

# Homes of the Future: Connectivity & Communities

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Together we can





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# FOREWORD

**Foreword and introduction**  
**By Max Taylor, Consumer**  
**Director, Vodafone UK**

The past year has seen our lives change in huge and unforeseen ways. The pandemic has forced us to look at our homes in a whole new light, with our personal spaces having to act as schools, offices and gyms, as well as places for relaxing and socialising with family. The pace of change has been rapid.

With this in mind, Vodafone has teamed up with some of the UK's leading experts on the future of home living to explore what our homes will look like in 20 years' time – how we'll be using them, how healthcare and the environment will inform changes and the connectivity we'll need to make it a reality. We asked top architect Piers Taylor, academic Flora Samuel and technology analyst Ben Wood to look at how our homes are going to change and develop now that they are being used as much for work as for leisure, and how we can get prepared. We also asked the people of the UK what they wanted from their future living spaces.

85% of Brits say that having strong broadband in all corners of their home is important. Considering we're already making video calls, streaming the latest must-see boxsets and asking Alexa to switch on the heating, that's no surprise: reliable and affordable connectivity is more important than ever. So just imagine what we'll be able to do in the future when connections are faster. It's been suggested that broadband speeds could need to reach 10 gigabits per second in the next 20 years.

The potential changes to our lives, as outlined by our experts, are both fascinating and exciting. We hope that this report and research will give a glimpse of how connectivity will enhance the way we use our homes in the future and help bring communities together.



## In partnership with experts



**Piers Taylor**

Piers Taylor is an award-winning architect, broadcaster and academic. He co-presented two series of 'The World's Most Extraordinary Homes' with Caroline Quentin and presented three series of 'The House that £100k Built', both on BBC Two.

He has designed a number of seminal buildings, including the RIBA Award Winning, 'Room 13', and the house, 'Moonshine', which won the AJ Small Project Award.

He has founded two architectural practices, Mitchell Taylor Workshop and Invisible Studio and is a former Design Fellow at the University of Cambridge and a Studio Master at London's Architectural Association.

He contributes regularly to the Architects' Journal and has also written for Blueprint, Building Design and the Architectural Review.



**Flora Samuel**

Flora Samuel is Professor of Architecture in the Built Environment at the new School of Architecture at the University of Reading. Prior to her current post, she was the first female Head of the highly ranked University of Sheffield school and was, until recently, the first RIBA Vice President for Research, where she promoted research in practice, post occupancy evaluation and social value.

She is internationally known for her writing on design. She is currently writing 'Why Housing Matters: making a housing system for wellbeing and happiness', to be published in 2022.



**Ben Wood**

Ben has over 25 years' experience in the technology sector and currently works as Chief Analyst overseeing research at CCS Insight, delivering predictions about the future of technology. In 2021 Ben was ranked as one of the top five tech analysts in the US and Europe by Apollo Research.

Ben is also the founder and co-curator of the Mobile Phone Museum, a non-profit initiative to safeguard a vast collection of mobile phones and support education about communications technology.

## Executive summary

The Homes of the Future report shows how we will use connectivity to improve our lives, whether it's creating the smart home of the future, ordering a factory-built home online, setting up an at-home office or helping to build communities that have sustainability at their core. Our experts have looked into how space can be used more effectively, the importance of outdoor environments and the greater use of voice control to showcase a way of living that fits better with a world that has changed beyond recognition since the start of 2020.

Piers Taylor says the pandemic has changed our lives forever and believes we need to place greater emphasis on how we use existing spaces. "Overnight, and quicker than any other change in history, we radically altered what we did in our domestic spaces. Suddenly our homes were where we lived and worked, with no separation or privacy. And in most cases, our homes weren't ready for it."

For Flora Samuel, one of the key changes will be how we design and build homes, with houses built off site and craned into place, utilising flatpack techniques that we usually use for furniture.

"For those who have been brought up on games like SimCity, Second Life or Minecraft, making a digital design, and even ordering the components online from the comfort of your sofa, should be both fun and easy."

Ben Wood says that the glue that will hold all of this together is complete connectivity. And with stable, fast connectivity, comes the opportunity for more connected homes. "The future will take us to a world where you'll start to think in terms of talking to your house, with voice control becoming as ubiquitous as WiFi."



# The evolution of the home



## Author: Piers Taylor

Piers Taylor is one of Britain's leading architects, and an expert in understanding what the house of the future might look like.

For Piers, there are three key historic events which have shaped our homes and play a vital role in understanding how they will change over the next 20 years.

"The first of these was the invention of the chimney, around the time of the Norman invasion in 1066. This revolutionised the design of houses, meaning that ceilings were lowered, while upper spaces were no longer filled with smoke. By Georgian times, from the early 1700s onwards, every house was made up of cellular rooms, each of which had a fireplace.

"The second change was a concept heralded by Modernism around 100 years ago: The idea of open plan living."

The interplay of these two developments remains key to this day, explains Piers.

"In many ways, modern life for the past 100 years or so has been about the tension between the idea of 'home' as an environment where separation is provided by the division of space through rooms, in contrast to a boundaryless, open plan space with no acoustic privacy. Throughout this time, most of us compartmentalised our lives into separate realms where we lived and played at home and worked somewhere else."

Then came the most recent and important change to our idea of home: Covid-19.

## **"Suddenly our homes were where we lived and worked, with no separation or privacy"**

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"Our lives and working patterns have changed forever, and for the better," he says. "Most of us have had a taste of the autonomy and freedom that comes with choosing how and where we work, and most employers have realised that there is no loss in terms of productivity if we work for some or all of the time from home."

The issue, however, lies in reconciling these new patterns with our domestic spaces. Creating the house of the future is about adapting what we have and adding space where we can. While things aren't going back to normal, we can make the most of these changes and find positive outcomes to the events of the past year.

Covid-19, says Piers, has raised the opportunity to rethink how rooms are used.

## **"A separate dining room can make a good office and quickly revert to a space for communal gatherings"**

"A separate dining room can make a good office and quickly revert to a space for communal gatherings, particularly with simple innovations like 'charging drawers' where cables can easily be hidden away."

Not everyone has the luxury of a dining room, of course. Piers says another solution may lie in the older buildings which many of us call home.

"Many of the Georgian, Victorian or Edwardian houses that form much of the housing stock of the UK have extremely lofty ceilings. These can allow the construction of garret-like mezzanine spaces with either a bed or desk, creating a work space above or below. This can feel intimate, separate and private and yet still be virtually connected to the wider world. Even houses that don't have lofty ceilings typically have ceiling heights of 2.4 metres, and that provides

enough space for a raised bed with a desk underneath. WiFi extenders also mean that every space in the house can be maximised with fast, reliable broadband.

"When space and budget is tight, the type of space saving that mezzanines and raised platforms offer can be invaluable. Apartments in Japan are usually smaller than ours, and they often have fold down and fold away desks, beds and tables. We have a good deal to learn from how the Japanese approach space. Decluttering can often be important for those who combine living and working in the same space."

If space and budget allow, then constructing a 'shoffice', a shed that doubles up as an office, is a great option for better utilising space within the home, says Piers.

Often these can be built without planning permission, under permitted development rights, and provide absolute privacy and separation from our domestic worlds. They can also be used as spare rooms or 'screening rooms' where people can go to watch a movie, reflecting new ideas about 'overlapping' functions. The advent of superfast, reliable home broadband means that these exterior spaces can now enjoy strong WiFi."

Whatever your budget, it is the sense of separation and a change of atmosphere that's important, says Piers.

"Even lighting can make a huge difference, particularly with smart bulbs that can change instantly via an app from bright 'daylight', which provides the best working environment, to a warmer and softer light for a cosier, more domestic feel when work is over."

# The home and communities of the future



## Author: Flora Samuel

Flora Samuel is Professor at the University of Reading School of Architecture and was the Royal Institute of Architects' first Vice President for Research. She is currently writing a book, *Why Housing Matters*, on the future of housing in the UK.

She says that, thanks to the pandemic, developments in futuristic housing are moving fast, with fewer high-rise homes that require lifts where you can't socially distance, and a greater emphasis on more cohesive, low-rise community housing. Those that find themselves in new homes in 2041 will have either built them themselves, or more commonly, live in buildings that are made in factories.

"These will be built in modules off site, craned into place and then finished off by local builders to add both personal detail and a local touch. This will be the best way to get cheap, high performance custom homes. Research indicates that people want distinctive homes that show evidence of great care in the detail, known as 'homely modern'." Building homes in factories speeds up the house building process as it's not affected by the weather, in turn making building sites more productive.

Flora says that people who buy on such 'collective custom build' sites will be able to pick modules for their home from a catalogue.

"For those who have been brought up on games like SimCity, Second Life or Minecraft, making a digital design, and even ordering the components online from the comfort of your sofa, should be both fun and easy." The complete dependence on online shopping over the past year, driven by lockdowns and powered by home broadband, is set to make such an approach easier than ever.

The good news is that, from a design perspective, these newer houses will be more diverse and interesting than current builds and, vitally, be built to higher environmental standards. That also means they'll be very cheap to run in terms of energy, adds Flora.

"Homes themselves will generally be designed flexibly to allow for easy changes of use and to be recycled when they are no longer needed. This involves partitions that are easy to move or take down, plenty of storage and natural light, and ventilation that is automatically controlled for optimum performance."

Homes are already becoming more digitally enabled and this technology is likely to become even more prevalent, with Alexa, Siri and the like tracking food

in our fridges, our blood pressure, body fat and exercise through fitness tech, as well as our utilities and at-home security.

"All of this tech will generate data that, with our permission, will be fed back into 'dashboards' for homes, allowing people to find out all sorts of important things about where they live. This in turn will be collated to help with the building of 'digital twins', virtual models of places and cities that will enable decision makers to plan for a better future."

Design will also be far more focused on improving accessibility, says Flora.

"Keep in mind that, proportionally, there are going to be more older people in 2041 - that means, wherever possible, people need to be able to age healthily at home and in their communities. Technology-enabled care will be common, such as heat sensors in floors that inform carers that a person has fallen, movement detectors and reminders to take medication."

It's not just within the home that things are set to change, however. A growing understanding of the importance of outdoor space, both private and communal, means that any new developments will place such considerations front and centre.

"That parks and green spaces are vital to health and wellbeing has become very obvious during the pandemic. In future, all homes will have to have access to fresh air and natural light in the form of some sort of private outdoor space or balcony."

"Not only are trees great for shade and to reduce flooding and carbon, people love them too. In Melbourne, trees even have email addresses. People have been using this as an opportunity to send them love letters."

Flora says that this will be reflected in greater ecological awareness from planners, as well as the utilisation of common outdoor spaces for growing food locally.

"Plants and greenery will be everywhere, even in the dark - smart tech will be used to keep plants healthy in the dark, allowing for food to be grown underground to maximise space. This approach is already in use at Growing Underground, a farm found in a tunnel under Clapham in South London."

Indeed, wellbeing and happiness are likely to be key factors when creating the homes of the future. Thanks to changes in working habits caused by the pandemic, this means more people living in lower-rise accommodation away from major towns and cities, says Flora, with an emphasis on green transport and easy connectivity.

"The 20-minute neighbourhood will be an idea that is enshrined in policy, meaning that people will be able to access basic amenities, food, health and innovation space within a 20 minute walk of their front door. An increased demand for app-based services like Deliveroo will mean that increased connectivity will be a vital part of such communities. By 2041, active travel, walking and cycling, with links to public transport, will become the norm, as it is in places like Denmark and Holland."

Renewable energy and superfast broadband will both be critical to the running of these connected homes.

"We have to give communities the physical and digital infrastructure to enable them to thrive and grow old without digital exclusion. Fast broadband will become a basic utility and right for all."



#### 20-minute neighbourhoods

Instead of sprawling cities, communities will become compact, with everything within a 20-minute walkable radius.

#### Underground greenhouses

Smart tech will be used to keep plants healthy in the dark, allowing food to be grown underground to maximise space.

#### Click-and-deliver homes

Purchasing homes will be like real life SimCity, with designs being made online and ordered from the comfort of sofas and craned into sites.



# The future of home connectivity



## Author: Ben Wood

Ben Wood is one of the world's leading tech analysts, with over 25 years' experience in the mobile sector. As Chief Analyst overseeing research at CCS Insight, he is an expert on what the future of home connectivity will look like.

He says that the pandemic has highlighted the importance of good connectivity at home, especially the increasing need for Superfast Broadband and 5G to ensure a strong connection in every room and outdoor space.

"At CCS Insight, we believe the future will take us to a world where you'll start to think in terms of talking to your house, with voice control becoming as ubiquitous as WiFi in homes," he says. 40% of UK homes already have at least one smart speaker (\*CCS Insight consumer surveys).

As well as allowing you to adjust lighting and turn on the TV with a voice command, such tech will also have more communal benefits.

"As more homes include smart features, we'll start to see the advent of digital neighbourhoods," says Ben. "Although neighbours will continue to keep in touch over the garden fence or on the phone, they will be able to pool their digital resources, for example sharing access to the cameras looking out onto the street, providing peace of mind for the whole community."

It's not just voice controls that are set to revolutionise our homes, however. Robots, too, are likely to play a key role. And with CCS Insight estimating that 10% of UK homes already own a robot vacuum cleaner, change is coming faster than you might think.

"In the future we expect that more capable robots will become commonplace in people's homes," says Ben. "Initially it is likely they'll be offered as an extension to home security, responding to alerts from sensors or cameras, if a door is unexpectedly opened or an alarm is triggered.

"The home-assistant robot will be able to move around the home like a remote-controlled car, providing real-time updates to an owner's smartphone, with a live video stream offering peace of mind by checking whether a door has been left open, a pipe has sprung a leak or even something as mundane as confirming that the post has arrived."

It won't just be humans in a home that will benefit from connected tech, says Ben.

"Owners working away from home or located in an office elsewhere in the house or garden will be able to remotely trigger the smart feeder for their dog and use the built-in camera in the feeder to keep an eye on their pet too. This will evolve so that home robots will be able to look after and entertain your pets when you are not available, by playing games or providing companionship."

Ben also says that robot drones are likely to be a key development, accessing areas that robots on wheels cannot get to. "These will be able to provide other useful functions - sharing messages with others in the home, finding the kids and telling them that dinner is ready, or delivering other messages will be possible."

## **"Seamless connectivity is essential if this vision is to be realised. There can be no dead spots of coverage in your home."**

Beyond robots, though, Ben says that a forthcoming boom in artificial intelligence (AI) could bring about even more drastic changes to our home environment.

"Further leaps in artificial intelligence capabilities will enable a world where surroundings will adapt to the user," says Ben. "Fixtures, furniture, lighting and heating will all intelligently adapt to your preferences. This might mean that if you enter a room when your favourite sporting event is about to start, your TV will automatically come on and select the channel with the event you want to watch. In dedicated working spaces, lighting will be automatically optimised according to the amount of natural light on a particular day or the work being done."

Ben says this technology will come into its own in the bedroom and even the bathroom, too. Until now, the bathroom has been a space that hasn't enjoyed a strong, smart connection with the rest of the home.

"Adaptive lighting based on the time of day, and ambient lighting conditions, will be able to start with a low, soft light that gradually intensifies, allowing someone who has just woken up to have a less abrupt start to the day when they go into the bathroom."

As well as AI, Ben also highlights impending developments in augmented reality (AR) as being key in the future home. Smart glasses, including those made by Nreal in partnership with Vodafone, are set to become major new products from 2022.

"Imagine a world where the smart glasses you are wearing personalise your surroundings," says Ben. "Each member of a household will be able to arrange the space with their own choices of artwork, virtual clocks and windows into different worlds. Meetings will be revolutionised as home workers are able to collaborate with other participants who are projected onto virtual seats around a table."

"Home design will become highly interactive; architects and garden planners will be able to overlay multiple virtual versions of redesigned rooms and garden spaces to allow their customers to understand how a transformation would look."

None of this will happen by magic, says Ben. Complete connectivity will be essential.

"Never has it been more important to have a total connectivity package," says Ben. "Connections into the home need to be supported by exceptional, whole-home WiFi."

"The obvious question is how much bandwidth will a highly connected household ultimately need? It's clear that great progress is being made. We've seen dramatic improvements in fixed-line and mobile bandwidth over the past three decades, going from a mere 9.6 kilobits per second on mobile and 56.6 kilobits per second on fixed-line communications to gigabit speeds on both. On this basis, it's rational to expect a tenfold increase over the next two decades and this makes the expectation of anywhere between two and 10 gigabits per second a reasonable estimate."

"Without this, meeting consumers' new demands for seamless communications and navigating the journey to future smart experiences will be impossible. As speeds get ever faster, the road to ubiquitous multi-gigabit connectivity in the home is now a realistic outcome as connectivity touches every part of our lives."



#### Pet-caring robots

Robots, powered by home broadband will play a part in keeping our furry friends company, with the ability to entertain, feed and provide companionship when owners are not at home.

#### Personalised surroundings

Each family member will be able to arrange the space around them with their own choices of artwork, virtual clocks and windows into different worlds that they see through smart glasses.

#### Co-worker projections

Meetings will be revolutionised as home workers are able to collaborate with other participants who are projected onto virtual seats around a table.

