Do smart homes know what people want and allow them to realize it?

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“Are smart buildings smart enough to allow me to open the window?”

Malcom McCullough, 2016

Is “smart” always smart?

The increase in the number and complexity of new technologies for “smart” homes gives us pause to ask the following questions:

- Who determines what makes houses smart?
- Do smart homes meet the needs & accommodate the know how of diverse occupants?
- How do smart homes impact energy and carbon savings?

The smart dilemma

- Smart technologies can contribute to occupant comfort, convenience, and control with reduced energy input.
- On the other hand: programmed technologies and complex interfaces can reduce user agency and flexibility, leading to sub-optimal energy use.

Smart in a historical perspective

Smart is the most recent phase in a long history of **delegating energy use** in the home to technologies and material/structural features that have been increasingly standardized and sealed.

Examples of smart technologies abound

- A “dumb” washing machine requires the user to put in the clothes, add soap, and turn a knob to start
- A “smart” washer can have numerous controls, settings, and options—not clear whether a people take advantage of these settings or ignore them
- A “dumb” heating control has on-off switch or a manual thermostat set point. “Smart” controls are digital and programmable.

Who makes “smart” home technologies?

- Apple: *HomeKit*
- Alphabet: *Nest*
- Amazon: *Echo*
- Samsung: *SmartThings*
- Others….

These are big players with an interest in digitalizing the home and home practices.

How are Smart technologies marketed?

- **Convenience**—scheduling lights, heating, a/c
- **Entertainment**—programing and recording music and
- **Comfort and Health**—maintaining comfort and protection from extreme temperatures
- **Security**—remote checking of home security
- **Energy Savings**—programming temperatures and lighting to reduce energy use

A Critique of Smart

We see four aspects that need to be considered in order to ensure acceptability and performance of smart homes:

1. Flexibility & User Control
2. Know How
3. Security & Invasiveness
4. Locked-in Designs

Flexibility and User Control

There is ample evidence that:

- People often want both automated delivery *but* have the ability to manually control or override programming.
- Many people are often skeptical of yielding comfort control to their devices
- Programmable controls can lead to user frustration and often sub-optimal comfort and energy performance

Know How

- Smart controls may appeal to a limited population that is tech savvy and tech centric
- smart home technologies are marketed to elderly households for reasons of health and security → the elderly often lack the know how to operate them—and remember their passwords!

Security & Invasiveness

- Smart technologies are marketed for reasons of increased security, but are often viewed by householders as potential security leaks
- Consumers also talk of the ability of smart technologies to spy on them and report their actions to others
- Collection of user data to “train the devices” is also seen as a source of concern if used by others

Locked-in Designs

- Smart technologies can lock in designs that prevent more flexible responses, e.g., operable windows that are user controlled, building orientation, exterior shades
- Standardization of smart technologies could further erode the capacity for flexible response, particularly in warm climates where houses are being designed for air conditioned comfort.

Making smart homes smarter

Policies for making smart homes smarter will:

- Identify the niche markets for early adopters and not assume “one size fits all”
- Draw on more culturally grounded, flexible articulations of smart. Encourage building designs that accommodate this flexibility, for example through participatory design.

Not just technology

Acknowledge that “smart” is not just about the technology, but the overall resource consumption of the household

Conclusions on “smart” homes

- Appeal for certain populations, e.g., millennials, early tech adopters, etc.
- Issues of control are important but these are subtle and not just technology focused, but involve space, times, and other dimensions
- Smart design must acknowledge differing levels of know how and demand for energy services in residential populations, balancing technology delegation with opportunities for user control.

A 1969 Ad for the Kitchen Computer

"If she can only cook as well as Honeywell can compute"

NEST *Learning Thermostat* showing impact of weather on energy consumption