Buckinghamshire **Live Lab** *Trial*

Final Business Case & Impact Assessment

Mesh Communications Network

Strategic Case (1)

The Strategic Case sets out why the intervention is needed, how it furthers national, regional and local policy and whether there is a clear case for change.

National, regional and local policy fit	This intervention seeks to address Buckinghamshire Council's objective of a connected, growing, healthy, sustainable and empowered Buckinghamshire, as outlined in Buckinghamshire's Local Transport Plan 4 (LTP4).
The case for intervention that meets those policy needs	The mesh network provides high bandwidth, low latency connectivity to facilitate the Live Labs trials of environmental sensors, adult social care sensors and renewable energy. It allows timely and accurate data to be collected remotely from a variety of IoT sensors with the potential to better inform operational, tactical and strategic decisions and contribute to Buckinghamshire Council's LTP4 objectives
The national, regional & local needs and challenges	As with many local authorities, Buckinghamshire Council is facing continuing budgetary constraints, at the same time as there is a growing need to address congestion, improve access to public transport, meet air quality and net zero targets; and deliver effective and efficient asset management.
The wider case for the intervention	A wireless mesh network is one way of providing the capacity, high speed and low latency to collect and transmit data from sensors to allow more informed decision making.

Strategic Case (2)

Strategic

Push for innovative solutions to existing problems.

Financial

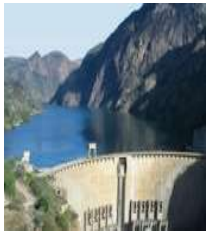
Provides connectivity for sensor technologies that may reduce operational costs through evidence based decision making and targeted activity.

Environmental

Enhanced environmental understanding and solutions through Internet-of-Things.

Legal

Data governance must comply with relevant standards including for cyber security and GDPR



Economic

Provides connectivity for IoT technologies with potential use cases and benefits for local businesses and residents.

Future Ready

New and innovative ways of providing improved outcomes and reduced costs to accommodate for localised issues.

Strategic Case (3)

The Logic Impact model shows how the inputs and activities carried out during the trial flow through to short, medium and long term impacts. Where trials are not yet operational, anticipated impacts are provided.

Inputs	Activities	Outputs
Wireless mesh network	Installation of mesh network hardware: • enTalk mesh controllers • enTalk Nemanode • enTalk DolFinial • DolFin Pro Back office support from EnLight	• Faster connectivity • Lower latency (faster response) • Greater capacity • Increased reliability • Better flexibility (more applications can be deployed)

Planned work

Outcomes – Impact		
Short-term	**Medium-term**	**Long-term**
• Underpins the Adept Live Lab trials of energy, environmental sensors and adult social care sensors • Allows evaluation of mesh network as a possible ongoing connectivity solution for smart spaces	• Supports continued use of the sensors installed during the Live Lab trials. • Gulley sensors could transfer onto the mesh network.	Provides capacity to add more applications

Intended results

Economic Case – Costs (update WP 4.1)

- Indicative capital and operational costs (for a 6-month period):
  - £257k (complete end-end solution incl. environmental sensors network, a breakdown of the cost was not provided by the Supplier)
- Indicative annual ongoing fees:
  - Up to £300k for annual supplier support and extended product warranties for the complete end to end solution – for the current scale of system.

These costs include the installation, maintenance and running of 6 enTalk Mesh Controllers, 1863 enTalk Nemanodes, 170 enTalk DolFinials and 55 DolFin Pro's that cover an area shown in the image below.

Economic Case – Benefits realised through the trial

Trial has been running from late November 2021 to May 2022 as the deployment has gradually scaled up. Due to the short timeframe of the trial, the full benefits have yet to be realised. As the system was implemented on a delayed programme, there has not been an opportunity for the Council and their Contractor to use the data to change processes and as a result some expected qualitative benefits have not been captured:

Monetisable

- The mesh network provides connectivity for sensor technology, which may increase efficiency and deliver benefits across a range of public services, but does not deliver monetisable benefits itself.

Quantifiable not monetisable

- As above, the mesh network will not deliver quantifiable benefits in itself but does facilitate connectivity that might.

Economic Case – Benefits realised through the trial

Qualitative

- The network facilitates the Live Labs trial of environmental sensors, adult social care sensors and renewal energy.
- Functionality:
  - Runs at 100Kbit/s and utilises edge computing topology thus achieving low latency.
  - Highly secure network utilising AES (Advanced Encryption Standard) and SSL (Secure Socket Layer) to protect data transfer.
  - Highly resilient network that can achieve low latency and maintain good signal strength in various weather conditions as it was designed to use Sub-GHz radio which works best in these environments.

Commercial Case

Procurement journey

Lessons learned through procurement include the necessity of vetting suppliers and clearly defining the scope of delivery at the start of the project. Furthermore, that small companies often cannot scale up to meet project delivery.

Implementation efficiency

The trial implementation was delayed and commenced at a small scale at the end Nov 2021, gradually building in scale through to May 2022.

The delivery programme was overly optimistic due to the lack of specific technology experience with the implementation of such an intervention. In addition, the circumstances of the COVID-19 pandemic made it difficult to collaborate effectively with delivery partners.

COVID-19 also impacted on supply chains, particularly with equipment manufactured in China. To mitigate the risk on delivery, the primary supplier had to reached out to alternative sources, however, there was a shortage of key parts (including processors) which delayed the overall implementation. The increased price inflation of parts added to the delay.

The first phase of the mesh network implementation was the installation of the composite columns which was put on hold for four months due to an on-site fatality.

The primary supplier was a relatively small business which had challenges in scaling up delivery which further delayed implementation. This was not helped by payment milestones which were not well defined and led to cash flow complications for the supplier.

Financial Case

Affordability

The operational period of the network was too short to recoup the costs and deliver a profitable investment.

However, it is likely that a more cost effective solution would be to use commercially available complete communication network, such as 5G, rather than a bespoke solution. This would likely have reduced the Council's management costs for delivery too.

Financial model

Another alternative model would be to buy data from other sources negating the need for certain sensors and communications network in the first place. For example, there is now an emerging market of available information and platforms, with developments in the IoT, floating data from third-party providers (e.g. Here, INRIX, Google and Tom-Tom) as well as safety-related, real-time data from vehicle manufacturers available to public sector bodies.

Funding sources

Funding for the trial was provided by the ADEPT Live Labs programme..

Management Case (1)

Project management approach

The trial would have benefited from more frequent interactions with suppliers to actively manage the programme, tackle issues early on and ensure that all parties take ownership of issues.

Remote working due to Covid meant that face to face relationships were not established and issues were picked up later than they might potentially have been had site visits taken place.

A lack of clarity and understanding of the scope by the suppliers also impacted on the delivery of the project. Involvement of a single system integrator may have helped develop and communicate an overall vision to delivery partners and the supply chain.

Consideration of a payment schedule which more closely matched the SME supplier's costs incurred would have reduced resourcing challenges.

Management Case (2)

Delivery plan

The delivery plan was not achieved for a number of reasons:

- The site delivery was paused for 4 months following a fatality onsite; this delayed the installation of the composite columns which was a prerequisite of the mesh network implementation.
- Following the fatality, the installation subcontractor involved stepped down from the job and closed their depot. This led to Buckinghamshire Council needing to take legal action to gain access to the component parts stored in the depot, further delaying installation.
- The mesh network supplier had challenges with scaling up delivery, cash flow problems hindered production and uncertainties around scope led to last minute issues.

The mesh network provides connectivity for the energy, environmental sensor and adult social care sensor trials. Therefore as it was the critical path trial, the delay had a knock on effect, delaying implementation of these other trials too.

In future, the risk of relying on trial technology to facilitate the trials should be recognised and suitable mitigation put in place, such as a back up communications network option.

Management Case (3)

Project management team and qualifications

It is essential that a project team delivering this form of trial has experience of integrating solutions across a range of suppliers and clearly specifying interfaces.

Buckinghamshire Council and their Maintenance Contractor will need to be provided with training to be maximise the value in accessing and interpreting the data being collated.

Management Case (4)

Benefit realisation and contract management plan

It's important to get buy-in from the Council's internal users from the outset to obtain their contribution to use cases, agree the technology solution, facilitating adoption of the system and agree the success criteria of the trial.

Evaluation strategy

Alternative communications options were not considered. However, off-the-shelf options, for example 5G, may have less financial and operating risk than the bespoke mesh network as well as acting as an enabler to 5G adoption by the local economy.