THE INNOVATION HUB

HUB

FOR AFFORDABLE HEATING AND COOLING

The Innovation Hub
for Affordable Heating and Cooling

Lesson Learnt Report

DCH at Scale: On-boarding Proof-of-Concept at a Queensland Hospital Site

Project DCH9

27th May 2022

Metro North Health, Bar-tech, Buildings Evolved.

About i-Hub

The Innovation Hub for Affordable Heating and Cooling (i-Hub) is an initiative led by the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) in conjunction with CSIRO, Queensland University of Technology (QUT), the University of Melbourne and the University of Wollongong and supported by Australian Renewable Energy Agency (ARENA) to facilitate the heating, ventilation, air conditioning and refrigeration (HVAC&R) industry's transition to a low emissions future, stimulate jobs growth, and showcase HVAC&R innovation in buildings.

The objective of i-Hub is to support the broader HVAC&R industry with knowledge dissemination, skills-development and capacity-building. By facilitating a collaborative approach to innovation, i-Hub brings together leading universities, researchers, consultants, building owners and equipment manufacturers to create a connected research and development community in Australia.

Primary Project Partner

i-Hub Lessons Learnt Report

Guidance notes for completion of the Lessons Learnt Report:

- This report is intended to be made public.
- Please use plain English, minimise jargon or unnecessary technical terms.
- Please use your organisation's branding for the report.
- The report should meet your organisation's publishing standards.
- Please use one template per each major lesson learnt and include as many as are relevant for your sub-Project. If what you learnt is more technical, this is the section to include technical information.
- The content of these Lessons Learnt Reports can be compiled (and updated, where necessary) for inclusion in the (public) Project Knowledge Sharing Report, for submission at the completion of your sub-Project.

Lead organisation	Buildings Evolved		
Sub-Project number	DCH9		
Sub-Project commencement date	March 2022	Completion date	May 2022
Report date	27th May 2022		
Contact name	Arne Hansen		
Position in organisation	Managing Director		
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Lessons learnt

Lesson learnt #1	DCH Commercial Service Levels Agreements not clear for technical support – Buildings Evolved					
Category	Legal / Commercial					
Choose from:	*Technical*	*Commercial*	*Social*	*Regulatory*	*Logistical*	*Other (specify)*

Describe what you learnt about this aspect of the Project.

At project commencement Buildings Evolved requested the creation of data access accounts for use in this project to be created, tested and handed over by the CSIRO DCH technical teams. This technical request went through a series of tests, discussions, emails, meetings and out of band communication by all partners which resulted in a delays of development work and squashed the project time left considerably.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

Building Evolved would ask of any enterprise software partner at contract negotiation phase of a project, to outline what they deem is a reasonable turn around time for technical support issues. In the software world this is called Mean time to resolution,(MTR) and usually has a specific commercial T&Cs which outline the support offered under the heading of 'Service Level Agreement.' We would also wish to understand what the escalation procedures and lines of communication should be if a technical issue needs to be escalated. This is fairly standard for most software as a service platforms selling to enterprise B2B markets.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

As CSIRO were subcontracted to offer the Data Clearing House Platform as a R&D platform i.e operating in a best endeavours support level agreement, prioritised based on project need, this is not a negative picture. Looking ahead to a world where the DCH successfully moves to commercial readiness; a solid SLA would need to be defined going forward so that future clients can operate and plan accordingly.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

N/a

Lesson learnt #2   Large Organisational Inertia – Metro North Health

Category	Regulatory				
Choose from:	*Technical*	*Commercial*	*Social*	*Regulatory*	*Logistical*	*Other (specify)*

Describe what you learnt about this aspect of the Project.

The journey to project acceptance by MNH was one of many paths. Commercial acceptance for an initial project size that is classified as small required the review of up to 12 people, including all the way up the CEO. There is a (valid) argument that committing taxpayer funds must be done in a defensible and value-supporting manner – the existing framework provides those checks to ensure value is achieved and spending is defensible, but there may be opportunities to streamline this process by rationalising thresholds for higher delegates to be required to act as gate-keepers.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

To adopt the innovative business models in any organisation, the inertia to change is a substantial barrier. Having a dedicated team who has carriage of the organisation's involvement in industry-collaborative projects such as this one, rather than that carriage being placed on existing teams, may streamline acceptance of future projects and increase compliance with reporting requirements.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

1. The need to share widely the successes of projects like this, to demonstrate value

2. Noting that some value is lost due to bureaucratic inefficiency associated with teams having to split their time between usual duties and duties related to such projects.

3. Acknowledging both of the above points, there are opportunities to increase the value-add of these industry-collaborative projects even further by ensuring the processes the organisation is required to follow are either streamlined as best they can be within legislative requirements, or is managed by a team dedicated to ensuring the successful outcome of these projects.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

N/a

Lesson learnt #3	Building Management Systems hardware capability assessments for data management at scale – Bar-tech

Category	Technical				
Choose from:	*Technical*	*Commercial*	*Social*	*Regulatory*	*Logistical*	*Other (specify)*

Describe what you learnt about this aspect of the Project.

With every Building Management System(BMS) comes bespoke configurations of system as they age. Many BMSs connected to buildings will be not by default set up for the intense data mining which is required when retrieving massive amounts of historical data for Smart buildings and or Digital readiness projects. Most will be built only for the requirements of the time. This is very evident with buildings that has 'Niagara; installations which use a Java Virtual Machines(JVM) to run their software. These JVM's from what we have experienced in this prototype project have very poor memory management issues, in particular garbage management. These memory management issues, in the JVM as a software execution environment, can cause instability when collating and gathering data form buildings at scale.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

As part of any future program using existing BMS infrastructure, we would suggest assuming a limited capability and scope otherwise without upgrades there will be limited data gathering at scale. As part of this project, we took the approach to assume always there is an extreme limit and simply query for small bits of data and allow the system to slowly gather the data over a longer period. Normally months or years of data can be consumed with this method every day, so it doest't create any critical issue if the project has the time to wait to collate the data. Normally within a few days years of data can be consumed. Thus the entire database can be up to date within a few days allowing for very small updates that can be scheduled to lower the load on a system.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

Assuming the existing BMS infrastructure is not up to current standards allows you to keep a system stable when collating the data. This not so much of an issue if the BMS on site is capable and or modern form the the start.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

N/a

Lesson learnt #4	Large scale data management of BMS data for integration into the Cloud requires a stand alone database – Bar-tech

Category	Technical					
Choose from:	*Technical*	*Commercial*	*Social*	*Regulatory*	*Logistical*	*Other (specify)*

Describe what you learnt about this aspect of the Project.

Existing large installations at large sites with a portfolio of buildings can have deceptively large data stores that can overwhelm relatively small new ingestion databases. I.e a file system size of 5 gig in an old data structure can equate to 10s of Gigs in new data tables. This is because new data can have meta and indexing which allows it to be accessed more efficiently however this adds large amounts of data overall, something modern server system don't need to worry about. Our initial installation being set up as a Virtual Machine meant we limited the database storage space creating 'lack of storage issue' as the data tables filled up completely, when we processed the historical site data into the Data Clearing House.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

Given the cost of database servers now it makes sense to always have an external database on a NAS or equivalent which deals with the data enabling only the program to run on the VM or another device. This will allow both to be better managed.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

A scalable architecture for processing data from site to the DCH should be use the a separate Virtual machine to the run the application logic only, and just do this one task. A separate staging database should be set-up on site as well. Given the cost of database servers now it makes sense to always have an external database on a NAS or equivalent which deals with the data enabling only the program to run on the VM or another device. This will allow both to be better managed and avoid resource contention issues winch we experienced.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

N/a

Lesson learnt #5	Dealing with Energy data suppliers is time consuming – Buildings Evolved

Category	Technical / Logistical / Commercial					
Choose from:	*Technical*	*Commercial*	*Social*	*Regulatory*	*Logistical*	*Other (specify)*

Describe what you learnt about this aspect of the Project.

The data procurement phase of the project began two-weeks into the project commencement which resulted in BE receiving the data needed in the last week of the project. This was due to poor data request processes in place at each of MH's energy suppliers. Collating MNH's asset related metadata and an authority to act authorisation letter proved quite challenging for the MNHs team having to traverse multiple different internal departments. The energy data was also of poor quality, a single concatenated file with data duplication and inconsistencies.

Please describe what you would do differently next time and how this would help. What are the implications for future Projects?

In future projects we will:

- Ensure asset meta data and supplier information is correct with the client/beneficiary before requesting information from suppliers.
- Plan for receiving data in a timely fashion by:
    - Getting contact details for a representative at the organisation who are able to help.
    - Agreeing on a time for delivering data and following up when data is not provided.
- Once data is received, spot check the data or use a data verification tool to confirm quality, check for things like:
    - consistent number of readings,
    - completeness, and
    - duplication.

This will enable better management of the data gathering process and flag issues in a timely manner. Ultimately this will improve project planning and delivery.

If your Project learnings have identified any knowledge gaps that need to be filled, please state it below.

When dealing with digitally formatted energy data :

1. Do not assume asset meta data and supplier information is correct.
2. Dealing with data suppliers is time consumption so plan for this.
3. Do not assume data completeness and accuracy from data suppliers.

Please include any other information you feel is relevant or helpful in sharing the knowledge you learnt through this stage of the Project. This may be qualitative or quantitative and may include a graph, chart, infographic or table as appropriate.

N/a