Why cannot houses be as smart as cars? An exchange

Generic Issues: Houses vs Consumer goods[1]

At all times and in all cases when research enters the building mode, manufacturing costs are a key element of concern. To cut these, one used to look at labor costs in the first place. But recently the limit of labor costs seems to have been reached. Since waste in material and time may be drawn to a stop through the potential influence of 'Continuous Flow Manufacturing', 'Just In Time' and 'Lean Procedures', one would conclude that every step in the process adds value to the product and that is what production is all about.

But this can only be achieved if the following conditions are met: every individual recognizes responsibility for eliminating waste; continuous improvement prevails over the one-time process; the production unit may equal one; the machine set-up time may equal zero; uncertainties in machine downtime, off-standard parts, and vendor quality specifications are identified and eliminated; and lines or cells are product-oriented in focused factory set-ups.

So there are certain difficulties. Mass production of houses would be countered because the house itself is only half of the equation, the other half being land. So, improving the house-costs would only be a partly contribution. Next, proposed new materials do not match the traditional, rooted, indigenous building materials that emphasize the looks of home for default users. Finally, the status of the house has been ignored. It was assumed that the consumer could be merely drawn to the performance of the built product. But, in contrast to the appreciation for genuinely industrialized products like cars, microwaves, and video, a man's home is 'wreathed in sentiment as is no other inanimate object'.

Prefabrication - the shift of the building process from the site to the plant – provoked intriguing ways of building. Traditional materials were traded in for modern more integrated building products and elements in order to cope with future markets. This became connected with the emergence of a more systematic, methodical, and comprehensive development process. Concurrent Engineering Design CED, or simultaneous engineering, integrates product design and process design. The objectives are to design products that the market demands and that can be efficiently fabricated, assembled, and tested. Also, all products and processes need a high built-in quality and be made as simple and as flexible as possible with a minimum lead time between initiation of product development and manufacturing start-up.

Big industry, including non-building multinationals, has stated solutions for their and our benefit. Operation Breakthrough (USA 1968), Housing 55 (Japan 1980), and Maison 85 (France 1985) are examples. Key-objective was to demonstrate the potential of the (building) industry. In Japan industry claimed 10% of the production in customized prefabricated homes.

Production and distribution of houses is in no way comparable to consumer goods. Yet the efforts put into industrialization and rationalization of the building mode have caused step-by-step alterations in common building practice. Whereas the production of industrialized consumer goods is largely monopolized by specialized investment, the built product often remains a reflection of intrinsic values rooted in society. These can be hindering CED and protect classic ways of building

regarding performance, cost, and status.

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Smart houses and smart cars

To the suggestive question: 'Why cannot houses be as smart as cars'[1], there is no simple answer, but it triggers my reaction. Having been active in the area of smart homes for almost 10 years and in projects where older people have been living in these for about 2 years, I can react on the basis of real experience.

It is true that, unlike cars, houses have not changed much in the past 40 - 50 years. And any changes have not always contributed to comfort and security. User interfaces have generally been less than user-friendly. Bouma states that no such things as central locks, automatic ventilation, or reminders about necessary maintenance have been realized. But houses are not cars. Would it be desirable to shut all doors and windows with one single press, if you don't have the overview as in shutting all four doors of the car? Yes, there are houses where older people live, which remind them with a beep that windows are not closed when the button 'everything off and intruder alarm on' is pressed above the bed. But this is not always appreciated when people like to sleep with the windows open.

On the other hand, most of the recent housing projects for senior citizens have automatic front door locks. This enables an older person to open the front door from bed, if necessary. But in the Netherlands, security regulations still do not allow electronic locks for getting the police mark 'Safe and Secure Living'. However, since we introduced the concept of electronic front door locks in 2000, many industries have picked up the challenge to make cheaper and more comfortable locks that in the near future will also get the police mark. Also, remote maintenance alerts for white goods are coming in 2003: large companies like Electrolux, Siemens, and Miele will introduce the concept of networked washing machines.

Bouma seems to believe that there are only single demonstration houses, such as The Smartest House of the Netherlands of the Smart Homes Foundation[2] and also that the emphasis is on gadgets for luxury rather than basic needs for health and security. Reality is that there are already more than 25 projects for older people in the Netherlands, where my team and myself have contributed with solutions for basic needs. In our experience, older people do not just want solutions in case of needs, mobility problems, or fear for intrusion. Fortunately, they are also asking for Internet connection, entertainment, and luxury. This is the main reason that The Smartest House contains, apart from the necessary things for health and security, also a lot of 'wannahaves'. According to our philosophy, if we make smart technology rather a wannahave than a necessary item, a real breakthrough of smart houses will come about soon.

The suggestion to hire car designers for competitive advantage would not work at all. I mention a few reasons. The car manufacturer is responsible for the whole car. With the house, on the contrary, many parties are involved and we tend to believe that tenants and buyers want optimal freedom in choosing everything themselves. But projects in which consumers could express their wishes and have total freedom of installing walls etc. have failed so far. At the end all tenants chose for the model plan of the architect. For technical

outfit, most consumers have no ideas either. Our belief is that in five years we will have many smart houses, based on flexible electrical infrastructure and wireless solutions. Interfaces, based on touch screens, will then be very user-friendly, because they can be simply adapted to the wishes of the user.

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Smart cars and smart houses
At least one person seems unhappy with the fact that the development of smart technology in houses isn't as quick as in cars[1]. However, the development of smart houses has other problems than smart cars. Also, cars can be developed much further.

The car exists just over a 100 years and is associated with freedom and luxury. The 2002 car is safe, reliable, and comfortable and looks great. Nevertheless, present cars still don't stop automatically when a 4 years old child suddenly crosses the road. Also, it is impossible to drive without traffic jams. By connecting the computers of the cars in front of you, the problem could be solved. Ever seen a car with a speed limit because of the rain, snow and other bad weather? That would increase safety. A lot has changed in cars recently. But can we already talk about 'smart' cars?

The phenomenon 'house' goes back centuries from now. Only in the last 50 years or so social developments have brought about changes in the houses. The family as an economic unit disappeared and local social networks decreased, followed by changes in life and work. Presently, the

human being is at the centre again and general wealth will ensure that investments will be made in the home as well. Domotica seems to be the beginning of answering todays' housing problems.

Several smart systems exist already for several years: Day and night heating, automatic window shields, internet, mechanical ventilation connected to air humidity, switches connected to light, security, fire safety. So why isn't domotica used on a larger scale? The main problem is the connection of all these subsystems into one mainframe. For this, no real standard solution is presently available. The reason may be that so many parties are involved like the consumer, government, electrical-, energy-, cable-, telephone- and building-companies, which need to cooperate for a large-scale installation. The 'greying' of society might increase the need for this. So, the smart house is closer than it perhaps seems to be. A standard network and cooperation within the house industry are the final steps to take.

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Smartification for compensation and enhancement
It has been said that money cannot buy happiness, although a decent car, a nice house, good health, and offspring often embody personal achievement of one's lifetime. As offspring cannot be bought, three other assets will still stand into play. Economy is a main factor of decision in the way that one's life is shaped. Money power can assure the immediate fulfilment of one's needs, among which the three above issues. The needs bare the name of lodging, mobility, communication, health,

and work[1]. These are proper targets of research, among which the generation of smart houses, smart cars, and harmonic use of these[2].

One can classify two types of goals of such research: first, technology for better aging[3], second, creation of new ways of living that are still non-existent in present society.

The first category addresses conditions that come with aging, such as a decrease in visual, tactile, auditive, or motor ability. These cannot be generalised to the entire population, as not every house or car is supposed to meet such requirements continuously. Special strategies can be designed and integrated dynamically as a planned reaction to observed evolution by prevention or compensation[4]. Gerontechnology is targeted on a specific age group, which makes generalisation of 'smartification' not immediately applicable or desirable for the entire public. However, aging will affect every individual, and public awareness will help to spread invented enhancement to all age groups, including enhanced housing and living options.

The second type is directed at new creative products of invention. These are meant to enhance life in supposedly ideal ways. They need not exist conceptually as yet, but advanced research can find them and announce them, first as possible and then, if financially and practically viable, as essential. The translation of luxury devices into commonly integrated equipment might constitute an ideal of this research, aimed at obtaining generic typologies of houses, adaptable to all possible needs at affordable prices. The complexity of such technologies has so far proved inefficient. If the rush in car technology evolution was directed at avoiding accident risks, in housing, such risks seem less, and other goals have to be found as generators of accelerated progress. In housing, negative health effects of various types of technology are evident only after long exposure, which makes it necessary to raise public awareness.

Customisation of such devices, the ambition of their permanent capability of sustaining family structure will be possible in small steps. Patenting and promotion of 'new ways of living' should be done continuously, and media should play an important role in the spread of this process. The odds of success and failure are probably equal, as non-uniform fluctuating living standards cannot dictate one unique research target. In the same time, success could also cause new types of addiction, thus making the human race subject to more and more slavery.

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Smart housing: making up leeway

Reactions to my somewhat provocative question: 'Why cannot houses be as smart as cars'[1] are of two types.

The first one explains why this should be so: houses are not yet consumer goods. The obvious consequence is that we will have to work toward bringing more of the consumer approach into the housing market. To stay with my example for the health domain: We wish to guarantee a healthy climate in kitchen, bathrooms, bedrooms, and living rooms for all inhabitants including possible COPD patients. So we design a system with sensors for humidity, for car-

bon dioxide, carbon monoxide, and other chemicals and combine these with effectors such as battery powered ventilation windows, the system controlled by a microprocessor. Such systems should be designed for easy installation both in new and existing windows and mass-produced.

The second reaction, somewhat more angrily, tells us not to worry and simply await the fast developments ahead. Now I welcome any serious effort, pilot project and real project that makes the home a better place to live for older persons[2]. But we must not beg the question how we can accelerate developments and solve difficulties and unwanted side effects proactively. We might learn a lot from experiences in different countries and different environments. One of the channels for this is discussions such as the present one in our journal, on our discussion site[3], in workshops and conferences[4], and anywhere else. If we agree that innovation comes too slowly in the housing environment, we admit that our housing is less healthy, less safe, less secure, less communicative, and less comfortable than the present state of technology permits. As responsible social and technical researchers, senior groups, engineers, designers, builders, and advisers we cannot leave older people in such a backward situation without actively making up leeway.

The drive toward innovative technology for better housing is wide open!!

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Hard Tech, Soft Touch
Technology to aid indoor mobility and transfer of immobilised older persons

It is well known that most elderly people are healthy, and more and more are getting wealthy, at least in western world. Gerontechnology fits their ambitions, wishes and needs[1]. But what about disabled elderly persons: for them too gerontechnology can 'assure a minimal dignified standard of life'[2].

If we have a glimpse onto such a 'niche market', we easily realise that developing technology for disabled old persons can bring advantages far beyond the final user. In the long term, the future course of disability amongst elderly people is uncertain. The literature offers little insight into the fundamental question as to whether longer life means better health and a reduction of years spent in disability. Surprisingly few population-based studies have addressed this question and there are significant inconsistencies within the literature.

It has been suggested[3] that the balance between the demographic trend towards longevity and the evolution of active life expectancy could lead to more disability adjusted years of life. However, the opposite outcome could also occur. A recent study in Finland[4] suggests a secular trend towards better physical functioning and decreased need for assistance over ten years in the older people aged up to 85 years. In the USA there is new evidence[5] of an overall improvement in the health status of older persons, although there are some inconsistencies in respect to different disability measures and population subgroups.

However, a sharp rise in the absolute and relative number of very frail oldest-old persons over the next decade[6] will inevitably lead to an increase in the prevalence of disability. For example, a recent Danish