Assisted Living installation practice

Learning from a case study

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Summary

The situation in relation to the delivery of assisted living (telecare and telehealth) services to the public is in a state of flux and is likely to change considerably over the next two years. With the support of significant government funding, a period of technological stagnation is shifting to one of rapid innovation. Government policy, the re-organisation and outsourcing of local authority services and initiatives focused on the delivery of services at scale, mean that we are entering a phase of intense scrutiny of the end-to-end delivery of relatively complex customer-oriented services. The spotlight is shifting to a previously poorly considered element of the service chain, how the recently developed, diverse range of interoperable devices and internet enabled systems will be installed into the homes of customers. Those customers are likely to be more demanding, a significant proportion will be self-funding, and the systems will increasingly be integrated with mainstream entertainment and communication systems in the home.

The current workforce is made up of groups with diverse backgrounds and skills. A proportion has transitioned from technical jobs in 'handyman' roles with predominantly carpentry and general non-electrical skills. Some practitioners undertaking 'installation' roles have social care backgrounds with some technical experience and basic skills. Others, particularly in the out-sourced specialist teams, have the relevant electro-technical and telecoms qualifications, but their role has been restricted by hierarchical organisational processes focused on cost-reduction, technological conservatism of intermediary proxy customers and cultural resistance to inclusion of the technical workforce within the care sector.

To this point the dominant customer group has been primarily based in local authority social services, and statutory and 3rd sector housing services. A restricted range of stand-alone and simple systems are currently implemented, often based on non-interoperable proprietary solutions. A typical example of the majority of the systems installed is a social alarm system consisting of a Lifeline hub or distributed alarm unit (DAU) connected to the master socket of the phone system, using analogue telecommunication to send alarm signals gathered from wired (wall fixed) alarms and wireless (body worn) pendant alarms. A range of additional sensors are being gradually added to the 'standard' system to add to the range of services available. These additional services are often sold to service provider customers by presenting devices labelled to address single issue problems, e.g. falls, wandering, etc. The majority of systems currently installed are not IP enabled due to the lack of broadband infrastructure and use within the client population, and due to current social alarm standards which are based on analogue telecommunication protocols.

There is service provider customer resistance to innovation partly due to the need for recycling to maximise stock availability and interoperability with the stock of legacy items. Work processes tend to be un-costed and service delivery may rely on multiple home visits by a range of practitioners. The service model tends to be characterised by hierarchical, multi-layered assessment and referral, with installation processes primarily shaped by non-technologically confident care practitioners. These processes tend to terminate with fairly specific instructions being passed to the installer team which may be in-house or out-sourced to specialist or manufacturer specific installation teams, allowing installers a relatively limited scope for creativity or decision making.

The private market has to this point been under-developed and is consequently low volume and immature. Installation practice for private purchase clients has been even more constrained by costs and the common service model is for the delivery of a basic social alarm through the post, to be plugged into the power and telephone network by the client.

There are currently no mechanisms to pick up dissatisfaction with sub-standard installation practice from current customers for statutory or privately funded services, though there is some anecdotal evidence of individuals refusing the service if their aesthetic or other requirements are not addressed. Customer expectations for installation have to be placed in the context that these services are mainly delivered as part of a non-commercial care service to an older generation who are commonly characterised as a more compliant client group.

In terms of assisted living, there are currently no required standards relating to installation working practice bar those relating to safety (e.g. health and safety, working with electricity, etc., and in relation to working in the homes vulnerable people, for example, safeguarding adults). The Telecare Services Association (TSA) Code of Practice[1] and the closely related European SSAIB Code of Practice[2] have direct relevance if the service includes a social alarm. There are additional professional standards relating to electro-technical or communications practice and these are set down by professional bodies and in statutory regulation.

Alongside the range of technical competences that are required, is a need for what are called ‘person-centred’ or client focused competences. The findings from this report are that a good understanding by the installation team of the client will result in an effective technical solution as well as good customer communication. In terms of the training and education that could provide the range of competences which are required, there are no courses available that can support both the electro-technical and person-centred range of competences though, if there were sufficient demand, they could be brought together relatively easily into accredited courses.

There appears to be little impact of poor customer service in installation practice on market position yet, though some statutory service providers are noting dissatisfaction with some out-sourced installation services, either from specialist or manufacturers’ teams, and a number are bringing these services in-house or seeking other solutions. This decision appears to be based on a poor response to the statutory service provider (proxy customer) requirements and on reports from disabled and older end clients of poor customer service.

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1 TSA Code of Practice: http://www.telecare.org.uk/information/45293/code_of_practice/

2 SSAIB Code of Practice, publicly available: http://www.ssaib.org/MainCat.asp?id=31

The range of devices and systems that are likely to emerge on to the market over the coming year or two will have the capability to be interoperable across different manufacturers' product ranges, will be increasingly integrated with entertainment and communications systems already existing in homes and will rely on the development of a rich and dynamic information relationship, supporting health and independence, with either the direct end-user or a family carer. The adoption and use of the information provided by these systems will become the key to the individual and their care network becoming more actively engaged with self care and support for self care. The relationship between the client and the technology will move from passive to active and fostering that relationship will become the remit of the installation team as the business process becomes less dependent on face to face contact with assessment practitioners.

In order to understand the changing technical and person-centred requirements for the installation workforce, learning from a case study is set out in section 1. This is drawn from a project led by Tynetec Ltd and funded by the Assisted Living Innovation Platform. The case study is supplemented in section 2 by the findings from a survey of installers and commissioners of current telecare and telehealth installation services. In section 3 the competences required from the installation workforce and the options relating to training and education are detailed.

In order to address the need to deliver innovative assisted living services at scale, to exploit the considerable potential for growth in this sector, to address the risks to market introduction of innovative systems and to gain market advantage, it would appear logical that current and prospective employers across the sector, the sector professional bodies and government bodies come together in order to invest in training and education for the customer-facing installation workforce.

1. Installation of intelligent activity monitoring systems

Information gathered from the monitoring of an individual's daily activity patterns can be used to plan care by their informal care networks and statutory health and social care organisations. Activity monitoring systems:

- use data gathered from a range of sensors, which may be positioned around the home or worn by the individual;
- transmit this data to the service provider who applies algorithms to derive intelligence about an individual's actions;
- present this intelligence in such a way that it can be easily understood and acted on by formal and informal care providers. The intelligence could be presented in multiple formats including web-enabled graphics, SMS text or email.

The range of sensors used in an activity monitoring system may include door open/close sensors, passive infra-red (PIR) sensors based around the home that detect motion, sensors embedded in pressure mats, as well as sensors attached to appliances that detect electrical current and therefore the use of the appliance.

The intelligence provided by such systems can be used in multiple ways, including: to enable accurate risk and independence assessments, to evaluate and monitor a specific intervention, and to enable carers to suggest timely and relevant care proposals. Intelligent activity monitoring services are relatively innovative and are currently used as complementary to, but distinct from, social alarm services. These systems do not have to comply with standard BS 8521 which applies to social alarms. They cannot be relied on to alert carers of an emergency situation and this is not what they are designed to do. This distinction has to be made clear to all the team working with these systems, including any call monitoring staff, who need to be able to distinguish care planning intelligence from an alert or alarm notification requiring action.

The importance of good installation practice

Such sensors (usually battery operated) send data messages wirelessly to a home hub or gateway device at pre-set intervals or when triggered. If the data is erroneous or incomplete due to poor installation practice this will create false, incomplete or faulty intelligence that can not be rectified or interpreted through later application of 'intelligent' algorithms.

To create an effective intelligent activity monitoring system, the multiple sensors that are positioned around the home and worn by the individual must be intelligently chosen and positioned, the mechanism for transmission of data out of the home must be fit for purpose and the client has to understand how the monitoring system underpins their strategy to maintain independence.

Installers of activity monitoring systems are therefore required to have a broad range of skills focused on three areas:

a) **Sensor network:** To create a sensor network that is capable of gathering data reliably, cleanly and to meet the objectives set out by the person specifying the system.

b) **Comms transmission:** To ensure the robust transmission of data from the home hub or gateway to the remote server so that intelligence can be provided that is sufficiently timely to be effective in care planning.

c) **Client communication**: To confidently communicate with the client, taking into account their learning and communication needs, to address their concerns on the gathering of their data and the subsequent creation of intelligence about their activity, and to enable them to understand how to get maximum benefit from the system.

The current telecare and telehealth installation workforce face a number of challenges as they move towards installing these intelligent activity monitoring systems in greater numbers. Many of the current practitioners are experienced in installing systems that employ stand alone devices or systems that use a mixture of hard-wire alarm pull cords and body-worn pendant alarms. Most have had little experience of creating a lean, effective sensor network from the relatively wide range of sensor devices that are available, one that is sharply focused on delivering the required information.

There are currently no nationally accredited training and education courses focused specifically on telecare installation practice. While there are related bodies of experience and training and education focused on data gathering in the home, for example in the security sector, the multiple differences in the requirements for data gathering impact substantially on installation practice. There is a requirement under the SSAIB Code of Practice (Section 2: 7.13.4) that 'service providers shall establish a detailed training programme for all new staff to ensure that they develop the skills, knowledge and competence required to perform their role.' This should include among other competences 'equipment installation procedures; and 'communication with users'.

There are a small number of installation guidance documents available, though most are not at the detailed level that will be required.

This paper highlights some of the challenges that faced installers of activity monitoring systems in a recent project in order to;

- outline how the project team addressed the challenges and created lean installation processes;
- identify the resources that exist to inform other installation staff on effective practice.

Reflecting the project learning it is possible to propose the skills and competences that installation teams will be required to develop to effectively install activity monitoring systems.

The final section of this paper identifies the training and education options that exist within the sector and in related sectors.

2. Project learning

The project learning set out in this paper arose from a project, funded by the Assisted Living Innovation Platform (ALIP) of the Technology Strategy Board (TSB), led by Tynetec Ltd. The project aimed to develop a service based on providing intelligent activity monitoring and refined the hardware development and service using learning arising from 300 installations of activity monitoring systems.

The Tynetec team and partners from Darlington Borough Council, Your Homes Newcastle and Age UK Alarm Services worked together to identify clients, carry out installations, apply 'algorithms' to the data received from clients homes and validate this intelligence against the situation in clients' homes. In the process there was a continued refinement of the data gathering process and an interrogation of installation practice.

The three client-side partners who were installing the activity monitoring system, Darlington Borough Council, Your Homes Newcastle and Age UK Alarm Services, had varying approaches to undertaking installation.

- Age UK Alarm Services have previously had no requirement for an installation team as pendant and Lifeline equipment is installed by the clients themselves. Tynetec installers therefore undertook the majority of the work to install the activity monitoring sensor network.
- Darlington Borough Council employed two installation companies to undertake all of their telecare installation. In addition a member of their telecare team accompanied the installation company engineer for each project installation.
- Your Homes Newcastle assessments and installations were conducted by their specialist in-house telecare consultants with a small number carried out by an installation company.

The 'standard' activity monitoring package that was installed in the homes of participating clients included a Tynetec SayPhone 21 alarm unit (a hub with integral memory and modem) a number of wireless sensors including Passive Infra-Red (PIR) movement detectors, an ambient temperature monitor and a number of door contacts fixed to entrances to the property.

The settings included individual homes and supported housing settings. Participating clients were experiencing a range of challenges to independent living; some were at risk of falls, and some had long term health conditions. Approximately 80% of people participating in the trials of the activity monitoring equipment lived alone. The majority of clients from whom activity monitoring data was used to refine the system were recruited to the trial by Age UK Alarm Services. The reason for this is that these clients and their family members were self-selecting on the basis of requiring information on trends in patterns of daily living that indicated reduced independence.

3. Challenges for installers: sensor network

Installers are required to create a sensor network that is capable of gathering data reliably, cleanly and to meet the objectives set out by the person specifying the system.

Project learning: placement and task assessment (i.e. what is needed to go where, and why)

Depending on the size and layout of the property, between four and six PIRs were installed. The PIRs were located in a central location, hallway and/or the landing; the living room; the bathroom; and if there was a separate bathroom and toilet, then one in each; and in the kitchen.

The positioning of the PIRs was dictated by the need to capture data that would indicate the location of the individual at all times while in the home. The requirement to monitor quite specific areas to capture indicative movements, e.g. at entry and exit points from the hallway to the bedroom, had to be balanced by the need to site the PIRs in locations that were as unobtrusive as possible to the clients. The design of most PIRs provides an option for changing the orientation of the PIR from a normal setting where the beam picks up movement across the floor up to the PIR installation height (recommended 2.1m) to a 'Pet Alley' orientation where the beam should not pick up anything below the (1 metre recommended) installation height. Orientation of the PIR, combined with positioning the sensor in terms of vertical height and position in the room (corner, wall, on shelves, etc) should provide a range of options sufficient to ensure the PIR can pick up specific activities and avoid obstacles to the PIR beam and the causes of false readings (rapid variation in temperature, high vibration or shocks, exposure to direct sunlight, powerful lights, wind, air conditioning, or heating).

To capture a comprehensive data picture the Tynetec team had to describe to installation practitioners how the data capture and transmission of data messages from the wireless sensor network to the SayPhone21 worked. An intelligent activity monitoring sensor network transmits data messages (e.g. on/off, in/out) to the hub at timed intervals. These data messages can be interpreted to indicate, for example, 'person in living room'. While the person is in the living room the system should regularly transmit the data that indicates 'person in living room' until there is a change in that situation. At this point the sensor in the hallway, for example, would transmit the data that indicates 'person in hallway'. In this way a picture of the person's movement around the home can be captured. The sensors were configured to capture and transmit data only on 'presence' and not on 'absence' (e.g. the PIR would not transmit a message that means 'no person in hallway'). This was in order to limit the amount of data that would be generated if the PIR sensor network was programmed to send 'absence' messages. The need for this was demonstrated when a 3rd party installer made an error on installation that resulted in both 'presence' and 'absence' data messages being sent to the hub. This led to the memory card on the hub rapidly filling up and data collection came to a halt.

Once the data has been sent to the hub the PIR sensor is designed to switch itself off in order to save battery power. The period that the sensor is inactive is called the 'mask time'. The original PIR sensor used on the project had a mask time of 5 minutes. This was legacy design arising from the original use of movement detectors by the security industry. When the project team assessed the early data for usefulness in deriving sensible intelligence about the individual's location, it became

clear that such a long mask time was inappropriate. The project team developed a new PIR sensor that offers a choice of a 3 minute or 1 minute mask time. The 1 minute mask time setting was designed to capture data in rooms through which people tend to move fairly quickly. This setting was found to be particularly useful to locate people as they move in and out of bedrooms, for which people tend not to choose to have PIRs installed, through landings and into and out of bathrooms.

Previously, with a 5 minute mask time, a PIR sensors in the landing and bathroom might pick up that a person had come up the stairs and into the bathroom, however they would not pick up that 2 minutes later they moved out of the bathroom and into the bedroom as the mask time exceeded this time period. The data available would indicate the latest 'presence' signal coming from the bathroom and nothing subsequently. The deduction might be that the person had moved into the bedroom. This is only confirmed when the person moves out of the bedroom, which might be several hours later.

While participating clients consented to have their movements monitored throughout the home, there was resistance to having a PIR sensor that could pick up movement in bed. The high cost of such sensors ruled out the use of bed (pressure) sensors and sensors that create a field across the bedroom doorway. Another solution considered was to use door contact sensors on bedroom doors, but it was found on the trial that many people sleep with the bedroom door open. The solution opted for was to install a PIR that could capture a narrow field of movement down the side of the bed that the person sleeps on. Despite the discrete movement that could be captured, many clients still chose not to have these sensors installed; (4 clients chose to have these sensors installed by the end of the project trial period). The reasons given were that the gathering of data in that location was perceived as too invasive and clients were very aware of the sensor, particularly as it had to be installed at one metre height.

The PIR sensors in the kitchen were not only positioned to indicate presence in the kitchen but it was also considered useful to capture trends in meal preparation activity as a good indicator of independence. This was sometimes problematic when the meal preparation area was situated near an open door and movement in another room could be picked up by the PIR in the kitchen leading to the potential for a false reading. Alternatives considered were the use of contact sensors on cupboard or fridge doors but these were ruled out as it was considered they did not give sufficient indication that the client went on to prepare meals. Tynetec therefore developed electrically monitored appliance (EMA) sensors that could detect the use of appliances such as kettles or microwaves and from this deduce meal preparation activity. A total of 29 trial participants were offered such sensors, 17 declined the additional sensor, 12 had agreed to their installation by the end of the trial period.

Other issues the project team were faced with when installing the PIRs were:

- Unusually shaped rooms, such as L-shaped or with extensive alcove areas, or narrow stair landings with tight corners.
- Doors kept open – risk that the PIR picks up movement in the 'wrong' room.
- Small rooms such as bathroom with interference risks such as heated towel rails, windows, etc.
- Pets jumping up on cupboards or furniture.
- Clients insistent that specific items could not be moved, e.g. spice racks, kitchen towels, etc.

- Placement in cold areas of the home (draft in hallway) resulted in low battery power signal from a PIR when the battery was in fact working.

Guidance: the only guidance that appears to be available is from the SSAIB and relates to positioning of alarm devices.

SSAIB Section 2:
7.4.5.3 Fixed trigger devices
Tests shall be carried out on all fixed trigger devices to ensure that
a) In the case of wired devices, they are connected to the local unit and controller and can raise an alarm condition with the local unit and controller
b) In the case of wire-free devices, they are registered and in communication with the local unit and controller and can raise an alarm condition with the local unit and controller from the location where they have been installed.

The results of all tests should be recorded on the installation record.

While the SSAIB guidance for social alarms is not completely relevant to activity monitoring, the principle can be implied that wireless PIR devices should be registered and in communication with the local unit and controller to ensure they can send the required data from the location where they have been installed. Although sensors can be pre-programmed to some extent, on-site testing is required to ensure each sensor is picking up the required data. The results of the testing of the sensor network should be recorded on the installation record. It is then necessary to review this data over an initial period of time and at regular intervals to ensure the data continues to be reliable in the face of changing circumstances.

Project learning: fixing of the PIRs

The original design of the PIR sensor led to the need for high strength adhesive due to the weight of the device. This design is another legacy from the security industry where PIR movement detectors are designed to be installed for several years at a time and robustness is a positive design feature. This is not the case for PIRs for assisted living, where the requirement for a sensor may be for relatively short periods of time as people's needs may change quite rapidly.

PIRs are traditionally fixed to walls and ceilings. Options considered by the project team for attaching PIRs to walls included using industrial strength glue, industrial strength adhesive pad and screwing to the wall.

Attaching with glue/ or foam based adhesive pads:

Pros:	**Cons:**
o this approach suits a business model based on client installation (though placement may be sub-optimal) offering rapid installation if wall and ceiling surfaces are suitable	o can cause significant damage to wall surfaces on removal o the weight of the sensor can pull wallpaper away from walls and old plaster can crumble while waiting for the glue to adhere o roughly plastered ceilings create challenge for adhesion of PIR sensors o grease, nicotine, condensation on kitchen tiles and low temperatures can result in lengthy adhesion setting times, or ineffective adhesion,

	extending installation appointment or requiring repeat visits o The use of adhesive pads for door contacts on PVC doors with bevelled doors meant that magnets failed due to difference in alignment, the only alternative was glue.

Attaching by screws:

Pros:	**Cons:**
o causes minimal damage on installation and removal o once screwed up, the sensor is unlikely to fall off the wall or ceiling	o requires installation staff trained in the use of power tools at heights and use of ladders, etc. o there are considerations of damage that may be caused on drilling, and potential health and safety issues, e.g. presence of asbestos, etc.

Project solution:
The Tynetec team invested in a redesign of the PIR which retained the flat base, which lends itself to being installed as a free standing item, and simplified the electronics to make the box smaller and lighter. The new design of the PIR can therefore be installed using lower strength adhesive or as a free standing item. For example on a mantelpiece, shelves, hall tables, windowsills. This has benefited users and also reduced installation costs. There may be disadvantages to this approach, which are yet to be established, in that the orientation of the sensor may more easily be changed by the client, carers and visitors.

Guidance: the available guidance from the SSAIB relates to the positioning of wireless devices connected to a social alarm system.

Guidance: SSAIB Section 2
7.4.4 Health & Safety and Hazards
Service providers shall ensure that the installation of equipment does not constitute a hazard or interfere with the health, safety or normal activities of the user. The manner of installation should be such as not to unnecessarily obtrude into the users' environment.

The requirement covers the location of the local unit and controller within the user's premises, the routing of wires from the local unit and controller to the power and telephone sockets and the location and manner of installation of any fixed sensor devices within the premises.

Installation and maintenance work should be planned so as to avoid posing a risk to the service user and others in the premises and should be carried out in a proper and workmanlike manner. Where work will require moving the user's property or fixing items to the fabric of the premises, the user's consent should be obtained prior to commencing the work.

A record of all works undertaken and the location and manner of connection of all elements of the installation should be maintained.

Where work undertaken results in damage to the user's property, the user should be informed and steps agreed and taken to rectify that damage.

4. Challenges for installers: comms transmission

Installers are required to ensure the robust transmission of data from the home hub or dispersed alarm unit (DAU) to the remote server so that intelligence can be provided that is sufficiently timely to be effective in care planning.

Project learning: DAU (hub) installation

Transmission of data from an activity monitoring system differs from transmission of data for either social alarms or security alarms, representing episodic, batched data transfer rather than single alert messages. The requirement of ensuring regular transmission of data created additional challenges to those relating to the transmission of social alarm messages.

- Many existing installations were found to have the hub or DAU not installed in the telephone network master socket, as required, but plugged into a telephone extension lead. The project team estimate that approximately 75% to 80% were not installed into master socket or not easily identified as put into the master socket (this is particularly problematic with recent designs for sockets that do not provide a way to easily differentiate between master socket and extensions).
- When installers encountered incorrectly wired telephone and social alarm systems, an issue arose over the liability arising from changing the existing system. One option was that the connections be replaced ‘like for like’ rather than correctly wired. The impact of not replacing handsets on extension leads on the optimal working of the system was explained to clients. Clients were also advised to contact their telephony supplier in the case of faulty wiring.
- A significant number of homes had 4-6 devices on telephone extensions, exceeding maximum Ringer Equivalence Number (REN) load (see Hamlin guidance note below). The risk of exceeding the REN maximum is that the data from the activity monitoring system might not be reliably sent from the home.
- Many of these problems arose from DIY installations of telephone equipment, an example was when a DECT hands free phone was found installed next to the alarm unit, contrary to guidance which is to place it at least 3 metres from the social alarm unit.

Guidance: Formal guidance from the SSAIB exists in this area:

> **SSAIB (Section 2: 7.4.2)** Local unit and controller
> The local unit and controller shall be installed in a manner that will allow it to interrupt other usage of the alarm transmission system in the event of an alarm condition being detected. This normally requires that the unit is connected to the primary telephone socket and that any extension sockets or other equipment are wired through the unit or via the connections provided within the primary socket for the connection of extension (slave) sockets.
>
> In circumstances where this is not possible, the situation should be explained to the user. The explanation should include the risks that may arise and should identify any equipment or circumstances that could give rise to these risks. If the user is happy for the installation to continue, the details of the circumstances, the explanations given to the user, the specific risks identified should be recorded on the installation record. The user should be asked to sign to consent to installation and confirm understanding of the risks.

Informal Guidance: some useful informal guidance was provided on the Assistech forum by Peter Hamlin, building on manufacturers' advice, which is pertinent to this issue (message on the Assistech mailing list[3] with permission from Hamlin).

> **Hamlin,** North Thames Regional Environmental Control Equipment Service (NT RECES), source: Assistech discussion forum
>
> A key function of a community alarm telephone is that it should be able to disconnect all other telephones and any call that may be in progress and seize control of the telephone line to make an emergency call.
>
> However, a community telephone alarm can only do this providing it is the ONLY device connected to the telephone master socket and all other telephone extensions are taken from the community telephone alarm.
>
> IMPORTANT: In any residence, where a single telephone line is fitted, there is ONLY ONE MASTER TELEPHONE SOCKET!!!
>
> Experience suggests that the location of a community alarm telephone within a residence tends to determine how an alarm telephone is connected. A community alarm telephone is usually placed at or near the central point within a client's home, However, if the selected location for the alarm is not near the master telephone socket then the community alarm may be (incorrectly) connected to a telephone extension socket instead. This is easier for whoever is performing the installation, as correct fitting requires running a telephone cable between the alarm telephone and the master telephone socket and then re-connecting all existing telephone extension sockets to the community alarm.
>
> The correct connection of community alarm telephone is something that seems to be overlooked but can easily be checked; there is a simple test that may be performed to check whether a telecare community alarm telephone is connected to the master telephone socket in a client's residence as follows:
>
> ---
> (1) First, remove all the handsets from ALL the telephones in a client's house and place each handset beside its respective telephone.
>
> (cont. ..)

[3] Assistech discussion forum: https://www.jiscmail.ac.uk/cgi-bin/webadmin?A0=ASSISTECH

Informal guidance: Hamlin on Assistech forum (continued)

(2) Second, trigger the community alarm, despite all the removed handsets, it should be possible to get through the community alarm call centre.

(3) If any or all of the telephone handsets have to be replaced to get a connection to the community alarm call centre then the community alarm telephone is NOT the only device connected to the master telephone socket and the provider or installer of the alarm should be contacted to remedy the situation.

4) If connection is made to the community alarm call centre without replacing any or all telephone handsets within a residence then the community alarm telephone is the only device wired to the telephone master socket (and all other telephone extensions are taken from the community telephone alarm).

NB: If all is well with the client then be sure to reassure the community alarm call centre staff that the call is a test and that there is no emergency. Be prepared to give your name and position as all community alarm calls are routinely logged; failure to satisfy call centre staff as to the nature of the call may result in the dispatch of an emergency service.

(5) When testing is complete, ensure that all telephone handsets have been replaced.

Ringer Equivalence Number (REN)

Typically the telephone output from a community alarm telephone has a Ringer Equivalence Number (REN) value of 2 so it may not support all the telephony devices previously connected to the master telephone socket (which should have a REN of 4). However, the REN value of a telephone line can be increased by purchasing what is known as a 'REN Extender' - most will increase the REN value to 8. A REN Extender should be fitted between the community alarm telephone and all other telephone extension sockets within the home. The typical cost of a REN Extender is around 40 pounds.

All items of telephone equipment have a Ringer Equivalence Number (REN) which is used to calculate the number of items that may be connected to any one telephone line. Although it is possible to have any number of telephone extension sockets, it is important to limit the number of telephones and other items including faxes, answer machines and modems, connected to the telephone sockets connected to a single telephone line within a home. Every telephone or item connected to the telephone has a REN, usually displayed on the base of the device (near to the green approval sticker) or in the user manual for the device. Most telephones have a REN of 1, but some faxes and modems may have a REN of more than 1.

To check that the REN limit is not exceeded, add up the REN numbers of all the devices connected to a single telephone line anywhere in a residence - the total should not exceed 4. It is likely that technical problems will be encountered (with equipment not working or ringing very quietly) if you exceed the REN limit of 4. If some or all of the telephones fail to ring or some ring very weakly then try unplugging devices one at a time until they work.

Project learning – data transmission

In order to gather regular, timely data, Tynetec's remote data server was programmed to dial into each SayPhone21 unit on a daily basis to retrieve the information. This meant that Caller Line Identification (CLI) needed to be enabled on

the client's telephone line so that the SayPhone21 unit would be able to recognise the incoming number and allow access to the information.

It quickly became apparent that there were a number of issues with this data gathering approach:

- Difficulties in explaining to clients that they needed to enable CLI on their telephone line. This led to questions such as: 'What is CLI?' And 'Why do I need it?'
- For some telephony providers, enabling CLI incurred a cost (for one provider this was £2.75 per month) which some clients, quite reasonably, did not want to pay.
- The time taken to activate CLI meant that revisits would be required if the server was still unable to access the information after activation.
- An issue arose with systems set up with voicemail services; when the Tynetec server dialled into individual DAU SayPhone21 units; if they were not installed correctly all the phones on system would ring a couple of times. This was particularly problematic as this action was programmed to happen in the middle of the night.

All these issues meant that the installation time proved to be quite lengthy averaging around 1½ hours. To reduce this time the Tynetec team tried to organize the enablement of CLI while at the client's properties; this proved difficult as some clients were unable to find a recent bill to be able to pass on necessary information.

Project solution: The solution to overcome the CLI issue was that Tynetec re-wrote the software in the SayPhone21 for the ALIP project to enable the unit to dial out from the home every night and download all the logs onto the remote data server. It was not feasible to charge clients for the cost of phone calls to transmit data. This was resolved for the purposes of the trial by programming the SayPhone unit to call Freephone numbers paid for by Tynetec. These costs were minimised by programming the phones to ring the server between midnight and 6am.

The length of time between retrying the call after getting an engaged tone was lengthened to accommodate increased congestion on the Freephone lines as more installations were undertaken. Rather than requiring a complete transfer of information each day, the software was changed with the result that only updated information since the last successful call was transmitted. The impact was a significantly higher success rate for a call getting through to the server first time. This software update is included in the new SayPhone offering.

Project learning - Internet service provision
There is growing awareness that telephony services through different internet service providers (ISPs) provide varying levels of reliability in terms of delivering social alarm data messages4. This also has an impact on the reliable delivery of activity monitoring data. Both Your Homes Newcastle and Age UK Alarm Services ask clients to notify them if they change service provider.

[4] Standards, Interoperability and Broadband. G. Worsley, Assisted Living Innovation Platform, 2010.

5. Challenges for installers: client communication

Installers are required to confidently communicate with the client, support the client to understand how to get maximum benefit from the system, and address clients' concerns on the use of the data and the subsequent creation of intelligence about their activity.

Project learning – person centred planning
The teams installing the activity monitoring systems found that installation processes were more complex than for standard 'Lifeline' installations. This was partly due to the need for greater assessment of lifestyle in order to intelligently position the PIRs, and partly due to the need for explanation to clients about how the monitoring system could underpin and not undermine their strategy for maintaining their independence.

In practice the project team found that there was a requirement for Installers to develop assessment skills and there were benefits in developing technical skills within the Assessor group. In this project the Assessor was likely to be a member of the telecare team who had built a relationship with the client. Problems arose when technically unconfident Assessors specified the system itself rather than the outcome that was required from the system.

Project learning included:

- Difficulty with identifying installation workers who would be competent to understand technical requirements and also communicate confidently with the client, assess their lifestyle, preferences and requirements.
- Many clients, particularly private purchase clients, were interested in the system and had a lot of questions about how and why the equipment would support their independence, which installation engineers did not initially feel equipped to answer. The need to address clients' questions also lengthened the installation appointment in a way that was not anticipated by all the teams.
- The impact of sending technically competent staff who didn't feel confident to undertake person-centred assessment relating to the installation was that end-to-end communication between assessors/ installers/ support services broke down. Another impact was that communication with the client was inadequate, lifestyle was not understood and consequently the installations did not capture the required information or captured erroneous information.
- Similarly where assessment staff with inadequate knowledge of these systems specified the system there was found to be a mismatch between the specification and what the experienced installers found the client wanted and needed.
- Without strong communication protocols external installation teams will install exactly what has been specified and not feel it is within their role to amend and improve the specification based on their on-the-ground assessment of the client's lifestyle, environment, etc. Partly this is due to perceived boundaries of their role and partly because they initially did not see themselves as part of the team working toward shared objectives, centred on the person's needs. This can lead to a technically correct installation but one that does not add value and which can even have a negative impact on the overall care plan.

Project solution: Multidisciplinary working and cross training
The solutions arrived at by the project team to address the need for such a broad range of skills and clear communication processes varied from sending two people

with complementary skills together to an installation, or sending one person with a broad range of skills to less complex installations (one appointment), or to carry out the survey and assessment (first appointment) and to undertake the installation itself (second appointment).

It was felt by the Tynetec installation project manager that, in future, competence in assessment by Installers could be developed through cross-training. The Installer role would then be to put in place a technical solution that would deliver the specified outcomes and which was sufficiently robust and flexible to accommodate foreseeable changes in the client's condition.

Project learning – client motivation and adoption
A quick turn-around from the point at which people express interest to completing the installation was found to be important to achieving a high rate of take up. Partly this required an administrative process for booking installations led by the installation team itself rather than mediated by other organisations in the service provision chain. Similarly the appointments for Age UK Alarm Services clients needed to be made in liaison with family members, who had often initiated the request for service. Installation teams, however, found they could not rely on family members to communicate appointment arrangements with the client requiring the installation.

Addressing early glitches and regular review was found to be vital if clients are to maintain support for the solution. Project teams aimed to carry out a 6 week visit to identify changing need and anticipate any problems and then review needs during annual visits and when batteries need to be replaced. Some challenges encountered were:

- Problems on day one create a bad perception of technology.
- Some people panicked when seeing technology on demonstration, particularly if family members have been the ones to have instigated the installation
- Motivation for some clients in adopting the service was to have a real-time web-enabled service. This was the ultimate project aim rather than a deliverable service during the project timescale.

Project learning – client expectations
In order to prevent clients' becoming disappointed in the service and withdrawing from the project, the team recognised the importance of establishing with clients an understanding of how the system worked and the response that clients could expect. This was complicated by the fact that this was a trial and so data was being used to refine the system but not to actively manage care. It became clear that clients were under the impression that the activity monitoring system provided real-time data underpinning a service that would be responsive on an hourly or daily basis. For example, a number of clients contacted the project team to ask why the fact that they had been away from home for a few days had not been noted and no contact had been made to check on their well-being. Another client understood the service would pick up the fact that, during a period of time that she was away from home, there was a burglary, and that the system would alert family or police. In fact later analysis of activity for that period clearly shows the burglar entering the home, moving around for several hours and then returning the next day.

These incidents highlighted to the Tynetec team that, when a commercial service is launched, there would be a need for clear messages about how the information would be used and the response clients could expect. This issue was complicated by the fact that the project was a trial that was using data from clients' home as a product and service development exercise rather than a service. Project learning was

that, for similar trials in future, it would be necessary to reinforce the nature of the trial through newsletters and, for a commercial service, to emphasise the nature and timescales of the potential service response. Tynetec have also developed GSM (mobile communication) as an option for communication of data from the hub to the server, which should allow for near to real-time presentation of data to clients, families and care networks. This would not necessarily imply a real-time response, though technically this could be possible.

Project learning – client feedback for interpretation of data
While it is not possible for an activity monitoring network to provide data that will distinguish between different individuals, unless body worn sensors are continually worn, the pattern of activity within the house can be interpreted to identify regular activities involving a number of people. For example, many of the clients had domiciliary care visitors or regular family visitors, which could clearly be picked up from the presentation of activity monitoring data. In order to refine the interpretation of data, the Tynetec team asked Age UK Alarm Services clients to fill out a diary sheet to note unusual activity, visitors, absences, etc. This proved invaluable for establishing the meaning of activity patterns outside of the usual pattern. Using diary information the project team found that trends and specific incidents could be interpreted, though this was after the event, when diary forms were retrieved. However the value of this information was proved and the use of retrospective or near to real-time feedback from clients is likely to be built into future service development initiatives.

Guidance: the available guidance from the SSAIB relates to the instructions to be passed to users of a social alarm system.

Guidance: SSAIB Section 2: 7.4.6 Instructions to users
Operating instructions shall be provided in a format and medium suitable for the needs of each user.
For the benefit of the user and helper the service provider shall also:

a) explain and demonstrate how the system functions, the necessary connections to the telephone and mains electricity, battery changing, etc., the purpose of all controls and indicators and the type of reassurance and response provided,
b) check that all the necessary operations are understood and can be carried out by the user,
c) explain the policy on non-emergency and reassurance calls,
d) explain the need for regular testing and the use of test calls,
e) advise users of portable trigger devices of the area over which the triggers are effective and of any circumstances which may reduce their operating range,
f) describe any condition or other equipment or service likely to inhibit or degrade the proper functioning of any item of equipment,
g) explain to the user the means taken to protect their privacy,
h) explain to the user the process for notifying changes to personal information supplied by them,
i) where helpers are provided by the service provider, explain the role of the helper and the means for identifying bona fide helpers,
j) arrange periodic visits to check the user's continued understanding of the equipment.

Project learning - consent and ethics

The approach to gaining consent from potential trial participants varied across the teams. Existing Age UK Alarm Services clients who privately purchase the service for themselves or their family members responded to a letter inviting them to take part in the trial. There was an attempt to recruit clients who were experiencing early signs of dementia and receiving services through the local authority and NHS. This required an application to the local research ethics committee and the time required for such an application made this unfeasible.

Some issues that arose on the project were:

- Some clients were concerned about the flashing lights that are standard on PIR sensors and interpreted the light to mean that they were being filmed. The project team addressed this by ensuring installers were asked to turn lights off and asking installers to demonstrate to clients that they were not being filmed by dismantling the PIRs and showing the internal workings to clients.
- For some private purchase clients the decision to install telecare is part of a complex negotiation between family members about how an individual can remain independent. When a family member is the person instigating the purchase of an activity monitoring scheme, the assessment and installation team were aware that the consent for the installation had sometimes to be renegotiated with the client themselves.

Informal guidance: SCIE, the Social Care Institute for Excellence[5].

Guidance: SCIE, Ethical Issues in the use of telecare (August 2011)

Some key points relating to installation:

- Telecare should not be imposed on people.
- Gaining informed consent from people with cognitive impairments requires effective presentation of information and judgment of mental capacity.
- Everyone involved in the commissioning and use of telecare should have realistic expectations of its capabilities and should understand its limitations.
- Problems can arise in any aspect of telecare services. All possible steps should be taken to avoid problems and careful business continuity planning is needed to cover the possibility of system faults (technical or human).
- Installation can either enhance or inhibit autonomy and beneficence, depending on how it is carried out.
- Installers need training and education to acquire the core competencies to support a person-centred service for people with cognitive impairments.
- Quality standards need to be established for the installation process.
- As in all direct care services, any infringement on privacy needs to be justified.
- Information generated from telecare services can help service providers determine whether the overall care plan is effective. However, this is dependent on data-sharing arrangements.
- Service providers must be clear about the purpose of collecting information generated from telecare.
- Telecare users and their carers should be informed about what information will be collected and how it will be used.
- The emphasis should be on using information from telecare to drive improvement and to promote people's independence as well as their safety.
- In order to maintain fairness of provision in the context of personal budgets and self funding, high-quality information and advice on telecare equipment and installation are needed.

[5] SCIE At a glance document number 24: http://www.scie.org.uk/publications/ataglance/ataglance24.asp

6. Resource requirement

A major part of the project learning, perhaps unanticipated at the start of the project, was the relationship between hardware and software design and the impact on cost and quality of the installation and maintenance service. When seen as part of an end-to-end service, there are clear benefits to designing out installation complexity and reducing client frustration by getting the design of the hardware right. This needed to be achieved without reducing the options for providing flexibility in how equipment could be installed in order for installers to provide solutions tailored to the individual.

Project learning – the need for multidisciplinary/ joint working

For activity monitoring installations, which are more complex than the majority of social alarm installations, the need to draw on skills and competences in both person-centred assessment and in technical installation appears to be unavoidable. Different teams came up with different solutions to accessing this range of skills and all sought ways to focus specialist skills cost-effectively.

- With different members of the team bringing different skills and backgrounds, project learning was that it was paramount to develop a communication process to enable all members of the team, including call centre staff, to understand the aim of the installation and how it works.
- Over the course of the project it has become apparent that the specialist telecare teams in local authorities are facing funding challenges and increasingly referrals were received by occupational therapists or social workers with little specialist knowledge. This was a problem when they specified a particular solution that failed to address the core problem (such as a fall detector for someone who's had a fall) rather than specifying an outcome and working with the installer to agree an effective solution.
- In theory, system design analysis could be undertaken during the survey but this practice, and generic tools to support such a practice, have not been developed to date. Currently assessors use their experience and, in ideal circumstances, review data collected to judge the effectiveness of the installation.
- Project teams complied with the SSAIB code of practice (Section 2: 7:10:7) that requires documentation of installation of community alarm devices but this is not usually undertaken at a level that would make it possible to use these records to analyse the impact of installation practice.
- Installation times were brought down from an initial 2 ½ hours to an average of about ½ to ¾ of an hour. This is compared to installation times for a basic dispersed alarm unit of between 10-15 minutes. Many installations would still take around 1-1½ hours if there are a large number of sensors or the assessment and communication with the client was more complex and involved.

Project learning - competence and training needs

- Tynetec provide in-house training for their installers to ensure competent and customer friendly service.
- As the level of training to install an activity monitoring system is significantly beyond that required for a DAU and pendant, Tynetec have developed a Train the Trainer programme aimed at external organisations who install Tynetec equipment. By training a trainer within an external organisation the intent is that Tynetec can liaise with that person about hardware, software and service

developments and that individual can also oversee the training of installers within their organisation. This approach is aimed at addressing the rapid turnover of staff.

- Tynetec developed a training tool for external installation teams and a trouble shooting page on their website .

7. Survey of the telecare and telehealth sector

In order to establish whether the challenges faced by the installation teams involved in the Tynetec-led project were characteristic of the sector, installation teams within the sector were invited to complete a survey.

Background to the survey
For four weeks between July and August 2010 FAST ran two concurrent online surveys, one designed for installers and the other for commissioners of telecare and telehealth installations. Both surveys were promoted on FAST's website, in e-bulletins mailed out to subscribers, through the FAST, DH Care Network and TSA bulletins and on the Telecare Aware website. 42 installation practitioners and 15 commissioners of installations completed the survey.

Survey participants
The majority of participants in both surveys identified themselves as working with telecare installations rather than telehealth. Three quarters of commissioners (74%) said they commissioned telecare, while the remainder commissioned both telecare and telehealth. Most installers (67%) worked on telecare installations, with the balance (33%) involved in both telecare and telehealth.

In both cases, most respondents were working within statutory services (commissioners 74%, installers 71%). The majority (81%) of commissioners responding to the survey had a primary focus on social care, rather than health (12%) or education (6%) and 43% saw their role as a strategic commissioner of contracts with 33% responsible for specifying individual systems and 14% managing the installation service. Commissioners indicated that 60% of the installations they are responsible for are carried out by an in-house team, 33% through a 3rd party contractor and 6% (1 person) was responding as a commissioner working within a specialist installation provider.

Of commissioners, a third (36%) reported they were responsible for between 500 and 1,000 installations in the past year and half of commissioners were responsible for teams which undertook between 50 to 500 installations in the year. Around half of installers undertook between 1 and 200 installations in the previous year, while a third (38%) were involved in between 200 and 500 installations.

Types of installation and infrastructure
Most of the installations reported in the survey were Lifeline or activity monitoring implementations. Two thirds of commissioners (63%) said Lifeline installations were their most common responsibility, while a third (33%) identified telehealth or environmental control implementation as the main areas of activity. The pattern was similar for the installers surveyed, with Lifeline and activity monitoring devices seen as the most common installations. Two thirds reported that it was not as usual for them to be involved in telehealth monitoring, and half had little involvement with environmental controls.

Installers said they were most commonly responsible for telecoms wiring installations, with 40% identifying this as the most common infrastructure. One in five (20%) said intercom/ access systems were their most typical area of activity. In contrast, levels of involvement with broadband, Ethernet, Cat 5,6,7, electrical wiring and gas installations were all very much lower.

Commissioners reported intercom/ access systems as the type of infrastructure they most commonly encountered, followed by electrical wiring and telecoms wiring. Their levels of involvement in broadband, Ethernet, Cat 5,6,7 and gas installations were higher than those reported by installers.

Types of user
Both commissioners and installers reported that older people represented the client group they were most likely to be working with. Overall, the client base was evenly split amongst people with long term conditions or neurological conditions; people with physical, vision or hearing impairments; people with learning disabilities; and people with mental health conditions.

Individual replies showed that telecare and telehealth installations are also being used to provide support for child carers and for people who have experienced domestic violence or who have been the victims of crime.

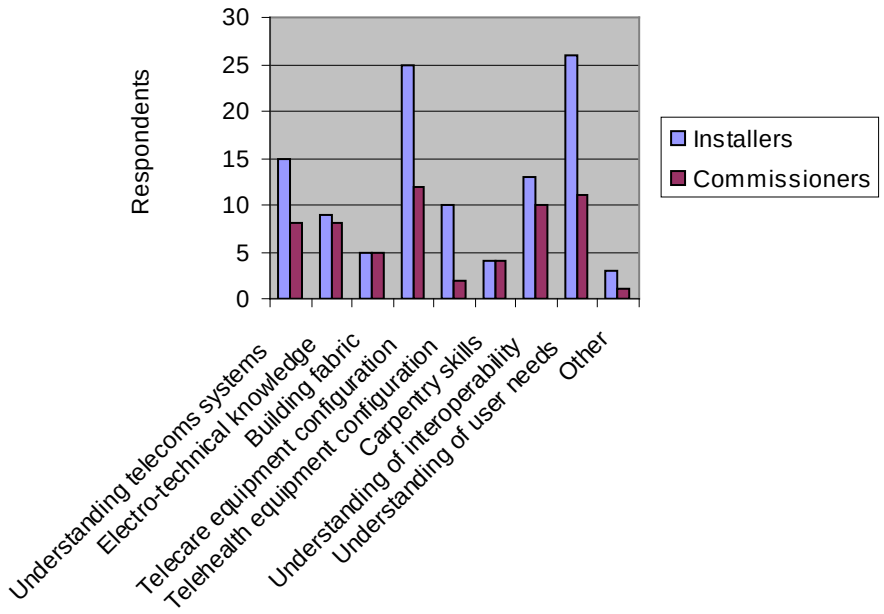
Qualifications required
FAST's survey highlights the absence of industry-wide qualifications in the field of telecare and telehealth. 74% of commissioners did not require their installers to have relevant qualifications and those who did say they required qualifications did not go on to state which qualifications were required. The majority (81%) of installers report that they do not hold specific qualifications in telecare and telehealth installations. Of the remainder (5 people) that noted they did hold qualifications, 3 had taken or were taking the City & Guilds VRQ Level 2 'Supporting Users of Assistive Technology' course run by the Centre for Housing Studies, the other two respondents noted that in fact they did not have qualifications. Interestingly no respondents noted electrical or electronic qualifications as 'relevant qualifications' indicating a lack of clarity on what qualifications may be relevant to the job.

Experience required
Almost all installers responding to the survey (95%) say they have built up experience in installing telecare and telehealth. The experience included electrical/ electronic qualifications and experience and many had 4-6 years experience of installation. The experience required was divided fairly evenly between technical and customer care skills. Three-quarters of commissioners (74%) say they require their installers to have relevant experience in this field, including:

- Technical and people skills
- Electronic/engineering experience
- Skills related to electrical/ technical installation
- Basic social care experience and experience of community alarms
- Customer Care; dealing with public; interviewing; experience of working with client group/s; use of power tools and ability to work at height
- We use our handyman service, tradespersons already but train them on each different type of telecare installation
- Provider support worker competency

Skills required
While commissioners pinpoint knowledge of telecare equipment configuration as the most critical expertise required to carry out installations effectively (cited by 20%), the next most important capability is given as an understanding of user needs (18%), followed by an understanding of interoperability (17%).

Installers perceive understanding user needs as the number one priority when it comes to assessing what expertise is needed, with 24% placing it top of the list, ahead of telecare equipment configuration (23%) and understanding telecoms systems (14%). However, installers are less concerned about expertise in understanding interoperability (12%), possibly due to the predominant use of relatively low-tech proprietary and stand alone systems.



On the job training

Most installers report receiving either on the job training (34%) or in-house training (33%), while a quarter (26%) had also attended manufacturers' training courses. The numbers receiving external training via a college or other institution were low (5%).

Commissioners note in-house training focused on product familiarisation but with some more broadly based. One example of a structured programme of training was provided:

- Providers assessing and fitting Telecare solutions will have at a minimum:
  - Received awareness and then installation training with the Telecare Coordinator and have received relevant information about the range of Telecare
  - Have completed an appropriate number of joint assessment and fitting visit with the Telecare Coordinator to enable competent working
  - Received training on the use of current documentation (leaflets, referral forms, assessment forms, review forms, etc) and use of User Held Record and completion of the Support Action Plan/ ACS Care Plan.
  - Received basic awareness training on the Mental Capacity Act and Deprivation of Liberty
  - Received level 1 training on safeguarding
  - Received level 1 training on personalisation training
  - Received basic awareness training on disability, equality and diversity including sensory impairment awareness.
  - Received basic awareness training on health and safety

A third of commissioners (33%) said their installers had received no externally-provided training but others noted a range of training including:

- Foundations course
- Product, First aid
- Call handling server provider for Lifeline installations
- Working with people with Learning Difficulties and Challenging Behaviour. How to react and respond
- telecare installation - provided by manufacturers / suppliers, City and Guilds in Assistive Technology
- We have provided training on adult safeguarding, personalisation

Requirement for accredited qualifications
All of the commissioners polled said they would like to see a nationally recognised qualification for telecare and telehealth installers, a view shared by 93 of installers (the remainder were undecided).

Both commissioners (70%) and installers (75%) maintained there is insufficient guidance on standards covering installation practice at the moment, while 90% of commissioners and 81% of installers believe the requirements for training and education in telecare and telehealth installation will change over the next five years.

One respondent from the commissioners' survey said the requirement was for 'accredited training on the practical application of telecare to meet service user needs', while another recommended 'specific qualifications/examinations plus a continuous re-assessment.'

These views were shared by installers; one suggested 'a fully accredited scheme at various levels' and another suggested training which offered 'individual modules covering all aspects of the telecare process; assessment; installation and maintenance; monitoring and response.'

Changing requirements for telecare and telehealth training and education
Both commissioners and installers were clear that the key reasons to make improvements in training and education for telecare and telehealth installation are the increasing complexity of the products coupled with the growing use of telecare as a cost-effective means of supporting older people and people living with long term conditions to continue to live independently. Recognition of the importance of telecare within this context was indicated by an installer 'The technology is a cornerstone of the government's agenda. To enable mainstreaming of this technology there needs to be more formalised training modules.'

One commissioner summed up the impact of this on installation practice by saying 'We will all become more professional and confident in providing telecare but it will become increasingly necessary to have accreditation and this should apply to installation too. Doing poor standard telecare is easy – good telecare depends on high quality assessment and then on everyone down the line delivering a high quality service.'

Individual responses from installers highlighted reasons why they find it difficult to keep their practice up to date, including the fact that products are changing all the

time, while the underlying technology is also evolving. There is also a perceived reluctance on the part of manufacturers to help support people working with older versions of equipment, even though it may still be in use in many settings. Others noted the need for training and education that will support installation teams to reach consensus on 'What the Telecare is intended to achieve ... no point installing something inappropriate just because that is what the paperwork says'.

The overall situation is summed up by the installer who said:

> 'I think there should be an accredited course for installers covering knowledge of equipment available and what it does. This should be set at different levels/sections, ie dependent on the equipment being used, suitability and the needs of the person. I looked into this five years ago and we are still no further forward.'

8. Training and Education

Competences required by the workforce
The FAST feasibility study of the training and education needs of the assistive technology sector, undertaken in 2007,[6] identified high-level, generic core competence or task statements and specific role based competence statements required by the workforce. This range or framework of competences was mapped out based on the literature and accepted good practice in the field and consultation with a range of sector experts and employers. The proposed framework was then benchmarked against the full range of competences across all Sector Skills Councils.

At the time the requirements for installation staff for assisted living services were not as clearly understood as they are currently and the range of competence it was considered may be needed was limited due to the relatively straightforward nature of the equipment then being installed. This in-depth review of the competences required for installation of activity monitoring systems and the survey of the sector however appears to indicate that the framework of competences developed for the feasibility study provides a good model of the range of skills required during the installation process for emerging assisted living services. Alongside the range of technical competences that are required, is a requirement for what are called 'person-centred' or customer focused competences to underpin effective practice and client communication.

The range of competences required depends to a large extent on the business model. For example, the cost model has to be developed to manage the relatively high costs relating to the initial home visit, i.e. the time allowed for an installation visit, the training costs for the installation workforce, and/or the potential need for two practitioners to visit. These potential costs have to be balanced by the service provider company against the risks of: gaining a reputation for poor customer relationships; non-adoption by the client of the service, leading to abandonment/ non-renewal of subscription; having to make return visits due to client error faults or to establish the cause of erroneous data resulting from poor installation; or receiving multiple queries from clients due to lack of understanding of the service/ the equipment.

The costs related to installation increase with a number of elements:

- The dependence on the face to face installation visit for understanding/ assessment of client capability, requirements, etc.
- The amount of client communication required and the complexity of issues to consider in relation to communication (this may relate to client capabilities for communication and learning, family relationships to negotiate, etc.).
- The requirements of the system to interface with existing and legacy services (i.e. broadband/ telecoms infrastructure);
- The requirements for on-site customisation of the device/ system and/or for the client to have access to services around the home rather than at one point within the home.

[6] FAST workforce report: http://www.fastuk.org/atforumactivities/workforcedevelopment.php

Each area of competence is outlined below in relation to the task that is required. There is no assumption that the task is undertaken by a particular job role but each competence or task is likely to be required for an effective installation. The competence or task statements when formatted and developed for training and education are underpinned by the required knowledge and understanding of policy, practice and standards and legislation and are demonstrated through a variety of means, written, work-based, role play, etc.

Required areas of competence
The competence cluster areas, one relating to person-centred / customer relations competences (key tasks a. and b. below), the second to technical competences (key tasks c. and d. below) are interdependent, i.e. the installer needs to match technical configuration to the client's requirements, capabilities and preferences.

a) Understanding and assessing the client and their service requirements - a core competence

All installers will need a level of understanding of the needs, capabilities, lifestyle and daily living context of the client in order to carry out their work effectively, even to ensure effective communication with the client about the most straightforward installation.

The information required by installers about the client is usually categorised in the following way:

- **Person** (customer) indicates the factors to be considered with regard to the customer's physical, sensory and learning and cognitive abilities and restrictions, the likely future needs of the customer as well as their life experiences, preferences and attitudes;
- **Task/ activity** indicates factors relating to identifying the customer's priority task, understanding how a task or action is undertaken physically and in terms of learning and support requirements and understanding the customer's preference about how that task is completed;
- **Environment** indicates factors relating to the natural and human-made influences within the customer's environment, the support networks and key relationships, and the impact of others' attitudes and lifestyles.

This information will ideally be ascertained by an initial discussion, or joint review of previously documented information, between the installer and the client, prior to any work being undertaken. The installer should then document their understanding of the relevant issues.

b) Client/ customer care and communication:

Taking assessment information into account, the range of competence required is likely to relate to the following working process/ tasks:

- Communicate effectively with customers and with their friends and family (while maintaining primacy of the service to the customer), taking on board their communication needs (physical, sensory, cognitive), their learning needs and preferred styles of communication.
- Demonstrate to the client and their immediate family the use of equipment and support their motivation to use the service through demonstration of priority services and by identifying additional services and benefits.

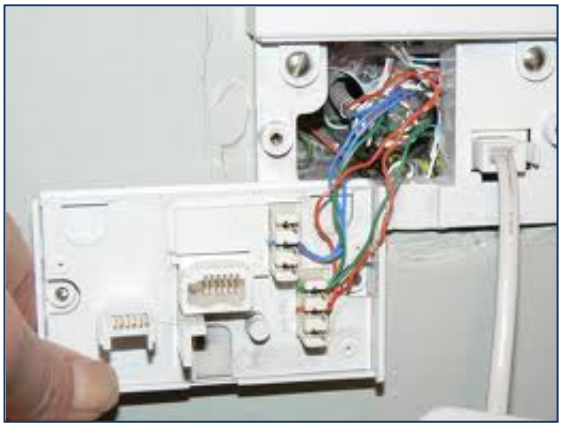
- Identify the service characteristics, such as response times if relevant, and ensure customer and family has realistic expectations and understanding of the service.
- Ensure the customer/ their family is able to identify faults in the service/ equipment and knows what to do to resolve the problem or how to report the fault.
- Pass on information in an appropriate format including key contacts, reporting, billing and review, renewal or upgrade processes where relevant.

Specific technical competences will include a range of communications, mains power and data skills areas depending on the devices and systems used (see Appendix 2 for a listing of relevant accredited electro-technical training and education qualifications).

c) The requirements of the system to interface with existing and legacy services

The tasks required to be undertaken by installers and related competences include to:

- Identify the nature of the existing infrastructure/ system, its robustness and issues relating to efficiency and safety;
- Identify the options for interfacing with the existing/ legacy infrastructure/system including processes for achieving improvements such as change of service provider, upgrade in modem, changes in the network set up, etc.;
- Explain the options to the customer, identifying the risks and benefits of each option and ensuring they understand the implications of each option;
- Document and get sign off from the customer for the interface action plan;
- Implement and test the interface with the existing system;
- Document / record the interface implementation and test results.
- Ensure existing/ legacy devices and systems which are impacted by the interface are tested and record the test results.



d) Set up of the device and system

Whether interfacing or not with the existing power/ data/ telecoms infrastructure, the tasks required to be undertaken by installers and related competences include to:

- Establish the objective of the set up of the device(s) and system in discussion with the client(s). Set up the device(s) and system in such as way that achieves this objective.
- Set up device(s) and system in such as way that takes account of the client's physical, sensory and cognitive requirements and capabilities and their service and lifestyle preferences.
- Undertake any required cabling work taking into account the needs, preferences and lifestyle of the client and the most efficient data transfer. Approach.
- Test the device(s)/ system.
- Document / record the set up, the agreed objectives, the reasons for the configuration and the test results.

There are also a number of generic competence areas which relate to equipment and assisted living service delivery, including to:

- Make available information about the service
- Support information seeking by the customer about services
- Record and amend customer records in paper and digital formats.
- Deliver / transport equipment
- Locate faults, repair and maintain devices and systems
- Provide emergency response to replace/repair devices/ systems
- Recover hardware and decommission device(s) and system
- Review provision and identify emerging/ changing needs and potential problems.

A number of generic competences areas that would be required to deliver an effective installation service, include:

- knowing the boundaries of safe practice;
- working in the homes of clients deemed to be 'vulnerable' in the context of safeguarding adults and children;
- understanding confidentiality and data protection;
- health and safety relating to in-home working practice.

A full mapping of these competences against existing National Occupational Standards is contained in the FAST report.[6]

Training and education to support development of these competences

There is currently no complete, stand-alone course at any qualification level that would support the development of this range of competences for this application area. Such support is currently available and accredited but through a diverse range of courses. Existing training and education provision (see Appendices 1 and 2) offers a number of possibilities.

In relation to supporting the development of person centred/ customer communication skills, the most directly relevant and coherent course in this respect is an installer module developed by Hereward College[7] for a level 2 vocationally related qualification (VRQ) 'Supporting Users of Assistive Technology' which is currently being delivered by a training organisation, CHS, and accredited by City & Guilds.[8] This focuses on supporting technically qualified installers to develop person-centred or customer relations skills when dealing with older and disabled people. The VRQ2 course and installer module could be developed to make it suitable to developing these skills in a mainstream electro-technical skilled workforce. This training could be delivered online, through distance learning, or face to face, if there are sufficient numbers of students within one organisation. The marketing for the course is not focused on the current electro-technical installer workforce, there is currently little take up and the course needs some adjustment to make it relevant to emerging technologies. It has not yet been transferred to the Qualification and Curriculum Framework (QCF) which would give it transferability and make it available for course providers to integrate with other accredited training and education, but recent discussions with C&G indicate that this could be relatively easily achieved if there was sufficient sector interest.

Using the VRQ2 course and installer module would provide a route to accreditation that is likely to supplement existing accreditation within the electro-technical workforce. Alternatively these modules could be delivered as stand-alone training within an internal training programme by existing education providers. The VRQ2 course could also be used to provide basic technical competence in the non-technical, customer focused, assisted living installation workforce. The most cost effective way to develop competence in electro-technical skills above this basic level would be to use the nationally available accredited training (see Appendix 2) that is available through most local colleges.

There are additional courses that could be used in their current format, or adjusted to support person-centred competence for an installer workforce:

- There is an accredited, generic person-centred module delivered in the NCFE Level 2 Certificate for non-care workers in care settings. The course does not currently relate to the installation area of practice. It would probably also need considerable adjustment as it is aimed at a wide range of workers in care settings who are not involved in direct care roles, whereas the reduction in multidisciplinary involvement in assisted living assessments means there is likely to be a direct care role for many installers.
- Foundations,[9] the not for profit umbrella body for Care and Repair schemes runs Trusted Technician training for the workforce who support disabled and older people and who deliver general handyman services at home, including some basic social alarm installations. These installers are likely to have good person-centred skills but are likely to have little background in delivering electro-technical installations.
- Virtual College,[10] an online education provider has developed a general telecare and telehealth course for health and social care practitioners. The college also delivers courses to support non-clinical roles outside the health

7 Hereward College: http://www.hereward.ac.uk/

8 City & Guilds course: http://www.cityandguilds.com/48094.html?sType=q&subject_or_code=Certificate+in+Supporting+Users+of+Assistive+Technology+%283070%29

9 Foundations: http://www.foundations.uk.com/home

10 Virtual College: http://www.virtual-college.co.uk/

and care sector. Virtual College could structure an online course on installation practice for assisted living which could be locally accredited. The challenge would be whether online delivery is the appropriate format to support the electro-technical installation workforce to develop customer communication skills.

- Various training providers (such as Disabled Living Foundation,[11] CuhTec,[12] etc) deliver courses for health and social care practitioners in assisted living. They could possibly develop a suitable course though this would be locally accredited. None currently have a track record on delivering installation learning.
- The University of Coventry[13]) delivers courses at foundation degree level and above on assistive technology/ assisted living. The foundation degree is currently delivered mainly through distance learning. Such course providers would need to develop modules to deliver installation learning.

There are, in contrast, a large number of courses based on well developed framework of competences mapped at a national level to support electro-technical competence (see Appendix 2 for listing of relevant courses and providers). It would be relatively easy for existing assisted living/ assistive technology training providers to develop, over the course of the next 6 months, some supplementary installation training that would fit within a national qualification structure. Although it would have formal, national recognition as an accepted sector qualification, which is only achieved through a mapping exercise conducted by a Sector Skills Council, through building consensus across the sector, this is what could be achieved in practice. It might then be possible to attain some level of professional body recognition for such a qualification/ standard, through bodies such as the Institute of Engineering and Technology, College of Occupational Therapists, etc. In the meantime there is a range of ways in which current employers can take forward their training programmes to support their installation workforce:

In-house training:
For employers who currently support their installation staff through in-house training there is the opportunity to use the framework of competences outlined in this report to identify gaps and identify learning material and training providers to fill the gaps.

Professionally recognised training:
For employers and individuals who support or undertake professionally accredited training in a related area, once they have identified the gaps in their current training provision and worked with the relevant professional body to gain consensus and approval to fill the gaps, there is the opportunity to develop a stand-alone course for their members or to identify supplementary external courses that, together would constitute a qualification recognised by the professional body.

Nationally recognised training:
Many courses, accredited at a range of levels by a range of examining bodies, offer modules that would support the development of the individual competence areas. These courses are currently aimed at fairly diverse student groups. The design of the Qualification and Curriculum Framework (QCF) is such that it should be possible to bring together relevant competences/ education modules to create a stand-alone

11 DLF: http://www.dlf.org.uk/content/training-and-events
12 Cuhtec: http://www.cuhtec.org.uk/
13 University of Coventry: http://wwwm.coventry.ac.uk/ptshortcpd/ugpt/pages/ugpt.aspx?itemID=1191&yoe=2011

course. Similarly it would be possible to develop course content aimed at specific student groups and integrate this with their existing training and education, for example for those with technical skills that need to develop and demonstrate person-centred skills, and vice versa. To ensure national recognition as a qualification for installation staff for assisted living a process of sector agreement will need to be undertaken by a Sector Skills Council. However a de factor agreement could also be operational until such a process is undertaken.

Appendix 1: Training to support person-centred competence

Person-centred with some focus on assisted living installation practice:

Provider	Course title	Level/ Accreditation	Awarding body	Format	Status	Comment
Foundations	Trusted Technician	Open College Network (OCN)	OCN	Workshops	Available	Focused on aids to daily living more than on assisted living
CHS	Supporting users of assistive technology: installer module	Vocationally Related Qualification (VRQ) Level 2	City & Guilds	Paper based or face to face for organisations with a sufficient number of students	Not transferred to QCF yet as viability of the course is in question	

Person-centred but not focused on assisted living installation practice:

Provider	Course title	Level/ Accreditation	Awarding body	Format	Status	Comment
DLF	Various	n/a	OCN	Face to face	Available	No course specifically but these organisations have the potential to develop a course, possibly.
Virtual College	Various	n/a	Virtual College	Online	Available	
Cuhtec	Various	n/a	Cuhtec	Face to face	Available	
University of Coventry	Assistive Technology	Foundation Degree	University of Coventry	2 year, part time. Online	Available	Focus on assistive technology including assisted living.
University of Coventry	Masters in Assistive Technology	Masters Degree (MSc)	University of Coventry	Part time. Individual modules available as part of continuing professional development.	Available	Focus on assistive technology including assisted living.
Various universities	Electronic AT degree courses (part of career progression for Clinical Technician roles)	Degree and post graduate	Relevant Universities	Only accessible as part of degree courses	Available	Focus on assistive technology including assisted living.

Appendix 2: Training to support technical competence

Source: National Database of Accredited Qualifications: Telecomms, Electrical and Security Technician Roles (Accessed June 2010)

Qualification Title Current	Qual. Latest Level	Qual. Type	Qualification Reference Code	Organisation Acronym
City & Guilds Level 1 NVQ for IT Practitioners	1	NVQ	100/4767/0	City & Guilds
PAA\VQSET Level 1 NVQ in Performing Engineering Operations	1	NVQ	500/2960/5	PAA\VQSET
RSPH Level 1 Award in Hazard Awareness	1	VRQ	500/3340/2	RSPH
City & Guilds Level 1 IVQ Certificate in Electrical Installation	1	VRQ	500/6022/3	City & Guilds
CCEA Level 1 Award in Occupational Studies (Engineering and Engineering Services)	1	OG	500/8149/4	CCEA
City & Guilds Level 2 Progression Award in Electrical Electronics Servicing: Consumer/Commercial Electronics	2	VRQ	100/1752/5	City & Guilds
EAL Level 2 Certificate in Engineering and Technology	2	VRQ	100/2953/9	EAL
City & Guilds Level 2 Certificate in Communications Cabling	2	VRQ	100/3321/X	City & Guilds
City & Guilds Level 2 Certificate in Electrotechnical Technology	2	VRQ	100/3569/2	City & Guilds
EAL Level 2 NVQ in Engineering Maintenance and Installation	2	NVQ	100/4531/4	EAL
City & Guilds Level 2 NVQ in Engineering Maintenance and Installation	2	NVQ	100/4532/6	City & Guilds
EAL Level 2 NVQ in Installing Structured Cabling Systems	2	NVQ	100/4719/0	EAL
City & Guilds Level 2 NVQ for Communication Technologies Practitioners	2	NVQ	100/4755/4	City & Guilds
EAL Level 2 NVQ in Electrical and Electronic Servicing	2	NVQ	100/4895/9	EAL
EDEXCEL Level 2 NVQ for Communication Technology Practitioners	2	NVQ	100/4982/4	EDEXCEL
EAL Level 2 NVQ in Performing Engineering Operations	2	NVQ	500/1448/1	EAL
City & Guilds Level 2 Diploma for Digital Home Technology Integrators	2	VRQ	500/1955/7	City & Guilds
NCFE Level 2 Certificate for Non-Care Workers in Care Settings	2	VRQ	500/2128/X	NCFE
EDEXCEL Level 2 NVQ in Performing Engineering Operations	2	NVQ	500/2466/8	EDEXCEL
PAA\VQSET Level 2 NVQ in Performing Engineering Operations	2	NVQ	500/2953/8	PAA\VQSET
EDEXCEL BTEC Level 2 Diploma in ICT Professional Competence (QCF)	2	QCF	500/3472/8	EDEXCEL
EDEXCEL BTEC Level 2 Certificate in ICT Systems and Principles for Apprentices (QCF)	2	QCF	500/3473/X	EDEXCEL
City & Guilds Level 2 Diploma in ICT Professional Competence (QCF)	2	QCF	500/3474/1	City & Guilds
City & Guilds Level 2 Award in ICT Systems	2	QCF	500/3475/3	City & Guilds

Qualification Title Current	Qual. Latest Level	Qual. Type	Qualification Reference Code	Organisation Acronym
and Principles for Apprentices (QCF)				
City & Guilds Level 2 Certificate in Fundamental Inspection, Testing and Initial Verification	2	VRQ	500/3516/2	City & Guilds
ABC Level 2 Award in Building Services Engineering	2	VRQ	500/3926/X	ABC
ABC Level 2 Award in Performing Electrical Installation Operations	2	VRQ	500/3944/1	ABC
City & Guilds Level 2 IVQ Diploma in Engineering Skills	2	VRQ	500/5770/4	City & Guilds
City & Guilds Level 2 IVQ Technician Certificate in Electrical and Electronic Engineering	2	VRQ	500/5812/5	City & Guilds
City & Guilds Level 2 IVQ Diploma in Electrical Installation	2	VRQ	500/6026/0	City & Guilds
City & Guilds Level 2 Certificate in Knowledge of Electronic Security and Emergency Systems (QCF)	2	QCF	500/6209/8	City & Guilds
City & Guilds Level 2 Certificate for Home Technology Integrators (QCF)	2	QCF	500/6502/6	City & Guilds
City & Guilds Level 2 Award for Digital Home Technology Integrators (QCF)	2	QCF	500/6541/5	City & Guilds
City & Guilds Level 2 Award for Digital Home Technology Integrators (QCF)	2	QCF	500/6541/5	City & Guilds
EDEXCEL BTEC Level 2 Diploma in Applied Science (QCF)	2	QCF	500/6671/7	EDEXCEL
EDEXCEL BTEC Level 2 Extended Certificate in Applied Science (QCF)	2	QCF	500/7453/2	EDEXCEL
EDI Level 2 Diploma in ICT Professional Competence (QCF)	2	QCF	500/8008/8	EDI
CCEA Level 2 Award in Occupational Studies (Engineering and Engineering Services)	2	OG	500/8147/0	CCEA
ETCAL Level 2 NVQ in Electrical and Electronic Servicing	2	NVQ	500/8485/9	ETCAL
City & Guilds Level 2 Award in Communications Cabling (QCF)	2	QCF	500/8616/9	City & Guilds
EDEXCEL Level 3 BTEC National Certificate in Telecommunications	3	VRQ	100/1440/8	EDEXCEL
EDEXCEL Level 3 BTEC National Diploma in Telecommunications	3	VRQ	100/1441/X	EDEXCEL
City & Guilds Level 3 Progression Award in Electrical and Electronics Servicing	3	VRQ	100/2769/5	City & Guilds
City & Guilds Level 3 NVQ in Electrotechnical Services	3	NVQ	100/2854/7	City & Guilds
EDEXCEL Level 3 BTEC National Award in Telecommunications	3	VRQ	100/3085/2	EDEXCEL
Lantra Awards Level 3 NVQ in Electrotechnical Services	3	NVQ	100/3104/2	Lantra Awards
EAL Level 3 NVQ in Engineering Maintenance	3	NVQ	100/3157/1	EAL
EAL Level 3 Diploma in Engineering and Technology	3	VRQ	100/3226/5	EAL
EAL Level 3 Diploma in Engineering and Technology (Progressive)	3	VRQ	100/3298/8	EAL
City & Guilds Level 3 Diploma in ICT	3	VRQ	100/3566/7	City & Guilds

Qualification Title Current	Qual. Latest Level	Qual. Type	Qualification Reference Code	Organisation Acronym
Communications Systems				
City & Guilds Level 3 Certificate in Electrotechnical Technology	3	VRQ	100/3602/7	City & Guilds
City & Guilds Level 3 NVQ in Engineering Maintenance	3	NVQ	100/3790/1	City & Guilds
City & Guilds Level 3 Certificate in Management of Electrical Equipment Maintenance (Code of Practice for In-Service Inspection)	3	VRQ	100/4338/X	City & Guilds
EAL Level 3 NVQ in Electrotechnical Services	3	NVQ	100/4720/7	EAL
City & Guilds Level 3 NVQ for Communication Technologies Professionals	3	NVQ	100/4756/6	City & Guilds
EAL Level 3 NVQ in Electrical and Electronic Servicing	3	NVQ	100/4896/0	EAL
EAL Level 3 NVQ in Electrical and Electronic Engineering	3	NVQ	100/4951/4	EAL
EDEXCEL Level 3 NVQ for Communication Technology Professionals	3	NVQ	100/4983/6	EDEXCEL
ETCAL Level 3 NVQ in Electrical and Electronic Engineering	3	NVQ	100/5685/3	ETCAL
City & Guilds Level 3 Diploma in Designing and Planning Communications Networks	3	VRQ	100/5693/2	City & Guilds
EDEXCEL Level 3 BTEC National Award for IT Practitioners	3	VRQ	500/1594/1	EDEXCEL
EDEXCEL Level 3 BTEC National Diploma for IT Practitioners	3	VRQ	500/1595/3	EDEXCEL
EDEXCEL Level 3 BTEC National Certificate for IT Practitioners	3	VRQ	500/1596/5	EDEXCEL
City & Guilds Level 3 Advanced Diploma for IT Professionals	3	VRQ	500/1724/X	City & Guilds
Edexcel Level 3 BTEC National Award in Communications Technology	3	VRQ	500/1827/9	EDEXCEL
Edexcel Level 3 BTEC National Diploma in Communications Technology	3	VRQ	500/1828/0	EDEXCEL
Edexcel Level 3 BTEC National Certificate in Communications Technology	3	VRQ	500/1829/2	EDEXCEL
City & Guilds Level 3 Advanced Diploma for IT Professionals	3	VRQ	500/3314/1	City & Guilds
City & Guilds Level 3 Certificate in the Requirements for Electrical Installations (16 to 17th edition update BS7671 June 2008)	3	VRQ	500/3446/7	City & Guilds
City & Guilds Level 3 Certificate in the Requirements for Electrical Installations (BS 7671 June 2008)	3	VRQ	500/3451/0	City & Guilds
EDEXCEL Level 3 BTEC Certificate in ICT Systems and Principles for Apprentices (QCF)	3	QCF	500/3470/4	EDEXCEL
EDEXCEL Level 3 BTEC Diploma in ICT Professional Competence (QCF)	3	QCF	500/3471/6	EDEXCEL
City & Guilds Level 3 Certificate in ICT Systems and Principles for Advanced Apprentices (QCF)	3	QCF	500/3476/5	City & Guilds
City & Guilds Level 3 Diploma in ICT Professional Competence (QCF)	3	QCF	500/3477/7	City & Guilds
EAL Level 3 Diploma in Requirements for	3	VRQ	500/3483/2	EAL

Qualification Title Current	Qual. Latest Level	Qual. Type	Qualification Reference Code	Organisation Acronym
Electrical Installations (BS 7671: January 2008) Update				
EAL Level 3 Diploma in Requirements for Electrical Installations (BS 7671: January 2008)	3	VRQ	500/3484/4	EAL
City & Guilds Level 3 Certificate in the Certification of Electrical Installations	3	VRQ	500/3517/4	City & Guilds
EAL Level 3 Diploma in Electrotechnical Services	3	VRQ	500/3526/5	EAL
EAL Level 3 Diploma in Inspecting and Testing Electrotechnical Systems and Equipment	3	VRQ	500/3542/3	EAL
EDEXCEL Level 3 BTEC Diploma in Engineering (Electrical / Mechanical)	3	VRQ	500/3895/3	EDEXCEL
EDEXCEL Level 3 BTEC Extended Certificate in Engineering (Electrical / Mechanical)	3	VRQ	500/3897/7	EDEXCEL
EDEXCEL Level 3 BTEC Award in Engineering (Electrical / Mechanical)	3	VRQ	500/3905/2	EDEXCEL
ABC Level 3 Award in Building Services Engineering (Electrical)	3	VRQ	500/3925/8	ABC
ABC Level 3 Award in Building Services Engineering Mechanical	3	VRQ	500/3943/X	ABC
City & Guilds Level 3 IVQ Technician Diploma in Electrical and Electronic Engineering	3	VRQ	500/5762/5	City & Guilds
City & Guilds Level 3 IVQ Advanced Diploma in Electrical Installation	3	VRQ	500/6029/6	City & Guilds
EDEXCEL Level 5 BTEC Higher National Certificate in Electrical/Electronic Engineering (Current NQF Level)	5	HL	100/3055/4	EDEXCEL
EDEXCEL Level 5 BTEC Higher National Diploma in Electrical/Electronic Engineering (Current NQF Level)	5	HL	100/3056/6	EDEXCEL
BCS Level 5 Diploma in IT	5	HL	100/6190/3	BCS
City & Guilds Level 5 IVQ Advanced Technician Diploma in Electrical and Electronic Engineering	5	HL	500/5805/8	City & Guilds