

Oktoberausgabe: Smart Homes

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The digital transformation of society is more driven by technology innovation than by needs. Let us be honest: The way it works is that we have a solution and now we seek the problem which it solves. This also holds for ICT-enabled homes, which we shall call “smart homes”:

- IoT (Internet of Things)• BIM (Building information Modeling)
- AI (Artificial Intelligence)• Several further technologies, like e.g. augmented reality
- Lots of communication tools and media, that are already broadly used for other purposes
- Several global trends like open data

BIM plays an increasingly prominent role in construction and in maintenance. The principal potential is already well understood. However, key open questions are: What could be the roles of IoT and AI be? What can we gain if we combine all of them? And: Which data to share as open data?

The big pictures

There are two main types of questions. The first relates to: Which problems of existing homes will we solve with smart homes. There, we are observing some consensus, that smart homes can become active, if their inhabitants have well identified challenges and risks, for example because they are elderly people that may fall and then be unable to help themselves. This for sure is a big topic worthwhile to be pursued with many resources. But is it the only type of problem we may have?

The second type of main questions relates to: What is our vision of a new quality of living in a smart home. There, many discussions related to energy or some version of self-organized fridges proactively issuing purchases. In some countries, these intelligent fridges are about to become a standard, but should we not look for visions that go beyond it?

Cornerstones, not be ignored

There are some corner stones, which we have to take into consideration, of course. The following list is not comprehensive, but indicates some relevant perspectives:

- Architecture: good design principles (varying to a large extent among scholars)
- Energy: concepts around net zero energy (including new findings about wellbeing)
- Construction & Maintenance: BIM & Co, feasibility aspects, knowledge about long term costs
- ICT: pattern languages
- Biology & Psychology: anthropological findings, e.g. territoriality concepts
- Art: literary descriptions of life styles

Pattern languages are a key element thereby. The architect Christopher Alexander has invented the concept of a pattern language, which flooded computer science thereafter, together with its evil twin, the concept of antipattern languages. Since the oo gang of four has appropriated his pattern language concept for computer sciences, we find it much easier to talk about code – and apprentices find it much easier to code professionally. So it is rather natural, to ask how architectural patterns change, when an ICT-enabled construction is possible, and how this leads to patterns for smart homes.

Fundamental research questions

There are several natural perspectives that come into mind (and I again do not claim that the list is comprehensive):

1. **Digital Representation:** If we create a digital twin of a building, how should it be structured? Which information is easy/cheap to obtain? How can we use the digital twin – both instantly and in the long run? Which information is hidden in the digital twin that is not available otherwise? Etc.
2. **Cognitive Perception:** How is a home, either smart or not, perceived by its inhabitants, visitors, and other actors? How does this perception fit with the digital representation? Can we extend the cognitive perception with proper digital tools? Etc.
3. **Information and service needs of users** (Users = owners, residents, visitors,

maintenance and service providers, construction companies, government, ...): Which information do users need about the home? Which intelligence do users want from their home? Etc.

4. **Combination with other sources:** How does the smart home with its devices and its intelligence interact with technology carried by its inhabitants? How does it interact with information services outside? And the other way round: Which useful information can be created for autonomous machines? Etc.
5. **Patterns and anti-patterns:** What are typical successful solutions (patterns), on which we can build? Is there a hierarchy of patterns? How do they relate to Christopher Alexander's and to classical IT patterns? What are typical bad solutions (anti-patterns)? Etc.
6. **Societal and Economic Change:** How will the new design opportunities for our homes influence or living styles and societal life? What will be the impact on our quality of life? Are there specific risks to be considered? Which societal problems can be solved with it? Which new markets will be created? Which existing markets will be significantly changed (how?) or destroyed? Etc.
7. **Disciplinary perspective:** How will the possibilities around the smart home change the professional and the scientific disciplines related to the home? What will the impact on architecting, constructing, anthropology, ethnology, sociology, etc. be? Will it lead to the emergence of new disciplines?

The [October edition](#) of Societybyte tries to start a discussion on these topics. We hope that you enjoy reading and thinking about it.

Yours sincerely, Reinhard Riedl