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SPECIAL REPORT: TECH & MEDICINE

Homes That Makes House Calls

In MIT researcher Kent Larson's "smart home," technologies that keep a close eye on your health will be built in

Architect Kent Larson is the director of the research consortium House_n: The MIT Home of the Future at the Massachusetts Institute of Technology in Boston. So, naturally, he's a dreamer. Larson envisions a house that would automatically and unobtrusively monitor its owners' health and well-being through sensors, which would send an alert if a resident took a bad fall or wasn't taking her medication. The theory is that smart homes could result in fewer hospital and doctor visits.

Many companies are betting such technology will be a major selling point with homebuyers. Already, the construction industry is moving toward customized house designs. Consumer-electronics companies are building their first prototypes of the healthy home. And cable service providers and utilities are looking at providing these medical services.

As a result, the smart home could be only a few years away, says Larson, who talked about his vision with BusinessWeek Online reporter [Olga Kharif](#) on June 29. Edited excerpts follow:

Q: What do you think needs to happen for the smart home to become reality?

A: I think it starts with good design. We'll have to first transform the construction industry, so it provides tailored solutions for individuals vs. one-size-fits-all houses. We already see the more creative players in the construction industry starting to provide very cost-effective, tailored designs.

Q: What features will be in the typical smart home?

A: If you have poor eyesight, it means having numbers on the appliances that are large enough to read. If you have arthritis, it means handles and knobs that are easy to turn. If you're in a wheelchair that needs storage, the storage has to be in places that you can have ready access to. The process of tailoring the home this way will involve the application of design and supply-chain-management software.

Q: What about the actual technology used within the home?

A: There, you apply technology as needed. You could start with algorithms that evaluate a person who's living alone and is developing Alzheimer's disease. It could flag when that person should no longer live independently. Or the technology could use biometric monitoring of the pulse and other vital signs to flag emerging health problems before they become problems.

What we at MIT are interested in is technology that proactively encourages people to live healthier lives. Some of the biggest problems today are obesity, Type II diabetes, and congestive heart failure. The solutions to these problems are really behavior-related. It's really about getting good exercise and eating right and remembering to take your medication and reducing stress. All of these require day-to-day intervention in people's lives to encourage them to live right.

Q: So what's your solution to this?

A: One solution that a researcher in our group, Stephen Intille, is working on is persuasive interfaces. Essentially,

he's looking for the right time and place to deliver a message or a reminder to the individual. For example, the technology could pop up a reminder on how long you've watched television and suggest alternatives involving exercise.

Another example: As you exit the subway station through the turnstile, you have a decision to make: Do I take the escalator on the right or the stairs to the left? What Stephen and his students did was have a system that automatically counts the people who take the stairs and the escalator, to find out what their normal behavior is. Then, they projected a series of messages -- like "Your heart needs exercise" -- onto a screen right above that point of decision. The experiment showed that the right message at the right time can dramatically increase the number of people taking the stairs.

Q: It seems like it would be pretty expensive to wire a house or the subway station with all this gear. Who will pay for this?

A: The technology and the sensors and the processing power are essentially free relative to the cost of the home. Most people have plenty of processing power in their home right now. Even your cell phone and your microwave have processing power, and most people have computers. And all this processing power is terrifically underutilized.

What's more, in the future the technology will be based on these tiny, portable, very inexpensive devices, like cell phones or personal digital assistants (PDAs) or tiny sensors that can be sprinkled around and bought at Bed, Bath & Beyond.

It will not be a reimbursement from Medicaid or Medicare or your insurance company. It might be an extra \$9.95 on your cable bill or your utility bill or your security-monitoring bill. All of those industries have companies in them that are, in fact, thinking about providing such a service. And I think that people would pay for them.

Q: Why would people pay for these?

A: If such a technology would allow a person living alone to live an extra three or five years autonomously, certainly they'll be interested. But, of course, they would need to be satisfied that their privacy will be protected. So, if this system is imposed on them by the insurance company, and if that insurance company receives very personal biometric or lifestyle data on them, they will, most likely, reject it.

However, they'll gladly buy it for personal use. I have no doubt about that. They have the money: Roughly half of health-care expenditures today are out-of-pocket expenditures by individuals for over-the-counter medications and for services.

Q: So you think health-insurance companies won't pay for this, period?

A: I think they will in other countries, like in Finland, where they have more socialized, centralized medical systems. In cases like this, there's usually only one entity -- a governmental entity -- that would benefit from cost savings.

In the U.S., there's no one entity. And people can change their insurance policies. I might keep you healthy for 30 years, and then you could change policies and someone else will benefit from all the preventative work I've done. Also, the health-care industry is increasingly financially constrained, and the thought of spending money on something extra, even if that makes perfect sense, just won't fly.

Q: Do you think people would be open to using technologies for treatments? A lot of people like talking to their doctor face-to-face.

A: I don't think it's black or white. You'll always have doctors and hospitals and clinics. People will visit their doctors, and that relationship with your physician will largely remain intact.

What will happen is we'll have better crisis detection. Right now, you have a heart attack, and somebody calls the ambulance. In the future, there will be an early-warning system that will be used in your home, after your physician identifies that you have a condition that could lead to a heart attack. That system will keep you from getting a heart attack in the first place.

You can also have prevention systems that would encourage healthy behavior and a healthy environment -- such as good air quality and good light -- for healthy people. Then, you can have technologies and services that would follow you as you recover from an operation, so your transition back to health is more closely controlled and more effective. Right now, you go from a high-tech, service-intensive hospital environment to your home, where you often have no support.

Q: Do we have all of the technology necessary to make at-home health care work?

A: Most of these products aren't here now. But you're starting to see companies that are beginning to produce really early versions of technologies that will become commonplace in about 5 to 10 years.

Here's why. It's almost this perfect storm happening: a crisis in the health-care system and the acknowledgement that the old ways are not sustainable, combined with very powerful technologies that are just waiting to be turned into products, and with consumer-electronics companies looking for the Next Big Thing. This perfect storm is brewing, and I think we'll see it coming together in the next few years.

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