scope and benefits of switching the provision of telecare in Scotland from analogue to digital.

There are three Products within this Workstream:

- **Product 1: Evidence Base and Profile**
  Product 1 creates a clear definition for Digital Telecare services in Scotland, and presents information on the existing profile, i.e. the degree of progression towards that definition that has already occurred. Additionally, the potential benefits that Digital Telecare may offer are recorded for further analysis and review in Product 2.
- **Product 2: Implementation Guide**
  Product 2 presents a high level implementation roadmap for organisations seeking to make the transition to Digital Telecare.
- **Product 3: Pilot Site Design**
  Product 3 designs a number of pilots to be established and conducted in 2016/17 to collate additional evidence and best practice for moving from analogue to Digital Telecare. The pilots(s) will aim to prove the robustness of the cost benefit analysis and implementation guide from Product 2.

The output of Product 1 was detailed in a report issued by FarrPoint in October 2015[1]. Following the delivery of the Product 1 report it was agreed that Products 2 and 3 should be combined. This report details the findings of the combined Products 2 and 3.

[1] "NHS24D3V3_0 - Final Report - Updated.pdf" dated 09 October 2015. http://sctt.org.uk/wp-content/uploads/2015/12/NHS24D3V3_0-Final-Report-Updated-12th-Oct-2015.pdf

3. Digital Telecare - 10 Year Vision

The implementation of Digital Telecare is likely to take a number of years to complete. Over the implementation period the range and nature of telecare services is likely to change through developments in technology, demand from service users, the number and nature of service users, and the technical environment in which services are delivered.

Given the potential period and scope of changes, it is not possible to predict these in detail. However, the remainder of this section presents a "10 Year Vision" outlining known and probable developments that will impact the implementation of Digital Telecare. The 10 Year Vision is considered from a number of viewpoints:

- The technology in use by service users and ARCs;
- The telecommunications marketplace via which all telecare is delivered;
- The user base for telecare;
- The telecare services delivered to service users.

3.1 Service User Technology

In the next 10 years' digital technology in the home will undoubtedly become more pervasive.

Older citizens are currently amongst the least likely to use digital technology[2]. However, in the future usage of digital technology by older citizens will increase as "younger older" people, who are already comfortable with digital technology, age.

The familiarity with digital technology means that telecare users are likely to own a range of Internet enabled "smart" devices. This includes mobile devices which will have the ability to provide information to telecare service providers such as biometric and geolocation data. These smart devices will also provide a range of ways to communicate with users including audio, video and interactive chat.

The Internet of Things[3], which is currently in its infancy will, by 2025, be the norm in the home. This means that a range of devices will be digital and Internet enabled allowing them to be remotely controlled and monitored.

[2] http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr15/2015_Scotland_CMR.pdf
[3] https://en.wikipedia.org/wiki/Internet_of_Things

For telecare service providers this means that there will be a range of smart sensors in the home environment that are likely to be able to provide a rich set of information sources to ARCs such as, ambient temperature, heating usage, occupancy detection, activity, mobility etc.

Internet connectivity to the home will improve in both speed and coverage. Minimum speeds of 20Mbps ("real life" actual speeds, rather than advertised "up to" speeds) are likely to be provided via wired/wireless broadband or mobile network. Fibre and high speed wireless technology is likely to become more widely available and affordable meaning that some homes will have connections at speeds of up to 1Gbps. Upload as well as download speeds are likely to be improved. Availability of fast Internet connectivity will increase in Scotland's more rural and remote areas resulting from the increase in the coverage of broadband and mobile networks[4].

3.2 ARC Technology

Within the ARC a richer set of information sources from digital service users will mean a greater volume and frequency of data will be received. In particular, multi-channel interactions (i.e. video, instant messaging, etc.) with telecare service users are likely, so each of these will require to be stored and referenced.

The use of digital always-on connections to service users' homes will proactively provide indication of issues / events within minutes of them occurring. ARCs will therefore need to deal with higher volumes of data and as such are likely to rely upon automated means to initially diagnose and triage all, or certain types of, interactions.

The digital format of the information obtained from users' telecare systems will facilitate the secure sharing of data between Health and Social Care staff allowing all professionals to obtain real-time and accurate information on service users/patients, and telecare equipment. This will provide robust support for health and social care integration in Scotland.

The shift of telecare to digital technology will mean that the equipment required in the ARC to deliver the services will be similar to that used to deliver other IT services. This will mean that the telecare solution could share elements of the wider IT infrastructure and be more easily integrated into standard IT support processes.

[4] www.scotlandsuperfast.com

3.3 Telecommunications Marketplace

The UK Telecoms marketplace is likely to see some significant shifts over the next 10 years influenced by some key drivers for change which are detailed below.

3.3.1 Analogue PSTN Decline

Worldwide, and within the UK, the number of calls made via the PSTN (the public phone network) from residential fixed lines is in steep decline due to a shift to other means of communication such as Internet voice (for example Skype and Facetime), and mobile telephones. It is expected that this decline will continue, leaving telecoms operators with a number of challenges of how to maintain fixed line services, that will become increasingly expensive to support.

The UK telecoms regulator, Ofcom, oversees the Universal Service Obligation (USO) which requires BT and KCom to supply a fixed line telephone and functional Internet connection to every customer in the UK at a fixed cost[5]. This obligation currently defines functional Internet as 28.8Kbps which is generally accepted as being insufficient. The USO is currently being reviewed and it is possible that a process of decommissioning fixed analogue telephone services could commence following this review[6], however, the likelihood and timing of this won't be known until the consultation and subsequent review are complete.

3.3.2 Superfast Broadband Roll Out

As of November 2015, 85% of homes in the UK were connected to Next Generation Networks (NGNs) providing them with access to Superfast Broadband services. In Scotland 83% of homes are connected, with the Highlands and Islands expecting to achieve 84% coverage by the end of 2016.

The attractiveness of NGNs to telecoms operators is lower operating costs compared to delivering the same services over the analogue telephone network. In addition, higher capacities offer the possibility of gaining additional revenues from providing other products and services such as TV, video on demand, and sport.

[5] http://stakeholders.ofcom.org.uk/consultations/uso/uso_statement/
[6] www.gov.uk/government/consultations/broadband-universal-service-obligation

The rollout of NGNs continues, which will improve the availability and speed of broadband services available to users.

3.3.3 4G/5G Mobile Broadband Roll Out

In 2012 Ofcom ran a tender exercise to stimulate the rollout of 4G to homes in the UK. Mobile operator O2 won this tender and agreed that it would supply 4G to 98% of the population indoors in the UK by 2017 (and 95% in Scotland).

5G mobile services are already in development and are expected to deliver significant benefits over 4G in terms of both capacity and reduced latency (delay). There has typically been 10 years in between each generation of mobile telephony services and if this trend continues, 5G services should emerge in around 2020.

Overall these will improve both the coverage and speed of data connectivity using mobile telephony services, including in rural and remote areas of Scotland.

3.4 Telecare User Base

The survey results from Product 1 of TEC workstream 5 estimated that there were approximately 150,000 telecare service users in Scotland in the Public Sector in 2015.

The Scottish Government has funded two initiatives to drive adoption of telecare by health and social care services; these include the Telecare Development Programme (TDP) and the Technology Enabled Care Programme (TEC). These programmes have shown how telecare can contribute to the support, security and quality of life of older people, enabling them to live at home longer and also be cost saving.

It is predicted that the usage of telecare services within Scotland is set to grow, which is based on analysis undertaken by various bodies within Scottish Government and healthcare organisations. It is recognised that citizens are now living longer, and therefore to support them the use of telecare services will also increase.

3.5 Telecare Services

A user seeking telecare services would currently find that the availability, scope and cost of services varies widely across Scotland. This issue is examined further in Section 5 of this report.

To ensure that telecare services can support an increased number of users, and deliver on the Scottish Government's 20:20 Vision for Health & Social Care, it is likely that in 10 years a more standardised range of services will be available across Scotland, and that these will be delivered to standard service levels defined by telecare providers or Government. This standard range of telecare services is likely to be wider than those available today, and take advantage of the increased availability and affordability of technology.

The range of telecare services will provide digital variants of the current analogue telecare services. In addition, a range of new services will become available, with these likely to take advantage of digital technology. Increasingly the existing line between telecare, telehealth and videoconferencing will blur with a range of digital health and care services being delivered via a single channel into the user's home, i.e. technology enabled care.

Telecare services are also likely to take advantage of digital technology already owned by the service user, for example smart phones and Internet enabled devices in the home. Telecare services will collect information from, and interact with, these devices to supplement, or replace, dedicated telecare equipment in the home.

The range of telecare services that will be offered cannot currently be determined, although some examples were provided in FarrPoint's Product 1 report. Small scale pilots of additional or enhanced telecare services are being completed under TEC programme projects currently in operation. These pilots will determine the telecare services that offer benefits to the users and/or telecare service provider. The outcome of the pilots can be assessed to identify the telecare service that warrant inclusion in the "standard" telecare service offering that is available throughout Scotland.

In parallel with the development of a "standard" telecare service offering, it is likely that standard service levels for these services will also be developed in order to ensure consistency of delivery across Scotland. It is likely that these service levels will be based partly or wholly on the existing Telecare Service Association standards over the short term, which it is assumed will develop to reflect the changing nature of telecare services. However, alternative approaches to service standards may emerge or be sought.

4. Implementation of Digital Telecare

4.1 Implementation Considerations

There are a number of factors that need to be considered when developing an implementation approach for Digital Telecare. Many of these factors are common to any deployment, and these are examined in the remainder of this section. Any implementation factors that are specific to a particular deployment model are examined in Section 6.

4.1.1 Connectivity

Historically, analogue telecare systems had little concern about the connectivity between the service user's home and the ARC because it depended on a telephone line, being both standard and available through the universal service obligation placed on BT. Some issues with these arrangements have been experienced over the last few years as a result of the rollout of next generation phone networks and the increasing number of homes with no landline (mobile only). However, connectivity has not been a significant issue.

Digital Telecare is dependent upon having IP network connectivity into service users' homes. There are a number of considerations around how this is provided, and how to ensure levels of availability, speed and quality.

Analogue telecare usually relies on using the service user's existing telephone line to provide the necessary connection (though there are a limited number of temporary, ruggedized, or other specialist installations that use a mobile telephone connection instead). This means that currently the service user is normally responsible for providing and funding it. If this approach is extended to Digital Telecare, then the service user would be responsible for providing an Internet connection for the telecare solution to interface with. This raises a number of issues:

- Telecare users are typically in the demographic groups currently least likely to have an Internet connection;
- Telecare users would be required to fund an Internet connection;
- There is a very large choice of Internet providers, connection types, and equipment to connect to the Internet (routers). This will significantly increase

the complexity of the installation and support arrangements for the Digital Telecare service user equipment.

These issues could be mitigated by the telecare provider supplying and financing the necessary digital connectivity into the service user's home, however, this would mean the telecare provider incurring additional costs compared to the existing model.

The speed and quality of the connectivity that will be required into the service user's home is dependent upon the range of telecare services being provided to the service user.

To replicate existing analogue telecare services on a Digital Telecare solution, capacity requirements are relatively modest, being limited to simple signalling, and potentially voice traffic. This level of bandwidth is likely to be widely available using a range of technologies, including basic ADSL broadband services and GPRS mobile data connectivity (2G).

If a wider range of telecare services are to be provided, including more detailed monitoring or the use of video to monitor or speak 'face-to-face' with service users, then higher bandwidth and quality connectivity will be required. Higher bandwidth connections will also be required if the connectivity into the service user's home is also being used to deliver other TEC services, such as telehealth services or video consultations. These services are likely to require higher bandwidth fixed broadband or 4G mobile data connections which are higher in cost than the basic connectivity mentioned above. In addition, availability of these services could be an issue, particularly in rural and remote areas of Scotland, although this is improving as a result of a number of Scottish Government interventions[7].

4.1.2 Legacy Analogue Telecare Equipment

There is currently a large installed base of analogue telecare equipment in Scotland and refresh and replacement timescales for this equipment can be up to ten years. This means that a 'big bang' deployment of Digital Telecare is not practical and so the implementation should allow for a phased approach and a period of 'dual running' of both.

[7] http://www.scotlandsuperfast.com/where-when/the-programme/

Existing analogue equipment in service users' homes can be difficult and time-consuming to re-programme. This needs to be factored into any implementation plan that requires a change to the configuration of existing analogue equipment. An alternative to re-programming equipment can be to put call-forwarding arrangements in place, however, this means the telecare provider incurring costs for each forwarded call, which needs to be considered as part of any implementation planning.

4.1.3 Digital Telecare Standards

There are currently no UK or international standards associated with Digital Telecare technology or services. As detailed in our Product 1 report, a European standard working group, led by Sweden, has been established to develop a European standard for Digital Telecare. Since we produced our Product 1 report, the British Standards Institute (BSI) has raised a New Work Item (NWI) to scope and deliver a technical standard for digital technology supporting telecare services. This is expected to take between 12-18 months to complete with the initial kick off meeting scheduled in Brussels during April 2016. The Scottish Government is currently completing work to scope the benefits of becoming a member of the BSI committee.

Purchasing a Digital Telecare solution prior to standards being agreed raises the risk that the solution procured is later found to be unable to support the standard. Digital Telecare solutions are likely to be based on standard PC/server technology, which means that any changes required to allow equipment to use any standard developed may be able to be implemented through a software change, so reducing the level of obsolescence risk. However, it is still possible that elements of the solution may not support the standard, and so some residual risk remains.

The obsolescence risk could be reduced by Scotland becoming engaged in the process of developing the Digital Telecare standards. This would ensure that Scotland had some influence over their development, and would have sight of draft standards in order to ensure that any potential issues/risks were identified early.

4.1.4 Digital Telecare Equipment Availability

There are currently a very limited number of manufacturers producing Digital Telecare equipment. This is probably due to a lack of market demand plus lack of agreed International standards, as highlighted above.

The lack of manufacturers and equipment will limit the level of choice and competition that can be obtained when purchasing Digital Telecare solutions and early adopters are likely to use equipment from a limited number of suppliers at a cost premium. This situation is likely to prevail until standards are agreed and levels of demand from the market increase.

4.1.5 Establishing and Quantifying Digital Telecare Benefits

The Product 1 report identified a number of potential benefits associated with Digital Telecare, these are summarised in Appendix B of this report. For those relating to moving *existing* telecare services to a digital platform, it is relatively easy to see how these potential benefits would be realised, and that they do deliver value. For a number of the other potential benefits, largely those relating to telecare services *in addition* to those currently provided, work needs to be completed to establish how they will be delivered, and whether they provide sufficient health, social, financial, or operational value to justify the cost and effort of implementation.

It is likely that a number of pilots of these additional Digital Telecare services will be required in order to establish the practicalities and costs of delivering them, and the benefits they provide. The process of completing these pilots is likely to take some time meaning that the range of services that Digital Telecare will provide cannot currently be defined and is likely to evolve over time.

4.1.6 Data Security

The implementation of Digital Telecare allows data relating to service users to be more easily stored and shared. Whilst this brings a range of benefits, it also raises a number of data protection and security considerations.

As part of the process of designing Digital Telecare services, work needs to be completed to ensure that services are compatible with relevant legislation, including the Data Protection Act. This analysis is likely to have an impact on the technical specification of the Digital Telecare solution, including security arrangements for the transmission and storage of data. There are also likely to be a range of controls defined for any sharing of data.

Data security analysis should be completed early in the process of defining Digital Telecare services as it is likely to result in a range of technical and operational requirements that will need to be included into the design and implementation.

It is noted that Data Protection regulation is currently being revised by the EU and it is unclear what impact this will have on the design of Digital Telecare services.

4.2 Recommended High Level Implementation Approach

The implementation considerations detailed in the previous section mean that a high level implementation approach can be developed. This is common to all the telecare deployment models considered later in this report.

Figure 4.1 summarises this approach and is split into two phases: “Rollout” and “Consolidation”:

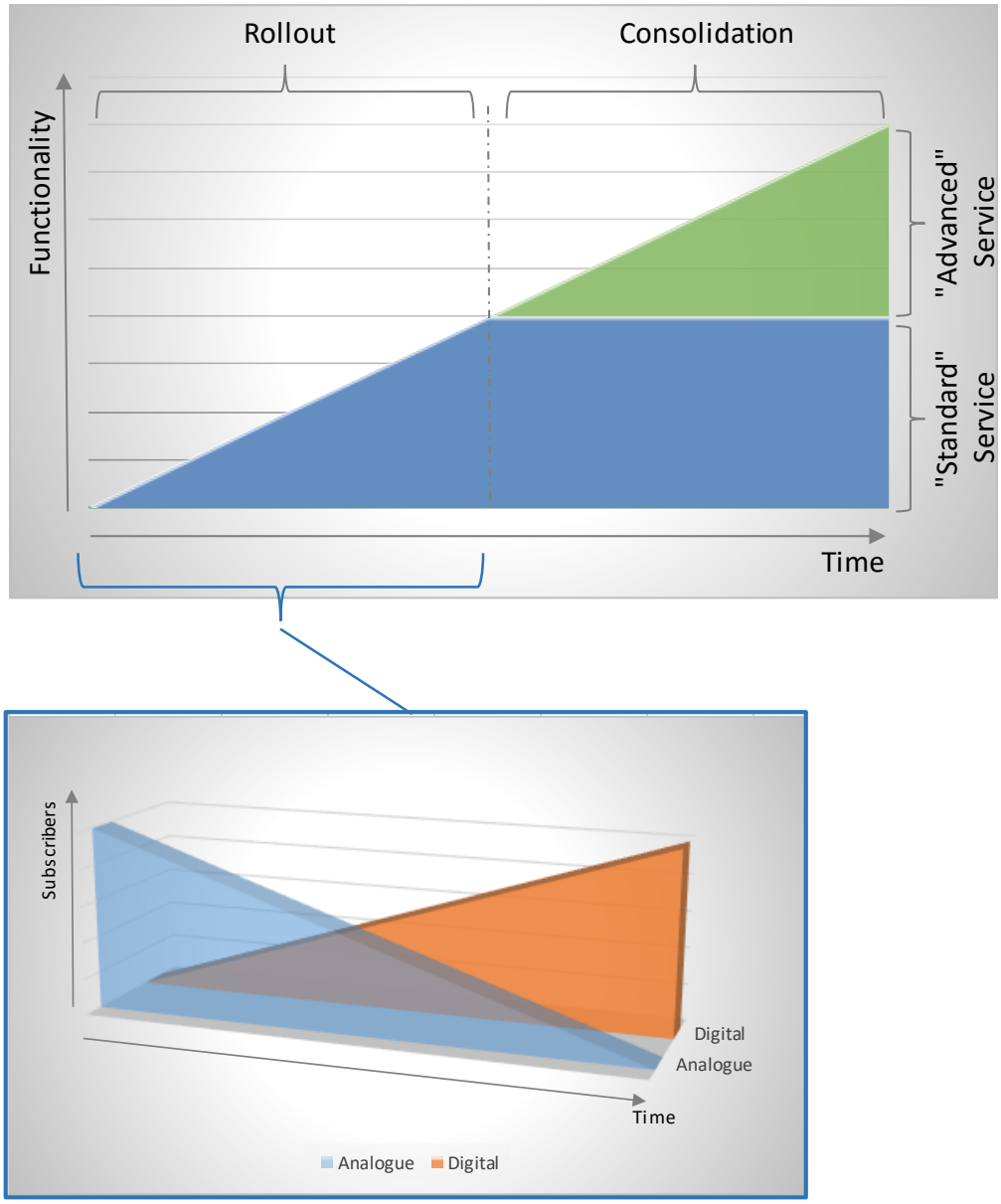

Figure 4.1: Overview of Proposed Implementation Approach (source: FarrPoint)

4.2.1 Rollout Phase

The Rollout Phase is focussed on transitioning telecare services from analogue to digital at scale. This will take a relatively large amount of time and resource given the need to establish a Digital Telecare platform and to migrate a large user base across to the new technology. During this phase there will be a period of dual running of analogue and Digital Telecare while analogue technology is gradually decommissioned.

For the purposes of this study it is assumed that the Rollout Phase will have a duration of approximately 5 years which aligns with the usual replacement period for service users' equipment. Some ARCs may take longer than this period to migrate if they have recently replaced their analogue ARC solution, or have other operational, financial, or technical reasons for not migrating early. Equally, some ARCs may migrate in a much shorter period if they have the resource available to do so.

During the Rollout Phase, telecare services will be transitioned to digital on a like-for-like basis, meaning that the initial Digital Telecare services will offer some increased functionality and benefits compared to the analogue services, but the full benefits of Digital Telecare will not be obtained until later. Benefits during the Rollout Phase are likely to be obtained from the increased reliability of services and potentially efficiency, operational and standards-related benefits.

Initially the bandwidth of the digital connectivity required to service users' homes is relatively modest meaning that it is likely that mobile connectivity can be used. This means that some of the challenges associated with delivering higher bandwidth connectivity can be avoided during this phase. This was the approach used in Sweden to deliver conversion to digital at scale and speed.

The duration of the Rollout Phase also provides time for a number of other developments and activities to be completed in preparation for the next recommended Phase:

- Pilots can be completed of "advanced" Digital Telecare services to establish those that deliver benefits and the optimum delivery mechanisms, including addressing some of the considerations around connectivity, data protection, and security as detailed in the previous section;

- The rollout of Next Generation Broadband and 4G connectivity in Scotland will have progressed, providing support for the delivery of more advanced Digital Telecare services, particularly in rural and remote areas where connectivity is currently an issue;
- The process of developing international standards for Digital Telecare will have progressed allowing Scotland to align its telecare services with these standards and benefit from increased competition in the telecare equipment marketplace.

4.2.2 Consolidation Phase

The Consolidation Phase commences once the Rollout Phase is complete. The purpose of this Phase, which is likely to be an ongoing evolutionary process, is to develop and enhance Digital Telecare services to obtain further functionality and benefits from the technology.

The advanced services which have demonstrated sufficient benefits, will be deployed during the Consolidation Phase. It is likely that not all service users will require, or will benefit from, advanced services, meaning that there will be a mix of service users using "Standard" (i.e. similar to existing analogue telecare services) and "Advanced" telecare (i.e. telecare services including wide, or more complex, monitoring than currently available).

It is probable that Advanced telecare services will require higher bandwidth connectivity than for Standard services meaning that 4G or fixed broadband connections is likely be required, with the associated increased cost and operational and support impacts. However, if the service user base for advanced services is smaller, these issues are likely to be manageable.

5. Operational Considerations and Standards

5.1 Overview

In addition to the technical and market factors influencing the rollout of Digital Telecare there are also a number of non-technical considerations around operational arrangements and service standards that will influence how Digital Telecare is defined and implemented.

As with the technical considerations examined in the previous section, many of the operational/standards considerations are common to any deployment, and these are examined in the remainder of this section. Any factors that are specific to a particular deployment model are examined in Section 6.

5.2 Service Offering and Service Standards

Telecare services currently being provided throughout Scotland vary between the operating partnerships and organisations. The use of different solutions, technologies and local operating procedures is evident, with no standardisation of service provision, reporting or charging arrangements in place.

Whilst these existing diverse arrangements could continue to be supported in a Digital Telecare environment, the wider range of services, equipment and processes associated with this approach means that it is likely to be more complex and costly compared with taking a more standardised approach.

Defining a “standard” set of Digital Telecare services that are offered by all service providers in Scotland would require the cost, complexity and benefits of the services currently offered to be examined to determine those that warrant inclusion in the standard digital offering. Whilst this approach would offer benefits in terms of standardisation of the service offering, it does mean that some current smaller scale local services offered by providers focussed on specific needs of their users, may not be accommodated.

The Telecare Services Association (TSA) currently accredits telecare service providers and is a membership and self-appointed representative body for the delivery and development of telecare and telehealth services in the UK. The TSA developed the Integrated Code of Practice (currently under review) for use by telecare and telehealth

service providers to ensure quality standards for service delivery. In Scotland there are 19 members of the TSA, however only nine of these organisations are accredited to various parts of the Code of Practice. Whilst the TSA Code of Practice is not specific to a particular vendor's technology, it is likely that the standards it defines will need updating to take account of the new ways of delivering Digital Telecare services and new Digital Telecare service offerings. It is also currently unclear what impact the development of European standards for Digital Telecare will have on the TSA Code of Practice.

It will be for Scottish telecare providers to decide whether to adopt any updated TSA Code of Practice, the European standards (if different from the TSA Code of Practice), or support the development of separate Scottish standards.

Current telecare technology is relatively static and is not developing significantly. However, it is likely that Digital Telecare services will evolve and expand rapidly in a similar manner to the rate of change seen elsewhere in the IT industry. Given this, the standards associated with these services will also need to be regularly updated to ensure that they remain current. It is currently unclear who would ensure that standards remain current, although it is noted that the Care Inspectorate currently have responsibility for the regulation of care services.

5.3 Sharing Services and Information

The shift of telecare to digital technology opens up a number of possibilities for increased sharing of services and information between public bodies. A number of these benefits were detailed in the Digital Telecare Product 1 report. These benefits include the ability to share data collected from service users with other agencies responsible for the users' health and social care, such as GPs, social workers, and the emergency services. Prior to any of these service or information sharing arrangements being implemented, it will be necessary to develop operational information sharing policies, protocols and processes defining what information can be shared, with whom, how it will be shared and used, and under what circumstances.

Data protection and security arrangements are also likely to be more of an issue than with current telecare service provision, and will need to be addressed as part of any Digital Telecare operational standards. In addition, Digital Telecare equipment is likely to be more closely integrated with service providers' corporate IT infrastructure than

current analogue telecare equipment, meaning that the potential for data leakage/theft is greater.

5.4 Council's Wider User of ARCs

Many ARC agents (call handlers) within Local Authorities are also responsible for covering other roles within the Council. Councils take advantage of the fact that telecare services require 24/7 staffing and use the telecare staff to provide other out of services, acting as points of contact for services such as lone worker monitoring, emergency repairs, and civil contingencies.

The telecare service is often co-located with the Councils' wider contact centres, and so ARC agents also support contact centre activities during normal working hours. Operationally this need to be considered as part of any planned clustering of ARCs (as examined in the following section) as the level of savings obtained may be impacted if Councils need to maintain out of hours staffing anyway in order to provide other services.

Any move of telecare to digital technology would mean that the systems being used for telecare services were increasingly similar to the wider Council contact centre systems. In some cases, there may be common equipment used for the two services. This is likely to result in efficiency savings for ARCs, but is also likely to mean a change is required to existing technical support arrangements and closer alignment with Councils' corporate IT support.

5.5 Response Services

The existing operational procedures that are used for mobilising response services will need to be reviewed given the potential changes to ARC location and capability.

If ARCs are clustered, then arrangements will need to be put in place to allow ARC agents in one location to mobilise response services in one of a number of other locations. These arrangements will also need to ensure that the ARCs receive updates back from the response service to allow them to monitor, update, and close calls.

The increased functionality offered by Digital Telecare is also likely to mean that there is a requirement for response procedures to be updated. The wider range of information available from service users means that ARC agents are likely to be able

to better diagnose the nature of the response required from service users, and to better interact with users in the event of a response being triggered, for example via two way conversations, or video monitoring. This will allow agents to ensure that the correct response is provided, better identify false alarms and provide an overall more personalised user experience.

The potential standardisation of Digital Telecare services will mean that there is potential for national procedures to be put in place for closer working with the emergency services to assist in identifying when an emergency response is required, and for providing support and information when it is.

5.6 Equipment Installation and Maintenance

Installation and maintenance of telecare equipment in service users' homes is currently completed either by the response service, or using a dedicated equipment installation team. Dedicated telecare equipment is installed in users' homes when they first start to receive telecare services; this equipment is then checked regularly and maintained and replaced as required.

Digital Telecare equipment in users' homes will provide the ARC with far greater visibility of its status than existing analogue equipment. This means that the ARC will be able to identify equipment in need of maintenance and replacement, negating the need for regular home visits to check equipment. This increased visibility in the ARC also means that the ARC will be able to identify any equipment that has been incorrectly installed or configured.

As Digital Telecare evolves it will potentially be more closely integrated with service users' own digital devices and could be delivered using a service user's own broadband connection. In these circumstances the resource requirements and processes around the installation, monitoring, and maintenance of these devices is likely to be quite different from at present and should be considered as part of any evolution of the telecare service. These elements could require their own service standards.

6. Digital Telecare Deployment Models

6.1 Overview

A number of Digital Telecare Deployment Models are examined in this report in order to establish which represents the optimum approach. The models examined are:

- **No Migration to End-to-End Digital**: This model examines the impact of not shifting existing telecare systems to end-to-end digital. This model is included in order to establish where there is a need for change and to establish the benefits and costs associated with the 'do nothing' baseline approach;
- **Standalone Digital ARCs:** This model assumes that each of the existing ARCs is moved to end-to-end Digital Telecare. This assumes that there is no clustering or consolidation of ARCs and that existing organisational and operational arrangements remain unchanged;
- **Clustered Digital ARCs:** This model assumes that care providers collaborate with each other to deliver shared services for Digital Telecare. This will result in a number of Digital Telecare deployments providing services to 'clusters' of ARCs as recommended by the McClelland[8] and Christie[9] reports. There are a number of deployment options for the Clustered Digital ARC approach, these are detailed in Appendix D. For the purposes of this study the examination of the Clustered Digital ARC Model is based on the Shared Agents Model as this approach is potentially the most representative of the clustered models, offering a balance between operational impact and efficiencies.

Each of the three approaches above is examined from a number of perspectives:

- **Technical Solution:** A high level technical solution is developed for each approach;
- **Costs:** A high level cost model is presented for each approach;
- **Benefits / Efficiencies:** The benefits associated with each approach is examined (with reference to the 'potential benefits' identified in Product 1) as well as the efficiencies each approach could potentially offer;

[8] http://www.gov.scot/resource/doc/96269/0023302.pdf
[9] http://www.gov.scot/resource/doc/352649/0118638.pdf

- **Operational / Standards:** An outline operational model is developed for each of the approaches detailing how the split of responsibility between the ARC, response teams, and other parties may operate. Included in this analysis is an examination of the impact the approach could potentially have on service standards;
- **Implementation:** A high level implementation plan is developed for each of the approaches, including highlighting of key risks.

6.2 Deployment Approach 1: No Migration to Digital Model

6.2.1 Technical Solution

Under the No Migration to Digital model the solutions in use would be identical to the current state.

The existing analogue ARC systems would be retained with refresh cycles (upgrades) of solutions being completed as required. This situation could continue until such time as a compelling event arose which necessitated a shift to Digital. The compelling event could be the removal of analogue telephone services from the marketplace, for example. It should be noted that this will undoubtedly occur at some point in the future, given the decline in usage forecast by telecommunications operators worldwide. However, the timescales for this occurring are currently unknown.

It is assumed that the existing number of ARCs and their service offering is largely unchanged under this model given the limitations in the flexibility of analogue technology.

Under this model the situation for service users is identical to the current position. Users retain their existing analogue connections, telecare units and any sensors. This equipment would remain in place, being refreshed as required by the ARC provider.

6.2.2 Costs

A cost model has been developed for all the ARC deployment approaches. Details of the cost model are contained in Section 6.5 and Appendix C.

The estimated costs of the current ARC delivery approach, and of maintaining this approach, is £14.2M per annum.

This cost will be used as a baseline against which the cost of the other delivery approaches can be measured.

6.2.3 Benefits / Efficiencies

Appendix B contains a list of potential benefits associated with a move to Digital Telecare. This list is a copy of that contained in our Product 1 report. The Appendix also details whether each of the potential benefits would be obtained under each of the Deployment Models being examined.

As can be seen in the Appendix, since this deployment model retains the existing analogue telecare solutions, none of the benefits associated with Digital Telecare are realised.

6.2.4 Operational / Standards

As this deployment model retains the existing technical solution it is assumed that the telecare service offering and operational arrangements would also remain unchanged. The lack of change has the advantage of not requiring any effort to implement: it does however mean that none of the benefits associated with this change are obtained. These include:

- Analogue technology is more limited in its ability to support a widening in the range of telecare services offered to users;
- The existing geographic differences in the range of telecare services offered, and the standards associated with these services, will continue;
- The existing lack of service reporting will continue;
- The existing difficulties in storing and sharing telecare data will continue;
- Unable to obtain some of the cost savings and efficiencies associated with ARC clustering and digital technology.

The limitations associated with the existing analogue telecare service offering and operational arrangements are likely to become more of an issue as the telecare user base increases. To meet the growth in telecare users every ARC is going to have to increase the number of agents and response staff, and invest in further analogue equipment to install in users' homes. This will:

- further increase the amount of routine maintenance calls and activity agents and response staff are required to complete (largely avoidable if digital technology is used);
- further increases the ARCs' investment in analogue technology which is known to have obsolescence issues;
- further increases the work and costs associated with any subsequent migration to digital technology (given the larger user base ARCs would be required to migrate).

6.2.5 Implementation

This deployment model does not involve any additional implementation effort as it retains the existing ARC equipment and operational approach.

There will be a requirement for ongoing effort as part of regular maintenance and technology refresh activity, however, this is "business as usual" activity and is not associated with any form of technical change resulting from Digital Telecare.

6.3 Deployment Approach 2: Standalone Digital Deployment Model

6.3.1 Technical Solution

Under this option, there would be a conversion of the existing analogue ARCs to digital technology on a like-for-like basis. This means that the existing number of ARCs is unchanged.

The analogue ARC systems would be replaced with digital equivalents with digital network connectivity between the ARC and service users. This is likely to be Internet connectivity, but could also be provided via a private network. In the short term, until digital connections are available to all service users, both types of connectivity would run in parallel to the ARC. Once all service users are converted to digital, it is likely that the telecare solution will not need to maintain a dedicated telephony solution, and can instead be integrated into the system used by the wider organisation (Council, Health Board, Housing Association, etc).

The move to digital technology is also likely to mean that the ARC solution does not use dedicated hardware, and will instead be a software based system. Similar to

telephony, this is likely to mean that the ARC solution can be provided and supported as a standard service by the organisation's IT department and hosted on existing hardware (i.e. virtual servers), rather than requiring bespoke dedicated equipment and support arrangements.

Under this deployment model, service users will have the existing analogue equipment in their homes replaced with digital equivalents. Existing controllers will be replaced with an equivalent device that connects to the ARC either via a mobile network or a broadband connection, instead of via dial up over a phone line. Sensors/monitors will also be replaced with devices that connect to the controller via a digital connection. From a service user's perspective little will change initially as the service is likely to be a like for like migration of the existing service to digital technology. However, the introduction of digital technology will mean that a wider range of services can be offered to users, and so over time the range of devices in the home are likely to increase or change.

6.3.2 Costs

The costs associated with the Standalone Digital Deployment model are estimated to be £21.5M per annum (see Appendix C for details).

This is an increase of £7.2M per annum over the no migration to digital approach which is almost wholly due to the costs associated with providing digital connectivity to service users' homes. The fact that this approach retains the existing standalone ARC model means that these additional costs cannot be offset by savings associated with the sharing of resources.

6.3.3 Benefits / Efficiencies

The potential benefits associated with a move to Digital Telecare, and whether each benefit would be obtained under each of the Deployment Models, are detailed in Appendix B.

In summary, this model scores highly for "Potential Reliability Benefits" with the exception of improved voice quality which is unlikely to be available during the Rollout Phase. This benefit could be made available during the Consolidation Phase.

The benefits under “Potential Efficiency Benefits” are limited, due to the standalone nature of the ARCs.

The benefits under “Potential Additional Functionality Benefits” can all potentially be obtained under this deployment model during the Consolidation Phase, following a pilot to establish their value and viability.

The benefits under “Potential Telehealth Benefits” can all potentially be obtained under this deployment model during the Consolidation Phase. However, the standalone nature of the ARCs is likely to limit the extent to which these benefits can be exploited when compared to the clustered deployment model.

6.3.4 Operational / Standards

This deployment approach involves a change in technology for agents, installers and users, and so training needs to be a consideration for all these groups.

At a minimum, operational arrangements need to be updated to take account of some of the additional capability Digital Telecare offers, for example, in the ability to automate some tasks that are currently completed manually (e.g. maintenance calls and visits). Updates of operational arrangements will also be required to allow ARCs to take advantage of some of the benefits associated with data sharing and closer working with other health and care providers.

The operational arrangements for mobilising response services are unlikely to need changing significantly.

This deployment model provides greater capability than the analogue deployment model to cope with the growth in the number of telecare service users and will reduce (though not eliminate) the requirement for additional agent resource to cope with the increase in users.

6.3.5 Implementation

The implementation of Digital Telecare is likely to take some time and a period of “dual running” of analogue and digital systems will be required.

For ARCs, analogue systems would be replaced with digital equivalents able to support both analogue and digital connections for this period of dual running.

It is assumed that the rollout of Digital Telecare would be completed in line with the normal refresh rate of service users' equipment, and so would have a duration of around 5 years.

Given the change of the ARC technology, there will be a need to complete training of ARC agents on the new ARC solution.

6.4 Deployment Approach 3: Clustered Digital ARCs

6.4.1 Technical Solution

This model involves a conversion of the existing analogue ARCs to the same digital technology as that used in the Standalone Digital deployment option. There will be a reduction in the number of ARCs with the exact number and scale of the digital ARCs to be defined by the level of clustering that is implemented, and so the number of service users that each is required to support.

The new clustered ARCs would be based on the same digital technology as that outlined for the standalone digital ARC approach with connectivity scaled to reflect the larger user base of the clustered solutions.

Depending on location, there is potential for the ARC to utilise the existing corporate telephone solution and IT hosting and support facilities.

Analogue equipment in service user's homes will be replaced with digital equivalents and existing controllers and sensors/monitors will be replaced with an equivalent digital device.

6.4.2 Costs

The costs associated with the Clustered Digital Deployment model are estimated to be £18.6M per annum (see Appendix C for details).

These costs sit between those of the other deployment approaches; being around £4.4M per annum more than the no migration to digital approach and around £2.9M per annum lower than for the Standalone Digital approach. The increase in annual costs is almost wholly due to the costs associated with providing digital connectivity to service users' homes. However, unlike the standalone digital approach, these

connectivity costs are partly offset by efficiencies obtained though the clustering approach and sharing of resources.

6.4.3 Benefits / Efficiencies

The potential benefits associated with this deployment model are detailed in Appendix B.

In summary, this model scores the same as the Standalone Digital model in terms of the extent to which it supports the benefits under the "**Potential Reliability Benefits**" heading. All of the potential benefits would be obtained during the Rollout Phase with the exception of the benefit relating to improved voice quality, which could only be delivered during the Consolidation Phase.

The benefits under "**Potential Efficiency Benefits**" heading are the main area where there is a difference between the Standalone and Clustered Digital deployment models. The Clustered Digital deployment model can take advantage, during the Rollout Phase, of the benefits relating to the efficiencies offered by the sharing of ARCs, equipment, and staff. In addition, the model allows the benefits relating to the intelligent routing of calls, sharing of data, business continuity, etc to be fully exploited.

The benefits under "**Potential Additional Functionality Benefits**" can all be obtained under this deployment model during the Consolidation Phase, following a pilot to establish their value and viability.

The benefits under the "**Potential Telehealth Benefits**" can all potentially be obtained under this deployment model during the Consolidation Phase. Unlike the Standalone Digital deployment model, the closer integration of ARCs in this model means that these benefits can be more easily exploited.

6.4.4 Operational / Standards

The reduction in the number of ARCs associated with this option means that this deployment approach is likely to involve the largest amount of change to existing operational arrangements and will require:

- Training of agents, installers and users in the new digital technology;
- Operational arrangements to be updated to take account of some of the additional capability Digital Telecare offers, for example, in the ability to

automate some tasks that are currently completed manually, such as equipment checks;

- Operational arrangements to be updated as the range of Digital Telecare services offered is widened;
- Operational arrangements, and data security/sharing arrangements, to be updated to allow ARCs to take advantage of some of the benefits associated with data sharing and closer working with other health and care providers.

Whilst this model assumes that ARCs are clustered, no assumptions have been made about what this clustering would look like in practice. For example, it is currently not known whether clustering would be achieved through some existing ARCs providing services on behalf of others, or via the setting up of new dedicated clustered ARCs. Whichever approach it taken there will be a need for the participating ARCs to develop service level agreements defining what services are to be provided, to what service levels, and the roles and responsibilities of each of the organisations.

Agents in the clustered ARC will have to liaise with, and mobilise, response services in a number of areas. The clustered nature of the ARCs is also likely to mean that the standardisation of the telecare service offering, and service standards, are more likely.

Most managers and staff ascribe significant value to call handlers knowing the characteristics of the local area well, and having the skill and knowledge to develop a relationship with regular callers. Some examples of serious accidents being avoided have been noted where the call handler realised that a regular caller was behaving or speaking in an uncharacteristic way. ARC managers advise that many regular callers will develop a warm relationship with call handlers, and that this may be the only social contact that person has. Smaller centres appear to actively encourage this. This can lead to daily 'monitoring'/check-up calls where the call handler calls the service user for no other reason than to make contact and ensure that all is well. This is obviously a significant extension of an alarm service, as it becomes an integral part of that person's package of care and support. A clustered ARC, with more agents and a larger user base is less likely to be able to maintain this 'personal touch' and this will need to be considered during the development of operational processes for the clustered ARCs.

The impact ARC clustering will have on service providers' non-telecare services needs to be considered. For example, telecare staff are often used to provide other Council

services, particularly outside normal working hours. The impact of the clustering of ARCs on these other Council services needs to be considered as telecare agents may not be available to assist in their delivery and this may reduce cost savings.

This model is likely to provide the highest level of capability amongst the options examined to cope with the growth in the number of telecare service users. The combination of the move to digital technology allowing the automation of some tasks, and the additional efficiencies gained from having pooled agent resource, will provide a scalable platform better able to cope with the increased volume of calls from users.

6.4.5 Implementation

The implementation is likely to be the most complex of the approaches examined in this report due to the larger-scale changes to operational arrangements.

Once the location of the clustered digital ARCs is determined, the new digital solutions will be deployed. A period of "dual running" of analogue and digital systems will be required while the transition is completed. With the clustered digital ARC option there are two main approaches to this dual running available:

- Existing analogue ARCs are maintained during the migration period to handle analogue service users with the clustered ARCs handling digital service users. This approach minimises the changes required to (inflexible) analogue technology but does, however, require existing analogue ARCs to be maintained until all service users are migrated to digital and so delays the cost savings associated with clustering.
- Existing analogue ARCs are decommissioned and the clustered ARCs handle all service users immediately: Calls from analogue service users would be redirected to the clustered ARCs until all service users are migrated to digital. This approach allows existing ARCs to be decommissioned early in the rollout period but does require existing (inflexible) analogue technology to be reprogrammed or for calls to be redirected (which will incur a per call cost).

This deployment model involves changes to the operational arrangements for the ARC and how they interact with response services. Given this, prior to the ARCs going live there will be a need to define and test the new operational procedures. ARC agents will need to be trained on both these new processes and the new digital ARC solution itself.

6.5 Cost Model

A cost model has been developed for all the ARC deployment approaches. This is contained in Appendix C. This section provides an overview of the elements contained within the cost model and the assumptions that have been made in its development.

The cost model provides estimated costs for the ARC equipment and staff and service user equipment. There are no costs included for the response service or for resource used to install and maintain telecare equipment in service users' homes.

The cost model provides the following estimated costs for the three deployment approaches examined earlier in this section

Deployment Approach	Estimated Annual Cost
No Migration to Digital	£ 14,231,060
Standalone Digital Deployment	£ 21,477,700
Clustered Digital Deployment	£ 18,614,800

Figure 6.1: Cost Summary for Each of the Defined Deployment Approaches

The model contains estimated costs for the following elements:

- **ARC System (Equipment)**: The costs associated with providing the equipment that comprises the ARC solution (for example Tunstall PNC7, or a digital equivalent). Costs are annualised over the estimated life of the solution;
- **ARC System (Support):** The costs paid to the ARC Solution provider for support of the equipment;
- **Telecoms / Connectivity Rentals:** Costs for the rental ISDN phone lines to the ARC and, for digital ARCS, for Internet connectivity;
- **Telecoms Call Charges:** Call costs. For calls made to service users or service user equipment;
- **Desktops:** Costs associated with supplying and supporting the desktop PCs used in the ARC. Costs are annualised over the estimated life of the devices;
- **IT Hosting:** Costs of the equipment rack space, power, and cooling required to house the ARC solution;
- **Facilities:** Costs of providing and maintaining ARCs' office space;

- **Staff (Agents):** Salaries, including estimated on-costs, of ARC agents;
- **Alarm Hub:** The unit cost of the controller/hub device installed in each service user's home. Costs are annualised over the estimated life of the devices;
- **Hub Connectivity Rental:** The annual cost of providing Internet connectivity to each service user's home to allow the controller device to be connected to the ARC;
- **Sensors:** The unit cost of the sensors/monitors/alarms installed in each service user's home. Costs are annualised over the estimated life of the devices.

The model has had to make a number of assumptions key as follows (a full list of assumptions is contained in Appendix C):

- There are 22 ARCs operated by, or on behalf of, the public sector in Scotland;
- Under a clustered ARC model the number of ARCs would be reduced to 8;
- ARCs currently have an average of 13 full time equivalent (FTE) agents. Clustered ARCs will have an average of 26 FTE agents. Agent salary averages £20,000. On-costs are 25% of salary;
- There are a total of 150,000 telecare service users in Scotland. The model compares Digital Telecare costs against existing analogue solution costs and so does not factor in any increase in these user numbers.

Other points to note:

- Any one off costs associated with the models have been annualised to allow models to be compared on a like-for-like basis;
- The model estimates the cost to the public sector of delivering ARC services. The model does not estimate any funds obtained from service users in the form of charges for the service;
- The model includes costs for providing and replacing equipment in service users' homes but does not include any costs for equipment installation. Response services are also excluded from costs and the model assumes that existing arrangements and costs are unchanged under the digital deployment model.
- Costs of any training required for agents, installers, etc., are excluded from the model.

7. Pilot Projects

This section outlines a recommended scope for Digital Telecare Pilot Projects. This work was originally to be completed as Product 3 of this study, but has now been included in Product 2.

7.1 Pilot Project Objectives

The pilot projects should be designed to meet the following objectives, which are focussed on the key benefits and technical considerations highlighted in this report:

- Validate the benefits to service user and care provider from 'Standard' Digital Telecare Services;
- Demonstrate the potential benefits to service users and care providers from 'Advanced' Digital Telecare Services;
- Validate the Digital Telecare implementation approach;
- Demonstrate the viability and benefits associated with ARC clustering.

As it is unlikely that a single pilot will be able to test or prove all of these objectives, multiple pilots will be required. The objectives are discussed further in the following sections.

7.2 Validate the Benefits from 'Standard' Digital Telecare Services

This objective is focussed on validating that Digital Telecare can deliver benefits to service users and care providers as a 'like-for-like' replacement of existing analogue telecare services.

The pilot would focus on benefits delivered by having a digital controller in service users' homes and a digital connection to the ARC. There are currently no digital sensors/monitors available in the marketplace and so the benefits associated with this technology cannot be tested.

Some implementation issues will only become evident with a larger user population. Given this it is recommended that a minimum of 50-100 devices would be deployed to provide sufficient usage information from the pilot.

It is anticipated that deploying digital controllers will deliver the following benefits that would be tested and quantified during the pilot (benefits are those identified in FarrPoint's Product 1 report):

- Increased reliability in the connection between the controller and the ARC (no issues with failed calls, redials, etc);
- Increased visibility of the controller status in the ARC. Reduced requirement for test calls, maintenance checks, etc;
- Increased ability for the ARC to remotely reconfigure the controller. Reduced requirement for maintenance visits, etc;
- Ability for the controller to make alarm calls even if the user's phone line is in use. Ability for the controller to notify the ARC of multiple alarm conditions simultaneously (particularly relevant to sheltered housing and other multi-resident situations);
- The fact that Digital Telecare equipment is smaller and more aesthetic than many currently deployed analogue devices may assist with take-up of telecare services amongst user groups reluctant to be seen as requiring the service.

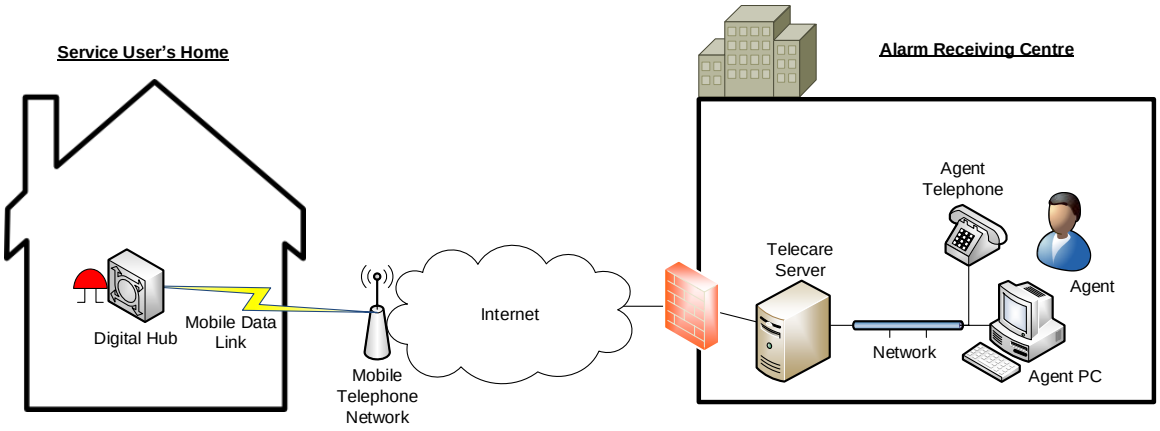

Figure 7.1: Standard Telecare Pilot (source: FarrPoint)

This pilot project is likely to be delivered by utilising an ARC that has existing digital capability. It would be necessary to complete the digital enablement of these ARCs and deploy the digital controllers in service users' homes.

Participation in the pilot will require new equipment to be installed in service users' homes and so the users selected will need to be comfortable with some degree of change.

7.3 Demonstrate the Potential Benefits from 'Advanced' Digital Telecare Services

This objective is focussed on identifying potential 'advanced' Digital Telecare services and demonstrating that they offer benefits to service users.

This objective may already be piloted, in part, via existing TEC Programme projects as many of these are focussed on piloting innovative technology solutions to deliver benefits to an identified user group. The outcome of these existing projects should be evaluated to establish their potential for inclusion in the scope of an advanced Digital Telecare service offering.

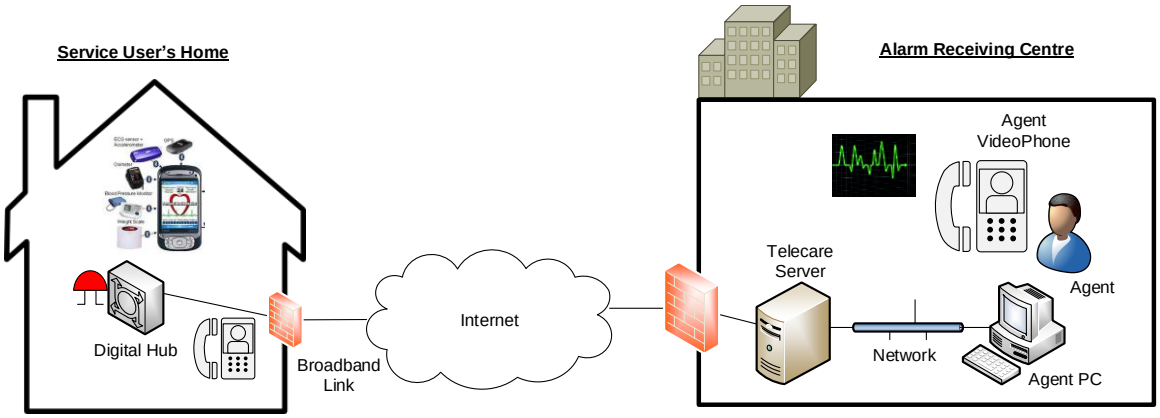

Figure 7.2: Advanced Telecare Pilot (source: FarrPoint)

If additional potential advanced services are identified which are not already part of a TEC Programme project, then these benefits can be included within the scope of the piloting of this objective. Note that the purpose of this objective is to identify the services that offer benefits for users, not necessarily to test the technology solution. This means that the objective could be met using any technology platform such as a hosted (cloud-based) or standalone solution and does not need to be a service delivered from an existing ARC solution.

7.4 Validate the Digital Telecare Implementation Approach

This objective aim to validate some of the key assumptions made about the best method of implementing Digital Telecare.

It is anticipated that this pilot project will demonstrate the viability (or otherwise) of the following assumptions:

- That the use of digital connectivity via the mobile telephone network is viable and reliable;

- That the use of the mobile telephone network for voice calls to users is viable, reliable, and offers acceptable call quality;
- That it is possible to 'dual run' digital and analogue service users on the same ARC system;
- That digital controllers can be used as a direct replacement for existing analogue devices (and still interface with existing analogue sensors/monitors);
- Establish the time, effort, and training requirements associated with the deployment of Digital Telecare equipment (to assist planning for the 'wider' rollout of the technology).

The pilot project would deploy Digital Telecare in a number of service users' homes (as before, to provide sufficient numbers of users we would anticipate that a minimum of 50-100 devices would be deployed) and would likely be delivered by utilising an ARC that has existing digital capability. It would be necessary to complete the digital enablement of these ARCs and deploy the digital controllers in service users' homes.

Participation in the pilot will require new equipment to be installed in service users' homes and so the users selected will need to be comfortable with some degree of change.

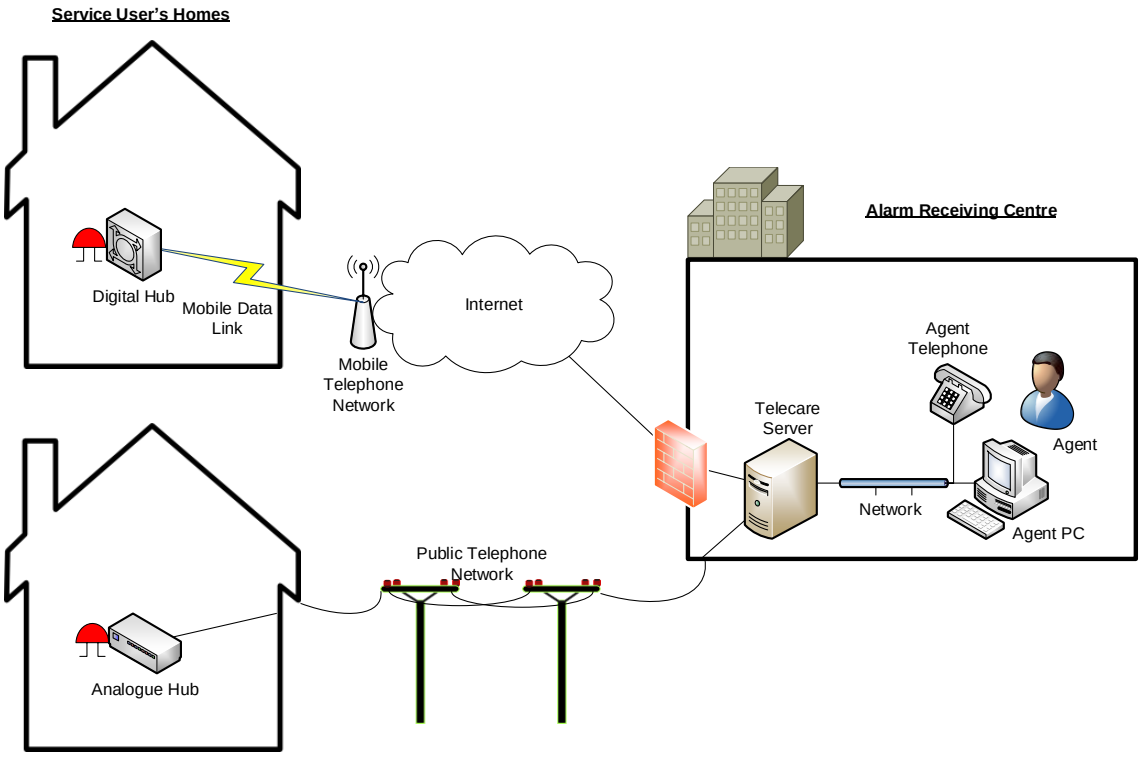

Figure 7.3: Implementation Telecare Pilot (source: FarrPoint)

7.5 Demonstrate the Viability and Benefits of ARC Clustering

This objective focusses on demonstrating the viability of using Digital Telecare to cluster ARCs and that clustering delivers benefits to service users and care providers.

The pilot needs to demonstrate the viability and benefits of ARC clustering from both a technical and operational perspective and would address the following:

- Demonstrate that digital technology allows service users to easily connect to a different care provider;
- Demonstrate that an ARC in one organisation is able to interface and share information effectively and securely with another organisation regarding service users' care;
- Demonstrate that an ARC in one organisation is able to mobilise a response service in another organisation;
- Demonstrate that an ARC in one organisation is able to effectively install and maintain digital equipment for another organisation's service users;
- Establish the increased agent efficiency (if any) delivered by ARC clustering;
- Demonstrate that 'standard' service offering and service levels can be delivered on behalf of multiple care providers.

The above list of expected outcomes is based on the assumption that the "Shared Agent" model as detailed in Appendix D is being piloted. Ideally, to meet this objective a digital ARC would be used to deliver services on behalf of a number of care providers, however, given that a number of the outcomes are based on demonstrating the viability and benefits of organisational processes, rather than technology, it is possible that some of the outcomes could be piloted using analogue based solutions. This could potentially be completed via a new sharing arrangement between care providers or an extension of an existing sharing arrangement.

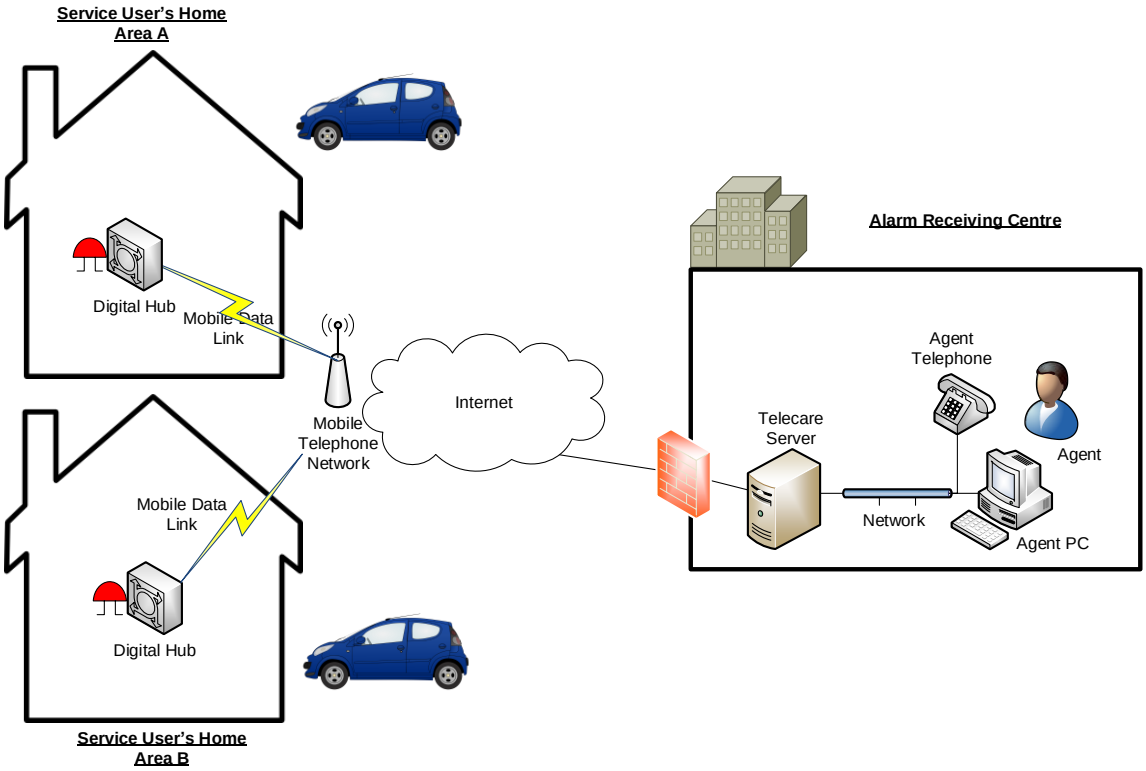

Figure 7.4: Clustering Telecare Pilot (source: FarrPoint)

7.6 Pilot Projects Summary

A number of pilot projects will be completed, with each addressing one or more of the four defined objectives. In this way a range of evidence will be gathered which will allow plans for the scope and implementation of Digital Telecare to be better defined.

A number of the pilot objectives may be met by projects being funded as part of the existing TEC programme, however, further dedicated (and separately funded) projects may be required to provide further evidence, if required, or to meet any objectives not being addressed by TEC programme projects.

It is recommended that pilot projects are completed over a period of at least six months in order to provide sufficient time for benefits and issues to manifest themselves. The pilots should be regularly reviewed and governed throughout their duration in order to gain early feedback and to provide the opportunity to adapt the projects as required. Feedback should be obtained from at least the following groups: ARC managers, agents, responders, and service users/informal carers. As part of the pilots, data sharing and data security considerations should be identified and potential solutions assessed.

As highlighted earlier in this report, telecare equipment and services do not currently exist that are capable of delivering all of the potential benefits associated with Digital Telecare. Given this, telecare equipment manufacturers and service providers will need to develop their offerings if Digital Telecare is to deliver its potential. To assist in starting this process it is recommended that telecare equipment and service providers are invited to participate in the pilots to allow them to better understand the requirements of service users and service providers, and to learn from the experience gained from the pilots. They could also potentially use the pilots as a 'test bed' to trial new technology and service offerings. Scotland Excel has existing relationships with a number of telecare equipment manufacturers / service providers and so could assist with this process.

8. Conclusions

The first product of this workstream established the potential benefits associated with Digital Telecare. It also examined the current telecare solutions in use in Scotland in order to determine the baseline from which any deployment of Digital Telecare would be started.

This report forms the combined second and third deliverables of the workstream and has developed:

- An implementation approach for Digital Telecare;
- A range of deployment models for Digital Telecare, with associated benefits and costs;
- Suggested scope for pilot projects to test and progress the suggested implementation approach and deployment models.

8.1 Implementation of Digital Telecare

The recommended high level implementation approach for Digital Telecare is summarised in Figure 8.1.

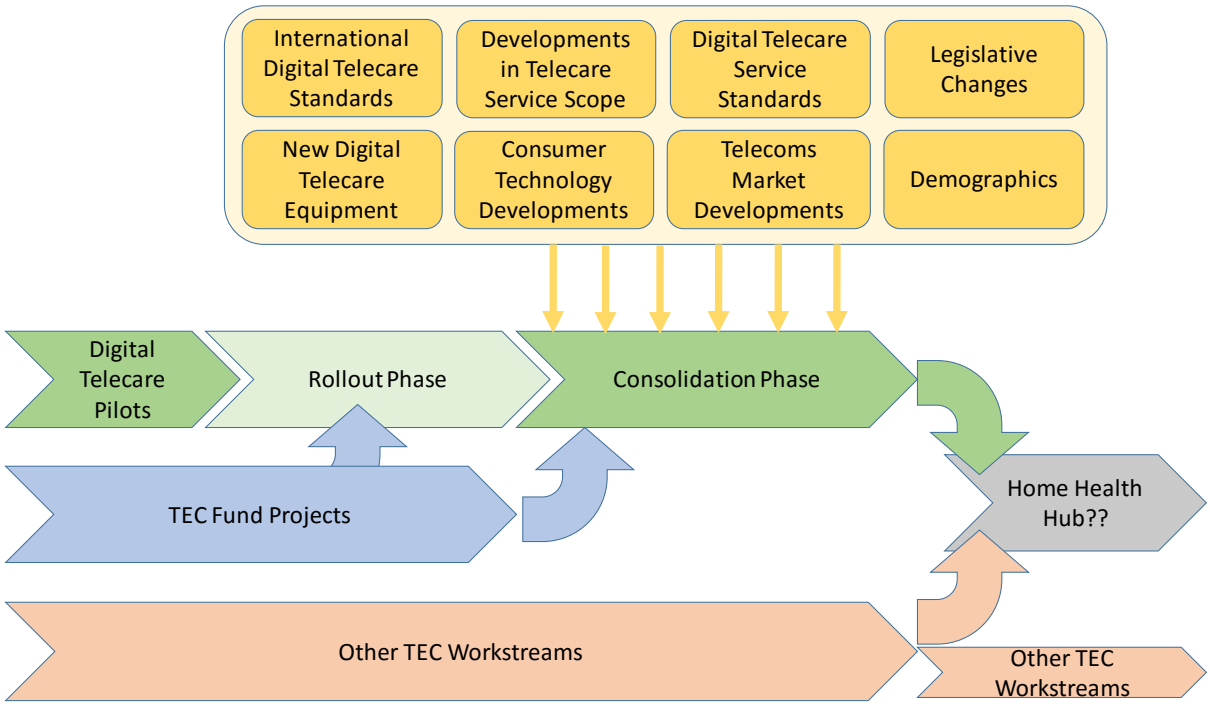

Figure 8.1: Digital Telecare – High Level Implementation Approach (source: FarrPoint)

The implementation is split into a number of Phases (shown in green in the Figure). Following the Pilot projects are a **Rollout Phase** and a **Consolidation Phase**.

Recognising that a shift to Digital Telecare is a significant undertaking in terms of cost, effort, and operational change, the initial **Rollout Phase** is focussed on shifting existing telecare services to a digital platform **on a like-for-like basis**.

During the Rollout Phase digital ARCs will be established and service users' equipment will be swapped for digital equivalents. Given the large amount of deployed equipment in users' homes, the process of migrating this to digital is likely to take some time to complete meaning that **there will be a period of 'dual running' where ARCs have a mix of digital and analogue users**.

The Rollout Phase assumes that digital connectivity is provided to service users' homes using the mobile telephone network. This approach, which is the same as that taken in Sweden, is recommended given the costs associated with using a dedicated fixed broadband connection and the operational complexity associated with using a fixed broadband connection provided by the service user (as well as the cost to the service user for this approach). Use of the mobile telephone network to provide connectivity reduces costs and operational complexity, but does introduce some potential coverage and capacity issues. These issues will need to be managed during the Rollout Phase with alternative connectivity approaches being taken, by exception, as required.

For planning purposes, it is assumed that the migration to digital user equipment will be completed in line with the maintenance/replacement cycle for existing analogue equipment meaning that **the Rollout Phase is likely to take around 5 years to complete**.

As the Rollout Phase is focussed on shifting existing telecare services to a digital platform on a like-for-like basis, **only a subset of the identified Digital Telecare benefits is delivered by this phase**. These benefits relate to the increased reliability of communication with service users and visibility of the status of equipment in the users' home. There are also further benefits if the Rollout Phase is taken as an opportunity to develop a more standardised and potentially shared approach to telecare service provision and service standards; this is discussed further below.

The Rollout Phase should be viewed as putting a digital platform in place that future proofs telecare services and has the potential to deliver significant further benefits. These further benefits are obtained during the **Consolidation Phase.**

The **Consolidation Phase is where the full benefits of Digital Telecare are obtained.** The phase is, in reality, likely to take the form of **a continual incremental development process** where new Digital Telecare offerings are added over time to the scope of the services provided to users.

Services will be added to the Digital Telecare offering once they have been established as offering a benefit to service users and/or service providers. The process of developing and evaluating potential new Digital Telecare services will be completed on small scale pilot projects, similar to those being completed via various initiatives today.

A number of external factors are likely to influence the development of the Digital Telecare service offering:

- **International Digital Telecare Standards:** There are currently no international standards for Digital Telecare. As standards are developed, the Scottish Digital Telecare solutions will need to be updated to use them.
- **Developments in the Telecare Service Scope:** There is currently no "standard" telecare service that is offered to all users in Scotland. If a more standardised approach is adopted, telecare solutions will need to be regularly updated to ensure that they can continue to deliver an evolving scope of telecare services.
- **Digital Telecare Service Standards:** Similar to the above, there are currently no universally adopted service standards for telecare services in Scotland. If service and reporting standards are adopted in Scotland, and as the telecare standards develop over time, telecare solutions will need to be updated to ensure that they meet these standards.
- **Legislative Changes:** Any introduction of, or changes to, legislation relating to telecare services, standards, or charging are likely to result in changes to the telecare service offering.
- **New Digital Telecare Equipment:** Telecare equipment providers will adopt digital technology as standard and will continually develop new equipment. Telecare service providers are likely to adopt new equipment that is shown to deliver benefits.

- **Consumer Technology Developments:** Telecare services are likely to be less reliant on providing users with dedicated equipment and will instead start to take advantage of devices users already own. As consumer technology develops it will offer new possibilities for enhancing telecare services.
- **Telecoms Market Developments:** Moving to digital technology means that telecare services are 'future proofed' in that they will be unaffected by any future decommissioning of the analogue phone network. However, Digital Telecare services are likely to be able to take advantage of improvements in the speed, cost and reliability of digital connectivity to users' homes and mobile devices.
- **Demographics:** Digital Telecare services are likely to have to develop to take account of a larger user base resulting from demographic change. A reduction in the age profile of telecare users is also potentially another factor that will result in a change of the scope of services offered.

Digital Telecare services are also likely to be influenced by other Technology Enabled Care developments. **The move of telecare to digital technology means that the current distinction between telecare, telehealth and other areas of TEC becomes increasingly artificial.**

In the short to medium term it is likely that the outcome of existing and upcoming TEC fund projects will assist with the definition of the Rollout Phase of Digital Telecare services and will form some of the first 'advanced' telecare services introduced during the Consolidation Phase.

In the longer term it is likely that the different areas of TEC will start to converge to a single digital platform in users' homes. This platform will be used to deliver a range of health and care applications, of which telecare will be only one.

Figure 9.1 shows this convergence of health and care applications to a common digital platform (a "home health hub") as a potential further evolution following the Consolidation Phase. Some other TEC workstreams are shown as also converging onto this common platform: these could potentially include some telehealth applications and video-based consultations. Some TEC workstreams are shown as continuing on a separate platform: this is likely where this is a specialised application requiring dedicated/specialised hardware to support it.

8.2 Digital Telecare Deployment Model

The implementation approach detailed in the previous section is independent of the model used to deploy Digital Telecare.

Three deployment models have been examined and each has benefits and issues associated with it:

- **No Migration to Digital**

  Main Benefits:
  - Lowest cost approach;
  - Does not incur any effort and risk associated with change.

  Main Issues:
  - Not future proofed or easily scalable;
  - Cannot deliver any of the benefits associated with Digital Telecare.

- **Standalone Digital Deployment**

  Main Benefits:
  - Delivers many of the benefits associated with Digital Telecare;
  - Minimises the level of change to existing operating procedures as the ARC number and location are unchanged.

  Main Issues:
  - Highest cost option as it does not benefit from some of the cost efficiencies associated with sharing;
  - Approach is less able to take advantage of some of the benefits associated with sharing of service and data.

- **Clustered Digital Deployment**

  Main Benefits:
  - Delivers the most benefits of any of the options examined as it is most able to share services and information;
  - Benefits from cost and operational efficiencies via the clustering approach.

  Main Issues:
  - Requires organisational/political buy-in to the clustered approach;
  - Involves the most change from an operational perspective.

The estimated annual costs for each of the deployment approaches are as follows:

- No Migration to Digital: £ 14,231,060
- Standalone Digital Deployment: £ 21,477,700
- Clustered Digital Deployment: £ 18,614,800

The costs are for the ARCs and all equipment, but exclude response services. The costs also exclude all income to service providers through charges to service users.

Both of the digital deployment options have a higher estimated cost than for existing analogue services. **This additional cost is almost wholly associated with providing digital connectivity to service users' homes.**

The clustered digital deployment model has lower costs that the standalone model because of the efficiencies associated with the sharing of ARCs. The model assumes that three existing ARCs merge into a single clustered ARC.

The choice between the digital deployment models is not going to be made on a technology basis as technology is equally able to support either approach. Instead, the decision will be based on a financial basis and the willingness and ability of existing telecare service providers to adopt a clustered approach. For this reason, this report cannot recommend which digital deployment approach is most suitable and instead only provides supporting information to allow a decision on the most suitable approach to be made.

8.3 Pilots

Pilot projects are required to validate the benefits of Digital Telecare and the proposed implementation approach.

Four objectives for the pilot projects have been defined:

- Validate the benefits to service user and care provider from 'Standard' Digital Telecare Services;
- Demonstrate the potential benefits to service users from 'Advanced' Digital Telecare Services;
- Validate the Digital Telecare implementation approach;
- Demonstrate the viability and benefits associated with ARC clustering.

It is unlikely that a single pilot will be able to address all these objectives and so multiple projects will be required. It is also noted that a number of the pilot objectives may be met by projects being funded as part of the existing TEC programme.

Pilot projects should be completed over a period of at least six months and be regularly reviewed throughout their duration in order to gain early feedback and to provide the opportunity to adapt the projects as required.

Consideration should also be given to allowing telecare equipment manufacturers to use the pilots as a 'test bed' to trial new technology and service offerings.

8.4 Next Steps

As detailed in the previous section, establishing a number of pilot projects focussed on the four defined objectives is required in order to validate the Digital Telecare benefits and implementation approach.

In addition to the pilot projects, there are a number of key issues and questions that have been identified during this study that will influence the definition and implementation of Digital Telecare.

Clustering: The choice of the Digital Telecare deployment approach that will be taken is largely dependent on the willingness and ability of service providers to participate in the clustered ARC approach. The viability of the clustered approach needs to be established through consultation with service providers. The modelling completed for this study is based on three existing ARCs moving to a single clustered ARC, but this assumption needs to be validated and work completed to establish the optimum level of clustering from a service standard, operational and financial perspective.

Standardising Telecare Services and Service Levels: There are a range of benefits that can be obtained if Scotland has a more standardised approach to the range of telecare services offered to users, to the service levels that are associated with these telecare services, and how these are reported. Whilst adopting a standard approach is not a prerequisite for Digital Telecare, the move to digital technology provides a good opportunity to standardise, and this will deliver additional benefits to both users and service providers. A decision is required on whether a more standardised approach is going to be taken. If so, the process of agreeing the services and standards needs to be included in the planning of the implementation of Digital Telecare.

International Standards: There are currently no international standards for Digital Telecare technology or services. Commencing any Digital Telecare deployment prior to these standards being finalised is a risk, but a manageable one. Scotland should become an active participant in the development of the standards to ensure that they reflect the needs of Scotland. Additionally, this will allow Scotland to understand how the standards are developing and so to ensure that insofar as possible the Scottish Digital Telecare deployment is in line with the developing standards.

Equipment Availability: The Digital Telecare market is currently relatively immature, and so levels of equipment availability and price competition is lower than for the established analogue telecare market. Digital controllers for users' homes and digital ARC solutions are available today, however, it is understood that availability of digital sensors/alarms is an issue meaning that it is possible that early deployments of Digital Telecare may need to rely on existing analogue sensors/alarms. As part of the process of developing and planning Digital Telecare, an engagement with telecare equipment manufacturers and service providers should be completed in order to fully understand the digital equipment/services currently available and to take the opportunity to demonstrate demand and hopefully stimulate the market to develop further.

Connectivity: Any deployment of Digital Telecare is dependent upon digital connectivity being available to users' homes. The recommended implementation approach is based on using the mobile telephone networks to provide connectivity during the Rollout Phase. The Digital Telecare services offered during this phase will have relatively modest bandwidth requirements meaning that it is likely that 2G mobile coverage will be sufficient (although 3G or 4G would be preferable). Mobile network coverage and fixed broadband is not universally available in Scotland and so this will be an issue that needs to be considered as part of the Digital Telecare implementation, particularly for rollouts outside the Central Belt. Both mobile and fixed broadband coverage is improving and liaison with Scottish Government, Highlands and Islands Enterprise, and Community Broadband Scotland should be maintained to ensure that developments in coverage are monitored and that demand for services from Digital Telecare are factored into rollout plans, where possible. Liaison with the emerging Smart City projects (which are unhelpfully named as they are not limited in scope to just cities in Scotland) should be also be considered for the same reasons.

Appendix A – Glossary

Term	Definition
Alarm Receiving Centre (ARC)	"Community alarm and Telecare services require an Alarm Receiving / Monitoring Centre capable of receiving and responding to alerts raised by the equipment in order to initiate the appropriate action. Many areas have established a 24 hour call monitoring centre to perform this function, where one or more trained operators (call handlers) provide an immediate, skilled, sensitive response to the person, or to the alarm. This part of the service is referred to as an Alarm Receiving Centre (ARC), monitoring centre, or call handling service." *Joint Improvement Team*
ADSL	Asymmetric Digital Subscriber Line. The technology used to provide broadband over a copper telephone line.
ALISS	A Local Information System for Scotland.
Analogue	The transmission of voice or data using audible tones.
British Standards Institute (BSI)	The national standards body for the UK. Produces standards of quality for goods and services.
Cloud / Hosted Solution	A model of subscribing to computer based services. In a cloud/hosted solution the hardware required to provide the service is owned by the service provider and located in their data centre. The service provider then uses this equipment to provide services to a number of customers. Customers access the equipment via the Internet or a private data network. This model of service delivery is frequently marketed as a lower cost alternative to a customer buying and maintaining their own hardware and housing in their own premises (the in-house approach).
COSLA	Convention of Scottish Local Authorities
Digital	The transmission of voice or data in a discrete binary form. In the case of voice, analogue voice is 'digitised' into a digital form.
DSL	Digital Subscriber Line. A technology used for delivering Internet broadband services over analogue telephone lines.
FTE	Full Time Equivalent.
Geo-fencing	A geo-fence is a technology which uses GPS (the same as used by satellite navigation) to track vulnerable service users. If a user travels outside a pre-programmed area (a geo-fence), for example further than 1 mile from their home, then an alarm is raised. The technology reports on the user's location to allow a responder to find them.

Term	Definition
GSM/2G/GPRS/EDGE/3G/4G	Standards for mobile telephones describing how telephone connect to a mobile provider's network. Multiple standards are in use today and more modern phones are 'backwards compatible' to allow them to connect to older networks. All standards support the transfer of digital data via the mobile network. Older standards (GSM/2G/GPRS/EDGE) can only provide low speed data transfer. More modern standards (3G/4G) offer faster transfer speeds, in the case of 4G speeds can be similar to a home "wired" broadband connection.
Internet Protocol (IP)	The most common computer networking protocol. Used on the Internet and a large number of other private computer network. It supports a unique addressing scheme which allows devices on a network to know where to send data.
ISDN	Integrated Services Digital Network. A standard for sending voice and data digitally over a copper telephone line.
Next Generation Network (NGN)	A telecommunications network built to transport data in its native digital form, generally using IP.
Private Data Network	A Private Data Network is typically used by organisations who need to transfer data between sites without the data crossing the Internet.
Public Switched Telephone Network (PSTN)	A national telephone network comprised of a number of providers interconnected networks. The PSTN provides connections to users via a range of methods, but most commonly via copper wires connected to the user's premises.
Service user / Subscriber	A user of public telecare / telehealth services.
TDP	Technology Development Programme
TEC	Technology Enabled Care.
Telecare	"The provision of care services at a distance using a range of analogue, digital and mobile technologies. These range from simple personal alarms, devices and sensors in the home, through to more complex technologies such as those which monitor daily activity patterns, home care activity, enable 'safer walking' in the community for people with cognitive impairments/physical frailties, detect falls and epilepsy seizures, facilitate medication prompting, and provide enhanced environmental safety." *Scottish Government: A National Telehealth and Telecare Delivery Plan for Scotland to 2016: Driving Improvement, Integration and Innovation* "The remote or enhanced delivery of care services to people in their own home or in a community setting by means of

Term	Definition
	telecommunications and computerised services. Telecare usually refers to sensors and alerts which provide continuous, automatic and remote monitoring of care needs, emergencies and lifestyle changes, using information and communication technology (ICT) to trigger human responses, or shut down equipment to prevent hazards” *Joint Improvement Team 2011*
Telehealth	“The provision of health services at a distance using a range of digital and mobile technologies. This includes the capture and relay of physiological measurements from the home/community for clinical review and early intervention, often in support of self management; and "teleconsultations" where technology such as email, telephone, telemetry, video conferencing, digital imaging, web and digital television are used to support consultations between professional to professional, clinicians and patients, or between groups of clinicians.” *Scottish Government: A National Telehealth and Telecare Delivery Plan for Scotland to 2016: Driving Improvement, Integration and Innovation*
TSA	Telecare Services Association
USO	Universal Service Obligation
VOIP	Voice Over IP. Voice calls carried over a data network.

Appendix B – Summary of Potential Benefits

Potential Benefit	No Migration to Digital	Standalone Digital	Clustered Digital
Potential Reliability Benefits			
The use of an end-to-end Digital Telecare solution would remove the issues associated with the quality of analogue signalling causing calls to fail.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
The use of a Digital Telecare solution would carry calls end-to-end in a digital format and so could result in improved voice quality for both the ARC agent and service user. It is also possible to provide "High Definition Audio" via a digital connection providing more enhanced clarity.	Not obtained.	Potentially Obtained – Consolidation Phase.	Potentially Obtained – Consolidation Phase.
Digital Telecare solutions can notify the ARC of alarm conditions even when a service user's phone line is engaged or a call with the service user is in progress. Digital Telecare solutions can also notify the ARC of multiple alarm conditions simultaneously (particularly relevant to sheltered housing).	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
The use of digital sensors/monitors/ would allow regular, two-way, and more detailed communication to be completed with the controller device. This would allow the controller to regularly check that sensors/monitors were still operating correctly, allowing device failures to be quickly identified.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
The digital connection between the controller and the ARC would allow the ARC to complete regular checks that the controller is operating correctly.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
The fact that there is a digital connection end-to-end between sensor/monitor and ARC would potentially provide the ARC with visibility of the solution's health and configuration, right through to the end devices.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
A shift to Digital Telecare would ensure that telecare services were unaffected by any future decommissioning of analogue phone lines.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.

Potential Benefit	No Migration to Digital	Standalone Digital	Clustered Digital
Potential Efficiency Benefits			
The shift to Digital Telecare means that there is a high degree of flexibility in how alarm calls are routed and shared.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Obtained – Rollout Phase.
Digital Telecare could increase ARCs' ability to cope with a Disaster Recovery situation.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Obtained – Rollout Phase.
The increased flexibility in call routing could allow calls to be routed intelligently, based factors such as time of day and call volumes.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Obtained – Rollout Phase.
Increased flexibility in call routing would more easily allow the number of ARCs to be reduced.	Not obtained.	Not obtained.	Obtained – Rollout Phase.
The shift to Digital Telecare means that there is a high degree of flexibility in where ARC equipment is located and who uses it.	Not obtained.	Not obtained.	Obtained – Rollout Phase.
ARC agents do not need to be co-located, potentially meaning that a dedicated telecare facility is not required.	Not obtained.	Not obtained.	Obtained – Rollout Phase.
There is potential for a number of telecare providers to share ARC equipment and so reduce equipment spend and support costs.	Not obtained.	Not obtained.	Obtained – Rollout Phase.
Telecare providers would no longer need to procure their own ARC equipment and instead could procure their ARC as a cloud hosted service from an external supplier.	Not obtained.	Not obtained.	Obtained – Rollout Phase.
Telecare providers could opt to fully outsource responsibility for providing ARC equipment and operating the ARC to an external supplier.	Not obtained.	Not obtained.	Not obtained. (Given clustered model analysed in this report)

Potential Benefit	No Migration to Digital	Standalone Digital	Clustered Digital
There is potential for the Digital Telecare solution to share or utilise elements of a telecare provider's existing IT infrastructure.	Not obtained.	Obtained – Rollout Phase.	Obtained – Rollout Phase.
The fact that Digital Telecare solutions will use mature technology and established standards is likely to increase competition in the marketplace and so reduce equipment costs.	Not obtained.	Obtained – Rollout Phase. Though limited by operational model.	Obtained – Rollout Phase.
Digital Telecare solutions could have the ability to deliver sensor/monitor outputs to multiple or different locations.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Potentially obtained – Rollout Phase.
The fact that data from sensors/monitors is received at the ARC in digital format, would allow this information to be more easily stored and shared with other parties.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Potentially obtained – Rollout Phase.
Digital Telecare information could be used for data analytics or 'Big Data'.	Not obtained.	Potentially obtained – Rollout Phase. Though limited by operational model.	Potentially obtained – Rollout Phase.
Potential Additional Functionality Benefits			
Under the Digital Telecare model, the controller in service users' homes becomes a form of 'digital health hub' through which a range of telecare, Telehealth, and other digital services can be delivered.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
Digital Telecare provides a higher capacity connection between service users' homes and the ARC and this provides the capability for the deployment of more sophisticated sensors/monitors and other devices.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
Digital Telecare could assist with the increased automation of tasks within the ARC.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.

Potential Benefit	No Migration to Digital	Standalone Digital	Clustered Digital
Digital Telecare systems could interface with building management systems and home automation solutions.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
The bandwidth provided by the digital link between the ARC and service users' homes means that video-based telecare applications can be supported.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
Digital Telecare, and the use of IP standards, means that telecare monitoring could be completed on service users' own digital devices (eg, smartphones or tablets), rather than dedicated devices procured and maintained by the telecare provider.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
The fact that Digital Telecare equipment is smaller and more aesthetic than many of the currently deployed analogue devices may assist with take-up of telecare services amongst user groups reluctant to be seen as requiring telecare.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
Digital Telecare may also be able to take advantage of the 'Internet of Things'.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
The broadband connection delivered to service users' homes to provide Digital Telecare could also be used to assist in addressing social and digital inclusion issues.	Not obtained.	Potentially obtained – Consolidation Phase.	Potentially obtained – Consolidation Phase.
Potential Telehealth Benefits			
A consensus is developing across Europe that Home Health Monitoring will have a significant role in future healthcare delivery based on improvements and cost reductions in the technology, better integration with existing healthcare processes and improved organisational arrangements, and demand from patients and public.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
At the disease level the evidence appears strongest for Home Health Monitoring for diabetes, heart failure, COPD and hypertension.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.

Potential Benefit	No Migration to Digital	Standalone Digital	Clustered Digital
TEC Workstream 1 is developing a national model for home health monitoring. The conceptual model identifies four tiers of monitoring of which levels 3 and 4 would involve significant data exchange between the patient and a 'monitoring centre'.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
Digital lines installed for Telecare monitoring purposes would offer an opportunity for Teleconferencing and given that this is, in general, a vulnerable population, there is likely to be some scope for additional use for Telehealth videoconferencing purposes to provide remote consultations, advice and support.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
There will be some overlap with citizens who need telecare services and also Telehealth services i.e. individual citizens will require an overall integrated package that monitors their physical environment and their health status, including advice and support services, as appropriate to their individual unique circumstances.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
Current Telehealth solutions are implemented with specifically developed hardware and software, much like current telecare solutions. Although the two services do differ in the information that is being collected and monitored, the communication infrastructure used to deliver both services can be common and there may be opportunities from a more integrated approach.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
There may be advantages in common or shared organisational delivery of telecare and Telehealth and support arrangements.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.
Additionally, a single integrated approach to both telecare and Telehealth could allow the accumulation of patient data from all sensors and measuring devices in a patient's home to be transmitted to the necessary recipients from a single terminal device. Not only would this provide the patient with a single solution, it may allow for better data analytics as there are more aspects of the patient's activity and health that are collected.	Not obtained.	Potentially obtained – Consolidation Phase. Though limited by operational model.	Potentially obtained – Consolidation Phase.

Appendix C – Cost Model

No Migration to Digital

	Annual	Notes
ARC Costs		
ARC System (equipment)	£352,000	No. of ARCs x ARC Cost / refresh rate
ARC System (support)	£440,000	
Telecoms / Connectivity rentals	£63,360	
Telecoms call charges	£26,400	
Desktops	£85,800	No. of ARCs x Agents (divided by 2 to reflect shifts) x PC Cost / refresh rate
IT Hosting	£220,000	
Facilities	£643,500	No. of ARCs x cost per agent x agents (divided by 2 to reflect shifts)
Staff (Agents)	£7,150,000	
Service user Costs		
Alarm Hub	£ 3,000,000	Service users x Hub Cost / refresh rate
Hub Connectivity rental	£ -	
Sensors	£2,250,000	Service users x sensor numbers x sensor cost / refresh rate
Total Annual Recurring	**£14,231,060**	
Total 5 Year	**£71,155,300**	

Standalone Digital ARC

	Annual	Notes
ARC Costs		
ARC System (equipment)	£352,000	No. of ARCs x ARC Cost / refresh rate
ARC System (support)	£440,000	
Telecoms / Connectivity rentals	£110,000	Assumes ISDNs remain in place.
Telecoms call charges	£26,400	Calls back to service users via PSTN
Desktops	£85,800	No. of ARCs x Agents (divided by 2 to reflect shifts) x PC Cost / refresh rate
IT Hosting	£220,000	
Facilities	£643,500	No. of ARCs x cost per agent x agents (divided by 2 to reflect shifts)
Staff (Agents)	£7,150,000	
Service user Costs		
Alarm Hub	£ 3,000,000	Service users x Hub Cost / refresh rate

	Annual	Notes
Hub Connectivity rental	£7,200,000	
Sensors	£2,250,000	Service users x sensor numbers x sensor cost / refresh rate
Total Annual Recurring	**£21,477,700**	
Total 5 Year	**£107,388,500**	

Clustered Digital ARC

	Annual	Notes
ARC Costs		
ARC System (equipment)	£128,000	No. of ARCs x ARC Cost / refresh rate
ARC System (support)	£160,000	
Telecoms / Connectivity rentals	£40,000	Assumes ISDNs remain in place.
Telecoms call charges	£26,400	Calls back to service users via PSTN - Uses original ARC numbers as assumes call volumes unchanged
Desktops	£62,400	No. of ARCs x Agents (divided by 2 to reflect shifts) x PC Cost / refresh rate
IT Hosting	£80,000	
Facilities	£468,000	No. of ARCs x cost per agent x agents (divided by 2 to reflect shifts)
Staff (Agents)	£5,200,000	
Service user Costs		
Alarm Hub	£ 3,000,000	Service users x Hub Cost / refresh rate
Hub Connectivity rental	£7,200,000	
Sensors	£2,250,000	Service users x sensor numbers x sensor cost / refresh rate
Total Annual Recurring	**£18,614,800**	
Total 5 Year	**£93,074,000**	

Assumptions:

Number of existing ARCs	22	
Number of clustered ARCs	8	
Number of service users	150,000	
Number of sensors per service user	3	
Cost of analogue controller	£100	
Cost of analogue sensor	£25	
Cost of digital controller	£100	
Cost of digital sensor	£25	
Technology Refresh Rate (Service user)	5	years

Number of agents per ARC (standalone)	13	FTEs telecare Only
Number of agents per ARC (clustered)	26	FTEs telecare Only
Agent annual cost	£25,000	Figure based on example salaries provided by ARCs + assumed 25% on-costs
Cost of analogue ARC solution	£80,000	
Cost of digital ARC solution	£80,000	
Annual support costs - Analogue ARC	£20,000	
Annual support costs - Digital ARC	£20,000	
Technology Refresh Rate (ARC)	5	years
Desktop Cost	£3,000	
IT Hosting Cost Per ARC (Annual)	£10,000	https://www.hahosting.com/colocation_racks
Facilities Cost per FTE (Annual)	£4,500	£300/m2 x 15M2 per FTE www.scottishfuturestrust.org.uk/files/publications/Asset_Management_-_The_Scottish_Government_Civil_Estate_-_September_2011.pdf
Annual Cost of ISDN at ARC	£2,880	
ISDN Call Costs (ARC)	£1,200	
Service user Digital Connectivity Cost (annual)	£48	~£4/month for 25Mb roaming SIM http://www.podsystemm2m.com/ m2m-network-services/m2m-sims-price-calculator
ARC Digital Connectivity Cost (annual)	£5,000	
Service user call charges existing (annual)	£83,640	

Appendix D - Clustered Digital ARC Approaches

The Clustered Digital ARC model involves the greatest level of change for ARCs from an organisational and operational perspective. Because of this, there are a number of ways that the Clustered Digital ARC model could be deployed. Three Clustered Digital ARC approaches are examined in this appendix.

The existing organisational / operational arrangements for ARCs is summarised in Figure D1. This shows an example setup where each care provider operates in a standalone fashion, and is responsible for hosting its own telecare solution, for receiving and responding to alarms and calls from its service users, and for mobilising a response service, as required.

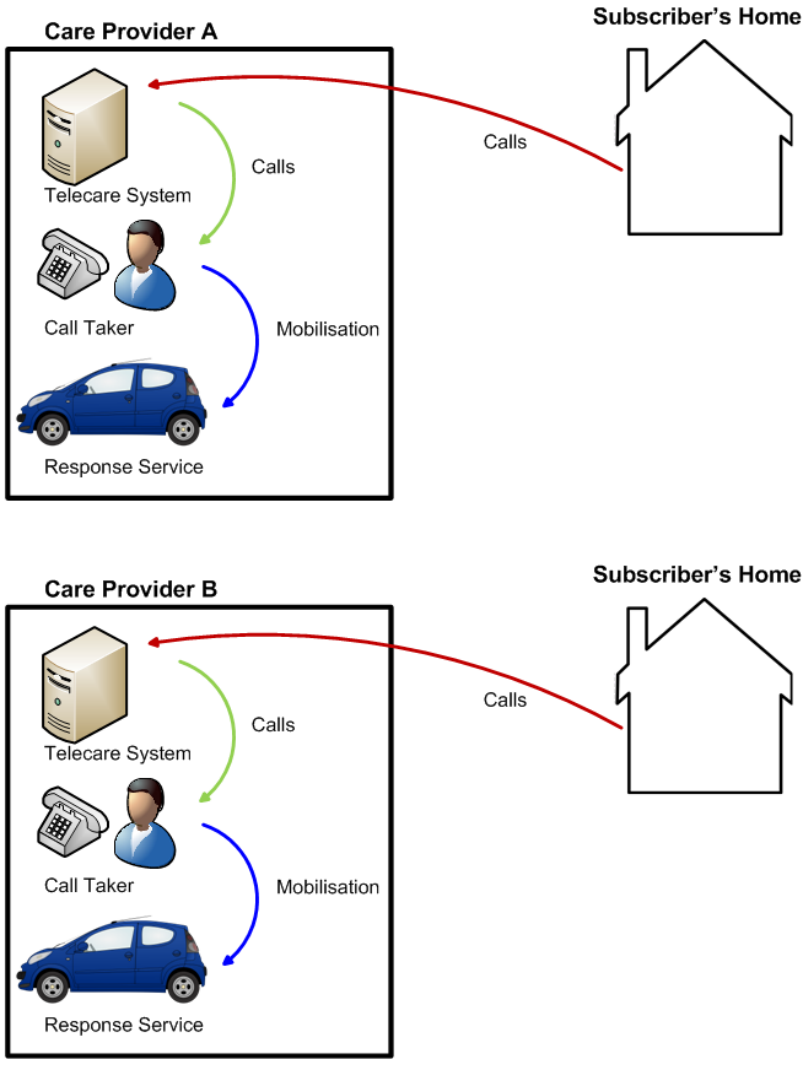

Figure D1: Standalone Digital Deployment Overview (source: FarrPoint)

Figure D2 summarises the first Clustered Digital ARC approach; the 'Shared Equipment' model. With this approach care providers share Digital Telecare equipment. Calls and alarms from both Care Provider A and B's service users are received by the telecare equipment in Care Provider A's premises, however, the call taker and response arrangements are the same as those in the standalone model, with both care providers being responsible for answering their own service users' calls and mobilising their own response service.

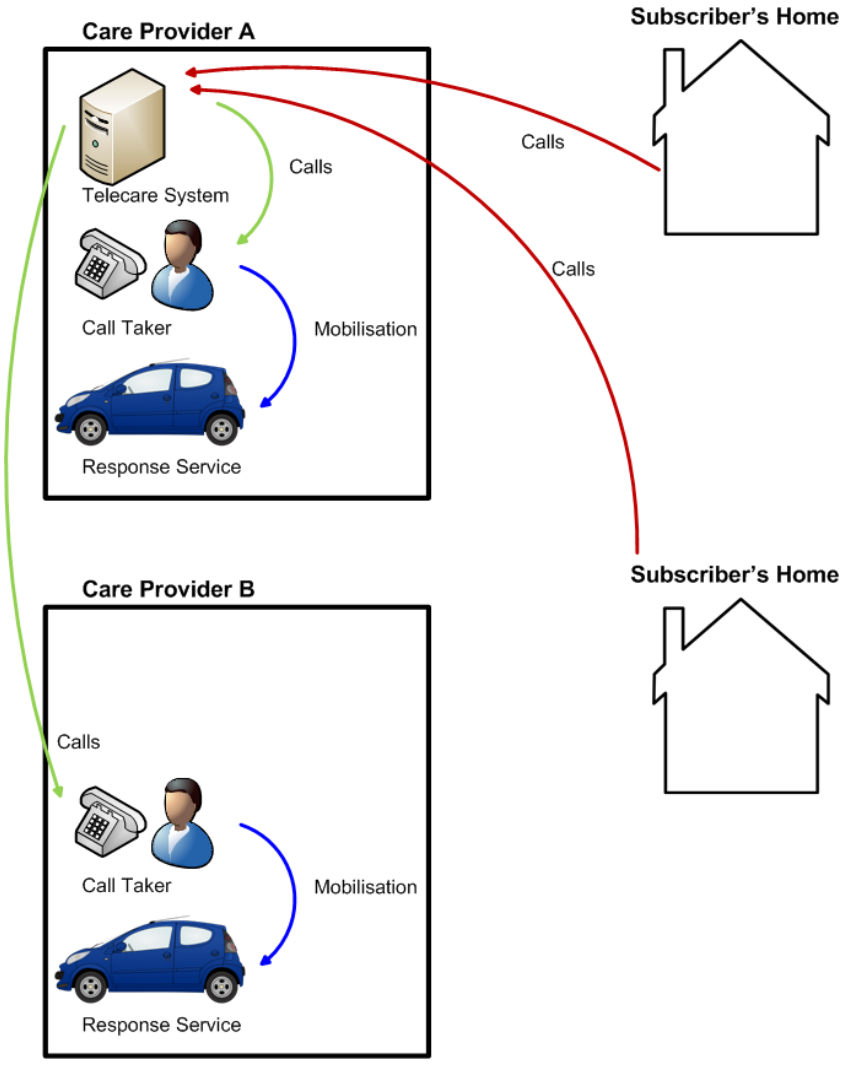

Figure D2: Clustered Digital Deployment – Shared Equipment Model Overview (source: FarrPoint)

Figure D3 summarises a second Clustered Digital ARC approach; the 'Shared Agents' model. As with the previous model, care providers share Digital Telecare equipment, however, with this model the Care Providers share a pool of agents that are responsible for answering calls from both organisations' service users. In this example the only dedicated service Care Provider B provides is the response service. Mobilisation of this response service comes from the shared agent pool.

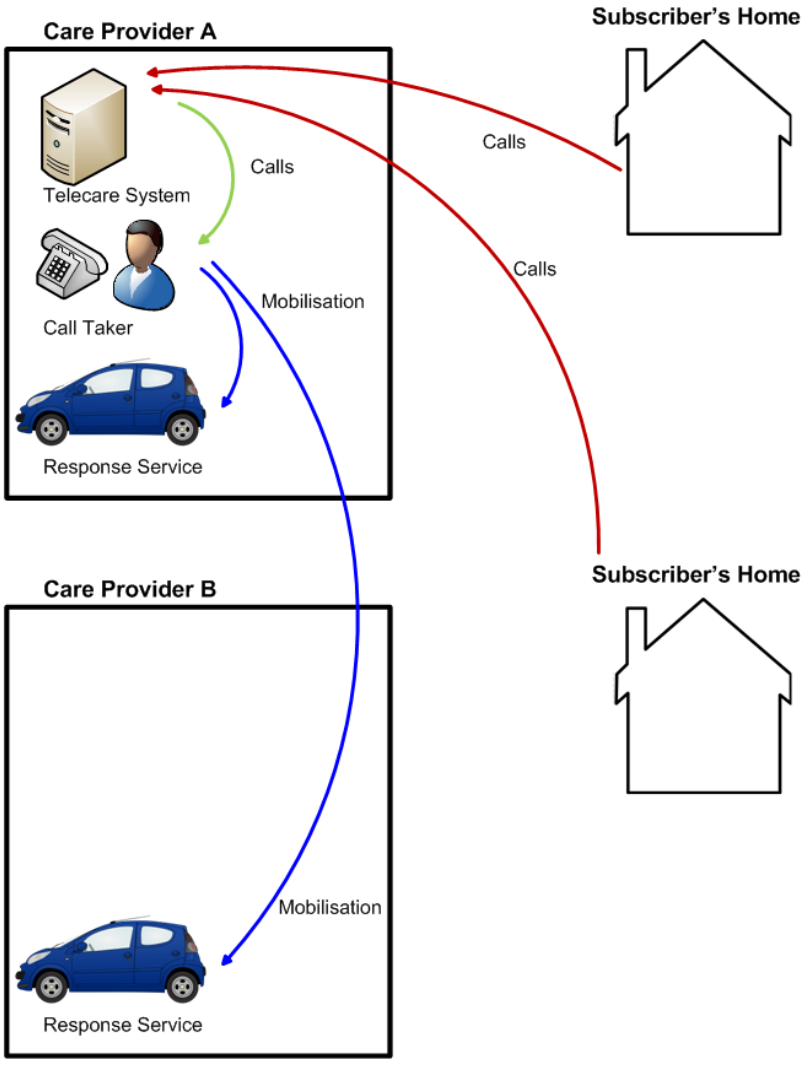

Figure D3: Clustered Digital Deployment – Shared Agents Model Overview (source: FarrPoint)

Figure D4 summarises the final Clustered Digital ARC approach; the 'Shared ARC' model. This is similar to the previous model where there is sharing of telecare equipment and a shared agent pool, however, in this model the telecare system and agents are provided by a third-party from a shared ARC. This third-party could be a public sector ARC provider, or a private sector provider / cloud service.

This means that both care providers are responsible for providing only a response service. Mobilisation of the response services comes from agents in the shared ARC.

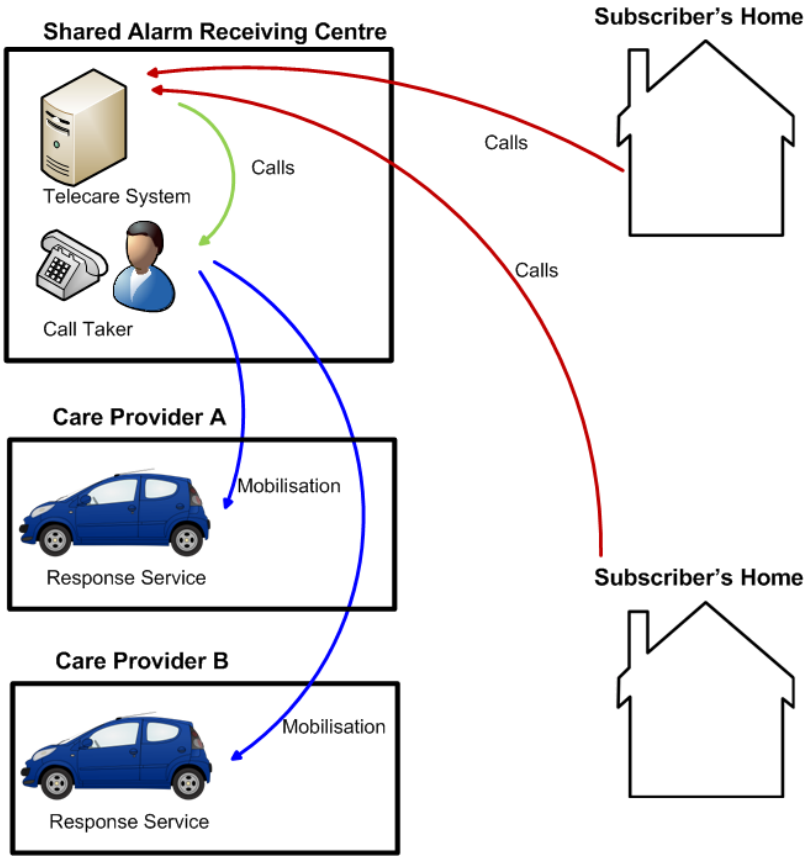

Figure D4: Clustered Digital Deployment – Shared ARC Model Overview (source: FarrPoint)

For the purposes of this study the examination of the Clustered Digital ARC Model is based on the Shared Agents Model as this approach is potentially the most representative of the clustered models, offering a balance between operational impact and efficiencies. As part of the analysis of this model reference will be made the benefits that are likely be lost or gained if one of the other clustered digital approaches is taken.