Approaching Near Zero Energy In Historic Buildings

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User Guide for all Participants in Participatory Design

Approaching Sustained Co-Design in Building Retrofit Projects

ENERGY
PATHFINDER

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User Guide for all Participants in Participatory Design

Approaching Sustained Co-Design in Building Retrofit Projects

This guide identifies co-design opportunities for improving energy performance in old buildings and is made of three parts: **MAKING**, **SEEING**, and **INFORMING**. Each part includes a way of looking at project stages called a 'temporal lens' (e.g. looking back, forward, both). Many buildings don't work as well as they could because of gaps in knowledge about their design. Co-design is important as it can reduce communication breakdowns, enable knowledge from all partner groups to be used to its full potential, test assumptions; limiting long-term costs such as building alterations due to untested assumptions, increase sense of ownership by users (important for a building's longevity), enable capacity building for self-sustaining measurement or recording systems to inform maintenance and future retrofitting projects, and overcome cultural barriers to adoption. This can allow optimal resourcing, and returns, for all involved where the whole is greater than the sum of its parts.

01 MAKING: Devising a Co-Design Strategy for Building Energy Refurb

Retrofit buildings provide a unique opportunity for co-design. While co-design in new-build projects is usually at the start of the design process towards making a building, historical building retrofit starts with the building. This is important because retrofit projects can help counter balance the over-emphasis on co-design happening only at the start of design projects. This can challenge our assumptions that buildings are fixed in time, or being ready for use as soon as their construction (or retrofit) is complete. From the beginning, a common mindset should be adopted by all partner groups — that co-design between partners can be sustained or emerged both throughout *and after* retrofit. We can call this mindset a *prospective* lens; a forward-looking approach that allows buildings to be retrofitted while keeping a holistic view of potential post-retrofit opportunities.

Co-design has evolved into a 'toolbox' of many different approaches. This guide does not describe them all but, instead, simply offers a flexible model relevant to energy upgrade projects open to both future iteration and refinement:

STEP 1: Partner groups should identify themselves to create common ground. Notwithstanding different contexts, usually these could include:

- Building Owner
- Building Users / Communities
- Service Providers / Consultants
- Relevant Local Authority
- *'Other Relevant Groups' (e.g. Sweat-Equity)*

STEP 2: Establish mutual understanding of co-design principles, process scope, and explicit commitment to these by each of the partner groups.

STEP 3: Each partner group to self-identify representatives for the Co-Design Team (including any reassessment of process scope, and circulation of mutually established co-design principles).

STEP 4: Engage service providers (existing and potential) to generate required data, timeframes, involvement, resources required and availability.

STEP 5: Summarise core information gathered in a clear presentation format for team circulation.

STEP 6: Plan with all parties initial and continued engagement processes (such as focus groups or workshops) not consultation exercises. Consultation is often taken to mean talking 'to' certain groups (e.g. building users), after which other groups determine the outcome (e.g. service providers). Co-creation embraces the open-endedness needed for ongoing shared decision-making for reflexivity and iteration (e.g. adapting project goals, resource allocation, and design) by all partners.

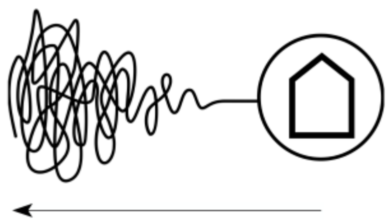
STEP 7: Make initial workshop known through all partner groups. Raise awareness of opportunity to participate to other potential stakeholders known.

STEP 8: Carry out planned engagement (e.g. workshops) with a neutral facilitator; an impartial person who has the ability to enable all voices to be, and feel, heard.

STEP 9: Ensure feedback is gained during and after each engagement and shared equally with all partners. Clarification of mutual project aims should be established as ideally these would directly inform the retrofit and monitoring methods. This can include specific challenges related to retaining cultural heritage as well as specific considerations for unique elements of the building itself.

NOTE: There is no absolute or 'fixed' process for engagement. However, it is critical that all partner groups are heard and have felt themselves heard as the creators of knowledge, not the passive receivers of it. This can be supported by ensuring extended opportunities for design input within agreed timetables, as well as different types of feedback during or after each engagement. Whatever the feedback format decided, the tool should fit the context — not the other way around. Each co-design decision then ends up in measurable form — it is built. We can then understand the value of these measurements, which we can then improve.

02 SEEING: Co-Design for Post-Occupancy Energy Retrofit Monitoring



Buildings do not always function and perform as intended. Post-occupancy evaluation (POE) offers insight into intended and unintended effects of energy retrofit to inform future projects. We can call this mindset a *retrospective* lens; looking back on results of the co-designed retrofit.

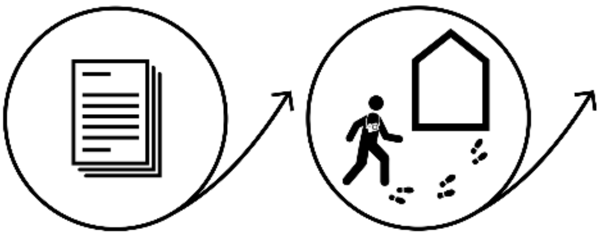
POE comes in many different forms, but can be understood simply as collecting and sharing information of value to partners within a building life cycle. By comparing the building's monitored energy use with the estimates before retrofit, the benefits (or lack thereof) of different improvements and estimation procedures might be seen. POE's that use more than one method and consider non-technical factors (e.g. interview, on-site participation) can be more insightful than exclusively technology-focused methods. For example they can even highlight users' areas of concern or cultural barriers to adoption. After all, buildings are never hot or cold — people are. POE does not have to be complicated nor expensive.

Ideally, the chosen POE would be led by a dedicated 'facilitator' (either independent or from the community, depending on context). This facilitator would help share feedback from the user groups to other partners who could help organise the results for sharing, while helping create a positive feedback environment where participants feel comfortable enough to speak and feel heard.

In any user community there are people who are able to provide valuable insights into, as well as understandings of critical issues of, how a retrofitted building does and doesn't work.

A simple example of a multi-method POE follows and is partitioned into 2 Cycles, whose aim can be to simply identify intended and unintended results:

- CYCLE A (Questionnaire)
- CYCLE B (Video Building Walkthrough)



Cycle 'A' Cycle 'B'

Both cycles can allow users to answer a short list of questions relating to co-designed aims before retrofit. Whatever the POE design, quality over quantity is recommended. An example is the *'Five Finger Feedback'* method; five open-ended questions that are brief, relevant, objective and specific:

- **Q1: What went well?**
- **Q2: What could be improved?**
- **Q3: What went wrong?**
- **Q4: What would we like to keep?**
- **Q5: What did not get enough attention?**

These questions can be used in both cycles — with answers related to carefully chosen and identified indicators, measured internally (e.g. temperature, air pressure, humidity, CO2 levels, energy consumption, heat pump usage or thermal stratification) and externally (e.g. pressure, wind speed and direction, rainfall, solar radiation, chill factor, UV index). The 'Shearing Layers' framework, explained below, offers a material dimension to the measured responses to the retrofitted elements and a structure for organising results to analyse as well as illuminating dimensions of lived experience.

CYCLE A: The questionnaire method can be 'light touch', straightforward, and facilitated remotely online to crowdsource and tabulate the results.

CYCLE B: 'New' methods such as Cycle B can motivate and enable service users to participate and share their experiences. Indeed, there are values that can only be acquired on location. The Building Walkthrough is simply a video-recorded walking interview — where one dedicated community facilitator interviews different building users, individually or in small groups, who can express their answers to the questions *in built form* by showing each in the relevant part(s) of the retrofitted building. The walk enables the interview participant to be regarded as the expert in their area, with facilitator (and by extension, the service providers) being the learners 'going along'.

NOTE: Photography can be used to illustrate their answers. The community facilitator should be reminded of their freedom to ask spontaneous or unplanned questions as needed.

Mixed-method (technical and experiential) results can qualify resourcing and clarify monitoring utility or value of renewable energy systems, as well as the systems of measurements (e.g. sensors, data loggers, and digital remote monitoring, sensing and recording). When all results are received, partner groups can then, together, identify different themes and categories that emerge from the results — which they can then use moving forward in managing economies of energy. However, each partner has different values of building attributes. How can these values be put in measurable form? For identifying any emerged themes in the results, we might classify different components that have or might have been upgraded. As can be seen in Brand's diagram evolving Duffy's 'Shearing Layers' which identifies different components distinguished by different rates of change:

- **SITE** (geographical setting)
- **STRUCTURE** (load-bearing elements)
- **SKIN** (exterior surface materials)
- **SERVICES** (e.g. HVAC, plumbing, moving parts)
- **SPACE PLAN** (layout; walls, ceilings, floors)
- **STUFF** (devices, furniture, objects)

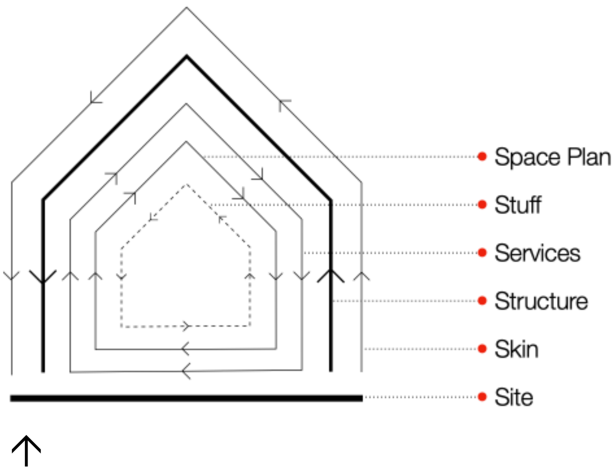
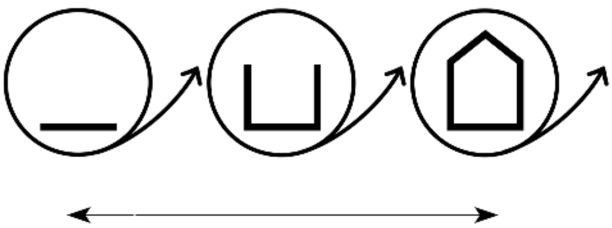


Fig. 01 The 'Shearing Layers' of a Building Differentiated by Rates of Change. Reconstructed by author from Brand (1994), extending from Duffy (1990).

03 INFORMING: (Co)Contributing the next 'Learning Loop' for Future Projects



The 'light touch' and multi-method retrofit POE, progresses the project from a one-dimensional feedback process to a multidimensional one. This in-depth nature allows the results of the project to have a high level of generalisability — meaning their learnings can be applied to the wider industry and its other projects as well. However, POE's impact in expanding industry knowledge has been limited due to a lack of dissemination to service providers and users. An urgent question is how to organise retrofit in a way that all disciplines can benefit from.

The long-term lens is recommended for this, which explicitly frames co-designed retrofit as not exclusively limited to certain stages of a single project, but ongoing across different projects. The co-organising of the **SEEING** stage's results and insights under emerged themes would crystallise 'best practice' lessons for developing future projects. For this, incorporation of feedback loops shared between different projects after their **MAKING** stages is recommended to deliver better, and more sustained, retrofit performance.

NOTE: A participatory online infrastructure could facilitate these shared insights and (co)contribute *ongoing* learning loops. Through providing continuous access to service users' attitudes and knowledge, each co-designed retrofit could be sustained in a 'post-project' future; with ongoing measurable indicators for consequences of works. This could include serving as a vehicle for whole life carbon assessment and providing an interface for complementing other policy objectives such as promoting sustainable development pathways (e.g. government climate action plans, SECAP: Sustainable Energy Climate Action Plan, and Drive to zero Carbon by 2050). Simply put, such an online platform would show the degrees to which historic buildings can be sustainable from an energy and CO2 perspective, economically viable and, through the co-designed process and mixed methods POE, both socially and culturally relevant.

References

[01] Brand, S. (1994). 'Chp. 2: Shearing Layers' In: *How Buildings Learn: What Happens After They're Built*. London, UK: Penguin, 2012. 14th ed.

[02] Duffy, F. (1990). 'Measuring Building Performance' In: Facilities, May.