Architecture & Design Scotland
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SCOTTISH FUTURES TRUST

Shared Learning Event

Energy Reporting & Monitoring

Introduction

Context

This Shared Learning Event was the first of 2025, and was designed to promote discussion and sharing of best practice. The theme for this event was **'Energy Reporting & Monitoring'**. It was hosted and facilitated by Scottish Futures Trust (SFT) alongside Architecture and Design Scotland (A&DS).

The event was open to all Local Authorities across Scotland to provide an open forum to discuss initiatives, share ideas and challenges. It was held on MS Teams on **11th March 2025** and brought together 160 delegates, a record number for one of these events, from Local Authorities and consultants across Scotland, including representatives from Scottish Government Learning Directorate. It featured presentations from:

- Allan Smith from Morrison Construction with Alan Skea from RYBKA and Matt Haggarty & Soo Darcy from Ryder Architecture
- David Thornton from South Ayrshire Council
- Paul Dodd from Scottish Futures Trust

Background

These shared learning events have come around post-Covid as an opportunity for us to all learn from the projects within the Learning Estate Investment Programme (LEIP) and the wider context of what is happening out in industry so far.

The **Learning Estate Investment Programme (LEIP)** is a joint programme between Scottish Government and COSLA, managed by SFT.

This innovative funding programme offers up to 50% of the capital equivalent funding to local authorities using outcome based funding over 25 years if criteria are met.

Energy reporting and monitoring are two separate requirements, two separate subject matters, but both under the MEP services banner.

This subject was chosen as a theme for this event due to feedback that some projects are experiencing challenges in terms of what the requirement is and how to get the information to support the outcome for energy, the requirement through LEIP and therefore how it impacts on the funding that goes along with that.

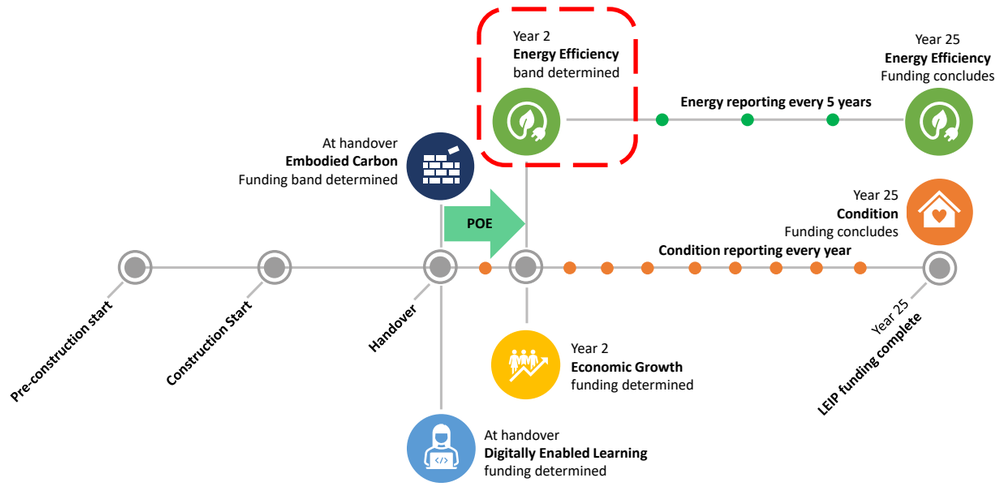
Some of these challenges may be in terms of the specification, design of the services, or even firewalls and BMS systems not quite working and why that is.

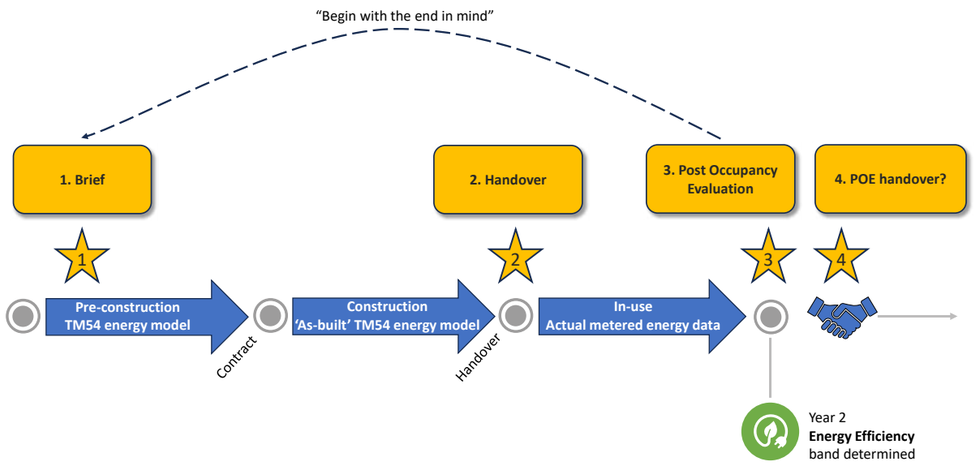
The first presentation explored this based on real world experience through their projects involved with LEIP. We invited Morrison Construction, RYBKA and Ryder Architecture who as a team have been involved in nearly half the projects within LEIP, so were perfectly positioned to review and share some advice and lessons learned from their experiences.

The second presentation was given by David Thornton, who is a building services engineer for mechanical at South Ayrshire Council. David is the 'go to' within the council in terms of energy monitoring across the whole of their public estate, and demonstrated 'the art of the possible', showcasing what has been achieved within the public estate in South Ayrshire Council and why it's important to them.

Finally, Paul Dodd who is Head of Improving Project Delivery and Infrastructure Technology at Scottish Futures Trust, introduced 'A Guide to Smart Infrastructure Scotland's Learning Estate'.This document introduces the benefits and opportunities that the requirement for monitoring the school estate brings you.

Share the learning energy reporting and monitoring





Allan Smith
Morrison Construction
Matt Haggarty &
Soo Darcy
Ryder Architecture
Alan Skea RYBKA

Allan Smith is the Low Carbon Manager at Morrison Construction, Matt Haggarty is Architectural Director at Ryder Architecture, Soo Darcy is Research & Engagement Director at Ryder Architecture and Alan Skea is an Associate (Building Physics) at RYBKA. Collectively they presented on their shared experience of a three year Post Occupancy Evaluation (POE) exercise in addition to their experiences (individual and collective) of working across a number of Learning Estate Investment Programme (LEIP) projects.

Project Life Cycle - Energy Efficiency

The diagram shown top left illustrates the various funding outcomes of LEIP and where they ultimately happen in the project life cycle. This focuses on the energy efficiency banding which is ultimately determined at year two of occupation. As it is not a banding that is determined at handover or in design, this ultimately means that the POE period is very important from handover to year two, to make sure that the building and the end users are performing and interacting with the building as ultimately it's been designed. From then on its reporting every five years where the banding is potentially adjusted or verified, up to the 25 year period.

TM54 Methodology

In the **Pre-Construction** period the TM54 energy model is produced and ultimately acts as the energy design tool to help inform the building performance requirements. Once on site that TM54 model is then verified through an **'As-Built'** scenario so it reflects the actual build of the building and then the commissioning that takes place.

After **handover** it's the end use actual metered energy data that is used and that then determines the energy efficiency banding.

Post Occupancy Evaluation (POE)

"For us POE is a critical stage in the journey of any new building; not only it does offer the opportunity to validate the early design decisions identified at the briefing and visioning stage, but as importantly, offers the opportunity to really understand first-hand how the building is operating and performing relative to its intended design" Matt Haggarty

End User POE: Common Issues encountered

- POE is treated as a standalone or optional activity – or not done at all!
- Lack of joined up approach between briefing and outcomes
- No ownership of the process
- Difficulty getting stakeholders to participate
- Impact and benefits for the longer term are not understood
- User feedback and building data are not joined up

Briefing & Evaluation Framework

In 2021 Ryder began working with SFT on the Briefing & Evaluation Framework. The framework was developed to support anyone embarking on any form of infrastructure investment to better define, develop and evaluate the outcomes they are seeking to achieve.

"The problem we often find is briefing and evaluation on these projects can be years apart, so not only might you have had a change of people and/or

Share the learning: energy reporting and monitoring

roles, it's easy to forget what the purpose and the fundamental goals were that you set out to achieve when you started on a project once you've got that briefing bit in the rearview mirror. POE shouldn't be this painful task you get dragged into unwillingly at the end of a project, it really needs to be that culmination of the thoughtful and meaningful brief" Soo Darcy

The intention of the framework is to start with a thoughtful and meaningful brief that leads to a **defined set of objectives** of what is trying to be achieved. There should be a clear rationale behind these objectives which is noted and recorded. These can then be checked and validated throughout the process to ensure the project is on track to deliver these objectives.

By POE there should then be a wealth of information about the building and the decisions that were made, so that even if people come to the project late or there is a change of personnel, they are able to understand what is going on and why decisions were made. This ensures **a sense of ownership** at the end which applies to the user experience as well as building performance data.

"The key is think of this as a continuous cycle, so the lessons we learned shouldn't just feed through the loop and inform the next project, they should be helping the building users to understand how to get the absolute best out of their new school, their new building, in the immediate term, but also for many years to come" Soo Darcy

Key Learnings of POE

- Need to engage early and often
- Need to express, share and understand the benefits of POE right from the outset
- Make sure building performance data is closely aligned with your building user information
- Need to understand how building users are actually behaving and how that's impacting building performance
- Need actionable data (not data overload) that can be shared and analysed in a in a meaningful way, and used throughout the three year POE period and beyond

Data driven POE

Common Issues encountered include:

Design
- In-use needs not understood in design
- Appointments not in place/budgeted for

Handover
- Ensuring ongoing understanding

In-use
- Issues collecting data
- Reliability of data
- Reporting to LEIP requirments

Having good data is a vital part of the POE and reporting process. It allows you to feed back into the POE process and either back up or challenge some of the findings, but also allows you to report on the targets that you have for the project.

The **chain of custody of data** is a crucial part of the process, ensuring that everyone knows at every stage the what, the when, the why and the how of the data they need to collect.

Key steps to mitigate issues

1. Brief
Implement clear & ongoing Measurement & Verfiication Plan

2. Handover
Meter testing, comissioning & reconciliation is essential - ideally pre-handover

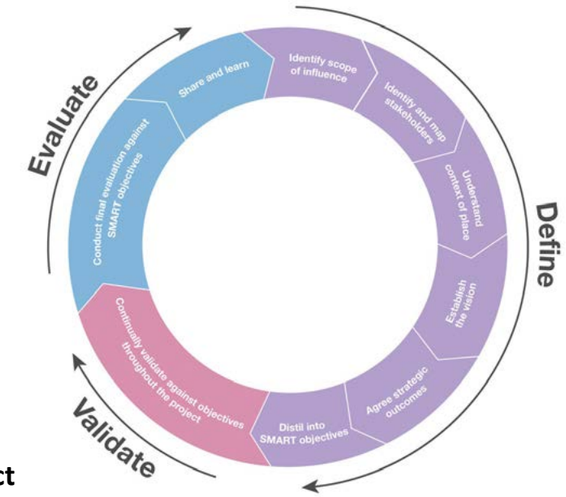
3. Post Occupancy Evaluation
Data Gathering - Automatic & centralised - removes the potential for data overlaps and data gaps

4. POE Handover?
Avoid Data Overload - Single LEIP reporting figure set up in BMS for simplicity & ensure continuity of data over reporting period

"How do we get an embedded culture throughout the project lifecycle to maximise energy and environmental performance?"
Allan Smith

SFT Briefing and Evaluation Framework

3 – Post occupancy

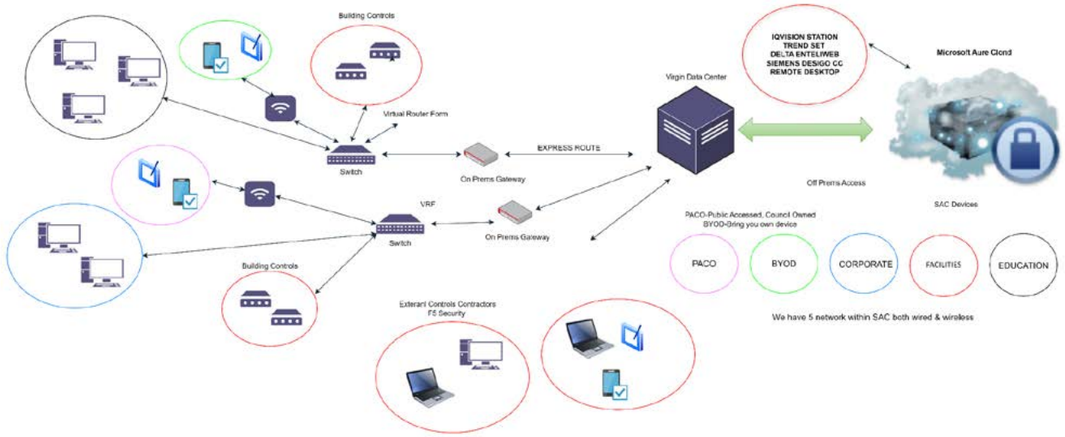


1 - Briefing

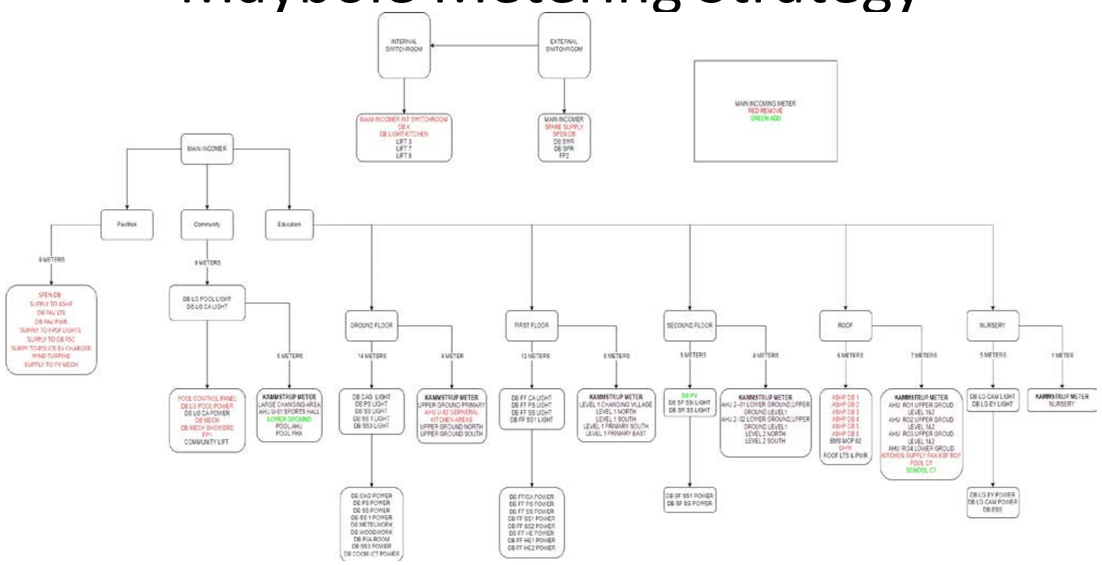
2 – Throughout project

Building Energy Management System IQVISION implementation in South Ayrshire

SAC ICT Network



Maybole Metering Strategy



David Thornton
South Ayrshire Council

David Thornton is a Building Services Engineer at South Ayrshire Council (SAC). David presented on the implementation and provided a demonstration of the IQVISION Building Energy Management System (BEMS) across South Ayrshire, with a particular focus on Maybole Community Campus.

BEMS in South Ayrshire

Trend Supervisor 963 used on 25 core sites through to 2019

- **IQVISION** introduced in June 2022 – Covid response
- Current access level - 116 sites
- Drivers - Net zero targets & energy prices

Current Management

- Daily Checks
- Monitor Connections
- Holiday Shutdowns
- Remote Heating changes & fault resolution
- High or excess consumption analysis

Challenges

- ICT Security and MS Azure setup
- BEMS contractor remote access
- Bacnet and Modbus connectivity within sites
- License – 549 devices & 17,415 points
- Site engagement (managing change)

Maybole Community Campus

The site for Maybole Community Campus opened in August ’23 but there was still construction going on in a third of the building with the leisure facilities being built onto that, so SAC didn’t gain access until February of ‘24. They were informed that they had 77 electrical meters and over 20 energy meters. When they conducted an audit they discovered that 28 of these were connected and reading data, so the challenge was then to identifying why the others weren’t working which was was largely due to contractor issues.

IQVISION

IQVISION is a building monitoring and management solution capable of integrating Trend controllers, third party devices and internet protocols such into a centralised software platform that is designed to manage buildings at an enterprise level.

It allows the end users (SAC Energy Team) to move the map about to wherever they would like it to be to allow them to access the necessary data remotely. This includes the site itself, floor plans and metering. The meters are broken up into sections so that they can actually see where the energy is being used within the building. There is also a 3D model which allows the team to spin around, pick a floor and visually look at specific areas.

SAC engaged with their contractor to come up with a bespoke module built in within the tradium system. IQVISION is built on Niagara software so they have a software developer who then built this module which allows SAC to visually look at how the building is performing without being overloaded with data. For example, the annual energy consumption profile shows only the electrical meters within the site allowing SAC to have a breakdown of different components such as just lighting and then how much energy is going to air source heat pumps

Building Energy Management System
IQVision Implementation in South Ayrshire

(ASHPs). Once they know the energy going to the ASHPs, coupled with the fact that they have heat meters, this allows them to see the electrical energy coming in and going out of the ASHPs, which allows them to look at the coefficient so they can see on a daily basis how the coefficient is performing. Tracked along with the air temperature this allows them to see how the ASHPs are performing, giving a yearly profile on how they are operating.

Reporting

IQVISION allows SAC to look at where they are with regards to **reporting on the LEIP metric requirements**. They are able to generate a report direct from site which produces the LEIP pro-rata calculation already for them, allowing them to know before year end where they are in relation to the target. They can also see how individual ASHPs are performing by selecting individual meters and running the profile across. The square meterage of the entire site is pre-loaded into the system, which SAC can alter to suit what they're doing. They are able to remove additional buildings that are located on site (such as the police station) and remove their energy, so that would then only collect the energy from education. With regards to occupational hours, they can easily change the information on how many hours the building is open, and then when the pro-rata starts or stops, allowing them to generate any report which draws back on the database that's been generated within IQVISION.

Energy Dashboard

Currently on the Maybole Community Campus site alone with the meter data there is currently 71,000 lines of data coming through on SAC's spreadsheet with no human contact; it's all done internally within the site itself.

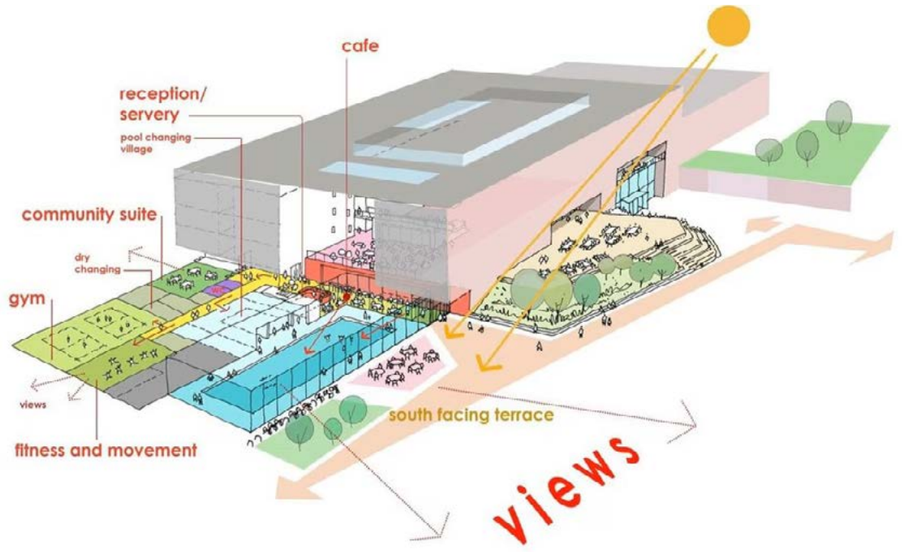
The **energy dashboard** pulls the data in and is able to give an overview of all parts of the site. For example it can show if the building is up to temperature on motorised valves, telling you what areas are open, how it's performing and where you've got any issues. It will also highlight where there are any data or connectivity issues. SAC have this for all sites, not just those which are involved in LEIP funding. There is the ability to draw the data out and run in a time clock to establish space useage, identifying potential savings. They are able to look into the history, pick a period that they want, and establish what the occupancy is. The site can also be developed to include PDF layouts of the plant and various other information. SAC can reset systems remotely. They are also able to quickly jump into offsite information and identify any issues. There is a lot of data to analyse and to look at and how to dissect that information is critical.

Monitoring

SAC also have constant **monitoring** of the connections, so they are able to see if somebody has either unplugged an ICT for example and are able to remotely disconnect it or reactivate it. They also have master settings so are able to quickly shut down a site if the weather changes. They are able to do this to multiple sites at one time and have them all running differently. This also applies to the **scheduling**; so rather than having to dial into every single site to go and change the schedule for the holiday period, they are able to just dial in to a specific site. This is not just restricted to electric or gas, they also have oil systems connected.

Summary Reductions

- **13.8m kWh of gas** the annual consumption of 1,384 homes
- **2501 tonnes CO2e** equivalent to taking 1,800 cars off the road
- And cost reduction to the Council of **£476,000**



Site Comparison – old vs new

MAYBOLE ALL SITES		MAYBOLE COMMUNITY CAMPUS		CHANGE	% CHANGE
TOTAL CONSUMPTION (kWh)	3,402,939	TOTAL CONSUMPTION (kWh)	1,553,598	- 1,849,341	-54%
TOTAL m2	13888	TOTAL m2	13367	- 521	-4%
ENERGY USE INTENSITY (kWh/m2)	245	ENERGY USE INTENSITY (kWh/m2)	116	- 129	-53%
TOTAL EMISSIONS (tCO2e)	638	TOTAL EMISSIONS (tCO2e)	328	- 310	-49%
COST TOTAL (ALL)	£284,460	COST TOTAL (ALL)	£397,721	£113,261	40%
COST USE INTENSITY (£/m2)	£20.48	COST USE INTENSITY (£/m2)	£29.75	£9.27	45%
		COST/TONNE SAVED	£365		

Smart Buildings for the learning estate

Paul Dodd
Scottish Futures Trust

Paul Dodd is Head of Improving Project Delivery and Infrastructure Technology at Scottish Futures Trust (SFT). Paul's presentation focussed on Smart Buildings for the Learning Estate.

Smart Buildings

'A "smart building" is defined as a structure that can **identify and adapt** to changing conditions by effectively utilizing data, information, and communication technology, **continuously improving its predictions and actions** to meet various building needs, urban activities, and operations; essentially, a building that leverages technology to optimize i**ts functionality and user experience** based on real-time data analysis.' *ISO standard 37137:2023*

Case Study 1 - Midlothian Estate

Four years ago SFT set about supporting Midlothian Council think about how they utilise Lasswade High School initially and then moving onto Mauricewood Primary School. The priority area was about utilisation within the building itself and the premise of that was about the **utilisation data** being a key data set to inform and support wellbeing, but also performance and sustainability.

SFT in partnership with Midlothian Council undertook a CivTech challenge, which is a Scottish Government innovation accelerator programme, to understand utilisation better within the schools. Buro Happold were appointed to support this challenge, and one of the first steps was to review what was currently available in terms of utilisation data information. Once this was established, the team started to experiment with different sensors, introducing **LiDAR sensors** within the large canteen area and large volume spaces.

This provided some interesting information about how people were using the space. There's an interesting linkage to where there are pinch points and overcrowding, which poses a challenge to pupils around their own wellbeing and overly crowded spaces at certain points of the day.

Through this exercise they were able to identify that utilisation was about 40 to 50%, which provided evidence and insights into where additional capacity was within the school and enable the leadership team to support timetabling. The leadership team and the council all worked with the new insights provided by the data which was important in trying to understand how and where they could rethink and reimagine the use of spaces within the school itself.

SmartViz

Out of this innovation challenge initially led supported by Buro Happold, a new startup called SmartViz was created, which has taken a portfolio approach to **coordinating data across multiple assets**. The approach to Lasswade was then was applied by Midlothian Council on Mauricewood Primary School. Prior to design Midlothian sought to get insights as to how the school was currently performing to informing the design thinking. There was a focus on a certain data set which was the utilisation. This leveraged a lot of new areas of consideration, insight, opportunity around building size, around future investment, and also the interplay between how the spaces were currently timetabled and the actual occupancy. This unlocked additional capacity, informed future design strategies, and the leadership team really engaged with the data to try and understand the school and how they can use it better. Additional benefits were that it created some interesting data projects for the pupils as a project as well.

Investment Benefits

Smart Buildings for the learning estate

- Unlock up to 20% additional capacity planning
- Inform future invest strategy and design
- Support and improve wellbeing for students and staff

Case Study 2 - SFT Offices

As an organisation SFT were able to apply a similar approach around performance and monitoring the environment within their own office space. This was done through less reliance on existing BMS systems, but more through the introduction of **multi sensors**.

The sensors provided transparency around how the space is used by individuals, how rooms are used and how desks are used to really inform how we operate the space. The multi sensor alson picks up the environmental metrics; temperature, CO2, carbon dioxide, VOCs and light as well. This demonstrates that there are ready made solutions which can be utilised within an existing estate.

Period of analysis - SFT undertook a focus analysis over 18 months and this informed the office move in October 2023. Once you have the data the important part is acting on the insights; so understanding the space, looking at historic data to understand where are the pinch points, which rooms need to be managed more carefully, where are the peaks and why. Acting on the insight is a challenge, ensuring that's done well and there's the correct resource within the system to help look at that.

Digital Estate & Infrastructure Group

A big part of SFT's work is to help share and facilitate learning from projects they are involved with, and as part of that they chair a Digital Estate & Infrastructure Group. The group focuses on the digitisation of assets, protocols, naming conventions, frameworks for implementation and the group identified the following as challenges around this space:

- interoperability
- security
- governance
- technology
- skills
- funding
- data standards
- legacy

SFT use this group to share this information and introduce speakers around some of the work that's going on at the moment. Other ways they try to support is through creating and capturing some of the lessons and guidance around this space. Last August they introduced;

A Guide to Smart Infrastructure for the Learning Estate

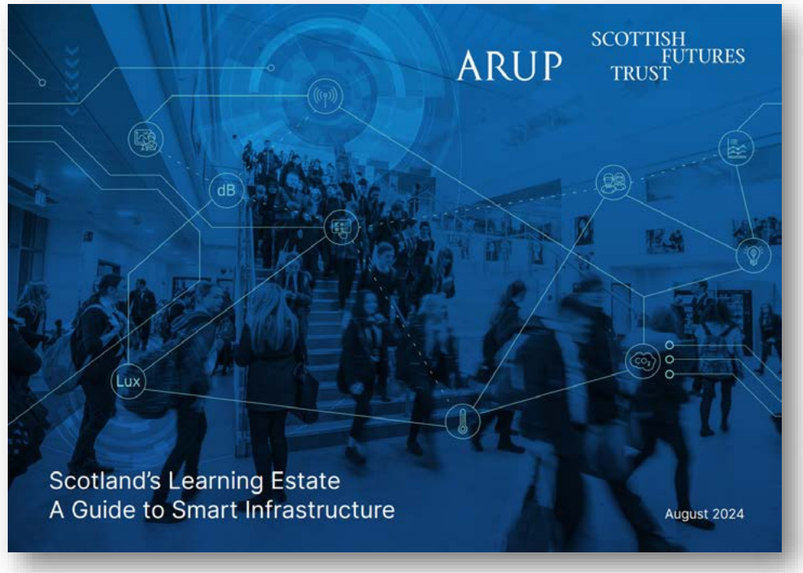
Developed in conjunction with Arup and other partners, this guide is trying to get that line of sight between the data and the outcomes. The guide itself includes a framework, a briefing document and a briefing template. There are also templates.where you can document the data that you're looking to require, the frequency of it, some of the challenges around levels of reporting and then link it through to which source or system would generate that data to map your smart building strategy.

Final Thoughts - Smart Building

1. Map the data to outcomes & benefits.
Develop proportionate approach to data capture that can support performance and ultimately outcomes.

2. Assess what you have and what you align with.
You might be sitting a lot of insights - It's about trying to bring some structure to that and looking at that closer.

3. Invest in secure, flexible and scalable solutions.
Getting that balance right which brings distinct challenges but there are a variety of solutions out there that would suit individual or estate needs as well.



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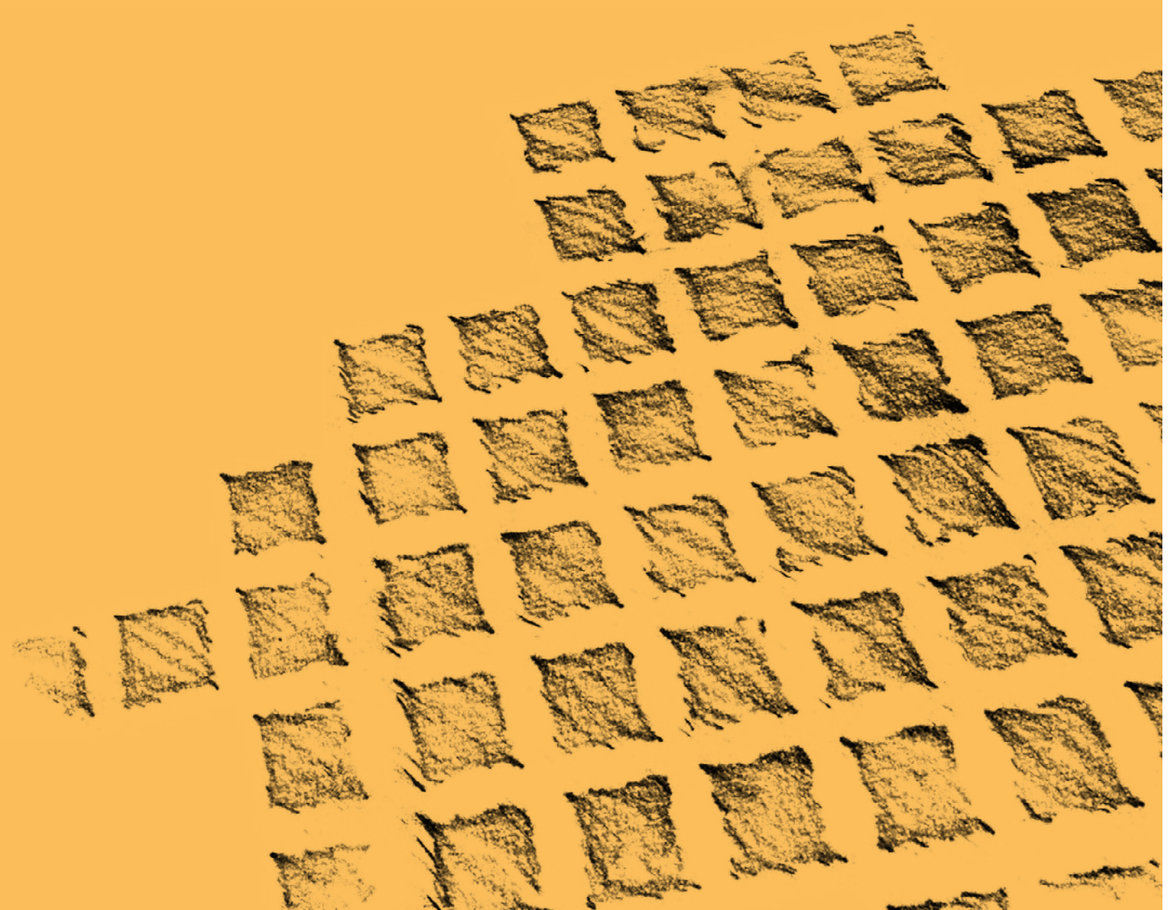
Key Aspects

- Framework for implementation
- Benefits
- LEIP ROI and data mapping
- Briefing Document
- Bassline information and IoT requirements
- Case Studies

Further support



Further support

As well as a forum for Local Authorities to join together, the Shared Learning Events are designed to complement support that is available on any aspect of the LEIP, from SFT's Learning Estate Infrastructure Team and wider stakeholders as appropriate. For relevant contacts at SFT and A&DS please see below;

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