In this chapter, you learn what to expect in the smart home of tomorrow.

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What's Next?

You've learned about many of the things that smart home technology can do for you today. But technology is constantly changing, with new devices and services being introduced every day. Most of the smart devices on the market today didn't even exist five years ago; what new devices can we expect to see in the near future? And, more important, what will the smart home of tomorrow look like?

Embracing Voice Control

To my mind, the most important advancement in smart home technology has been the availability of the voice-controlled personal assistant. The first such device was Amazon's Echo, with its Alexa voice-controlled assistant; the newer Google Home is a worthy competitor, with its Google Assistant voice-controlled assistant.

Consolidating Control

Before the Amazon Echo and Google Home, you controlled your smart home devices via one or more smartphone apps. Now, this wasn't particularly inconvenient, but it still required some degree of technical prowess and physical dexterity. Because every device had its own smartphone app, you had to juggle multiple apps and screens and constantly switch from one app to another. Not quite the ease-of-use that was promised by smart home proponents.

Admittedly, some smart technology companies tried to alleviate this dilemma by linking together devices that used their own networking protocols. Thus all SmartThings-compatible devices could be controlled by the SmartThings app, and all Wink-compatible devices could be controlled by the Wink app. (Apple even got into this game with its HomeKit technology, with multi-platform support within its Home app.)

Using one app was better than using many, even though issues still existed if you used smart devices from different platforms—and you still had to whip out your phone or tablet whenever you wanted to control anything. This, as you know, is how things existed up until the past year or so.

Using Voice Control in the Home

This brings us up to the dawn of the voice-controlled smart home. Thanks to Amazon and what was originally billed as a smart speaker, we now have a device that can control multiple smart devices with simple voice commands. You can use either the Amazon Echo or Google Home as the hub for all (or at least most) of your smart devices, and you'll never have to open another smart home app on your phone again. (At least while you're home; smartphone apps are still useful for controlling your smart home devices when you're away from home.)

I can't tell you how much of a difference voice control makes. Yes, I'm technically proficient enough to open an app on my phone and tap a button or two, but it's so much easier to do the same thing with a single voice command. Compare opening the Philips Hue app and tapping through a couple of screens to get to the right button to simply saying "Alexa, turn off the living room lights." The difference in ease of use is considerable.

The fact that both Alexa and the Google Assistant can do a lot more than just controlling your smart home devices adds to their usefulness and appeal. All of a sudden, my Amazon Echo Dot is the nexus of all activity in my house; my wife, and my grandkids, and I rely on Alexa to tell us the current temperature, tomorrow's weather forecast, today's news headlines, the answers to relevant math questions and conversions, and whatever random information we may need or want to know at any given time. Yesterday afternoon, for example, we asked Alexa the following things:

What's the weather forecast?

How many miles equals .1 kilometers?

When is Easter?

Who is Captain Cold?

Those questions were in addition to issuing a variety of commands, including "Turn on the living room lights," "Turn on Netflix," and "Play the Pokemon theme song."

Making Voice Control Universal

Voice control makes so much sense in the home that it's amazing we didn't recognize this sooner. Yes, we have voice control on our phones (Siri on the iPhone), but that capability always seemed a stretch to me. Most people these days use their phones for texting, not talking, so it didn't make sense to me to have a voice-activated assistant on my phone. When I had an iPhone I never used Siri, and I don't currently use the Google Assistant or Samsung's S-Voice on my Galaxy S7 edge.

I do, however, use Amazon's Alexa in my living room. A lot. It's how I control most of my smart devices, and it's become a part of my daily routine. So much so that I want Alexa in more than my living room. I find myself calling out to Alexa from my bedroom, and in my office, and in the kitchen, even though she's not in any of those rooms. I like Alexa so much I want her available everywhere.

Yes, I could buy multiple Echo Dots, and I might. (They're certainly affordable enough.) That would solve part of my problem. With Echo Dots installed in every practical room in the house, Alexa would always be within the sound of my voice.

Whether I want to dim the bedroom lights or find a recipe in the kitchen or ask random questions while I'm working in my office, I want Alexa there to help me.

This sort of ubiquitous voice assistance extends beyond the home. I've also found myself wanting to query Alexa when I'm driving in my car, and when I'm sitting in the local coffeehouse. Yes, I know I could pull out my smartphone and query S-Voice (or Siri, if I had an iPhone) in a similar fashion, but I don't want to pull out my smartphone and I don't want to query some other virtual assistant. I want to query Alexa whether I'm at home or driving or out walking; I want all my familiar skills and commands available, and I want all my queries and information tied together. And I want to do so without relying on my smartphone.

What I want, I think, is something similar to the ship's computer on the various *Star Trek* TV series and movies. I want to just speak (or maybe tap my com badge and then speak) and have that friendly female voice answer my question or initiate my command. I don't want to fire up my phone and tap a button or two and then speak into the phone; I want it as easy as it is in my living room, where all I have to say is "Alexa" to get the ball rolling.

So my wish, and my expectation, in the smart home market is to expand the capabilities of today's current voice-controlled assistants. Whether we're talking Alexa or the Google Assistant or some future Siri-based device from Apple, I want that assistant to control more things from more places. I don't want to use Alexa in the living room and the Google Assistant in the car and Siri when I'm out walking; I want one assistant to be accessible everywhere, and to remember everything I've asked in other locations. I want to have Alexa turn off my bedroom lights when I'm in my car, or turn down the heat when I'm at the coffeehouse, just by asking.

One voice-controlled assistant to follow me everywhere and control everything. That's a key part of the smart home future that I envision. And it's one that's likely to come true, probably sooner than we can imagine.

>>>Go Further

SMARTER ASSISTANTS

My virtual assistant wish list also includes smarter assistants. Let's face it, Amazon's Alexa is only as smart as what she's been programmed to do, either by Amazon's engineers or the third-party skills you can add to her repertoire. The Google Assistant is a little smarter, in that it actually learns from your behavior, but they're both on the left side of the learning curve at this point in time.

We need virtual assistants that are better at intuiting what we really mean from what we actually say. We need virtual assistants that learn from what we say and do and can anticipate our next questions and commands. We need virtual assistants that can provide more information than is available in the first paragraph of a Wikipedia entry.

More important, we need virtual assistants that more easily connect to and control the other smart devices in our home. I shouldn't have to search for and install a new Alexa skill every time I add a new smart device in my home; Alexa (or whatever future virtual assistant I'm using) should automatically detect when a new device is added and recognize the voice commands I use to control it.

In addition, I want tomorrow's virtual assistant to automatically link devices when I speak certain commands. I shouldn't have to program complex IFTTT (If This Then That; see Chapter 14, "Adding More Functionality with IFTTT") commands to do what are really simple and logical tasks. When I tell my virtual assistant "I'm going to bed," that assistant should just know that means to turn off the lights, turn down the furnace, and lock the doors. I shouldn't have to program anything in advance to make this happen.

So add more smarts to my virtual assistant wish list—if it's not too much to ask.

Seeking Easier Connections

In general, smart homes of the future need to be smarter than the smart homes of today. We spend a lot of time connecting and configuring and linking various smart home devices to each other and to the cloud. This can be daunting, especially to the technologically intimidated. If our smart devices are so smart, why can't they configure and connect themselves?

Making the Connection

Consider what's involved when you add a new smart lightbulb to your system. You have to open a smartphone app to manually connect that new lightbulb to your existing hub. If your smart lighting is also part of a master control scenario—via SmartThings or Wink or Apple HomeKit, for example—you probably have to open that app to add the new lightbulb as well. And if you have an Amazon Echo or Google Home device, that's another smartphone app you have to open to add the new lightbulb. That's a big hassle, and one that should be totally unnecessary.

It gets worse when you consider the multiple and conflicting protocols, systems, and standards that affect interoperability. If you have an Insteon hub, for example, don't expect that new Wink-compatible device to connect to it; your new Insteon device won't work on your Wink or SmartThings network, either. Although compatibility is getting better, we still live in a world where half the smart devices out there can't speak to the other half. Most companies still think in a proprietary fashion, and that is limiting consumer adoption of this groundbreaking technology.

Seeking Universal Connectivity

Manufacturers' proprietary thinking has to change. We need all smart devices to work with all other smart devices. The smart home of the future can't be an Apple-exclusive or SmartThings-exclusive or Wink-exclusive experience. If something works with Apple's HomeKit, it also needs to work with SmartThings and Wink hubs, as well as with Nest thermostats and Amazon Echo and Google Home devices. Everything needs to work with everything else. There has to be an open protocol embraced by all manufacturers, and any companies not participating will be left out in the cold.

Beyond this, devices need to connect to each other automatically. Today, it's a hassle just to connect Wink-compatible devices with a Wink hub, let alone to a non-Wink device (such as an Echo or Google Home). We need smart devices that recognize when new smart devices are introduced into an environment so that the devices can automatically connect to each other with little or no manual intervention. Quite frankly, I hate adding new smart devices because of all the grunt work involved in getting them to recognize each other. In my ideal future, I shouldn't be involved at all; the devices should do all this heavy lifting behind the

scenes without me having to open a single screen on my smartphone. It should just happen, no questions asked.

Making Connections More Reliable

It goes without saying, of course, that not only should device-to-device connections be more automatic, they should also just work. If you've played in the smart home playground at all, you've had the all-too-common experience of trying to add a new smart device and having something go wrong. Devices that are supposed to be compatible aren't always. Devices that should be recognized by a given smart hub aren't. Devices that worked yesterday all of a sudden don't work today.

These sorts of glitches are perhaps to be expected when we're dealing with groundbreaking technologies, but they make things a lot less user-friendly, especially to those who are less technologically adept. Most average consumers just want things to work. We want a toaster to make toast and don't expect to have to tweak the toaster's settings or delve inside its technological innards to make it work. We wouldn't put up with a toaster (or vacuum cleaner or car) that is as unreliable as many of today's smart devices appear to be.

To attract a truly mass audience, smart devices need to work as advertised, with little to no troubleshooting or maintenance required. Look, I can buy a $2 "dumb" lightbulb, screw it into my lamp, and it works. There's no reason to expect any less from a $25 smart lightbulb; I should be able to screw it in and have it work—which includes having it connect to my various smart hubs. If it's too much trouble or requires too much effort, the average person won't do it.

Bottom line, smart home technology has to get more reliable and easier to use. I expect for this to happen, but continue to grow impatient as to when.

Making Everything Smart

We've discussed a lot of different smart devices in this book, from smart lightbulbs to smart thermostats to smart refrigerators. Still, when you think about it, we're talking about just a small subset of all the items you have in your home. There are a lot more things in your house or apartment than can benefit from the addition of smart technology.

What sorts of things are we talking about? Just look around the room you're in, and consider how everything you see could be made smarter.

Seeking a Smarter Living Room

If you're in your living room, look at your furniture—your couch, your chairs, your tables. Expect to see furniture that incorporates electronics—a comfy chair with a built-in tablet on the arm, for example, or a coffee table that functions as a giant touchscreen computer. Beyond that, imagine furniture that knows the desired firmness, contour, and even temperature of each family member and adjusts itself accordingly.

Now look at your windows. You probably have traditional window coverings in your home, but you know that smart motorized blinds and drapes are available if you want to upgrade. But what about the windows themselves? Several companies are working on smart glass that changes from clear to tinted on command to selectively block light, glare, and even heat from the outside. While smart glass technology is probably a decade away from the consumer market, it's on its way—and will be a part of the smart home of the future.

Embracing the Smart Automobile

The smarts don't stop within your house. Smart technology is coming to your car, and it promises to change not only what we drive but how we drive.

Automobiles have been getting progressively smarter over the years. Today's cars contain dozens of computers or computer-like devices, all working together to make sure your car runs as well as it's designed to. These electronic control units control all sorts of in-car functions, including braking and cruise control, and heating/cooling and entertainment systems.

As fancy as all these systems might appear to us today (especially if we remember old manual transmission cars without seat belts!), they're still kind of dumb. I mean, all the fancy sensors in your brand-new car do nothing more than feed indecipherable error codes to a central communications module, which triggers a single Check Engine light that tells you absolutely nothing about what's wrong. You have to visit the dealership and have a mechanic connect his computer to your car to decipher the code, and then manually fix what needs fixed.

In the future, however, diagnostics will get easier because the car's electronics will be even smarter. Instead of generating those indecipherable error codes, your car's smarter computer will display plain-English explanations of what's wrong. Even better, smart diagnostics systems will identify potential problems before they become real problems—brake fluid levels getting low, belts wearing out, that sort of thing. And then the computer won't just tell you about the problem, it will use available wireless technologies to notify the repair center of the problem. The repair center will then order the necessary parts and contact you to schedule an appointment to perform the repairs. That's a whole lot better than dealing with an aggravating Check Engine Light on your dashboard.

Equally important, smart driving systems are slowly but surely finding their way into the average family auto. We're talking dedicated systems that help drivers perform difficult or sometimes dangerous maneuvers and operations. This ranges from adaptive cruise control and lane assist systems to collision avoidance and automated parking systems—all available today on select vehicles.

And then there are self-driving cars. They're already on the road, in small quantities, used by Uber and other commercial companies to deliver people and packages to their designated destinations. Consider this activity the beta test of the technology, as we will see self-driving technology filter down into affordable passenger vehicles, probably within the next 5 to 10 years.

Connecting to the Smart City

If every home becomes a smart home, how can we make things even smarter? By connecting all our smart homes (and smart businesses) to the grids and utilities of a smart city.

Smart devices have promise across the entire fabric of our society. In addition to making your home smarter and easier to use, smart technology can help reduce congestion on local roadways, alert the fire department in case of emergencies, and even signal the need for road maintenance or additional police patrols. And that's not even counting the energy savings that can result from all those smart homes connected to a city's smart grid. There's a lot of potential here.

Understanding the Smart City

Not surprisingly, municipalities across the country and around the world are keen to adopt smart technology. In fact, there's a recognized "smart city" concept in discussion, which presents a set of guidelines that cities can model going forward.

The goals of the smart city are to make better use of public resources, increase the quality of services offered to citizens, and reduce operational costs of the public administrations. To achieve these goals, the smart city must deploy an infrastructure that provides simple and economical access to most, if not all, public services, including transportation and parking, lighting, utilities, surveillance and maintenance of public areas, and more.

What does this theoretical smart city concept mean in practice? It could have all sorts of potential public benefits, including more efficient traffic flow, better management of public buildings and areas, reducing the (huge) costs of public lighting, better managing waste removal and other public utilities, and more effective policing and emergency services. These are all worthwhile goals.

Collecting Data

Key to the operation of this smart city will be data collected from smart devices of all shapes and sizes. All this data can also be used to increase the transparency of the local government, enhance the awareness of the public about the status of their city, and stimulate citizens' participation in the public administration.

To assist in this data-collection effort, expect the smart city of the future not only to collect data from local homes and businesses but also to install thousands of sensors on local streets, parks, and buildings. As a result, the city will be able to gather information about public usage, air quality, noise levels, and the like—and then use the collected data to provide better and more efficient services.

Enhancing Responsiveness

All this data can help a city better deploy its human and non-human resources. As an example, consider the all-too-common spring scenario where a rash of potholes needs to be repaired. Today, this typically happens when someone notices the pothole and calls into City Hall to complain about it. The city routes

the complaint to the streets department, who puts it on their list. Eventually, a crew is assigned to fill the pothole, typically by receiving a printed list of issues to address on a given day.

Now see how this might work in a smart city, with the appropriate embedded sensors networked into smart systems. Instead of waiting for a citizen to complain about a pothole (typically because he lost a hubcap while driving into the thing), smart sensors detect the presence of the hole and report it—complete with its location and size—to the central system. The system automatically enters the issue into its main database and assigns repair to an appropriate street crew, prioritized based on location and severity. Thanks to smart technology, the city knows about the problem sooner and gets it fixed faster. Everybody wins.

Police and other emergency responders also benefit from faster, smarter communications. Home and business security systems are connected directly into the city's central system so that police are notified the instant an alarm goes off. In addition to receiving the alarm, the police also receive information from other sensors in the building—door sensors, window sensors, motion sensors, even security cameras. The police get notice of the problem faster, along with important details to plan their response.

It's the same thing with firefighters. A smoke alarm goes off; the data gets sent directly to the nearest fire department. Before they pull the fire truck out of the station, they know where in the building the fire is active, the best route into and through the building, and what obstacles they might face. They also get the latest floor plans of the burning building, previously stored in their central database.

Emergency medical technicians (EMTs) also get smarter and more effective thanks to smart technology. When a call comes in, they receive data from any wearable medical devices on the citizen, as well as the person's complete medical history. The responders know what to expect before they ever get there and can thus be better prepared for that particular medical emergency.

Improving Roads and Traffic

Smart technology will also affect how cities manage their roadways. We're talking traffic control, road maintenance, parking management, you name it, all of which

will be made easier by a combination of smart roads and sensor devices, along with intelligent management systems.

Let's start with the parking problem. If you live in a city of any decent size, you know how hard it is to find a parking place downtown, especially during popular events. Wouldn't it be great if you knew exactly where the nearest open space was, so you wouldn't spend half your time driving around looking for it?

Smart parking technology can solve this particular problem. Already Google Maps is working to identify available parking in some cities. This effort will get even more effective when cities embed sensors in on-street parking spaces. These sensors will detect if a car is parked there or not and send that data to a central service. Drivers can then use their smartphone app (or in-car technology) to find the nearest unoccupied spaces.

Of course, parking is just part of the urban traffic problem. Smart technology can help you avoid traffic jams and minimize the number of red lights you have to stop at. By constantly monitoring traffic flow with roadside sensors, smart systems can manipulate traffic signals and even lane availability to make sure the greatest number of drivers get to their destinations with the least number of interruptions.

Even smarter traffic management will come when we make the roads themselves smarter. Smart roads of the future will combine several different technologies to better manage traffic flow and avoid congestion and accidents. We're talking glow-in-the-dark road markings, smart roadway lighting, and smart roadway displays that deliver the information you need when you need it. And that's before we add self-driving cars to the mix!

Embracing Smart Utilities

Many cities run at least some of their own utilities—water, waste management, even gas and electricity. Keeping costs down for both the city and its residents is an important challenge.

Take, for example, garbage collection. Not only is the collection costly and time-consuming, you have the issue of where to put all the trash. Smart technology can help with this.

Let's start with smart trash bins. Right now, all your trash goes into a big green (or yellow or blue) trash bin that the garbage truck collects and dumps once a week, whether it's full or not. In the future, imagine a container with embedded sensors that detect how full the bin is and summons the truck only when necessary. This will reduce costs by optimizing the truck's route and make for more efficient collection.

Then there's water management. Right now, most cities still employ meter readers to walk through neighborhoods and take manual meter readings. That's very, *very* old school.

Some cities are already installing smart water meters with embedded sensors and radio-frequency (RF) transmitters to monitor individual household water consumption. By collecting real-time data, the water utility can notify customers (via phone, email, or text) if usage levels are unusual, thus warning of potential water leaks. This data will also provide cities with insight into overall usage trends on a neighborhood-by-neighborhood basis. (They can also compare water usage with other collected data—temperature and precipitation patterns, for example.)

Connecting to the Smart Grid

This leads us to your local electric company, and something called the *smart grid*.

The electrical grid, smart or otherwise, is what you plug into when you turn on your TV, flip a light switch, or power up your computer. Our country's current grid was built more than a century ago, although it's seen some technology improvements since then. It consists of close to 10,000 electric-generating units connected to more than 300,000 miles of transmission lines—truly an engineering marvel capable of generating more than 1 million megawatts of electricity. However, the grid is starting to show its age. Large pieces of the grid have been patchworked together, and we're stretching its capacity to the limit.

Moving forward, we need a smarter grid, one built from the ground up to handle larger power loads—and better manage those loads. This new grid, the so-called smart grid, will use digital communications technology to collect and disseminate data about energy usage—the behaviors of both consumers and suppliers. That data can then be used to improve energy efficiency, helping consumers use less energy and save money.

The smart grid will enable two-way communication between the utility and its customers, which will let smart home devices talk to the utility and make for more efficient energy usage. This new grid will also contain sensors along transmission lines to better monitor power usage in all possible ways and respond more quickly to changing energy demand.

This last point means putting power where it's needed, when it's needed. More efficient distribution of the power load will result in fewer power outages and brownouts and, as power usage will be better-balanced, require less power overall.

Power usage can also be managed by having the utility communicate with smart devices installed in homes and businesses. We're talking smart thermostats, smart appliances, and the like that can receive instructions from the power company and shift their usage to times with lower demand.

For example, during a hot summer day, when energy usage is peaking, the utility might send out instructions to cut power for nonessential operations, such as turning up the temperature for air conditioners and turning off appliances such as dishwashers and laundry equipment. This will not only help alleviate overall demand for electricity, but also lower usage rates.

The power companies, of course, will take full advantage of all the data collected to more effectively manage their resources and infrastructure. Companies will get a better handle on customer energy usage and manage supply to better match this demand.

All the data generated by the smart grid will (or at least should) be available to consumers, too. The more you know about your own energy usage, the smarter you can be about what you use and how. You'll have access to real-time data about energy usage by time of day, and what devices exactly are using all that electricity. You'll also see how much that usage costs, which will help you save money by using less power when electricity is most expensive.

And that's just some of what we can gain by embracing smart technology—not only in our homes but in our cities. There's a bright future ahead, and it all starts in your own home!

>>>Go Further

THE SMART HOME AND ME

I've been using a lot of smart devices during the writing of this book. I own some of these devices, and some were provided to me for evaluation by the companies involved. Some of these devices have become an essential part of my life; others, less so.

Which smart devices do I use the most? It's an interesting list, and maybe not what you'd expect. (Naturally, your favorite devices might be different from mine; that's the way the world works.)

The most essential smart device in my home at this moment is the Amazon Echo Dot. My entire family uses the Echo's voice-controlled assistant, Alexa, to not just control smart lighting and other devices, but to provide information, answer questions, and play music. While I'm currently using both an Echo Dot and a Google Home device, and while I tend to prefer the way the Google Assistant works, my grandkids like the Alexa voice better and the Dot is a lot less conspicuous (and less expensive) than the larger Echo and Google Home devices. So that's the one we've gravitated to, at least for now.

My next favorite smart devices are the smart lightbulbs from Philips Hue and Cree. Combined with the Amazon Echo Dot, we're getting really spoiled saying "Alexa, turn off the living room lights." It's to the point where I'm not sure we remember how to turn on or off the lights manually.

I'm also a huge fan of Logitech's Harmony Hub. This device has replaced my older Logitech universal remote control and operates all the various components in my home entertainment system—TV, Roku box, cable box, Blu-ray player, and audio/video receiver. With the Harmony Hub configured to work with our Amazon Echo, we're now saying "Alexa, tell Harmony to turn on the TV" and "Alexa, tell Harmony to turn on CNN." It's a lot better than fumbling for the handheld remote and remembering which buttons to push.

The last smart device that I'd call essential is the Ring Video Doorbell. I really like being able to see who's at the front door before I answer it—and to see who's ringing my bell when I'm away at work during the day (via the Ring smartphone app). This is one of those devices I didn't know I needed until I got it.

I'm less enamored of the Nest Learning Thermostat. Frankly, I find little to no advantage to having Nest "learn" my schedule; it's simply too easy to program a traditional thermostat. And I haven't (yet) gotten much use out of linking the Nest with other smart devices, although that might change over time.

It all comes down to how my family and I use these devices—our personal habits and routines. You might find other smart devices more to your liking based on what you and your family do during the course of a day.

Whatever smart devices you gravitate to, I'm sure you'll discover a lot of ways to use them that you didn't think of before. That's one of the joys of smart technology—it changes your life in ways you never imagined. Enjoy!