Case Studies zu datengesteuerten intelligenten Gebäuden
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Data-Driven Smart Buildings case studies collected in IEA Annex 81

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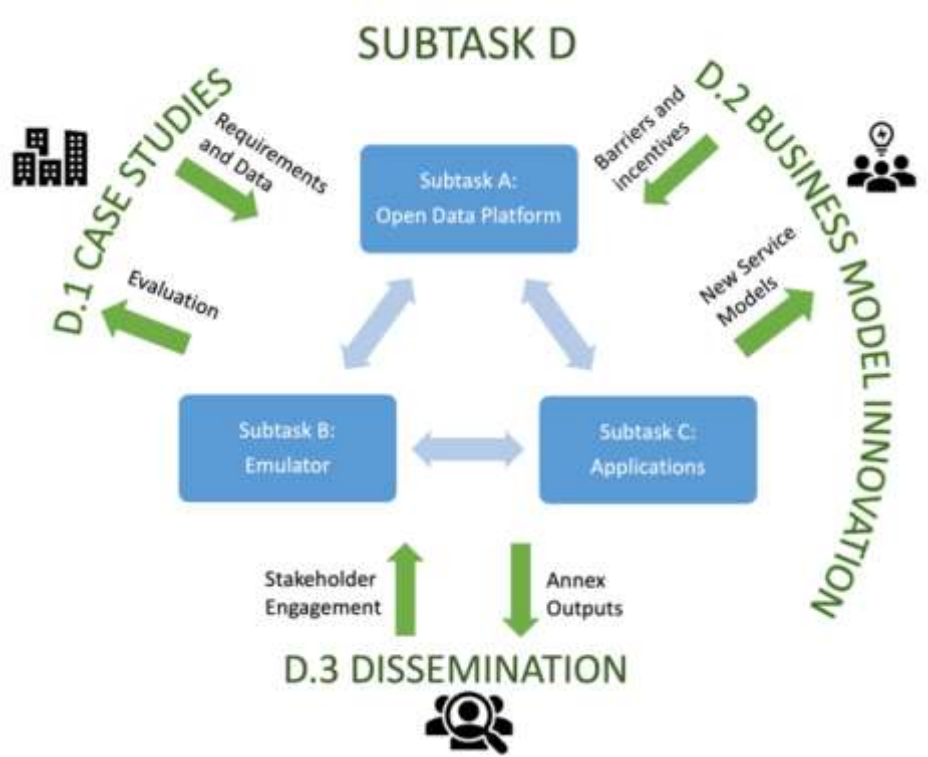
The International Energy Agency Annex 81 ‘Data-Driven Smart Buildings’ project



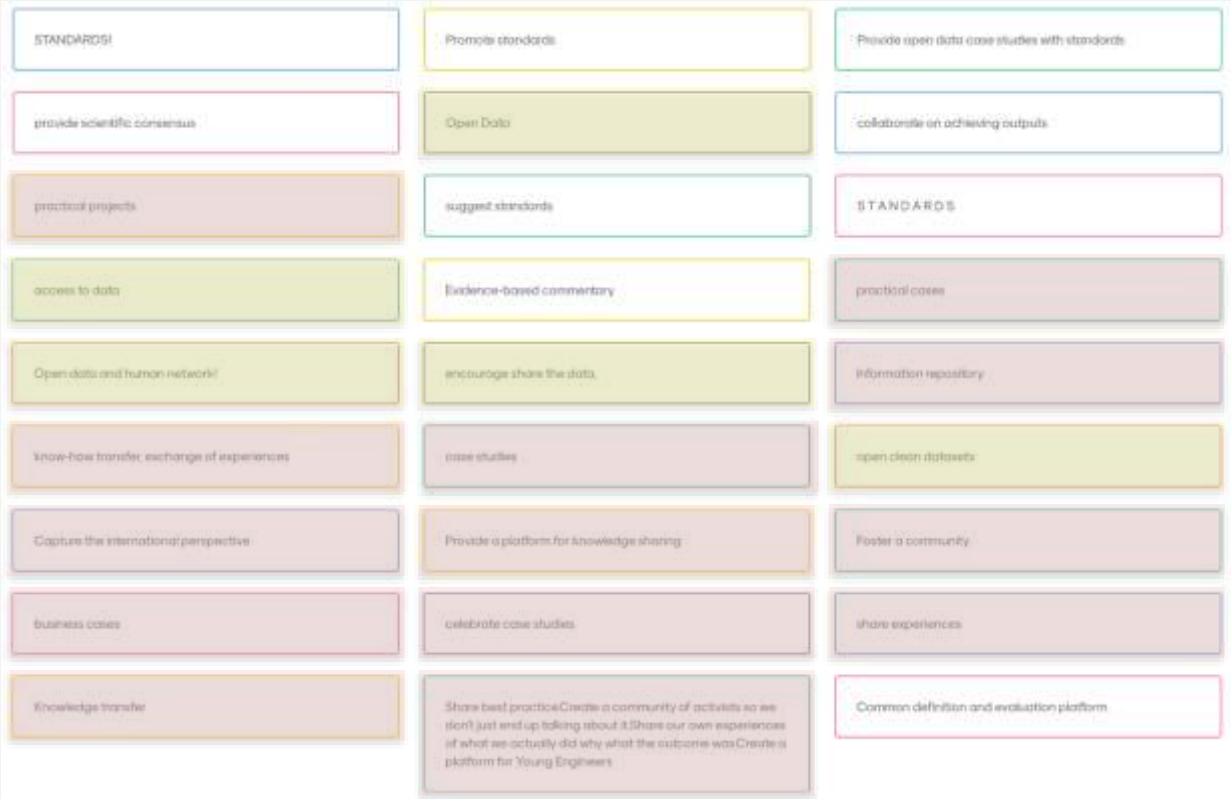
- Advancement of technological solutions and energy efficiency software have been successfully demonstrated in practice.
- Limited smart technology adoption in the current state of practice (e.g., implementation efforts, costs).
- Transition to real-world implementation requires understanding of stakeholders’ needs and potential of such technologies.

*Annex 81 aims to support **knowledge** and **technology transfer** by consolidating knowledge and providing evidence to **accelerate the adoption** of data-driven smart building technologies.*

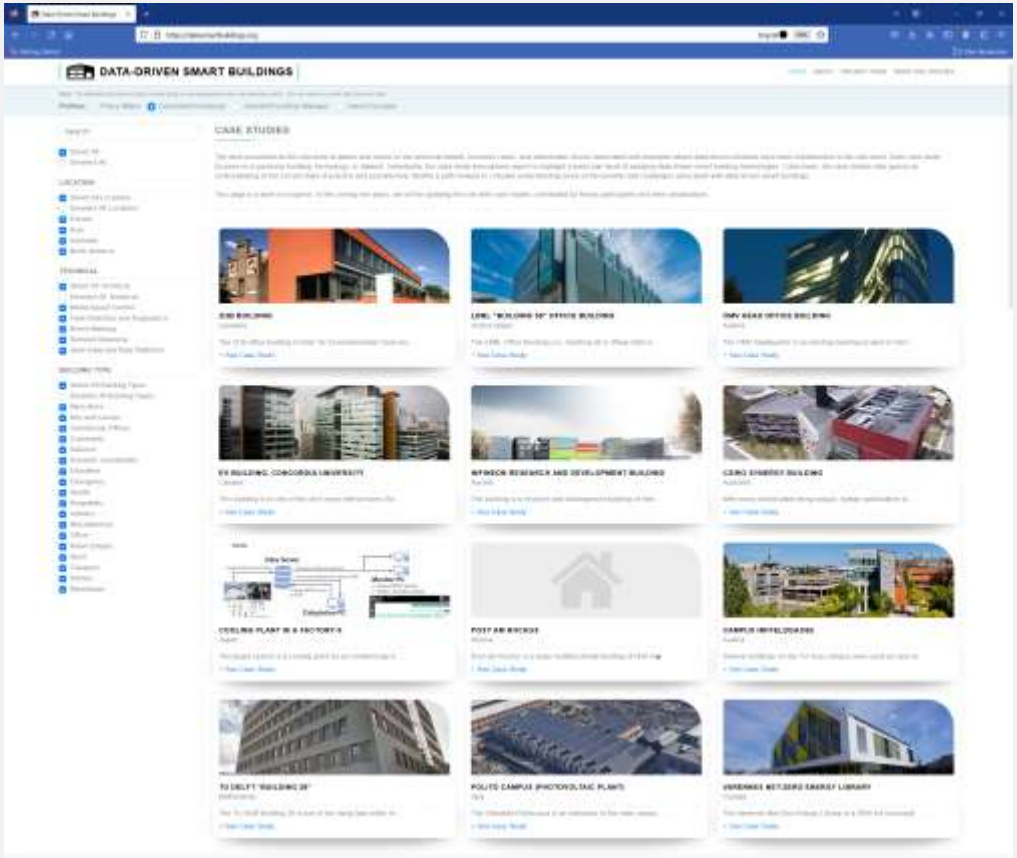
More than 100 members from 19 countries and 4 continents

Stakeholders' perspectives on barriers to smart-buildings technologies

Stakeholders’ perspectives on Annex 81 contribution to accelerate innovation



The Data-Driven Smart Buildings case studies



https://datasmartbuildings.org/

- Web page for each case study
  - Interactive tabs with case study information (technical details, business cases, stakeholders' stories)
  - Images and links to further information (e.g., data, wider project outputs, plans)
  - Export case study to PDF
  - Contact case study contributor

- Filter case studies according to:
  - Location
  - Technology
  - Building type
  - Stakeholder profile

Lessons learnt from the case studies collected

- 9 case studies analysed (location: Austria, Australia, Canada, Germany, Italy, Japan, the Netherlands and the USA)
- All case studies aimed at reducing the building energy consumption while improving users' comfort taking differing approaches
- Different building types (education, offices, industry)
- Different technologies installed (model predictive control, fault detection and diagnostics)

Lessons learnt | Data quality and data availability

Data quality and availability from the installed sensors were an issue in all projects:

- Gaps in data recording or access to standardised metadata were problematic in several cases;
- Unavailability of metadata can reduce FAIR access to data and usability for data-driven applications;
- Issues with sensor quality and accuracy were reported, which may lead to suboptimal maintenance and higher operating costs.

Good data quality was crucial for the smooth operation and optimisation of the cooling system of the CSIRO building. The use of such data for advanced fault diagnostic allowed to automatically detect typical issues encountered during commissioning.

Reliable metadata can be obtained using dedicated methods like the brick ontology adopted at LBNL 'Building 59', reducing control logic installation costs.

Lessons learnt | Understanding users’ preferences

Understanding and accounting for user preferences is crucial for the acceptance of fully automated systems:

- Users were adverse more reluctant to accept fully automated systems (with no overriding option);
- Users were more likely to accept setpoint variations when they did not notice a mechanical change or when the building's thermal mass contributed to such change;
- Occupants' play a predominant role to obtaining actual performance in-use.

Based on experience, users training is recommended when new technology is introduced.

Training enables the users to learn best-practice operation of new technology and associated benefits and operate it as intended (e.g., reducing manual control overrides).

Getting involved

Why contributing:

- Attractive location to host your projects;
- Opportunity to summarise the project and help distil key messages from the review process (which can be reused for other purposes);
- Dissemination and promotion of case study (CC BY-NC-ND 4.0 license) and existing material;
- Not too onerous process.

What we are looking for:

- Mixture of technologies with specific non-domestic buildings/ types;
- Case studies with ease of access to buildings, data and occupants (for follow-up data);
- Capturing various stakeholders involved and their needs;
- Ideally, buildings with a full range of performance factors (including non-energy) and business models;
- Ideally, buildings with data for before/after a control's refit (or upgrade) to measure performance improvements and better understand decision-making mechanisms.

Getting involved

How to contribute:

- Each case study can focus on a particular building, technology or dataset.
- Fill in a 2-page template to provide information on a number of aspects:

General info on the case study and its context

Case Study Title

Project Information			
Continent:	☐ Europe ☐ Africa	☐ Asia ☐ North America	☐ Australia ☐ South America
City, Country:			
Building typology:	☐ Agriculture ☐ Community ☐ Education ☐ Hospitality ☐ Office ☐ Transport	☐ Arts and Leisure ☐ Defence ☐ Emergency ☐ Industry ☐ Retail (Shops) ☐ Utilities	☐ Commercial Offices ☐ Domestic (Residential) ☐ Health ☐ Miscellaneous ☐ Sport ☐ Warehouse
Technology installed/proposed:	☐ Model-based control ☐ Fault detection and diagnostics ☐ Energy benchmark ☐ Demand response ☐ Open data and data platform ☐ Other: **Please provide a brief description of the technology:**		
Data availability:			
Status:	☐ Design/Development ☐ Construction ☐ Testing/Commissioning ☐ Operational - awaiting results ☐ Operational - results available		

Description
Short introduction paragraph giving the context and a short description of the case study

Info on technical details and business models

Project aim

This section may include a short discussion on:
a. Project design background;
b. Project aims and objectives;
c. Project motivation;
d. The key technology to be/has been included.

Implementation

This section may include a short discussion on:
a. General information for the building, the building services, and energy management system (if applicable);
b. Data-driven approaches applied (e.g. improved control, FDD, etc.) (*if applicable*);
c. Description of data requirements and data sources.

Value proposition

This section may include a short discussion on:
a. Operational performance (e.g.: how well did it work, is it easy to use?);
b. Significant benefits compared to traditional technologies/the past.

Impacts

This section may include a short discussion on:
a. Benefits gained;
b. Comparison to expectations;
c. Reasons for any discrepancies;
d. Scalability/Transferability.

Business Proposition/Business model

Discuss the business case, or potential business model for the innovation like:
a. Annual contract for service?
b. Software as a service?
c. At-risk with shared savings?
d. Install only (customer manages)?
e. Other?

Stakeholder stories and knowledge generation

Lessons learnt

This section might include the following:
a. Unsolved issues during/after the design, implementation and commission of the technologies;
b. Lessons learned in the design, implementation and commission of the data-driven technologies;
c. Occupant acceptance (complaints/endorsement);
d. Challenges faced (e.g., delays, installation issues, commissioning problems, complexity, user complaints?)
e. Unintended consequences (e.g., unexpected impact on other systems? Safety issues/ Reliability issues? Privacy/security risks?)
f. Other concerns.

Key stakeholders (as appropriate))	Information providers
Select one/some of the followings ☐ Client ☐ Designers ☐ Consultants ☐ Manufacturers / Suppliers ☐ Contractors ☐ Monitoring and reporting ☐ Others (e.g., building operator / manager)	Who provided information for the case study and their role/perspective in this project?

For more information on the Case Study:

Contact person:	Name/E-mail address/Affiliation

Please, get in touch with the Annex 81 case study collection team for more info and participation

Thank you

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