SMART TOWNS DELIVERY MANUAL

VERSION 3

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Ariennir gan
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INTRODUCTION

This document aims to provide a guide for how stakeholders can design, plan, deliver and evaluate place-specific Smart Towns projects.

Its primary audience is local authority and town council officers, but we hope that its content is helpful for any decision maker who is driving positive change in their place, such as town and county councillors, business groups, and community organisations.

About Smart Towns

A smart town is an urban area that uses different types of electronic methods and sensors to collect data. Insights gained from that data are used to manage assets, resources, and services efficiently; in return, that data is used to improve the operations and future prosperity across the town.[1]

The adoption of the Smart Towns concept in Wales has been driven by the Year of Smart Towns programme and Smart Towns Cymru, both delivered by Menter Môn and funded by Welsh Government.

With its contribution to delivering economic, environmental, and social value, the Smart Towns concept aligns with multiple Goals and Ways of Working of the Well-being of Future Generations Act. The concept is also embedded in key funding frameworks like the Transforming Towns Placemaking Grant Framework, which aims to revitalise town centres across Wales and includes 'Digital Towns' as an intervention.

Example use cases

Below are just some examples of how Smart Towns technology has been used already to support places across Wales and the UK. For some more in-depth case studies and further information, see the Smart Towns Cymru website.

[1] https://www.smarttowns.cymru/en/home

Source: Bookry Ltd

Tourism and the visitor economy

In Cardigan, local organisation 4CG provides a super-fast public Wi-Fi service across the town collects. This collects footwall and dwell data, which it analyses and shares it with 120 businesses via a regular e-newsletter. The town also has a mobile app that helps users discover the best areas to visit, eat and shop; and it gathers data on where visitors have come from and why they are visiting.

Source: Smart Parking Ltd

Parking and traffic management

In Cardiff, over 3,000 in-ground parking sensors (SmartSensor) and a network of gateways (SmartSpot) are installed. The data from these sensors is fed into variable message signage placed around the city and the Park Cardiff mobile app. Council offers can use the Smart Parking dashboard to view live parking events, generate reports and analytics, and gain insights into parking behaviour.

Other use cases include the use of smart traffic cameras.

Air quality monitoring

In Neath Port Talbot, 70 VTX Air sensors installed on street lighting columns measure air quality at a street-by-street level. The sensors give the Council a hyperlocal view of air quality and take targeted actions to reduce pollution.

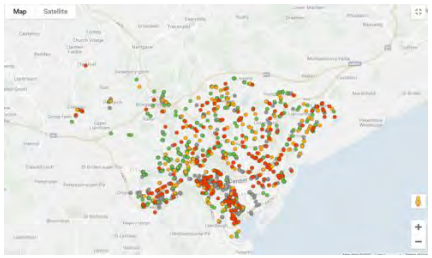
Source: Vortex

Building management

Blaenau Gwent CBC have begun using smart building management solutions to monitor and manage public buildings, optimising the air conditioning and heating schedule of buildings based on usage. As the solutions use LoRaWAN sensors, the Council are able to deploy sensors wirelessly, allowing them to respond quickly and easily to room configuration changes and further optimise their systems.

Source: Willmott Dixon

Other use cases include monitoring a building's humidity, temperature, and air quality levels and monitoring of electricity and water usage.



Source: Cardiff Council/Enevo

Environmental management

In Cardiff, 500 bins are fitted with Enevo sensors that measure their fill level. The Council can use an online dashboard to review data on bin locations, fill levels and collection and optimise emptying routes accordingly.

Other environmental management use cases include monitoring fly tipping, green infrastructure, waste levels and the quality of waterways.

Source: Thingitude

Community safety

In Reading, the MyWay may-style app helps women students feel safer walking on their own. Co-designed with women students from the University of Reading, the app pulls in data generated by LoRaWAN sensors on 120 streets in residential areas of the city that measure light levels, people movement and types on noise, along with bus data and crowd-sourced data.

Other use cases include anti-social behaviour detection and smart lighting.

Source: Safecility

Supported living

Across mid-Wales, Barcud Housing Association uses LoRaWAN sensors to identify vulnerable tenants who may be the victim of anti-social behaviour. With a tenant's consent, sensors monitor environmental factors and create data sets from which patterns can be determined, including those that relate to archetypes of certain anti-social behaviour scenarios.

Barcud also use LoRaWAN Emergency Lighting sensors to automate testing of emergency lighting in their housing blocks.

DELIVERY APPROACH

Below is an example approach to designing, planning, delivering, and evaluating Smart Towns-related digital projects, based on lessons-learnt from past projects and feedback from those who have delivered them.

For each key delivery stage, we include:

- the desired outcome(s): what should be in place by its completion
- a suggested approach: key tasks (not necessarily to be completed sequentially)
- links to relevant resources

Key risks and potential measures to mitigate them are included in the next section ('Risks and mitigation') and organised by the key delivery stage and tasks from this section.

Please note that the approach set out below is not intended to be exhaustive–in particular, it does not include comprehensive explanations of standard project management tasks and techniques (for example, risk management) that are necessary for delivering any complex project.

It is also important to recognise and remember that every place is different and so presents unique opportunities and challenges, and so this approach will need tailoring to local circumstances.

1: Identify the problem or opportunity

Estimated time frame: days to weeks, depending on extent of engagement.

Identify and thoroughly explore the problem or opportunity you have identified and consider at a high-level what sort of action you might take to address it.

Desired outcomes

Key stakeholders understand:

- the problem or opportunity being addressed through the project
- key factors affecting the project (for example, the likely budget).

Tasks

A. Review relevant strategic documents

Carry out a review of strategic documents relevant to your place to see what problems or opportunities are described and might be tackled using digital, or–if you have identified a problem or opportunity from a different source–to see if it is included. (If it isn't, ask and explore why this is the case. Is it because it has already been addressed, or because it is not considered a priority, or for some other reason?)

These documents might include town/community-level Place(making) Plans, Masterplans, Strategies or (Digital) Action Plans, as well as documents with a county, regional or national scope. These can usually be found online (sometimes they are only attached to Council scrutiny reports) or provided upon request from relevant officers.

You will also want to source and review documentation from relevant previous projects to reflect on any lessons previously learnt.

B. Identify and engage with place stakeholders

With this improved understanding of the strategic context, it will be possible to engage with stakeholders about the problem or opportunity you wish to address. At this stage, get their feedback on the extent to which the problem or opportunity is a priority and field their ideas about how it could be addressed. And remember, lead with discussion of the place and its problem/opportunity, not any possible (technical) solution.

These stakeholders might include:

- Town and County Councillors
- Town and local authority officers
- Business Improvement District or Chamber of Commerce representatives
- Local business owners
- Community groups

Always ask stakeholders who else they think you should speak to, as this may well reveal someone you've missed out.

Within a local authority, it is important to engage across departments/directorates, not least because it is possible that existing infrastructure put in place for another purpose might partially/fully address your problem or opportunity. For example, Cisco Meraki units installed to provide Wi-Fi in public areas also provide a source of data on footfall within the range of the unit.

From these stakeholders, identify the key people who will be most useful for the remainder of the project and/or need to be kept informed of its progress. For a larger project, these key stakeholders could form a steering group, but for smaller projects something informal may be more suitable.

C. Analyse the information

Put all the information you've gathered so far in one place (so you can easily refer to it later on and others can find it easily in future) and conduct some light-touch analysis of it to help structure your thinking. You might want to use a simple framework to structure this, such as SWOT (Strengths, Weaknesses, Opportunities and Threats). If possible, involve multiple stakeholders or colleagues in this analysis to get the widest perspective on the situation and mitigate against confirmation bias.

D. Write a plan on a page

Put together a concise document that summarises the findings of your scoping work so far. Doing so provides an opportunity for you to clarify your thinking and the document will provide a point of reference for you, stakeholders, and other interested parties.

The document should describe the aim and rationale for the intervention, provide a list of the key stakeholders, and list any key points (points of context, proposed ideas, identified risks, likely maximum budget etc) raised by stakeholders in initial discussions.

At this stage, the content should be written in as non-technical language as possible; where this is not possible, key terms should be defined so all parties understand what they mean.

Share this document with your key stakeholders and ask them to confirm that this is their understanding of the context and position at this point in time.

Resources

Data maps for Welsh towns:
https://www.welshtowns.placekits.com

Smart Towns Cymru Masterclass on Digital Placemaking and Digital Place Plans by Owen Davies Consulting:
https://youtu.be/FVspi0X6g3E

Smart Towns Cymru: National Data Analysis information and reports: https://www.smarttowns.cymru/en/data-map-wales.html

2: Explore possible solutions

Estimated time frame: days to weeks, depending on extent of engagement

Scope out possible solutions to the problem or opportunity you identified and tested in the previous stage.

Desired outcomes

You understand:

- possible ways to address the identified problem or opportunity
- how this might be funded.

Tasks

A. Engage with wider stakeholders

Using your clear understanding of the context and the identified problem or opportunity facing the place(s) you want to work in, look elsewhere to see if something has been done elsewhere that may be applicable to your place.

A good starting point is the resources (particularly the case studies and masterclasses) produced by Smart Towns Cymru, but also make sure to look elsewhere. At this stage, the most important factor to look at is whether the existing intervention sought to address the same problem/opportunity as you are interested in–differences in the context may be important but this can be explored later.

If you come across something that appears relevant, reach out and try and speak to someone involved in the delivery of the

project. When engaging with wider stakeholders, focus on getting information about:

- What impact the intervention has had to date and how they measured this
- Lessons learnt from the delivery process, including
    - Key dependencies, such as required enabling infrastructure (LoRaWAN gateways, etc.)
    - Biggest challenges and how they overcame them
    - What they would do differently if starting again
- Costs (estimated, if necessary)

B. Conduct market research

Alongside reading about and speaking to wider stakeholders involved in or with knowledge of relevant projects from elsewhere, review what relevant products might be close to or on the market already. To do this, start with known trusted sources of information like Smart Towns Cymru (particularly the Smart Solution Showcases videos) to get inspiration and understand the types of solutions available, and then work outwards from there.

Where possible, speak to the developers of the solution to try and cut through the marketing speak and understand its strengths, weaknesses, and realistic costs. Take this opportunity to ask what you may think are obvious questions–it's far better to do so now, rather than later.

C. Review available funding sources

In almost all scenarios, the solution you will be able to implement will be constrained by the amount of funding available.

Using what you now know about what has happened elsewhere, what is on the market, and the rough cost of these, consider what source of funding would be most appropriate and viable for the project.

Below we highlight a number of public funding opportunities that could be used to fund or part-fund Smart Towns digital projects, but the list is not exhaustive. Use Funding Wales and engage with your local authority's regeneration department or similar to find out what opportunities apply to your place.

Name	Description	Link to further information
UK		
Levelling Up Fund (Round 3)	Fund supporting town centre and high street regeneration, local transport projects, and cultural and heritage assets. The fund will run until 2024/25. Available to local authorities. Relevant part of funding framework: 'Regeneration and town centre investment' theme (Round 2)	UK Government: Levelling Up Fund (Round 2 info)
UK Shared Prosperity Fund	Funding allocated to areas of the UK via a funding formula to help places deliver enhanced outcomes across a number of levelling up objectives. Ends in March 2025. Relevant parts of funding framework: Investment Priority 1: Communities and place: W1, W15 Investment Priority 2: Supporting local business: W17 Investment Priority 3: People and skills: W42	UK Government: UK Shared Prosperity Fund
Wales		
Welsh Government Transforming Towns programme	A £100 million fund to improve town centres available across Wales from 2022 to 2025. Funding is available to local authorities who can work with partner organisations to develop projects. Relevant part of funding framework:	Welsh Government: Transforming Towns

	'Digital Towns' Intervention	
City and Growth Deals	The Deals include Cardiff Capital Region City Deal, Swansea Bay City Deal, North Wales Growth Deal, and Mid Wales Growth Deal.	Cardiff Capital Region Swansea Bay City Deal Ambition North Wales Growing Mid Wales
Other regional funds	For example, Tech Valleys.	Blaenau Gwent CBC: Tech Valleys
The National Lottery Community Fund: Awards for All Wales	Funding from £300 to £10,000 to support communities with the things that are important to them. Available to voluntary or community organisations.	The National Lottery: Awards for All Wales
Local		
Local authority core budgets	Core budgets for regeneration, economic development, active travel, highways etc.	
Town Council reserves or small grants programmes		
Business Improvement Districts	Business-led partnerships that deliver additional services to local businesses.	

D. Review and compare your options

Use the information from the previous steps to conduct a light-touch options comparison or more rigorous 'options appraisal', in which you define a number of delivery options, evaluate them against a set of agreed criteria (against the broad themes of desirability, viability and feasibility), and then identify the preferred option. If possible, do this in collaboration with colleagues/other stakeholders to get as many perspectives as possible.

Share the findings with your key stakeholders for feedback and agreement in order to establish consensus on which option to take forward.

Resources

Year of Smart Towns: Cisco Meraki Guidebook: https://www.smarttowns.cymru/cms/resources/cisco-meraki-guidebook-by-the-year-of-smart-towns.pdf

Funding Cymru: https://funding.cymru

Smart Towns Cymru: Solutions Showcase: https://www.youtube.com/playlist?list=PLSamvMtOI0QtG1SNsGUEh1GyJJdM6vECi

UK Government Alternative Delivery Models Toolkit: Guidance Stage 5: Options appraisal: https://www.gov.uk/government/publications/libraries-alternative-delivery-models-toolkit/stage-5-options-appraisal

3: Plan and procure

Estimated time frame: weeks to months

Work out how to deliver the preferred option identified in the previous delivery stage and procure the necessary goods and services.

Desired outcomes

The following are in place:

- a costed plan for delivery of project
- the necessary contracts for capital (technology and install) and associated revenue.

Suggested approach

A. Write a Project Plan

Before jumping into procurement and other project tasks, take the time to produce a single document that describes how the project will be managed and delivered. The Project Plan doesn't have to be lengthy document, but it should certainly include a project schedule (individual tasks, time required to complete them, and key interdependencies), a plan for managing risks (see below), and anticipated costs and funding sources.

Once drafted, share the Project Plan with key stakeholders for feedback and approval.

Update the Project Plan after carrying out the other key tasks in this section so it remains a useful live document, and keep a simple log of the major changes and/or use automatic version

history tools to keep a record of how things change over the course of the project.

B. Identify and plan how to mitigate key risks

Although it might feel like too early in the project delivery process, spend time now working out what are the key risks to the project and how you will try to make them less likely to occur and/or less damaging if they do.

The Key Risks and Mitigation table in the next section contains examples of risks facing the delivery of Smart Towns digital projects to help you mitigate them and presents an example of how to think about and describe risks and risk mitigation during the planning stage.

Again, share the risks with key stakeholders so they can sense-check them and use their knowledge and experience to suggest how they can be mitigated.

C. Complete necessary data protection/compliance procedures

To ensure you comply with data protection regulations and adopt good practice, follow your organisation's data protection/compliance procedures and the advice of the Information Commissioner's Office, and engage with your data protection officer or other officer with responsibility for data protection.

The UK's data protection regime is set out in the Data Protection Act 2018, which sits alongside and supplements the UK General Data Protection Regulation ('GDPR') that came into effect on 1 January 2021.

An organisation must go through a Data Protection Impact Assessment to identify and minimise the data protection risks of a project that involves processing that is likely to result in a high risk for individuals, but it is good practice to do an Assessment for any major project that requires the processing of personal data (information that relates to an identified or identifiable individual).

Menter Môn have shared by way of example the Assessment they conducted before the development of Patrwm.io, a platform that aggregates and publicly shares footfall analytics data collected using public Wi-Fi systems, powered by Cisco Meraki Wi-Fi access points–see below. (For more about Patrwm, see stage 5: Share and use the data). There is further information about data privacy and the Cisco Meraki units in Step 6 of the Year of Smart Towns Meraki Guidebook (link below).

If the Wi-Fi access points are used to provide public access to the internet, you will need to provide a Terms of Service and likely configure the access points to restrict what people can do online using the network (for example, to prevent streaming of video).

It is also good practice to inform people that footfall analysis using Wi-Fi signals is taking place; one way of doing this is through the use of physical signs or stickers that provide a link and QR code to view the data (on, for example, Patrwm) and information on how to opt-out (by turning off the Wi-Fi on their devices).

Procure goods and services

Following relevant procurement guidance and using the knowledge gained from your scoping work, procure the goods and services necessary for delivery of your project.

If available, seek advice from procurement colleagues to avoid making mistakes (which can have knock-on effects far in the future) and get the best outcomes.

Some things to consider:

- It might be possible or necessary to use your organisation's existing framework agreement for procuring ICT products and services. In some cases, however, these do not include the smaller and more specialist suppliers who operate in this field.
- Not all suppliers may be registered on platforms such as Sell2Wales, so it might be necessary to prompt them to sign up in advance of procurement to get the widest range of responses.
- If you are confident in the exact specification of the hardware required for your scheme, it may be cheaper to procure this separately from any required services (for example, installation). This, however, creates new risks, such as incompatibility between hardware and software.
- Consider what maintenance is likely to be required and whether this should be procured at the same time as the installation.
- If you plan to use local authority assets, check with the relevant officers to find out what restrictions are in place that might affect your procurement.
    - With street lighting columns, for example, it may be the case that only a trusted and pre-appointed contractor with the relevant specialist skills and equipment can conduct works on them; if this is the case, consider how these services will be procured.
    - Similarly, mounting car parking sensors in a local authority-maintained road or car park will require the involvement of the local authority's Highways department.

D. Identify and secure permissions for install locations

Use the insight gained from the scoping stages and produce a list of hardware install locations (including alternatives in case a preferred location isn't workable). If possible, work with your appointed install contractor to identify the locations, as they will be able to use their experience to suggest where is likely to work best.

Be aware of the limitations of hardware and software and plan accordingly. Cisco Meraki units, for example, collect footfall data by counting the number of Wi-Fi enabled devices (like smartphones and tablets) within range of the access point, and then use several parameters (including signal strength) to aggregate and classify the data for easier analysis. The range of an access point can be 100-200 metres, but this is reduced if buildings or other dense objects are between it and the user's device.

Use your organisation's GIS tool (for example, Parish Online) to identify potentially useful public assets and Google Maps and its Street View (noting the date the image was last captured) to see

an area, before conducting detailed in-person surveys. A simple tool like Google My Maps can be used to map out proposed install locations without use of a more complex GIS tool.

Under the provisions of the Town and Country Planning (General Permitted Development) order 1995 (as amended), Schedule 2, Part 12, class A(b), the installation of a LoRaWAN gateway often falls under permitted development rights for local authorities.

If working in a 'conservation area' (an area of special architectural or historic interest provided for by the Planning (Listed Buildings and Conservation Areas) Act 1990 and the Historic Environment (Wales) Act 2016) or with 'listed buildings', be aware that there may be restrictions on what changes can be made to a building that affect its character. In this case, engage with local authority planning and/or heritage officers before proceeding.

If the place on/in which you want to locate hardware is privately-owned, you will need to get the permission of the business located in it and, if different as is often the case, the owner/leaseholder of the building. This permission will most often take the form of a signed wayleave agreement (an example of which is available on the Smart Towns Cymru website, link below).

Some technology-specific points to consider and discuss with the technical supplier when planning a scheme:

Wi-Fi access points and LoRaWAN gateways

- Positioning devices as high up as is possible (for example, near the top of a street lighting column or on a rooftop) will usually maximise the distance they can broadcast a signal.
    - Specialist contractors can carry out desktop radio mapping to estimate coverage levels and check predicted signal strength in specific locations.
    - LoRaWAN network tester devices can be used to measure and test coverage in the field.
- The most reliable means of providing backhaul (a connection to the internet) is by running a network cable from a broadband router (or another access point) to the device. If this is not possible, there are usually alternatives:
    - Some Wi-Fi access points, like the Cisco Meraki units, can 'mesh' and share a single (or multiple) internet connection(s). In this case, the 'repeater' units will need a strong (unobstructed/line-of-sight) connection to a 'gateway' unit (preferable) or another 'repeater' unit.
    - Some LoRa gateways have built-in support for using mobile data networks (4G or 5G) to connect to the internet, either as the primary means of connection or as a back-up means of connection. In this case, you will likely have to provide a SIM card with a suitable data plan.
- If a Wi-Fi access point is provided with backhaul by its host business (that is, it is connected to its existing broadband connection), you will likely want to set a cap on the access point's download/upload bandwidth to minimise the risk

that the access point's activity has adverse effects on the business's internet connection speed.

- Power can be provided directly from a mains 3-pin plug or, if supported by the hardware, via an external grade network cable (CAT5e or CAT6) and power injector, using 'Power over Ethernet'. The latter has a maximum distance of 100 metres, so the device can be positioned some distance from the power source, if the network cable can be run safely and discretely.
    - In some locations, there may be existing outdoor power sockets installed; ownership of these can be complicated, however, so seek advice from stakeholders and do not assume the sockets are still live until tested.
- Estimated electricity costs can be calculated using online calculators (link below) and data on average power draw from the specific product's information sheet.

Wi-Fi access points (like the Cisco Meraki MR units)

- Outdoor Wi-Fi access points are usually attached to a wall or pole using a mounting plate and/or strap.

LoRaWAN gateways

- Both indoor and outdoor LoRaWAN gateways are available. Outdoor gateways provide a larger coverage area than indoor towers and usually have an external antenna connected to the body of the unit.
- Outdoor gateways could be mounted on poles attached to buildings, on a pole with ballast on a flat roof, or on a street lighting column. It is best practice to mount a gateway above a roof line.
- Expect to achieve coverage of up to 2km in an urban environment or 8km in a more rural/less dense environment. LoRa uses a low-power radio signal in the frequency band previously used for analogue television and so will penetrate walls into buildings, though some of the signal will also be reflected off the walls at random.
- Strongest coverage will be achieved with line of sight between a gateway and end devices.
- The ability of a gateway to receive data will be negatively affected by metal, such as street lighting columns, scaffolding or other metal poles being near to or at the same level as it. This does not occur if a gateway is mounted on top of a metal structure.
- Gateways are capable of supporting hundreds or thousands of end devices (sensors).
- Although gateways are designed to be robust and reliable, as with any technology, problems do sometimes occur, and so if continuity of data from some sensors is critical, consider making sure that at least one other gateway provides

coverage of them (sensors broadcast data to all gateways in range).

LoRaWAN sensors

- Although most LoRaWAN end devices (sensors) draw very little power and so are battery powered, some (for example, a traffic counting sensor) have greater power demands and so require mains power or, in some cases, can be solar (and battery) powered.
    - If battery powered, it is usually recommended to use more expensive Lithium batteries that have a higher energy storage density and so last longer and perform better at extreme temperatures compared to Alkaline batteries.

    - The rate at which a battery is depleted is determined by how often the sensor sends out data; this can be configured to strike a balance between battery life span and granularity of data.
- Sensors that need to be located within reach – for example, soil moisture sensors in street planters – can be to some degree disguised, but, if they remain conspicuous, it may make more sense to include with them a sign asking that they are not touched and providing a QR code to a webpage providing more information and the data collected.
- Some sensors that are not rated for outdoor usage, for example some infrared beam-break people counters, can be enclosed in robust cases to allow them to be used outdoors.

LoRaWAN networks

- 'End devices' (sensors) send data wirelessly to a 'LoRaWAN gateway'(s), which then uses its internet connection to forward on the data to a 'network server', which manages the entire network. The data can then be processed by an 'application server' and used by the end user.
- As such, a LoRaWAN gateway must be registered (through its configuration) to a LoRaWAN network server. This server can be public or private.
    - An example of a popular worldwide LoRaWAN network is The Things Network, which is crowdsourced, open and decentralised. Anyone can connect a gateway, register devices and send/receive data for free using The Things Network.

THE THINGS NETWORK

- Most LoRaWAN gateways and end devices (sensors) have in-built support for The Things Network.

With all the factors to consider, it is easy to become bogged down trying to design the perfect scheme; in most cases, it is usually best to get something(s) in place and start to capture some data for analysis and sharing, thereby preserving a project's momentum.

E. Engage with key stakeholders

As in earlier stages, share the proposed installation plan with stakeholders for discussion, feedback and approval.

F. Plan for monitoring and evaluation

Before the scheme is delivered, think about how you will measure its success in terms of whether it addresses the problem or opportunity identified in stage 1. At its most basic, this involves asking yourself and key stakeholders 'what would success look like?' and working out how you will measure this.

For example, if a scheme aims to provide public Wi-Fi, you might want to look at measures such as the number of users (individual and repeat), the time spent connected (average and maximum), the days of the week and time of day when people connect, the amount of data transferred, and what type of sites are being visited.

In many cases, the purpose of installing the Smart Towns infrastructure is to collect data that itself can be used to measure more accurately the impact of another scheme or intervention. In this case, the initial picture of success will be that the installed infrastructure is functioning and providing the data as planned.

Resources

DataMapWales: Listed Buildings: https://datamap.gov.wales/layers/inspire-wg:Cadw_ListedBuildings

DataMapWales: Conservation Area Boundaries: https://datamap.gov.wales/layers/inspire-wg:conservation_areas

Energy Guide: Electricity Cost Calculator UK: https://energyguide.org.uk/electricity-cost-calculator/

Google My Maps: https://www.google.com/maps/d/

Information Commissioner's Office: Data Protection Impact Assessments: https://ico.org.uk/for-organisations/guide-to-data-protection/guide-to-the-general-data-protection-regulation-gdpr/accountability-and-governance/data-protection-impact-assessments/

The Things Network: LoRaWAN Architecture: https://www.thethingsnetwork.org/docs/lorawan/architecture/

Smart Towns Cymru: Wi-Fi 'the Portal' Privacy Policy Example: https://www.smarttowns.cymru/cms/resources/wi-fi-the-portal-privacy-policy-example.pdf

Smart Towns Cymru: Patrwm.io Privacy Policy: https://www.smarttowns.cymru/cms/resources/patrwm-privacy-policy.pdf

Smart Towns Cymru: Wi-Fi 'the Portal' Terms of Use Example: https://www.smarttowns.cymru/cms/resources/wifi-the-portal-terms-of-use-example.pdf

Smart Towns Cymru: Data Impact Assessment Example: https://www.smarttowns.cymru/cms/resources/data-impact-assessment-example.pdf

4: Install and maintain

Estimated time frame: days to weeks, depending on supplier availability

As planned, install, test and maintain any necessary new hardware and software.

Desired outcomes

- New hardware and software are installed, configured and functioning as expected.
- Maintenance plans and protocols are in place.

Suggested approach

A. Install hardware and configure software

Working with the appointed supplier(s), install any new hardware in the locations identified in the planning stage.

Most hardware will be pre-configured by a supplier before being installed in situ, but some additional configuration may be necessary on site to adjust for conditions. Obviously, as LoRaWAN gateways or similar are likely installed in awkward locations, it pays to get the installation right first time!

Some sensors, such as parking bay sensors, will require initial calibration and so may require a short learning period before the data becomes accurate.

B. Test and sense check the data

With the scheme installed, set aside a pre-agreed period of time for testing that everything is working as expected and that the data generated is reasonable.

C. Confirm maintenance arrangements

Confirm with the appointed supplier(s) the arrangements for maintenance of the hardware and software, agreed during procurement.

Most Smart Towns devices, particularly those designed for use in remote places, are designed to be reliable and should require little routine maintenance. The routine maintenance that will be required is the updating of firmware (the software that controls hardware), but this can be done remotely over the internet in most cases.

Make sure that stakeholders know what the threshold for seeking maintenance support from the supplier is. That is, for how long (hours/days) and on what scale (how many sensors etc) should a problem exist before the need for further investigation is raised.

5: Share and use the data

Estimated time frame: months

Share the data being collected with stakeholders and then support them to analyse and draw insights from it.

Desired outcomes

- Data is being shared with stakeholders in a way that is convenient for them.
- Stakeholders are starting to make decisions based on the data.

Suggested approach

A. Set-up system for sharing data with stakeholders

Once the hardware is installed and configured and data is being transferred from the sensors to the gateway and on to the network server, the appointed supplier(s) or you will need to set up the means by which the data is accessed by the end-user.

The way or multiple ways by which stakeholders access the data should be based on their preference, which you discovered during the earlier scoping phases.

In some cases, the manufacturer of a certain product or system will provide an 'out of the box' means to visualise the data. Taking the Cisco Meraki Wi-Fi access points as an example:

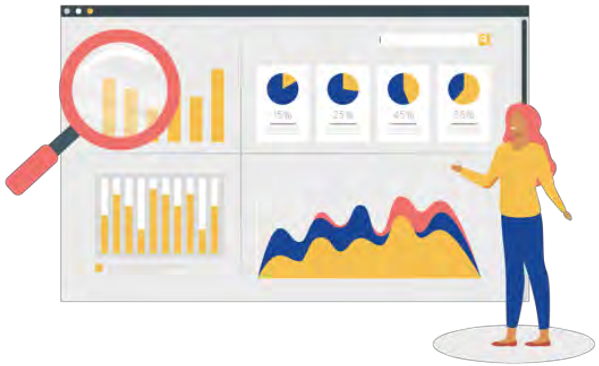
The footfall data generated by the devices is visualised in interactive charts on a sub-page of the secure web-based Cisco administrative dashboard. Whilst it is possible to create a dashboard log-in with read-only permissions for a stakeholder to give them access to the data, it is not particularly user-friendly.

There are, however, various alternatives:

- Take screenshots of the charts and put them in a folder/live document/email etc.
- Manually download the data from dashboard as CSV files and share these.
    - Note that CSVs are plain text files that only contains numbers and letters, so they require further manipulation to be useful.
- Use an API to automatically pull the data into another platform, such as Patrwm (see below) or Google Sheets.

In most cases, however, especially within the LoRaWAN ecosystem, even data collected using devices from different manufacturers can be brought together on a common platform, of which there are many.

In general, there are a number of different ways to share data with stakeholders:



Use an online platform to display the data online

Online platforms can be used to pull in and store the data being collected by sensors, then process and organise it.

Once in the platform, applications such as web dashboards can be built to visualise the (live or near live) data in dials, charts, tables or maps. Some platforms can display web content from outside of the platform within a frame on a dashboard, allowing you to present data from elsewhere and make the dashboard a true single point of reference.

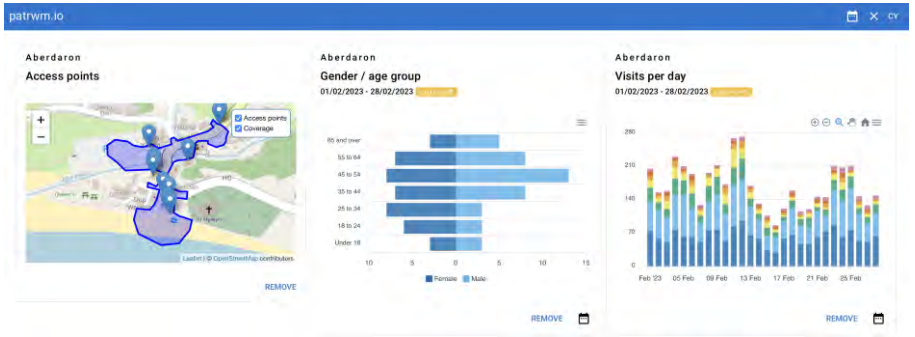
These dashboards can be made publicly available or access can be restricted to specific people, and they can be linked to from or even embedded into existing webpages (for example, a Town Council's website).

Many of the platforms require no coding to be done and the dashboards/applications built using them can be custom branded.

Whilst some platforms are free or offer a limited free tier, others are commercial and ongoing costs usually vary depending on the number of devices and/or amount of data being processed.

Examples of Internet of Things online platforms include Akenza, Daizy, Datacake, IoTConnect, TagoIO and ThingsBoard.

Patrwm



Source: app.patrwm.io

Patrwm is a bilingual data sharing platform for smart towns and places across Wales, developed in partnership by Menter Môn and Kodergarten.

Like other platforms, it collects data from Internet of Things devices (for example, LoRaWAN sensors), sorts and visualises it in easy to understand formats (maps and charts), and makes it publicly accessible online: https://app.patrwm.io/#/

Unlike some other IoT-focused platforms, Patrwm also specialises in collecting, anonymising, analysing and presenting the footfall data gathered by Cisco Meraki Wi-Fi units. It can also be used to collect and present demographic information about Wi-Fi users if Porth, a secure and bilingual Wi-Fi login portal, is used.

Patrwm is a managed platform and so set-up and ongoing costs depend on the number of places and access points involved.

Automated alerts

Many online platforms can also be used to send automated alerts (by, for example, email, text, or push notification) when automated analysis of the data shows that a value has gone outside pre-defined parameters. For example, an email alert could be sent automatically to a group of stakeholders when a sensor measuring the fill level of a rainwater-filled water butt suggests that it is likely to overflow soon unless emptied.

B. Support stakeholders to use the data

Even with a platform automatically collating and visualising the Smart Towns data, some stakeholders will need support to become more confident with how to interpret the data visualisations and draw conclusions from them.

There are various courses that provide a means to do this, such as those provided by Data Cymru that are aimed at the public sector.

For examples of how data driven decision making is benefiting Welsh places, see the case studies on the Smart Towns Cymru website.

Resources

Akenza: http://www.akenza.io/

Daizy: http://www.daizy.io/

Data Cymru: https://www.data.cymru/training-courses

Datacake: https://datacake.co

IoTConnect: https://iotconnect.io

Patrwm: https://patrwm.io and https://app.patrwm.io/#/

Smart Towns Cymru: Case Studies: https://www.smarttowns.cymru/en/case-studies

TagoIO: https://tago.io

ThingsBoard: http://thingsboard.io

6: Monitor and evaluate

Estimated time frame: months

Monitor how the new scheme performs and evaluate the effect it has had on the problem or opportunity you sought to address.

Desired outcomes

- The performance of the scheme is monitored and reviewed.
- The benefits of the project are being measured and recorded.
- Lessons learnt are recorded and shared with stakeholders.

Suggested approach

A. Monitor performance and evaluate effects

Using the plan produced earlier, monitor the performance of the scheme, looking at metrics such as: activity (various measures), down-time and number of outages, power usage (if available; some devices send monitoring data like power supply level with their sensors data), data usage etc. If possible, discuss this with the supplier(s) to identify if anything can be changed to improve performance.

Measure the effects of the intervention against the criteria identified in the planning phase. This may include seeking feedback from stakeholders about their experience of accessing and using the data, at the end of an agreed trial period.

B. Identify and share lessons learnt

Work with the key stakeholders involved in the delivery of the scheme to identify lessons learnt: what went well, what did not go well, and what you would do differently next time.

Record and share these lessons and your monitoring and evaluation findings with wider stakeholders (including Smart Towns Cymru) so that others can get inspired, learn and try something similar themselves.

Resources

Smart Towns Cymru: Case Studies:
https://www.smarttowns.cymru/en/case-studies

KEY RISKS AND MITIGATION

Delivery stage	Name	Description	Responsibility	Impact (1 to 5)	Probability (1 to 5)	Rating (Impact x Probability)	Mitigation
Identify	Failing to engage with key stakeholders	Failing to engage with key stakeholder can cause you to miss a critical piece of contextual information.	Project lead	4	2	8	Map out key stakeholders early on and share with colleagues. Ask each stakeholder 'who else should I be speaking to?'.
	Focusing on the technology, not the opportunity/problem	Enthusiasm for a new technology can mean you put in place something that isn't really needed.	All	3	2	6	Focus on the place and its priorities, then consider how you might address them.
Scope	Becoming overwhelmed by the amount of information/number options available	There are so many different competing technologies, models of hardware and versions of software that it	All	2	4	4	Speak to people who have done something similar before or specialists. Engage with projects like Smart Towns Cymru.

		is hard to know where to start.					
Plan and procure	Delivery plan has gaps or contains major assumptions	It is tempting to rush the planning tasks and do them poorly when you want to get on with delivery.	Project lead and key stakeholders	5	2	10	Do not proceed until all key stakeholders have reviewed and are content with the project plan.
	Procurement is conducted poorly	Procurement is very difficult to get right and doing it properly is a resource intensive task.	Project lead	5	2	10	Engage with procurement colleagues or specialists to get their advice and support. Engage with potential suppliers in advance to inform your ask.
Install and maintain	Unable to get permissions for desired install locations	For whatever reason, some building owners will not want to host equipment, or some local authority assets will not be able to be used.	Project lead	2	5	10	Design your scheme so that each location has multiple options and ensure the whole scheme is not dependent on one location.

	Not considering maintenance costs/responsibilities	Faults develop that are not fixed in a timely manner.	Project lead	4	1	4	Build maintenance arrangements into your procurement process. Agree protocols before signing a contract with a supplier.
Share and use	Stakeholders don't know how to access or interpret the data	The scheme generates data, but stakeholders cannot access it or can access it but cannot understand it	All	5	3	15	Use the scoping tasks to understand how stakeholders are willing to access the data. Train stakeholders in how to analyse and interpret data.
Monitor and evaluate	Not knowing if the project has made a difference or not	Stakeholders, including funders, don't know whether the scheme has been successful.	Project lead	3	1	3	Put in place a monitoring and evaluation plan and carry it out as agreed.

SMART TOWNS DIRECTORY

Information sources

LoRa Alliance: https://lora-alliance.org

The Things Network: http://thethingsnetwork.org

Smart Towns Cymru: https://www.smarttowns.cymru/en/home

Suppliers

Consultancy and training

Cwmpas: http://cwmpas.coop

Data Cymru: https://www.data.cymru/eng/

Kodergarten: https://kodergarten.com

Morgan Walsh: https://morganwalsh.co.uk

Owen Davies Consulting: https://owendaviesconsulting.co.uk

SenseAbility: http://senseability.uk

Thingitude: https://thingitude.com

Urban Foresight: http://urbanforesight.org

Hardware, software and solutions

Alliot: http://alliot.co.uk

Bubltown: https://www.bubltown.com

Cisco Meraki: https://meraki.cisco.com

Concept13: https://www.concept13.co.uk

Connected Things: https://connectedthings.store/gb/

Eazi Apps: https://www.eazi-apps.co.uk

Grand Bequest: https://www.grandbequest.co.uk

Hello Lamp Post: https://www.hlp.city

Microsoft Soundscape: https://www.microsoft.com/en-us/research/product/soundscape/

MiRewards: https://mi-rewards.com

Patrwm: http://patrwm.io

QR Boxx: https://qrboxx.com

Safecility: https://safecility.com

Sensei: https://www.senseinetworks.co.uk

Smart Building Products: https://www.smartbuildingproducts.co.uk

Smart Parking: https://www.smartparking.com

Visitor Insights: https://www.visitorinsights.ai

VivaCity: https://vivacitylabs.com

VZTA: https://www.vzta.com

WiFi Marketing: https://wifimarketing.co.uk