Smart Thermostats: Market Analysis for Social Landlords

1. Overview

Introduction

With connected home technology finding its way into an increasing number of residential homes the Connected Home Consortium has put together this guide to assess the benefits this technology can offer social landlords. With the market for consumer 'Internet of Things' (IoT) devices currently driving the connected home sector, we have evaluated the top Smart Thermostat technology currently available to buy and provided analysis on how viable these products are for use by UK housing providers.

Why Smart Thermostats?

From a commercial perspective the standout 'Internet of Things' product has been the Smart Thermostat. Big name brands such as British Gas's Hive and Google's Nest have successfully placed these devices into 100,000s of owner occupier homes and made major inroads toward mainstreaming the technology through their partnerships with big energy companies. Smart thermostats therefore offer a natural point of entry to the world of connected technology.

The success of smart thermostats is rooted in the clear payback they offer users. Manufacturers and the energy companies backing these products have been promoting the potential energy savings available to households who connect their home's heating systems to the internet. To take one example, tado° claim their product can save up to 31%[1] on energy bills, with the UK average Gas spend £752 in 2014[2] smart thermostats potentially offer a very quick return on investment. The rise also coincides neatly with the soaring use of mobile devices being used to access the internet[3] and the growth in popularity of online banking[4] indicating a shift in the UK population's attitude toward the services and products they are comfortable controlling online.

What Does a Smart Thermostat even do?

Smart thermostats replace the timer device most homes use to control their heating and hot water. A smart thermostat will be connected to the internet and this will allow the user to control and programme their heating from anywhere they can get online. Many systems also detect your presence in the home using a variety of sensors and can automatically turn your heating off when you are out. It is this combination of automation and increased information and control that smart thermostat manufacturers believe will change the way consumers interact with their heating system and save them money in the process.

Potential business case for investing in smart thermostats

Why should housing providers invest in smart thermostats?

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[1] tado° (2015) https://www.tado°.com/gb/heatingcontrol-savings

[2] DECC (2015) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415794/qep231.xls

[3] ONS (2014) http://www.ons.gov.uk/ons/dcp171778_373584.pdf

[4] BBA (2014) https://www.bba.org.uk/news/press-releases/britains-bank-customers-use-internet-banking-7-billion-times-in-just-one-year/#.VXV0Tka6Kiq

As outlined above smart thermostats offer savings to residents on their energy bills through technology which is relatively low cost. The business case for investment in smart thermostat systems is usually based on a similar case as presented for other energy saving technologies. Payback is achieved through fulfilling either or both of the following goals:

1. Delivering fuel poverty targets set by Housing Providers in a cost effective way
2. Increasing rent payments through reducing residents' expenditure on energy

If housing providers are satisfied with achieving the first goal as payback for investment in a smart thermostat system, then many of the market ready consumer products will be appropriate to roll out at scale now.

If goal 2 comes into play, it is worth taking a critical look at patterns of arrears post fuel saving interventions. As yet there is not robust evidence that initiatives to save residents money on their household expenditure feed into increased instances of rent payment. This is because of the many items of expenditure in a household's budget, paying rent appears low down the list with food, energy, council tax, credit card and other debt repayments all taking priority.

This does not mean that smart thermostats are not viable in housing stock but that alternative streams of value for the housing provider need to be identified.

At the Connected Home Consortium we believe providing the landlord with access to data generated in the home will offer a range of opportunities to transform service delivery. Providing better and more efficient services to residents can provide the returns on investment which justify implementation of a smart thermostat system.

Business Transformation

How can access to smart thermostat data offer a return on investment?

Connected technology allows us to understand how we use our homes in detail we have never previously had access to. Connected products use sensors to learn about our environment and data analysis tools to understand our interaction with that environment.

These insights will allow housing providers to provide services in new ways and in some instances re-imagine the types of services they will offer residents in the future.

We have identified three key areas in which smart thermostats have the potential to provide insights:

- Energy use and management
- Accommodation use and management
- Tenancy Management

Energy Use and Management

Smart thermostats are attractive to residents as they are a tool to save money on their energy bills. Housing providers could use information on the energy use and energy profile of the building to recommend tailored energy saving advice. It can also help identify cases of fuel poverty. Housing providers could use this data to design future energy efficiency improvements based on a real understanding of the thermal characteristic of their housing stock.

Accommodation use and Management

Smart heating systems have the potential through landlord access to their sensor data to provide business relevant information about the way a property is used. This has applications in three main areas: 1. Boilers and Gas Safety 2. Assisted Living 3. Building Management

Boilers and Gas Safety: Smart thermostat systems are in a unique position to gather information about the health and operational efficiency of the boiler. As data analysis techniques advance it will be possible to predict breakdowns and schedule repairs accordingly. Moving from reactive to predictive repairs offers a clear cost saving on maintenance bills and provides a far superior service to tenants. In the long run it is possible that this technology could replace the needs for an annual gas safety inspection with homes constantly monitored.

Assisted living: Using data collected about how a vulnerable person uses a property, patterns of use can be identified. Deviations from these patterns may be used in conjunction with other data sources to alert a carer or schedule other forms of social care intervention before a severe issue occurs.

Building Management: Understanding how frequently areas in the home are used will allow housing providers to plan maintenance schedules based on hours of use as opposed to fixed cyclical repair refurbishment programmes.

Tenancy Management

Data from smart thermostat systems could feed into systems to detect illegal subletting. Data could also be used to help customer service teams and maintenance operatives make contract with residents based on when they are likely to be in the property.

These use cases are just some of the possible advanced applications of smart thermostat data in the home. As more devices become connected and more data sources derived, many more possible forms of insight and service delivery will open up.

IoT, Big Data and Smart Thermostats

The range and quality of data available from smart thermostats are contingent on how these devices are situated in the connected home ecosystem. As smart thermostats are likely to be one of the first connected devices to make it into most homes, the smart thermostat is in a unique position to become a hub for other 'internet of things' devices to connect to. Smart Lighting, smoke alarms, connected boilers, keyless entry devices and energy monitoring systems are some of the many IoT components which will look for other connected devices to interact with. Some Smart thermostat makers have recognised this and are beginning to expand their application layer to interact with more devices. In the future we predict there will be fierce competition to control who has access to data generated in the home, with companies competing to capture value through offering services based on user data.

Ensuring that these initial IoT devices are built to specifications which enable us to build the connected home ecosystem we desire in the UK housing sector is fundamental. Any connected technology needs to be able to provide us with open access to the sensor data it collects and use communication protocols that allow a sufficient degree of interoperability. Privacy and security are also key concerns when installing networked sensors. Systems must be designed to respect the privacy of users while also using data to generate insight.

The Connected Home Consortium is therefore looking to the technology sector to adapt to the specific requirements of the UK Housing sector and is recommending products which demonstrate a commitment to working towards this specification.

2. Market Conditions

Overview

This year the consumer market for smart thermostats is showing signs of maturity. 2014 saw lots of new devices entering the market and the major energy companies partnering with smart thermostat manufactures to provide their technology with deferred payments and at discounted rates. British Gas's Hive claims to have 200,000 units installed, a significant number for this new technology. The products available are also maturing in a way not seen with other IoT devices. Version 2 Nest is now available and software updates have added new features and refinements to devices already in the wild.

A basic level of functionality is becoming uniform across the consumer market. However features that consumers expect from a Smart Thermostat product diverge from those that a social landlord requires to derive value from a smart thermostat system. Below are the common features which have come to define the Smart Thermostat product in the consumer market:

Defining Consumer Features

Remote Heating and Hot water Control

Using a smart phone, tablet or other mobile device as the controller for the heating system is the key feature in this market. Granularity of control over the heating programme varies between products and not all systems can control hot water, although the trend is for manufacturers to add this feature.

Home Heating Data

A key advantage of a smart heating system is the ability for the user to access data on heating and energy use in the home. Data is usually available through an online portal accessed via the user's device while some data is displayed on the smart thermostat unit. How this data is presented varies across products with some manufacturers including energy price data and energy usage targets to incentivise energy saving.

Smart Occupancy / Geo-Fencing

Geo-fencing uses a smart phone's GPS function to communicate when a user is likely to be returning home. This allows the smart thermostat to begin to heat the home before a resident's arrival. PIR occupancy sensors can be used to tell the system when particular rooms are in use and adjust heat to these rooms accordingly.

Learning / Smart Scheduling

At present there is a divide between systems which offer the user increased control of the heating systems and those which attempt to manage heating for the user. Learning systems fall into the latter category, adapting to the users' habits and preferences. Some use weather data to complement these insights. This is a very new way of managing a home service and will take some

time to be fully embraced by all users, but we predict that the ability of machines to get this right will become increasingly clear and learning will become a must-have feature.

Design and Usability

Smart thermostats straddle the line between being a high end consumer tech product and a household utility. Manufacturers have gone the route of designing products to appeal to consumers' desire to interact and use aesthetically pleasing items. This is a positive move to encourage uptake, interest and long term engagement with an item which has often been presented in a utilitarian form.

Granularity of Control of Heating Zones

Of all the features detailed in this section, granularity of heating control offers the most to both resident and landlord. The ability to control multiple zones in the house allows for much greater efficiency in heating of the home. Rooms which are not occupied are not heated, saving energy and money. For the landlord this function also provides additional data on multiple parts of the house, enabling insights to be gained into how the space is used. Currently a number of levels of granularity exist:

- 1 Zone - Thermostat measures the temperature in one area and heats the whole house to this level
- Multiple Zones – Thermostat in each plumbing zone in the house, heating in each zone is independent
- Remote TRV Control – Occupancy and temperature determine the flow to each TRV fitted radiator. This allow the most granular control of the heating system

What are the requirements for social landlords?

The above features are the pull factors drawing consumers towards a Smart Thermostat system and will drive demand for these products from a landlord's residents. However they do not in themselves off a value proposition to the social landlord.

We have identified the key functionality social landlords require:

Implementation

Social landlords will need to roll out at scale a simple installation process requiring the minimum of contractor training.

The ability for the smart thermostat to work with a wide variety of heating configurations is also an advantage.

Connectivity

Currently most systems require broadband connection. As data connectivity becomes ubiquitous this will not be an issue. However where landlords are wanting to ensure universal solution, or want to reduce dependency on household broadband, other connectivity technologies should be considered. Currently cellular and long range mesh network technologies such as SigFox are some of the methods of achieving this. At this stage in the market's development, Housing providers concerned about this may want to hold back and see what the market delivers over the next 12-18 months.

Support

How these devices will be supported is a crucial question for Housing Providers. Devices that can be supported by the manufacturer will have an advantage here.

Data

Housing providers will require access to data generated from Smart Thermostat systems. This may come in the form of a dashboard control designed by the manufacturer and ideally with an API so that data can be fed into a Housing Provider's other databases and management tools.

Privacy and Security

Ideally data would remain property of the resident and the housing provider. Setting up robust agreements over who has access to this data is vital in assuring residents of the integrity of the system and ensuring housing providers can generate value from the data.

The security between devices in the home and between the system and remote servers should be of industry standard security. Security protocols for the IoT are still being developed so a commitment to keeping up with developments on this issue is essential, as is a commitment to maintain the security of the device once it has been installed.

Identifying Gaps in the Market

Of the products on the market, none fulfil all of the above requirements. This is to be expected as devices marketed specifically to landlords are almost non-existent. Many of the devices provide some of these features or have the ability to add these features in the future but require direction to get there. As is the case with many 'Internet of Things' products, manufacturers struggle to fully comprehend the needs and requirements of Housing Providers, although those which have engaged with housing previously are able to meet some of these requirements successfully.

A significant gap in the market exists for a supplier that can produce a device which can support current housing needs with ability to expand and accommodate the business transformation possible as more devices become connected.

3. A Criteria for a Smart Thermostat Designed for Social Landlords

1. **Price**

The per home cost of the system including installation and ongoing costs

2. **Ease of implementation – including connectivity**

The ease at which housing providers can roll the product out, including installation and ability to communicate with existing communication infrastructure.

3. **Ease of use for tenant – including support**

Usability and feature available to the tenant. How well the system can provide the benefits listed in the consumer features section

4. **Granularity of Control – (1 zone/multi-zone/TRV control)**

The number of independent heating zones that can be controlled. Those with a low marginal cost per zone are rated more highly

5. Data available to landlord

The data available to landlord and the form this is presented in full landlord API access is preferred.

6. Security

Security protocols implemented and commitment to maintaining these in the future.

7. Future Outlook

The ability of the system to be forward compatible and the commitment of the manufacturer to support further IoT developments

4. Assessment of Products

Products assessed based on above specification and given an overall rating:

tado°

The tado° device is well established in Germany and is among the biggest suppliers in the UK. tado° advertise an impressive energy saving of up to 31% based on a thermal dynamics simulation. Of the smart thermostats available on the market tado° offers some of the most advanced features for landlords, with tado° care as a standout feature. Access to an API means housing providers could integrate tado° data with their building management data and perform their own analytics. tado° is competitively priced for a single zone system. However it does not score well as a multi-zone product with the ability to control only one heating circuit and without the ability to control radiator TRVs. tado° is however very future-orientated - they have informed us that TRV controls are in the pipeline as is the ability to control multiple heating circuits.

1. **Price 7/10**
   tado° is priced at £199 for a single zone system there is an additional cost of £79 for Hot Water control (tado° Extension Box) and £50 installation
2. **Ease of implementation 6/10**
   The tado° thermostat replaces an existing thermostat in the home. The extension box replaces the programmer. Both are designed with standard back plate fittings. Installation requires creating a tado° account and registering the tado° devices online.
   tado° must be connected to a broadband connection to operate.
3. **Ease of use for tenant 7/10**
   The tado° system offers a range of learning features, including algorithms to calculate the heat profile of the home. Weather data and the location of users (via geo-fencing) are also used to determine when the heating should be turned on. tado° provides historic heating and boiler data to the user through its mobile device app and through a web portal. Both the app and the device follow a minimalist design aesthetic.
4. **Granularity of Control 3/10**
   Currently tado° can only control a single heating zone in the house but it has the hardware capability of controlling other heating circuits. This feature is due to be enabled via a software update this year
5. **Data available to Landlord 7/10**

tado° currently does not provide any dashboard services to landlords; however an API is available. Housing providers could use this to take data from the smart thermostat system.

6. **Security 8/10**
   Encryption is used between devices in the home and the hub and between the hub and the cloud.

7. **Future Outlook 9/10**
   tado° have already implemented a number of integrations with other smart home technologies and automation tools such as If This Then That (**IFTTT)** with more due further down the line. The most exciting prospect at tado° is tado° care which will monitor the boiler's health remotely and provide self-fixing advice and contact a boiler technician if needed. The potential for this data to feed into a housing management system and provide insight on pre-emptive repairs is huge.

   OVERALL RATING: 47/70

HEAT Genius

Heat Genius offers one of the most advanced systems on the market for controlling multiple heating zones however this granular control comes at a price, with the Heat Genius systems coming in as the most expensive system in our comparison. While offering some of the biggest potential for savings on heating, Heat Genius has so far not developed open APIs or a landlord control platform to make the most out of the vast amount of data generated by the system.

1. **Price 2/10**
   £249.99 for 1 zone heating control plus £49.99 for hot water control. Individual radiator controls cost 59.99 and sensors to detect presence are £34.99 Total price for a 3 bed room flat around £600. Heat Genius do offer a cheaper 2 zone only system at £299 but we feel this neglects to take advantage of Heat Genius's prime feature: the ability to control each room independently.

2. **Ease of Implementation 4/10**
   Heat Genius requires a professional install which takes around 3 hours. This reflects the complexity of a system which can have a presence in every room in the home.

3. **East of use for Tenant 8/10**
   Heat Genius learns how each room is used and heats each room accordingly. PIR sensors allow the system to make corrections and respond to out-of-routine use. This allows for almost full automation of the heating programme enabling the user to relinquish control of the heating system.

4. **Granularity of Control 10/10**
   Heat Genius allows each room to be controlled individually allowing for full granular control but at a significant cost per room

5. **Data available to Landlord 5/10**
   Currently there are no landlord focused tools for managing the system and no API to enable 3rd party access. Heat Genius plan to release an API for IFTT in the future along with a landlord focused dashboard to manage multiple homes.

6. **Security 8/10**
   Home data is stored locally on the hub. This means the system can be controlled without an internet connection within the home (although local WIFI network is required). Storing data locally offers the resident good protection against unauthorised access.

7. **Future Outlook 6/10**

Heat Genius are releasing an API in the future however it is not clear if this will allow access to the hub data. The system is being adapted to control underfloor heating and electric heating systems.

OVERALL RATING: 43/70

Heat Miser - Neo

Heat Miser produce a range of non-smart thermostats and have recently added a range of wireless and smart products to their offering. These products straddle the line between smart and standard thermostats allowing full user control of the heating at the wall. This functionality is a good fail safe and useful where no data connection is available. Neo does not have the advanced learning features of some of its competitors and cannot detect room to room occupancy but does learn required heating start times for each thermostat.

1. **Price 6/10**
   Heat Miser costs £264.10 for a 1 zone system with hot water control. Additional thermostats to control additional heating zones cost £69.00. The low cost for additional thermostats makes Neo one of the cheapest systems to control multiple zones if you have these configured in the property.
2. **Ease of Implementation 8/10**
   The Neo thermostat system varies from many other systems by replacing each existing non smart thermostat with a programmable smart thermostat. This means individual thermostats can be programmed at the wall without a data connection, useful in homes without a broadband connection. Installation involves simple rewiring and the pairing of each thermostat via the smartphone app.
3. **East of Use for Tenant 7/10**
   Neo features geo fencing via GPS to allow the system to begin heating as the user is returning home. Neo lacks advanced routine learning relying on user intervention and programming for most of the control. However Neo does learn the thermal dynamics of the room so the heating switches on at the optimal time to reach the desired temperature.
4. **Granularity of Control 6/10**
   Neo can control individual heating circuits at a marginal cost of £69 which is more competitive than many of the other single zone systems. As yet there are no known plans to implement TRV control.
5. **Data Available to Landlord 6/10**
   Neo offer an API to partners which could allow integration with a landlord's housing management system. It should be noted that only temperature data and geo location data is generated from this system which provides a limited source of data on occupancy. Neo devices communicate using a custom protocol over Zigbee which a number of smart home products use. This leaves room for further integration with other devices potentially offering more data sources, Control4 have developed a platform to control the Neo device.
6. **Security 4/10**
   Security between devices is through the Zigbee protocol, we do not have details of the security between the hub and the cloud
7. **Future Outlook 5/10**

It is difficult to discern where Heat Miser Neo will go next. The ability to communicate with other devices over Zigbee means Neo can be controlled by a third party automation platforms, however Heat Miser do not have any plans to build their own platforms.

OVERALL RATING: 42/70

Inspire Home Automation

Inspire Home Automation is designed for use in the Private Rented Sector and offers features for landlords who manage multiple properties. The system is particularly suited to environments where communal heating is provided as part of the rent and where heating may be used excessively.

1. **Price 9/10**
   A 1 zone system with hot water control costs £179.99 with a wireless thermostat. Additional wireless thermostats cost £100 per zone. This makes Inspire Home Automation one of the cheaper systems currently on the market
2. **East of Implementation 7/10**
   Installation requires replacing existing thermostats, a 30 minute job according to Inspire Home Automation. The system can be controlled from the wall units without the need for an internet connection.
3. **Ease of use for Tenant 2/10**
   Currently the landlord version of the Inspire system does not offer access to heating control or data on the heating use in the home. This is because the system is designed for landlords to maintain complete control of this function. As detailed above, this may be useful in some tenancies; however this will not be suitable for residents who pay their own energy bills.
4. **Granularity of Control 6/10**
   A total of 3 previously configured heating zones (including a hot water channel) can be controlled using wireless thermostats. Additional thermostats are competitively priced
5. **Data available to landlord 6/10**
   Landlords have full access to data generated by the Inspire Home Automation System. The data available includes historic and current temperatures and schedules and instances of user intervention/tampering with the local device. As the system does not use sensors to detect presence, occupancy data is not available. The landlord's dashboard can show data from multiple properties side by side.
6. **Security N/A**
   We have so far not received any information about security from Inspire Home Automation so cannot provide a rating for this criteria.
7. **Future Outlook 6/10**
   Inspire Home Automation are planning to release a feature to allow residents to gain remote access to the heating system and access some of the data generated. Levels of access will be managed by the landlord. Inspire Home Automation also hope to integrate control of smart lighting systems and provide control for storage and panel heaters.

OVERALL RATING: 36/70

PassivSystems – PassivLiving

PassivLiving offer a basic smart thermostat system which allows remote control of the home's heating but lacks the ability to control multiple heating zones and does not feature occupancy sensing. However PassivLiving does offer strong features to landlords. Drawing on Passiv's systems expertise in heat pump and solar management, Passiv offer an advanced energy management dashboard that can present not only basic heating data but which can be integrated with solar energy generation and other energy management data sources.

1. **Price 6/10**
   A single zone system costs £279.00 plus £50 for Hot Water control. Installation is included in this price. Passiv charge a service fee of £3 a month after the first 12 months.

2. **Ease of Implementation 7/10**
   Installation takes around 1 hour. A data connection is required to use remote control and programming features however the temperature can still be controlled manually from the locally installed device.

3. **Ease of Use for Tenant 7/10**
   PassivLiving allows tenants to control their heating remotely using a smart phone application and online portal. This features scheduling and a quick settings for the user to indicate their occupancy. The online portal provides information on cooling and heating times in addition to external temperatures, to allow the user to better understand the heating dynamics of their home. The system does not detect occupancy using sensors and relies on the user to manually provide this information. The system borrows algorithms from the PassivPro system for understanding the thermal properties of the building. This optimises heating switch on points for efficiency.

4. **Granularity of Control 2/10**
   PassivLiving only controls one heating zone in the house. Additional thermostat and TRV control are not available but are part of Passiv's development plans.

5. **Data Available to Landlord 8/10**
   PassivLiving's strongest feature is its ability to integrate with the PassivPro energy monitoring system. This allows landlord access to all heating data generated in a dashboard. The same system can also monitor PV generation data and the heat pumps. For stock with energy generation capacity, this will be a particularly useful integration. APIs are also available for partners and third parties.

6. **Security 7/10**
   Z-Wave protocol is used to connect devices in the home using standard z-wave security. An encrypted connection is used between the hub and PassivSystems servers.

7. **Future Outlook 8/10**
   Passiv are committed to developing a dashboard platform which facilitates the needs of social landlords with plans for integration with demand management services and asset management systems. There strong presence in the solar energy monitoring market provides a solid platform on which to expand this functionality. They are also planning remote boiler management.

   OVERALL RATING: 45/70

OpenTRV

OpenTRV do not yet have a market ready product however their ambitious vision for smart thermostats make them worthy of inclusion here. We have accordingly not given them a rating for each category. OpenTRV are developing an open platform with the aim of incentivising maximum adoption through on-boarding of third party manufactures. OpenTRV's genuine commitment to creating a product that is energy saving at a low price point and offers great features to social landlords is why we think OpenTRV are one to watch.

1. **Price N/A**
   OpenTRV do not currently have a market ready product but as a guide to price they aim to sell Smart TRV valves at around £10 per unit significantly cheaper than the current market rate.
2. **Ease of Implementation N/A**
   The system is designed to work autonomously of an internet connection or smart device. Installation will require the installation of a hub the fitting of individual radiator TRVs.
3. **Ease of use for Tenant N/A**
   OpenTRV is designed for full autonomous operation, detecting presence using light sensors and learning the routine of the residents. All OpenTRV data is available to the resident JSON format from the hub or can be accessed on 3rd party cloud sensor platforms such as opensensors.io
4. **Granularity of Control N/A**
   Open TRV offers full granular control with each radiator learning behaviour for that room.
5. **Data Available to Landlord N/A**
   OpenTRV are committed providing full access to data. Full data currently available to the landlord through 3rd party cloud sensor platforms. A central management platform is in pipeline.
6. **Security N/A**
   OpenTRV are working on an open IoT things security specification which will be available for other industry players to adopt and contribute to.
7. **Future Outlook N/A**
   OpenTRV are looking to build a highly interoperable and customisable smart heating platform which will be able to integrate with many other heating and smart products. There ethos of keeping the hardware protocol design open will should bring additional manufacturing resources to the table and accelerate the project.

   OVERALL RATING: N/A

Nest

Google's acquisition of Nest in 2013 brought connected products into mainstream conversation and also gave a clear confirmation that the real value in connected products lay in data and ecosystem. Nest's elegant design combined with simple operation has made it the pin up device in the smart thermostat world. However despite boasting some of the most advanced learning and automation features it does not offer advanced control of individual radiators and provides only limited data on presence in the home (a single PIR sensor on the thermostat).

1. **Price 5/10**
   Nest costs £179 for a Single zone system. Installation is £70. Nest cannot control your hot water supply. Additional zone control requires an additional Nest at £179 making Nest one of the most expensive systems to use in a multi-zone set up.

2. **Ease of Implementation 4/10**
   While many products advertise a quick 30min self-install, Nest advise a professional installation. This is because, in variation to many of the other systems evaluated here, Nest does not just replace the thermostat or programmer but requires an additional device to be connected to the junction box of the heating system.

3. **Ease of use for Tenant 9/10**
   Nest is one of the most intuitive devices to use with design expertise from the creator of the ipod touch wheel integrating a familiar circular thermostat interface with modern autonomous operation features. Nest learns the routines of residents and predictively heats the house and supplements this with weather data. Nest is building a platform for the interoperation of smart products with a number of compatible devices available now.

4. **Granularity of Control 4/10**
   Nest only controls one heating zone out of the box and requires additional Nest devices to control multiple zones. This makes Nest one of the most expensive systems for controlling multiple zones.

5. **Data Available to Landlord 5/10**
   Nest is not designed for use by landlords. However multiple Nests located in different properties can be controlled from one Nest account. Nest has API available for approved partners. Permissions for data access are determined by the user. Third party housing management integration could be possible with Nest approval and potentially licencing.

6. **Security 7/10**
   Nest uses standard encryption between the device and the cloud and Thread protocol between Nest and compatible devices.

7. **Future Outlook 8/10**
   Google's acquisition of Nest is a good indication that Nest intends to become a hub for the connected home. The 'Works with Nest' standard already has numerous compatible devices and Google/Nest are backing the Thread protocol, a low power mesh network technology that carries IPv6 traffic and is tipped to become a dominant standard in device-to-device communication. Nest however have not indicated any intention to enter the landlord or social landlord market, instead focusing their business very much on home owner consumers.

   OVERALL RATING: 42/70

Climote

The Climote product, distributed by Scottish Power as Connect, is one the smart thermostat products that has made the biggest impact on the social landlord market. Climote have fitted 2000 devices in local authority properties in Ireland and have developed many of the supporting services to maintain these devices. They have the infrastructure to provide technical support to residents and crucially the product relies on cellular communication for remote control, allowing for its rollout in homes without a data connection. Climote however is lacking on a number of learning and sensing features which will come to define this market and which will add real value for social landlords.

1. **Price 6/10**
   The Climote device costs £263 and includes 1 year of free service. After 1 year the service fee is £36 per year. Climote can control hot water and 2 heating zones in total.
2. **Ease of Implementation 9/10**
   Climote can go out now into the vast majority of properties. Its cellular connectivity means that home broadband is not required. Installation is a 30 minute job requiring the replacement of the existing programmer.
3. **East of use for Tenant 6/10**
   Climote uses a circular navigation device to operate the device hub which is designed to mimic the look and feel of an old fashioned pin timer, this is meant to be intuitive but arguably the old pin clock timer design was never really user friendly. Climote offers SMS control which is useful in households where not all members have a smart phone and the full control at the physical device means that it can function without smart features. Climote lacks any kind of learning capability and cannot currently interact with other smart devices (Climote does not have Wifi or local radio technology), this also limits the possibility of introducing remote TRV controls and associated sensors.
4. **Granularity of control 5/10**
   Climote can control a total of 3 zones out of the box including the hot water circuit. This offers good value but the lack of ability to implement TRV control in the future is a limiting factor.
5. **Data available to Landlord 1/10**
   Climotes remote access offers the user basic heating data over the web. However no specific configuration has been developed for landlords. No API exists for third party integration. The data collected by Climote is extremely basic, with only temperatures and schedules generated.
6. **Security 7/10**
   Data is transmitted by GPRS over GSM to Climote's servers.
7. **Future Outlook 5/10**
   Climote is a ready-to-go product for social landlords, which is extremely limited in what it can offer other than energy saving for the resident. Its lack of communication protocols apart from cellular means that integration with other devices will at best require a cloud platform with no local comms possible. Climote therefore cannot be the hub device in the home.

   OVERALL RATING: 39/70

Hive

British Gas's Hive is one of the most recognised names in smart heating and with more than 160,000 installations has gained the most traction in the UK. Hive is a fairly simple product, which controls a single heating zone remotely. It supports geolocation switching but does not act autonomously. Despite lacking some of the more advanced features of competitors, Hive clearly see themselves as a hub device, with the ability to control multiple zones in the pipeline and a smart plug that is currently used to extend the WiFi range but looks to be the Trojan horse for smart plug control.

1. **Price 8/10**
   Hive costs £199 for a single zone system that controls hot water. This price includes installation.

2. **Ease of Implementation 4/10**

   Hive like Nest requires an engineer installation as a control box needs to be connected to the heating system's junction box. This is more time-consuming than systems which require just the replacement of the programmer or thermostat.

3. **Ease of use for tenant 6/10**

   Hive's has a well-designed app for control of the system (Hive inform us that 50% of users engage with the app every other day) and provides information such as outside weather. However it does not use this data to automate temperature settings.

4. **Granularity of Control 3/10**

   Hive can only control a single heating zone. However we hear there are plans for future zonal control.

5. **Data available to Landlord 4/10**

   Hive currently do not have a landlord focused platform or open API. However from our conversations with Hive we understand that they are looking to develop the product in this direction.

6. **Security 7/10**

   Hive devices communicate using Zigbee encryption is used between devices and between the hub and the cloud. Third party testing of the security protocols has been carried out.

7. **Future Outlook 9/10**

   Hive is the largest smart thermostat provider in the UK and this gives them a significant advantage when the market for other connected products grows. Hive will be in a good position to become the hub for IoT and crucially control the data generated by these products. Hive's parent organisation, British Gas Connected Home, have some of the most exciting smart home products for social landlords. The boiler monitoring product currently under development could change the way boiler repairs and servicing are provided.

   OVERALL RATING: 41/70

5. Score Matrix

Supplier	Price	Ease of Implementation	Ease of use for tenant	Granularity of Control	Data available to landlord	Security	Future Outlook	Total
tado°	7	6	7	3	7	8	9	47
PASSIVSYSTEMS	6	7	7	2	8	7	8	45
HEAT GENIUS	2	4	8	10	5	8	6	43
Nest	5	4	9	4	5	7	8	42
HEAT MISER	6	8	7	6	6	4	5	42
HIVE	8	4	6	3	4	7	9	41
CLIMOTE	6	9	6	5	1	7	5	39
INSPIRE HOME AUTOMATION	9	7	2	6	6	N/A	6	36
OpenTRV	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

6. Recommendations/Conclusion

The products currently on the market do not adequately cater for the needs and future needs of social landlords. While many of the products out there show potential for future development of the kind which will allow the kinds of big data generation and integration with housing management systems and provide real value for the landlord, many have not yet demonstrated a commitment to that direction.

Our overall conclusion is to hold off purchasing a system yet if you hope to achieve value for both the resident and the landlord.

Climote is the only product suitable to be rolled out now in the vast majority of housing stock where a broadband connection is not present. However Climote is not well positioned to expand its offering from this position. It does not have the ability to network with other smart home devices lacking WiFi or any other local RF connectivity and therefore cannot become a hub device for data collection in the property. Climote may well be able to save residents money on their heating bills but cannot offer much in the way of data to the landlord.

Our most highly rated product tado° combines a competitive price point with a high level of functionality and importantly a very ambitious future outlook. tado° are developing smart TRV valves and boiler monitoring capability. tado° recognise that interoperability is a competitive advantage in the IoT space and are committed to open API's. While tado° scored highest in our analysis we would still suggest further engagement with tado° to ensure the product developed suits the needs of the social landlord market.

Hive misses out on a top spot despite its market leading position in the consumer sector. This does not mean that Hive should be overlooked. Hive and British Gas connected home are working on some of the most innovative and disruptive technology in connected heating. The smart boiler technology currently prototyping can predict maintenance issues and prepare engineers with the correct parts for a call out job. This functionality will become part of Hive and with it offer a valuable data stream from the sensor in the boiler. Hive also have the financial weight behind them to develop platforms to access this data and from our conversations have a willingness to work with housing associations to determine their needs.

Heat Genius and Nest scored similar points however are two very different systems. While both use learning algorithms to heat rooms more efficiently, Heat Genius has far greater information about activity in the home. Nest however is set up to use the data it has more intelligently and to function as a hub for other connected home devices. If Heat Genius can offer up the extensive sensor data to landlords the potential for exciting big data insights is massive. Heat Genius's other major obstacle is price. OpenTRV are committed to overcoming the prohibitive pricing of current room by room heating solutions, however they remain a long way from market at the moment.

PassivSystems ability to control a number of different types of heating systems including district heating and heat pumps lends itself to a large housing stock with varied heating systems. The dashboard is the most developed of landlord focused data offering available however will be even stronger when more granular information about the heating profile of the accommodation is available.

This analysis represents a snap shot of the market as it stands. Developments are happening rapidly with new features and capabilities making their way to products on the market. New entrants are also emerging. For instance Switchee is a new landlord-focused product which unfortunately has not made it into our evaluation this time around.

We will be updating our evaluations to reflect shifts in the market and new product developments.

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