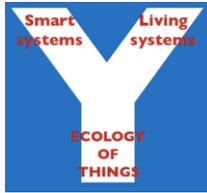*INSIGHTS*

EOT - ECOLOGY OF THINGS

Reader, keep in mind this is an Y-shaped column. Two separate observations get connected to the third observation, the insight....
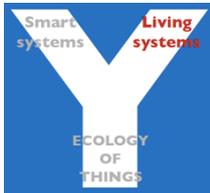
Smart systems

Working on Circular Economy, I encounter almost every day quotes like 'design of smart solutions' or 'design of the smart city'. In the second sentence, after these quotes, you will hear as a second statement that we need to be prepared for the 'Internet of Things' as a smart solution. It gives me the feeling that the, often very smart, person speaking does not have an idea of the 'how and what'. Though, it seems to work. It gives a good feeling to the audience, because: 'smart = good' and the 'Internet of Things' sounds promising, almost magical. The combination is a powerful way of speech: it is good and magical. Is it a 'self-fulfilling mechanism'?

I am not intending to discuss the value of smart solutions nor the need of development of smart cities nor starting a debate on the pro's and con's of the IoT. These developments have started some decades ago and are part of the evolution of society in the 21th century. Our cities become smarter and smarter since the beginning of urbanization. First there came schools, libraries, art-centers, clubs, cinema's and more. All institutions that facilitated the growing intelligence, knowledge and capacities of people that live in the cities. The city became internally connected in the early days by roads and social networks like churches, guilds and café's. This internal connection got new input through postal services, telephone and telegraph. The connections were not mere physical anymore, the cables, electricity and relevant devices (radio, television) came in. The 'internal connections' came in in a revolutionary phase through the internet and communication was facilitated exponential. Now the communication between 'things' becomes reality.

Living systems

Educated as an ecologist in nature- and landscape management I know the values of living systems. They provide us with biodiversity and all the qualities of life that we need for hea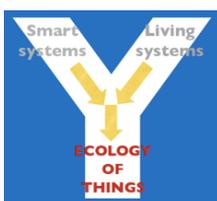lthy living. Our ecosystems are basic for food supply, recreation and inspiration. These ecosystems are sometimes not manmade and sometimes highly influenced by man, as our agriculture is. Nowadays we see nature often as an inspiration for design of products, biomimicry. Nature has had 3.8 billion years of innovation normally known as evolution. With more and less successful developments. As Nobelprize-winner Robert Zimmerman wrote: 'times they are a changing'. In design we strive for nature based products and services. The underlying question is: are we successful in nature based design. Let me introduce the concept 'Tree' to you. A Tree is a good combination of functionalities and products: it cleans the air, gives us shadow, creates wood as a building material, its leaves are feedstock for many other organisms and in real natural systems the dying Tree allows other species to grow. Many of our product designs can give similar results: shadow, air-purification, recycling of its building materials are already incorporated in human designs. Though there are some qualities that are more difficult in our designs: self-healing, growth, adaptation to its growing condition, support life of many different species based on abundance and it is alive. It is part of an ecosystem, where interdependencies are key, continuity is shown and 'live and let die' is normal. No manmade product is alive, growing and facilitating so many qualities. We learn but still have a long way to go. But we learn more and more to understand the quality of nature as an example for our systems. In circular economy we strive for more ecosystems of production. A type of language that can be heard everywhere: 'our organization is an ecosystem'.

Ecology of things

Coupling the concepts of *smart* and *living systems,* makes a new way of thinking about products dawning: the **Ecology of Things**. Design is the key to realization. In living systems all materials, all elements, all minerals are being used and re-used because they stay in the loop. That is the metabolism of life. In the **Ecology of Things** we acknowledge the power of 'waste is food' also on a higher value-level: products are feedstock for new products even before they become waste. Than it is about remanufacturing or refurbishment. It can be foreseen that products will have a materials-passport and are connected through the Internet of Things (IoT). Resources become

manageable even when part of a product. Insights in the need of maintenance of products becomes obvious.

In the **Ecology of Things** the connectedness, the interconnections (*symbiosis*) and the ability to track resources is becoming reality. As we say about ecology: everything is interconnected to everything. From a systems perspective the interdependencies will appear and the grand challenge is to understand, manage and operate the **Ecology of Things**. For design it implies six principles that are basic for product design:

1 All materials are save to use & keep their original value also after use;

2 All connections (in products) are made for disassembly;

3 Products are self-healing or fit to be repaired & maintained;

4 Products are interconnected through the IoT

*5 Products have a materials-passport (through the IoT) and fit for symbiosis;*

6 All products and materials need to be taken care of, now and later.

This makes products ready for disassembly, recycling becomes upcycling, longevity is a guarantee and products become assets. In the Circular Economy the performance of products is essential for business models. That makes sense when products are characterized and managed as assets.

As in ecology the biodiversity is key to the resilience and adaptive capacity of systems, we strive for diversity in products: Celebrate diversity!

The **Ecology of Things** takes care of quality and quantity of products. Since thermodynamics is applicable on all products, there is a continuous entropy (decay) going on: the embedded energy that makes the product function and existing is slowly flowing away. The natural way to counter this process is adding energy and labor (exergy). This means that products need care, so the embedded materials and energy can prolong.

Thinking in terms of the *'Ecology of Things'* makes the system smart, living and go round (almost) forever!
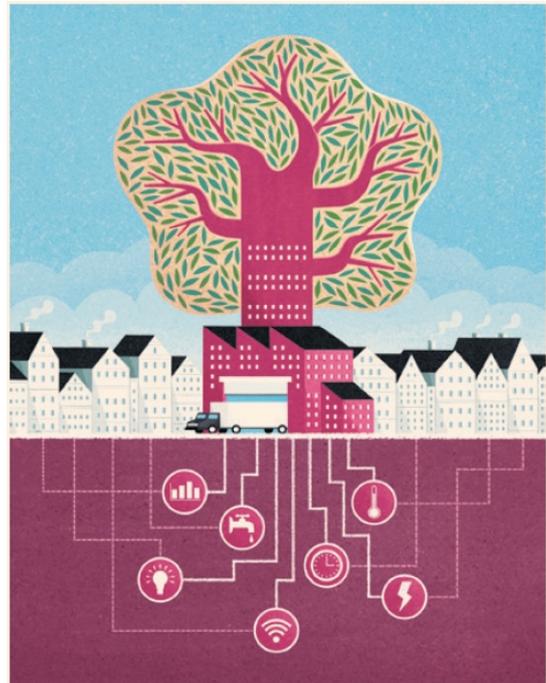
-ILLUSTRATION: FINANCIEEL DAGBLAD, OCTOBER

Douwe Jan Joustra
Amsterdam, October 2016

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