NEIGHBOURHOODS OF THE FUTURE

BETTER HOMES FOR OLDER ADULTS – IMPROVING HEALTH, CARE, DESIGN AND TECHNOLOGY

A WHITE PAPER FROM THE AGILE AGEING ALLIANCE,
A CAMPAIGNING SOCIAL BUSINESS CONNECTING
DIGITAL INNOVATORS IN AN AGEING SOCIETY

McCarthy & Stone
The UK's leading retirement housebuilder

AgileAgeing Alliance

Better homes for older adults – improving
health, care, design and technology

"Always look on the bright side of life"

Eric Idle
1978

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THE
HUMAN TOUCH

McCarthy & Stone's CEO, Clive Fenton, explains why it is vital for housebuilders, housing managers and their ecosystem of suppliers to embrace innovation and ensure that the housing needs of the next generation of older adults are met.

2017 will see McCarthy & Stone turn 40. The concept of retirement has changed dramatically since we built our first development in 1977. In many ways, it no longer applies.

People live longer, work longer, travel more, and expect more. But while most of the change has been positive, certain aspects have declined. Every day we read or hear about older people struggling at home, the poor quality of social care and health services, and rising levels of loneliness affecting health and well-being.

In 1977, when we built our first retirement development, there were around eight million people aged 65 and over in the UK. Today, there are 11 million. In 2035, there will be 17 million, so the numbers will have more than doubled over this period. This pace of demographic change means there is an increasing need for better products and services for this growing segment of our population.

The move into the information age has been the other major change in our society. New forms of technology and 'big data' present possibilities for everyone, especially older adults. However, their impact on those in later life is relatively unexplored. This is of great interest to us, particularly how they can support this age group to live better at home.

We have therefore commissioned this report in partnership with the Agile Ageing Alliance, under the technical authorship of Professor Merlin Stone. Its purpose is to review what role technology can play in supporting independent living, providing entertainment and education, while keeping families and friends connected.

It is our view that technology will never replace the human touch and we are sure that developments in robotics will not compensate the need for personal care delivered by humans, but we would like to understand how tech can improve health

and well-being and Indeed, what is the relationship between health, older people and technology, and how can they support each other and co-exist?

Much of the UK's retirement housing built over the past four decades reflects the way we, as market leader, have defined the sector. As part of our anniversary celebrations, we'd like to know what the next 40 years has in store for our market, and that's where this report comes in.

Much like the 'concept car of the future', exploring the potential of emerging technologies to enhance our homes and support independent living will help us to continue to innovate and deliver state-of-the-art homes in our smarter neighbourhoods of the future.

We expect this report to influence our thinking, and the thinking of other housing providers. Our aim has been to summarise in one place, perhaps for the first time, what technology is on the horizon and consider how it could empower older adults and improve their quality of life. We would like this report to serve as a valuable resource for all housing providers. To use an appropriate technological term, we want it to be 'open source' – for the benefit of everyone – and ultimately to facilitate the creation of new homes that will support happier, healthier and, hopefully, longer lives.

**CLIVE FENTON**
CEO McCarthy & Stone

MANAGEMENT SUMMARY

What this report explores

Neighbourhoods of the Future examines the so-called housing 'crisis' facing the next generation of older adults. It suggests that although there is most definitely an urgent need for more 'age-friendly' housing and built environments, innovative new product and service solutions enabled by evolving technologies such as the Internet of Things and 5G provide a golden opportunity to rethink the outlook for ageing populations, particularly if various sectors, organisations and stakeholders adopt new collaborative business models and work towards a common and mutually beneficial reference framework for age-friendly housing.

This report is based on the outcomes of a 12-month pan-European roadshow in which we have listened to the needs, achievements and plans of the public sector, together with hundreds of inspirational businesses, NGOs and institutions. It is also informed by interviews with some of the leading commercial and academic players, an extensive literature review and our own experimental research comparing the needs of current older adults with those of the next generation.

This next generation, often called the baby boomers, is not only the largest generation of older adults the UK has ever seen, but also the most educated, financially secure, technologically aware and experienced. It is a generation accustomed to the service economy, not just as customers, but also as suppliers. Many will still be working in the service industry, possibly from home, being semi-retired, and many will also be running their own small businesses from the comfort of their own homes.
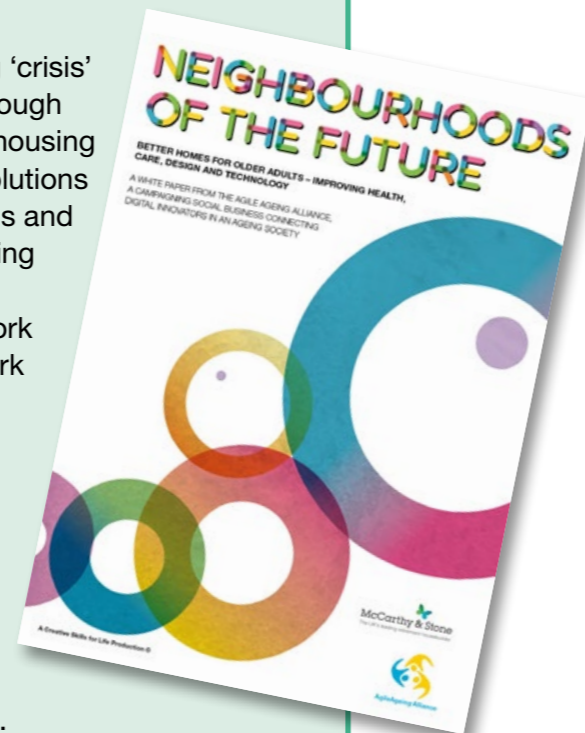
WELCOME TO THE COGNITIVE HOME
The empirical research we undertook for this report indicates that this generation is ready for a fundamentally different approach to housing, not necessarily in terms of the physical design or size of their property (most are happy with conventional designs, while many plan to downsize just once), but rather in terms of their relationship with the home, which may be redefined and facilitated by means of smarter information and communications technologies (ICT), moving towards what we call the 'Cognitive Home'.

Baby boomers are open to the idea of a cognitive and empathetic home with human qualities. They also anticipate smart non-intrusive, secure connections with friends, family, GPs and/or carers who keep an eye on those who look after them. They have become comfortable with the idea of inanimate objects such as their car talking to them, and now they are getting used to conversing with their devices, with the latest development being the move away from the hand-held. Increasingly, they will have constructed their own private ecosystem to manage their lives and are inspired by the idea of homes keeping them safe and healthy.

For the most part they recognise they are on a journey, a mental and physical journey of possibly declining health and increasing time to savour life. Many believe that mental and physical fitness, creative pursuits (play), companionship and a balanced diet are key to what we call 'agile ageing', frequently aligned with longer (often part-time) employment. Whether they are as fit as a proverbial fiddle, frail, or disabled, they need facilities and incentives that support healthy and active ageing, but they do not want ugly, cumbersome devices imposed on them.

They expect transparency in relationships and information. They look out for value for money. They also want suppliers who think about consumers' service experience and the journeys they go on. They love people competing for their business and do not like monopoly suppliers. They are getting used to and want more cool tech and, perhaps most importantly of all, they want suppliers to focus on them as customers, not as patients, end users, or care clients.

FLEXIBILITY IS ESSENTIAL
Homes may also increasingly become intergenerational living spaces. While we live in a society where independent living is prized, co-living may become more common, with younger couples needing affordable housing and older generations nearby to offer and receive support as required. Good inclusive design and technology can help to create modern, flexible spaces that can be adapted in the event that adult children need to care for frail parents.

PEOPLE POWER
The technological innovations featured in this report could have transformative benefits for older adults. However, like health care, where health literacy is a huge challenge, we need to do more to engage the widest possible audience in this debate in order to avoid the possibility of a two-tier society: those who are tech-savvy, and those who are left behind.

And let's not get too carried away with the idea of technology as the be-all and end-all. The vast majority of stakeholders we spoke with were keen to point out that digital innovation can enable, improve, support, augment and empower – but not replace – human communication and relationships. Taken together, the innovation elements outlined in this report can be truly transformative.

AGENTS OF CHANGE
So, this report is a rallying cry – a brilliant opportunity to tap into the experience and thinking of a generation of receptive older adults who are willing and able to serve as agents of change. They are READY FOR SOMETHING DIFFERENT. Some have already started, smartening their homes, taking control of their relationship with health services and the medical profession, and perhaps with social care, as many have older relatives or friends they are helping or caring for.

In summary. If housing providers are willing to listen to prospective customers, we can look forward to the growth of a new breed of smarter homes in our Neighbourhoods of the Future. Enabling our older selves to enjoy more meaningful, healthy and creative lives, living in fit-for-purpose environments which will in turn facilitate life-affirming opportunities for personal development and social engagement.

SETTING
THE SCENE

Ian Spero, founder of the Agile Ageing Alliance explains how developments in the UK can benefit through cross-border, transdisciplinary collaboration and knowledge exchange.

The convergence of game-changing assistive technologies and big data analytics constitutes a golden opportunity to rethink the outlook for ageing populations, especially in terms of housing. This is the driving force behind Neighbourhoods of the Future, a pan-European collaborative initiative orchestrated by the Agile Ageing Alliance (AAA), an independent social venture and campaigning organisation which aims to boost knowledge, investment and commercialisation of innovations that promote agile ageing at home and in the community.

Once considered a luxury, the demand for streaming services, social media and gaming has turned high-speed internet into an essential utility. In the UK the Government recently announced plans to invest £700 million in ultra-fast broadband, as part of a £1 billion boost to Britain's digital infrastructure. Indeed, as the world becomes increasingly connected, we need sustainable networks that can boost emerging technologies in order to empower our smarter homes, cities and Neighbourhoods of the Future.

Central to all of this, I believe, is the importance of a more holistic, collaborative and open approach to research, development and commercialisation. Like most complex challenges, the question of what constitutes an age-friendly home cannot be addressed through the lens of a single discipline, especially in this day and age of seemingly endless possibilities. To this end, for the past year the AAA, in partnership with the European Commission, has been taking soundings from world capitals to city halls and rural communities, in order to inform the development of a 'European Reference Framework for Age-friendly Housing'.

Working alongside Utrecht University, we engaged with national governments, city, local and regional authorities, health and care practitioners, NGOs, corporates, SMEs, end-users, tech solution providers, financial institutions, academics and others. We listened to hundreds of private, public and third sector stakeholders talking passionately about new forms of cross-border and cross-sector collaboration, sharing capacity and developing risk-sharing models in a spirit of open innovation. This bodes well for a future where, instead of focusing on imposing our own exclusive standards, we should be thinking about improving user experience and interoperability. While we will still be competing, let's embrace a shared long-term vision based on a set of principles, a voluntary code of conduct and a common language.

Some of the ideas covered herein could be mistaken for science fiction, but they are all based in reality. In the words of science fiction author William Gibson: "The future is already here – it's just not very evenly distributed".

Made possible by AAA founder member McCarthy & Stone, the UK's leading retirement housebuilder, this report embraces the art of the possible and is unapologetically optimistic. Here we look to the future for our older selves and ask: What If?

IAN SPERO
Founder, the Agile Ageing Alliance

A BIGGER PICTURE – **THE EUROPEAN DIMENSION**

How stakeholders are willing to collaborate in a united effort to reimagine how we house the current and next generations of older adults.

While the UK is in the process of leaving the EU, it would be counterproductive not to work together with our European neighbours on big societal challenges. This is not just because we share a culture and the challenge of an ageing population, but also because our links with Europe go far beyond legal frameworks. They are based on friendship, a shared culture, ideas, ideals and history. Furthermore, Europe, much as the rest of the world, is going through a digital revolution.

Digital innovation can support some of the major challenges ahead in ensuring that older adults as well as the wider population remain independent and active in society, receiving coordinated care and enjoy living longer in their homes, particularly in remote and rural areas, while increasing the efficiency of health and social care systems and supporting new (and vibrant) sectors of our economy.

Co-creative ICT-based design and development approaches will allow key supply sectors such as the construction and tech industries to work more effectively with institutional and private clients to integrate smart home and IoT technologies into safe, supportive living environments for all.

In December 2016 at the second European Summit on Digital Innovation for Active and Healthy Ageing, European Commissioner Günther Oettinger (Digital Economy and Society) delivered the first phase of a Blueprint which aims to demonstrate how digital innovation can transform demographic change into an opportunity for Europe's economy and society.

Recognising that a shared vision is essential to mobilise investment and guarantee the commitment of all actors, the blueprint is a collaborative process involving a broad spectrum of stakeholders including the European Innovation Partnership for Active and Healthy Ageing, reference sites, industry, standards organisations, and user organisations; underpinned by a €4 billion commitment from the public sector to invest in health and care innovation in the next three years across Europe.

The Commission envisage that this vision will be developed through a unique, open, collaborative and dynamic set of resources and tools, co-created with a number of "champions" including organisations such as the Agile Ageing Alliance.

The quality of life for all citizens, but especially for the growing number of older citizens and those living with chronic conditions, is determined mainly by how far the physical and social environment of their daily lives supports autonomy, independent living, social connectivity and meaningful social participation. Improving this environment requires authorities at all levels to move from traditional, 'siloed', top-down approaches to policy development and service provision to facilitative and distributed models that allow self-organisation and empowerment of citizens to drive social transformation.

That said, innovation is not exclusively about new technologies. Digital innovation can enable, improve, support, augment and empower – but not replace – human communication and relationships. Taken together, the innovation elements outlined in this report can become game-changers that transform our lives and how we provide or receive health, care and social services.

BACK
TO THE FUTURE

In this section Professor Merlin Stone explains how he was lured from retirement to consider how digital technologies can help us to live better at home.

IT'S ME YOU'RE TALKING ABOUT

All this talk about digital health and innovation, smart technologies and homes – what does it mean to me as an 'older adult'? There, I said it, I am the proverbial 'senior citizen'. I may be 68, but I'm feeling 40 or thereabouts and like so many of my friends and peers, I'm enjoying life to the full.

Truth be told, I tried retiring a few years ago, but it drove me (and my dear wife) crazy, so here I am doing what I love, helping explain complex concepts, products and services to encourage innovation. In fact, I have enjoyed working on this project so much that I have accepted a part-time professorship at my local university, and – yippee – I now walk to work, or if worst comes to the worst, take a local bus. It is free, after all, when you get to my age!

By way of introduction, I started my working life as an academic in economics, but then moved into industry as Business Research Leader and Professor of Business Transformation for IBM, where I led a team focused on enabling IBM corporate customers to use customer relationship management (CRM), information technology and services to become more consumer-oriented. At the time this was quite revolutionary thinking. Nowadays of course, you will find it difficult to identify a credible consumer-facing business that doesn't take account of customer insights and user experience.

Except when it comes to older adults that is. We are a poorly served demographic. Rich with disposable income and a wealth of knowledge yet, more often than not (and especially when it comes to marketing), we are treated as second class citizens. Research for the Financial Times by Silversurfers website bears this out, with 82% of retirees saying they felt businesses and brands did not understand their lifestyle and 69% believing advertising aimed at the elderly was patronising.

In truth, **there's a whole new phase of life up for grabs which is poorly catered for**. The move to the information age, with seemingly never ending new technologies and 'big data', presents possibilities for everyone, particularly older adults. But their impact on those in later life has been relatively unexplored. This is what interests us most, particularly how these possibilities can support my age group to live better at home.

According to the European Commission over 70% of Europe's housing stock is not fit for purpose. In the UK the average home is older, smaller, more overcrowded and less modernised than in most of the other advanced European countries. With a rapidly ageing population, this is frightening, and it prompted me to respond favourably when a former IBM Innovation partner Ian Spero invited me to join the Agile Ageing Alliance, with a view to taking a fresh look at how smarter homes and environments can enable an ageing population to live healthier, more meaningful, agile lives, for as long as they are physically able.

AN ENLIGHTENED AGE

The first thing that struck me from my research was how disjointed this sector is. To have any chance of realising this vision, stakeholders will have to invest more time talking with each other, developing ideas together and testing and implementing the ideas together.

Now, with thanks to AAA partner McCarthy & Stone, we have been able to apply this thinking to our smarter Neighbourhoods of the Future. Our research aims to bring together the perspectives of the many stakeholders involved, using their insights as well as our own to connect the dots and inform the aforementioned Reference Framework for Age-friendly Housing; working in a spirit of open innovation, not of superior knowledge and expertise, which no-one can claim.

The outcomes we need will only be possible with strong input from pioneering social and technological entrepreneurs, who will complement the role of local and central government, not for profit and housing organisations, private developers and end users.

However, a word of warning – it would be counterproductive to rush into detailed insight based on the current 70+ generation. Even seeking the opinions of those of us with elderly relatives is unreliable, because our relatives did not grow up with Facebook, smart phones, live streaming or any of the other pervasive technologies that permeate our lives and which most of us now take for granted. That does not mean to say we should ignore the needs and desires of this older generation, but neither should we allow this to restrict our vision.

To this end, we have engaged and conducted research with a wide range of older adults and consumers, focusing on baby boomers – average age 60 – plus older adults with an average age of 80 – taking account of their views, potential needs and aspirations.

We also interviewed senior industry decision makers and thought leaders and carried out an extensive review of the literature produced by the myriad of academics, government and nongovernment organisations and private sector companies interested in our topic. The results of the research have been used to build the picture that follows.

Back to the Future continued

NOW HEAR THIS

It's truer than ever before that life begins at 40, 60, or whenever, with years of healthy living and exciting life events ahead for many of us. We can be parents, grandparents and even great-grandparents. If we are lucky, in the next two decades, we baby boomers (born mid-40s to mid-60s) will learn all about agile ageing, while Generation X (born mid-60s to early/mid-80s) follow closely behind. Yet instead of celebrating this marvel, we find ourselves overwhelmed by statistics about the size of these generations and the inadequacy of current housing and public health services to meet the needs of the elderly.

There is another way of looking at all this. Let us imagine a growing number of older 'customers', who not only sustained and developed the consumer and service economy of the post-war years, but who will continue doing so, perhaps being considered 'older' customers for another 30 years! We're not of course forgetting the current generation of older adults, but it is the contrast between them and us that poses the challenge for the planners and decision makers. We are following a great generation, and there are a lot more of us on the way.

As our generation ages, we will become centres of social activity for family and friends. Many of us will continue running our own micro businesses from home. We will expect our homes to become an active partner in our lives, not just a place to live. Through modern technology, our homes will welcome us, warn us, help us survive and enjoy life, not just be a passive receptacle for our ageing bodies. When we enter our smarter houses and apartments, we'll expect an update on what's going on, in and around our home, and share them with those who help us, should we need to. When problems are imminent, whether in our home or outside, we'll expect to be alerted, in a way which goes far beyond the warnings about open doors or undone seat belts offered to us by our (current) cars. In short, we'll expect our homes to be – dare we say it – almost human.

According to the European Commission over 70% of Europe's housing stock is not fit for purpose. In the UK the average home is older, smaller, more overcrowded and less modernised than in most of the other advanced European countries

As we age, controlling and managing our homes will become instinctive. We will know everything we need to know about monitoring our home, our neighbourhood and ourselves, without having to refer to manuals. This will include simple things where the technology is already available and in use in many homes, such as maintaining the right temperature, opening and closing windows, curtains/blinds, turning lights and appliances on and off. However, it will soon include much more advanced functions, the prototypes of which are already emerging, based on the idea of the 'Cognitive Home' as a partner in our lives, helping us deal with more complex tasks like preparing for storms, planning trips, providing updates on events in the neighbourhood, communicating with our doctors and carers, or managing transportation, whilst enjoying media content when and how we want it, all without us having to log on to or carry round a device.

So, when you talk about us and our future homes, you must realise the discussion is much bigger than just where we live. It's about the technology (devices, services, content etc.) that will help us live, for richer or poorer, in sickness and in health, in fair weather and foul, with our spouses, partners, neighbours, families or alone, and with our doctors, our banks, our carers, and anyone else who affects our lives. We are after all the generation that grew up in the service economy, often being part of it as providers. We expect the days of having to battle with authorities and suppliers to get what we need to be long gone. Don't forget too that we are (some of us at least) the most moneyed older generation there has ever been. We lived through the yuppie years, and no matter what that meant for us financially in terms of how we are now, we expect, as customers, a good service experience.

That's because we have all used the same products and services of the companies providing our mobile phones, computers and software, our satellite or cable TV suppliers – whether directly or through their ecosystems of app and services – to set up how we live, and support us as we change. And this experience has informed the way all the providers of goods, services and administration have been obliged to innovate, to enable us to deal with them digitally, in areas such as health, financial services, taxation, local administration (from parking fines to collecting rubbish) and so on.

So, let us be clear. When planning our homes and communities of the future your offer must be compatible with the way that we already lead our lives. We don't want to be 'educated' to use this product or that system. Instead, recognise that many of us will be committed to, perhaps even devotees, of at least two and possibly more of the leading providers – Amazon, Apple, Google, Microsoft, Facebook and other social media channels – and anything that doesn't fit smoothly and quickly (yes, we are impatient and don't want to have to mess around with tech stuff) with the way we generally do things is going to be ruled out immediately.

Back to the Future continued

And please, let's ensure that – when we need them – that the connections with our doctors and the local health centre, our carers, our family and neighbours, perhaps even the police – are equally smart.

LET'S MAKE A CONNECTION
Those of us lucky enough to own relatively modern vehicles have already experienced the joy of being welcomed, warned about bad weather, alerted to our bad driving and (if we are lucky), maybe even taking a moment to read as the car drives itself!

So, why shouldn't we talk with our homes and vice versa? This may be simple things; we set the house alarm and the car lights go on, and in the winter the heated seats go on too, then we arrive home and the house lights go on. Or more complex things; "Help, someone's too close", says the car to the house, "trigger the alarm", or; "There's an intruder in the house, start your alarm", says the house to the car. We don't want a car or an alarm employing disparate proprietary systems of course, so interoperability will be essential.

Please don't make us wait too long for any of these developments. When we bought into our relationships with the big providers, we mostly signed up for the long term, where their capabilities are constantly improving, along with the benefits we receive.

No longer are we the patient, polite folk waiting in line to be served, or waiting days for engineers to show up at their convenience.

Today, agile technologies enable improvements to be delivered automatically, and if need be, easily configured by us. Consequently, if and when our health worsens, of course we expect interventions. However, the technological age in which we live has raised our expectations for products and services to be delivered instantly, and in some cases round the clock or seven days a week. We don't want to wait in queues or for people to arrive. We want to programme what we get – to suit both us and whoever is helping us – to create a private ecosystem that ensures the appropriate help is supplied at the right time, or if we are carers ourselves, to provide the right help.

In other words, our private ecosystem must intersect with public ecosystems (like health and social care) and the private ecosystems of other individuals (friends, family, neighbours). If we're sadly in the situation of needing frequent help, we will be visible on the dashboard of our doctor or carer, hopefully displaying green and not red!

WE'LL CUSTOMISE OUR LIVES
Of course we know that we're a real mix. At one end of the spectrum there are the early adopters who always have the latest and best technology, while the majority prefer to wait for things to be tried and tested. Either way we would like those who help and serve us to make it easy for us to personalise and adapt our solutions as and when we see fit.

Given the opportunity, many of us would love to be co-creators and self-designers, planning our lives with the support of great devices, systems, networks and content, which we expect to be served up on a digital plate. Some of us are already customising our digital lives, increasingly around not just our smart phones but the ecosystem that goes with them; we design our own networks and communities, and lay down the rules – when we want interaction and when we don't. We select what we want, taking a few options from the hundreds (or thousands) of media channels available. We are the home producers, but also the home players and entertainers, managing and adding to our content in ways that we determine. We increasingly consume content digitally, whether it be text, videos or music, and are less likely to purchase newspapers.

Put simply, we are the online buyers with the real money, and now we're at home to take the deliveries.

We are more aware of developments and how we stand in relation to them, especially about our health – what we have now and what awaits us. We are (though perhaps only some of us) prepared to do some serious thinking, even if it's sometimes last minute. We do expect to be consulted throughout, or at least to know that customers have been asked and ideas have been tested with them. However, we may want the consultation to be digital not physical – no embarrassing interviews please.

Even though it is good manners, we don't need our doctors to ask "How are you?" If we allow them access to our data, they will already know how we are. Of course, we like the human touch of a doctor, but if the doctor turns out to know far less about us than we do, that doctor becomes an obstacle no matter how helpful their intent. And that's assuming you are fortunate enough to have access to a doctor. As Martin Ford put it in his book *The Rise of the Robots*:

"The UK is already facing a crisis with 30 percent of GP training posts unfilled in 2015. As many as 500 local doctors' surgeries may have to be closed as Britain is confronted by the fact that many of their doctors are approaching retirement age and there simply aren't enough doctors to replace them."[1]

We want our doctors to be cognitive, and to help us diagnose ourselves, using basic sensors and ever more intelligent diagnostic tools at home. Bearing in mind that older adults are likely to suffer from at least one chronic condition and will become proficient at managing that condition, that expertise should be embraced by the medical profession, and used to reduce health management costs, not inflate them. As we learn to get used to the ambient computing power of our smarter homes, before contacting our GP – if we have any uncertainty and don't know what to do or what is going on – we'll ask Siri, Cortana, Alexa, Google Now or Samsung's new Bixby; or maybe we'll even refer to our own personalised digital assistant, digital doctor or robot.

Back to the Future continued

SECURE INTERVENTIONS

We are getting used to managing and mitigating risk through digital channels. We are getting used to giving off masses of data and to seeing it being used to improve our lives, and we are also aware of the risks. That said, our research confirms what has been found in many studies, which is that so long as consumers feel confident that their data is held securely and used to their own benefit, most of us are quite happy to share it.

Our research produced some interesting findings regarding people's attitudes to their home and what they want it to do. For example, older adults (average age 80) were actually more comfortable than baby boomers with the idea of interacting directly with their home; of having it welcome them, warn them about problems and update them on news and events in the neighbourhood, whereas baby boomers were happier with the idea of managing their home and lives via a mobile phone application. The baby boomers were also very favourable to the idea of accessing their doctor remotely, as much as possible, and researching medical matters before visiting a surgery. The two generations were both reasonably comfortable with the idea of their home helping keep them healthy, including all round monitoring and security, and they both demonstrated a strong desire to stay in their existing home as long as possible, to adapt it when needed and to be involved in its adaptation.

Most of us know we are on a journey, a mental and physical journey of possibly declining health and increasing time to savour life. Many of us believe that mental and physical fitness and creative pursuits (play), companionship and a balanced diet, are the key to healthy, active *agile ageing*, frequently aligned with longer (often part-time) employment. Whether we are as fit as a fiddle, frail, or disabled we need facilities and incentives to maintain fitness (physical and cognitive), adjusting the required level of exertion to match our respective capabilities.

If you, dear reader, are in the business of providing us with solutions PLEASE focus on us as customers, not as 'patients', or 'end users', or 'care clients'!

It's time you started seeing things from our point of view, not just yours. Stop imposing ugly cumbersome devices on us as we age. We are getting used to cool tech, so start designing products that support assisted living that we want to buy. Yes, buy from a shop or online – we don't want hospital cast-offs thank you! And, we are not only thinking of ourselves. We want the generation following ours to benefit from our skills and experience – to ensure that everyone's lives are enhanced. Don't forget we are on a journey, so any concepts that are provided must be flexible enough to account for changes in our life systems covering: housing provision, financial solutions, charges, costs and care arrangements.

CONCLUSION

We did not set out to produce a conventional white paper on the state of older adult housing, health and care, there's more than enough of that out there already. Our intent is to take stock of the current state of play and give a voice to ageing home owners and tenants who could benefit from a much more collaborative approach to planning.

We hope it will serve as a rallying cry for the next generation of older adults to become agents of change, to get involved in how housing, health and care services are designed and delivered. So let's be explicit. WE are ready, indeed want (and dare we say it), need to engage in very different relationships with local authorities, architects, planners, product designers, manufacturers and service providers, even if our thinking is tinged with the sadness of knowing that as we age we may get sick, will become frail and then die. Mortality and morbidity are an inevitable feature of this subject.

The previous generation are probably no less desirous of wanting to take an active, co-creating part in this, saving costs and enhancing dignity, but they were just a little early.

But WE are ready for something different. Some of us have already started, engaging online with local government, smartening our homes, taking control of our relationship with the medical profession and perhaps with the caring profession, especially if we have older relatives or friends we are helping or caring for. We want the same degree of innovation in business models among our suppliers, using the solutions we prefer rather than technology which is mandated to us

We want suppliers who think about the experience we have with their services and the journeys we go through, but we don't expect it at any cost, because we have been trained to do things efficiently by new model suppliers. We do like people competing for our business and do not like monopoly suppliers.

We are very pleased to see that many suppliers are already converted to our ways of thinking, suppliers who understand what we are trying to do and will help us on our journey. And we are not preaching. Rather, we are encouraging planners, suppliers, governments and NGOs to seize this opportunity, to mutual benefit, using innovative business models and the best of the new technologies, so that in future we won't have to bend and flex ourselves to meet your needs.

Come on in!

Merlin Stone is Research Director of the Agile Ageing Alliance and Professor of Marketing and Strategy at St Mary's University, Twickenham, London.

[1] Ford, M. (2015). The Rise of the Robots. One World Publications. Ch 6, The Healthcare Challenge, p157.

There is a growing demand for age-friendly housing, but where will the funding come from?

Here we speak to experts in longevity, property, banking and architecture to understand the perception of the challenge, as well as the opportunity within this growing space.

HEALTH

FUNDING – IS THERE A DISCONNECT?

The next generation of older adults (and even the existing one) are not set in their ways and are taking very well to technology. Isolation is a serious problem, but even this can now be mitigated by technology. In many cases an older generation is helped by the next generation, who have introduced them to new products and services.

It is evident we still need much more research into the next generation, as confirmed by Jeremy Porteus, former National Programme Lead for Housing at the Department of Health and now Director of the Housing Learning and Improvement Network. Jeremy was particularly keen to emphasise that the next generation will require much more in the way of co-creation and collaboration rather than "dictating" terms of provision. Most commentators that we interviewed agreed that the next generation will be split broadly between those who need specialist retirement housing or care, and the 'younger older' adults who are able to remain independent, want simple one-stop shops for products and services, and require much better information on services available. Also, wealth issues are going to be very important, as these determine attitudes to costs and the desire to buy private professionally configured homes for retirement, of which there is not enough provision.

David Sinclair, director of the International Longevity Centre confirmed that meeting the needs of last time buyers and encouraging downsizing is crucial to addressing the housing crisis. According to David, "Downsizing may enable older people to stay in their own homes for longer, and can release equity that can be used to fund social care in later life. Indeed, unless the UK Government acts to

encourage local authorities and developers to meet this growing need, we are looking at a probable gap of more than 160,000 retirement homes by 2030. If current trends continue, the gap could grow to 376,000 homes by 2050."

Our own research confirms that older adults generally envisage ageing in their current home or downsizing just once, releasing funds, to help the next generation and to make their own final years more enjoyable. So there is clearly a need which is also reflected in the recent UK government white paper: Fixing our broken housing market. One of the biggest barriers is the lack of innovative financial mechanisms specific to age-friendly housing. We learned about pioneering home adaption subsidy and low interest loans schemes in France and Germany, but there is a growing need across Europe, and further afield. So, what about the private sector? AAA spoke with Michael MacBrien Director General of the European Property Federation (EPF).

"Believe it or not, property investment companies are scrambling to meet the public and private demand for health care real estate, largely motivated by the needs of the ageing: modernised hospitals, smaller, strategically located specialised clinics, assisted living facilities and age friendly housing. In fact, they are going through the kind of business plan sea-change you only normally see in times of radical change such as war. The downside is that these investors are so busy meeting basic demand that they may be missing out on other, hidden opportunities.

"As the Neighbourhoods of the Future roadshows demonstrated, there seem to be many private, public and third sector organisations looking for funds to support the development of real estate-related products that they know the ageing population needs but isn't getting. Is there a disconnect? Should the two sides be speaking more?

"EPF's members own and manage commercial and residential property assets worth €1.5 trillion. A significant number of EPF's property investment company members are either entering the health care real estate market or expanding their existing operations and asset base. Maybe with the help of the Agile Ageing Alliance and the Commission we can address this disconnect and create some sort of forum by which future demand meets those who can fulfil it."

Watch this space…

In the UK, AAA has been supported by NatWest bank. According to Regional Enterprise Manager, Nick Howe; "We are seeing a perfect storm of greater demand for health services across the board, and this is augmented by a growing need for care to be closer to the home.

"By partnering with the Agile Ageing Alliance, we are aiming to construct, profile, and prove the market for age friendly housing. To have collaborated as early on as we have done in Neighbourhoods of the Future we have seen very clear problems being identified and we are now supporting the development of innovative solutions to help address them. These business ideas, once validated, could not only benefit our retail and business customers, but also our own staff base and the wider ageing population. By being such an early mover within a significant emerging market, this partnership represents a huge opportunity to generate economic wealth, jobs and growth.

"We look forward to staging the next Neighbourhoods of the Future UK stakeholder event at NatWest HQ in London May 10 and 11 2017." Visit www.agileageing.org or contact info@agileageing.org for further details.

> **Believe it or not, property investment companies are scrambling to meet the public and private demand for health care real estate, largely motored by the needs of the ageing**

AN
ARCHITECT'S PERSPECTIVE

Here we summarise the views of architect and housing expert Judith Torrington regarding the current mismatch between the UK's housing stock and people's needs in later life.

HOME DESIGN: IS IT FIT FOR OLD AGE?

Nearly all older people live in standard housing in conventional neighbourhoods. In England, only seven per cent live in housing designed for older people or in residential care homes. Remaining at home, even in advanced old age, is a clear preference for most people – and why not? There is clear evidence of the benefits to well-being, autonomy and sense of self in living in a known and familiar setting.

On the face of it, this is a happy situation. But evidence suggests that UK housing stock is not well adapted to older people, and there are many mismatches between their needs and their homes. First, housing is designed predominantly for families – a typical home has three bedrooms and a garden. One consequence of increasing longevity is that, at a time of a significant UK housing shortage, a large number of older people occupy houses designed for bigger households. There is evidence that older people would like to downsize but there are too few smaller, more easily managed homes to meet the growing need. Housing designed specifically for older people is available in diverse forms, offering varying levels of support, but it accommodates relatively small numbers across the country.

How well does housing support the physical changes that accompany old age? People age differently but physical decline is inevitable: 45 per cent of the

UK population over state pension age is disabled in some way. With age, nearly everyone experiences some loss of mobility and increasing difficulty in bending, stretching and weight bearing.

The key features of accessibility – level access, flush thresholds, wide doors and circulation space, and entrance level toilets – are found in only five per cent of homes in England.

Older people may have difficulty getting in and out of baths, walking upstairs, bending down and reaching up. Some of these needs can be met by adapting existing homes – fitting handrails, stair lifts and replacing bathrooms with wet rooms. But studies indicate that 16 per cent of homes would need major structural alteration to become fully

accessible, and in 28 per cent of homes alteration would not be feasible.

Most people lose some of their sight as they age. According to the NHS, 64 per cent of registered blind people and 66 per cent of partially sighted people are aged 75+, and 66 per cent of those with hearing loss are 65+. Most homes cannot cope with this. Stairs and landings are poorly lit, increasing the risk of a fall. Acoustic environments in local neighbourhoods, shops, restaurants and cafés are also often unhelpful to people with hearing loss.

Then there is the challenge of dementia. Estimates suggest the UK will have more than one million people with dementia by 2025. Today, two thirds of such people live at home. Where they may allow pans to burn, turn on the gas but not light it, let baths overflow, get lost by wandering off. There are endless potential hazards and good design could help, but most design guidance is written with specialist accommodation in mind.

Neighbourhood design is also important for older adults. Living in a supportive neighbourhood is beneficial to health, well-being and social connectivity. But accessing neighbourhoods can be difficult or impossible for older people if there are no step-free access points, ramps, handrails, seats or working toilets. Properly maintained surfaces and removing the seasonal hazards of autumn leaves and winter ice and snow are similarly essential to prevent older adults from being confined to their homes.

In 2012, 22 per cent of homes in England did not meet the 'decent homes' standard, with poor heating, insulation and lighting, damp, unsafe stairs costing the NHS around £600m in falls and another £700m in cold-related problems such as hypothermia, and leading to around 40,000 excess winter deaths annually in England.

POTENTIAL FOR CHANGE

Although physical decline is inevitable, this does not necessarily translate into misery. The Office for National Statistics found in 2015 that 65-79 year-olds have the highest levels of personal well-being, though this declines in older age groups. There is potential for houses, furnishings and equipment to be much better fitted to the needs of an ageing population.

Currently, 24 per cent of the UK population is over 60, a figure that is expected to rise to 29 per cent in 2035. Large numbers of older people become invisible with advancing age, confined indoors by an unsupportive physical environment and/or physical disability. The aids and equipment that support old age are not generally found in normal shops; they come from suppliers specialising in disability, accessed via health professionals. In contrast, you can buy everything you need for a young child in supermarkets or on the high street.

The need for more and better-designed, age appropriate housing in the public and private sectors has been recognized and supported across the political spectrum. Some exemplary new models have proved to be very popular with their residents and commercially successful, but they are not widespread. There is a wealth of design guidance and expertise available – the hope is that it can be taken on board.

Judith Torrington is an architect and former Researcher in Architecture at the University of Sheffield, author of Future of Ageing: adapting homes and neighbourhoods (Government Office for Science, 2015).

An extended version of this essay is available in the Design Museum's OLD NEW catalogue

There is no doubt that an ageing population constitutes a significant challenge, but we can rise to the occasion.

The future is coming, but what will it look like? Here we let our imaginations run wild. Our Cognitive Homes of the future will seamlessly align interoperable solutions which will redefine the way we live, play and learn.

TECHNOLOGY

EXTERIOR

COMMUNAL LIVING SPACE

KITCHEN LIVING SPACE

HOME SMART HOME

In years to come assistive technology will touch most, if not every aspect of ageing at home. To mark the 40th anniversary of their first groundbreaking purpose-built development for older adults, our friends at McCarthy & Stone asked AAA to reimagine what a retirement home might look like in the next decade or two.

Following an international competition we selected Moive Ltd – a London based architectural, design and visualisation consultancy. The following images are based on an initial concept design for a future cognitive living cluster – made up of modular 'plug and play' units which take advantage of sound design principles and advances in pre-fabricated construction techniques and technology to create a barrier free environment which will support independent living.

Working in collaboration with the AAA, Dariusz Sadowski and Martin Piotrowski of Moive have been thinking about the relationship between architecture, design and technology, to empower and sustain older adults. According to project lead Dariusz Sadowski; "The idea is to integrate advanced building fabrics with a preinstalled technical membrane so that these advanced living clusters work seamlessly with their immediate and wider natural environment to minimize the impact that buildings have traditionally had on our natural resources. In addition to supporting home based health and care systems, advantage will be taken of ever more efficient renewable energy production, ultimately not only making the 'cognitive living clusters' independent from external energy supply requirements, but even being able to produce additional energy to feed into the grid".

Here we look at some of the innovations we may well find in our Cognitive Homes of the not too distant future:

SONTE SOLAR SHADES GLASS

BIOMETRIC DOOR LOCKS / AUTO OPEN

DRONE SECURITY

WALKING ASSIST DEVICE

THE HONDA WALKING ASSIST
A device that reduces the load on leg muscles and joints utilizing an easy-to-use structure consisting of a seat, frame and shoes.
https://ontheroadtoinnovation.wordpress.com/
See also Aura Power Suit page 63 and AXO suit page 53

THE EBIQ ELECTRIC BICYCLE
A battery supported electric bicycle that allows the docking of IT devices, tablets, laptops etc.
http://www.coroflot.com/yujifujimura/concept

SONTE – SOLAR SHADED GLASS
Digital technology applied to glass – Sonte can alter the levels of transparency or opaqueness of windows either automatically or remotely (eg. through an app).
http://sonte.com/findoutmore

DRONE SECURITY
Here are some of the best personal drones available now:
https://www.youtube.com/watch?v=_gGMBiez4os

EXTERIOR

As we near home, our personal drone(s) will fly ahead to ensure there are no surprises waiting in store. We will have kept up to date via the screen mounted to our electric bike, or our smart watch as we stroll with assistance from our friendly smart walk assist device. If it's been a particularly hot day, our thermostat has adjusted accordingly and our solar shaded windows will have recalibrated to let in just the right amount of light.

Labels on image:
- **PROJECTION SCREEN** STREAMING, VR, IAT COMPATIBLE
- **HOLOGRAPHIC / TOUCH TABLE**
- **WALKING ASSIST DEVICE**
- **SMART MIRROR**
- **SOLAR SHADES**
- **HUMANOID / ROBOT**
- **ACTUAL WEATHER / NEWS STREAM**
- **ACTIVE CHAIRS**
- **FALL DETECTION FLOOR**
- 360 TABLE AND SOFA ROTATE
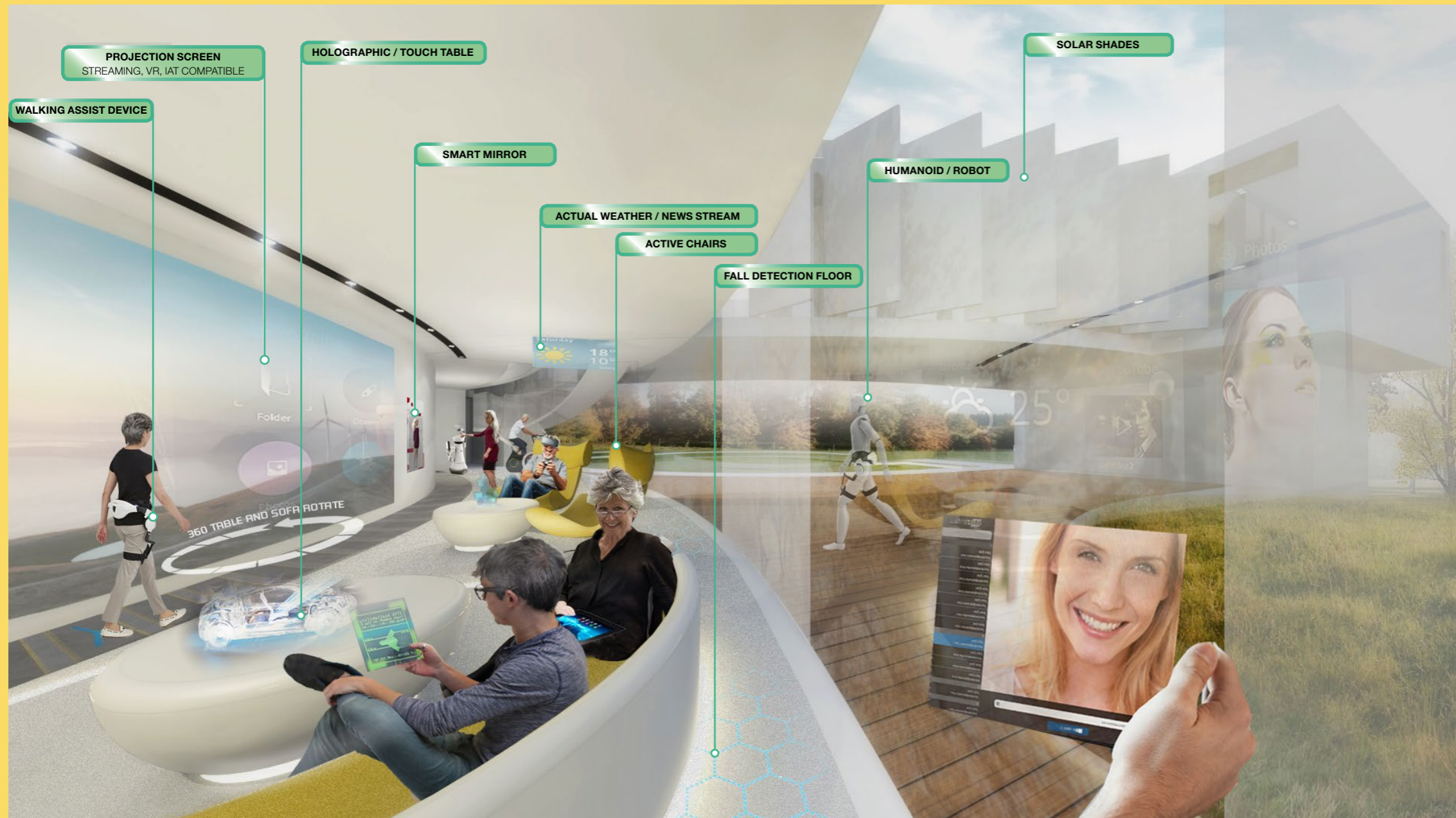
COMMUNAL LIVING SPACE

Rather than being isolated in technically gilded apartments we envisage an open lounge where you can meet with neighbours, friends and family. Or maybe you may just want to hang out quietly catching up on your favorite hologram series. If you are feeling more energetic you could take a virtual cycling tour in the country or around your favorite city. And do this knowing that should anything untoward happen if you are alone, someone in the vicinity will be immediately alerted.

VIRTUAL SCREEN
A virtual, see-through touch screen or keyboard display that, when 'touched' in mid-air by the user's finger, transmits that signal directly to the computer or mobile device.
https://www.asme.org/engineering-topics/articles/technology-and-society/virtual-touch-screen-floats-midair

FUTURE HUMANOIDS
The new generation of 'robots' – being developed to assist – not replace – humans in their everyday tasks.
https://angelnjuly.wordpress.com/2011/02/03/the-unthinkable-humanoids-will-think-for-you-in-the-future/
http://www.intechopen.com/books/the-future-of-humanoid-robots-research-and-applications

HOLOGRAMS – MICROSOFT HOLO LENS
Microsoft HoloLens is a self-contained, holographic computer, potentially enabling one to engage with digital content and interact with holograms in the world around you.
https://www.microsoft.com/microsoft-hololens/en-us

HOLOGRAPHIC / TOUCH TABLE
A multipurpose table which can be used for holographic projections or its surface used like a giant tablet. Doodles produced on the table can be 'selected', saved and sent to someone. Sony's Future Lab demonstrated an interactive table top concept at the USA's SXSW festival in 2016, employing sensors and motion tracking to know when objects are placed on the table.

SMART MIRROR
If you are not up for a trip to the city and want something a bit more bespoke than on-line shopping, a 'smart mirror', will let you shop virtually and try different clothes. Alternatively, it can also be used for motivational purposes – for example it could show you a potential new body shape after sticking to an exercise routine. Here you will find some of the best smart mirror concepts to dream about.

SMART WEATHER STATION
Everything you could possibly want to know about the weather in real time. Here are 10 of the best wireless weather stations for home reviews.

SOLAR BUILDING SHADES
Shades that adjust automatically to the time of the day and aspect – to maximise views and daylight, but limit the amount of solar glare in summer months to avoid overheating are already in use. In future they will become the norm rather than the exception.

CICLOTTE STATIONARY BIKE
The first exercise bike to use an electromagnetic resistance system with a transmission that replicates the effort of pushing on pedals when riding on the road.
http://oneappsgroup.com/the-future-fitness-machine-ciclotte-stationary-bike/
https://www.youtube.com/watch?v=ZZqPWjQb0rc
See also Activ84Health Explorer page 46

FALL DETECTION FLOOR
A smart floor that detects falls and immediately sends an alarm signal to a designated carer. In future, these systems are likely to be able to identify scenarios that will help to avoid and softer falls.
http://www.silvereco.eu/sensfloor-a-smart-floor-to-detect-falls/
See also the universAAL IoT platform page 44

ACTIVE CHAIRS
Hospitals are stressing the importance of smart chairs on elderly care wards to ensure that patients are encouraged to remain active during their hospital stay. The chairs allow older patients to spend more time out of bed thanks to their built-in pressure management cushions and adjustable back and leg rests.

Looking to the future, active chairs will not only support and empower older adults in their own homes, they will also look great.

KITCHEN LIVING SPACE

CARE O BOT

FALL DETECTION FLOOR

PULL DOWN SYSTEM

KITCHEN ROBOTIC ARMS

SMART FRIDGE

FULL ZONE INDUCTION

SOFT MOVING WALKWAY

ECO FIRE LINE

BIO WALL
VEGTABLES / HERBS
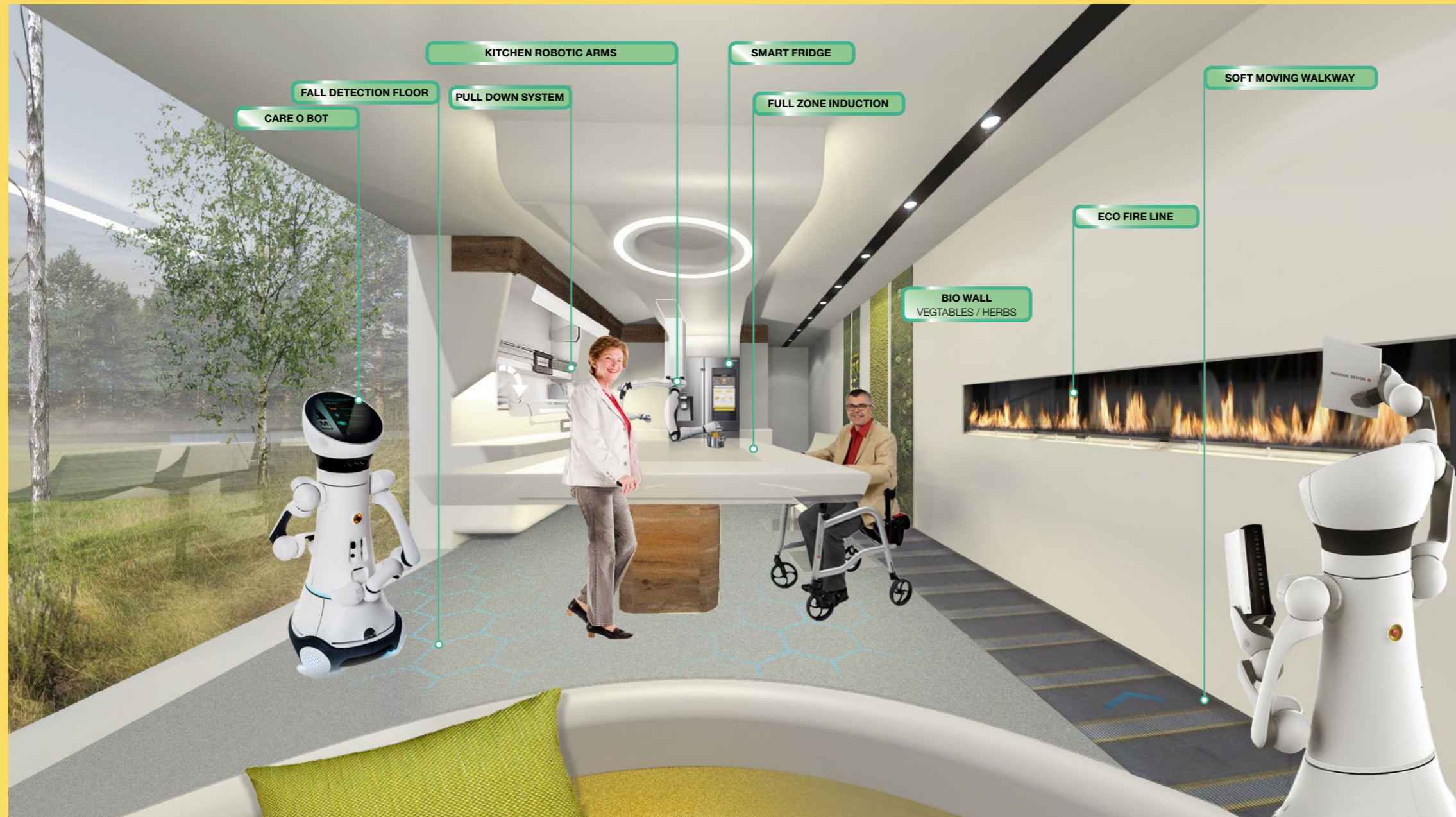
If you want to give your robotic chef the night off, you will find it much easier to reach your pots and pans thanks to spring-mounted, pull-down shelves, while your smart fridge makes sure you don't run out of ingredients by automatically keeping stocks topped up. And you will be able to grow your own herbs and vegetables on your very own indoor biowall.

PULL DOWN SHELVES

Existing technology – allows users to literally pull down storage without the use of a step stool – making is safer for both older adults and young people.
http://www.solmer.co.uk/kitchen-accessories/pull-down-two-tier-wire-shelf.html
http://www.independent4life.co.uk/vibo-pull-down-two-tier-wire-shelves-for-600mm-width-wall-units.html

ECO FIRE LINE

In the future, there will be more ways to enjoy the aesthetic pleasure of a fire, safely yet realistically. According to Plankia "Creating a long line of real fire wouldn't be possible without Burning Ethanol Vapours (BEV) technology, which ensures the highest level of safety, fuel combustion efficiency and allows the presentation of a unique fire – natural, golden flame with ideal shape and height.

SMART FRIDGE

This is one of the more advanced IoT enabled development solutions. A smart fridge can communicate with personal digital assistants and alert users to foods needing replacement or even order directly with the supplier if so desired. When connected with health monitoring devices, the fridge can even advise you to stay away from that whipped cream!
http://www.dailymail.co.uk/sciencetech/article-1341190/Revealed-The-hi-tech-fridge-future-tell-dinner.html

CARE-O-BOT 4

Modular service robot assistant to support humans in their daily life tasks.
http://www.care-o-bot-4.de/
See also DOMEO home helper robots page 53

BIOWALL

Biowall is a hand-woven structure that can be crafted into lace-like surfaces of any dimension and form providing a vertical support system for growing plants, vegetables etc. According to one of the leading company's working in this area is Biotecture "Sustainable living walls are a truly flexible, modular system that help transform any built environment bringing a new level of sustainability through intelligent water management and stable system dynamics."

FULL ZONE INDUCTION

Allows you to take advantage of any part of a worktop surface for cooking – without specific 'hob' zones. Looking to the future we envisage that surfaces and counters will be multi purposed. Here is a video for an early Gaggenau system.

KITCHEN ROBOTIC ARMS / ROBOTIC CHEF

A compact stationary robotic device that can prepare meals to any digitally acquired recipe.
http://www.ibtimes.co.uk/robotic-chef-can-cook-michelin-star-food-your-kitchen-by-mimicking-worlds-best-cooks-1496168
https://arstechnica.com/gadgets/2015/04/the-worlds-first-robotic-kitchen-prepares-crab-bisque-for-ars-technica/

SOFT MOVING WALKWAY

Modelled on the principle of an airport moving walkway we envisage a smart walkway in the home environment providing a convenient and safe means of moving about.

TOMORROW'S WORLD

AAA Founder Member Tom Braekeleirs, Director Microsoft Innovation Centers Belgium, explains why he believes it is essential to give senior citizens a voice in designing new products and services.

> ...information systems will free us of many small burdens that today add stress and chip away at our mental focus. Our own neurological limits, which lead us to forgetfulness and oversights, will be supplemented by information systems designed to support our needs.

When we think about an ageing population and our neighbourhoods of the future, there are a couple of perspectives that spring to mind. Let's start with the essence – but one that is too easily forgotten – and that is the end-user him/or herself. We hear, see, read so many opinions and proposals derived from the desks of people that are often not considered 'the target group'. That is why it is so important to give senior citizens a voice in informing development of product and service concepts that are directed at them as potential users, even to the point they can test and make-or-break the proposed approach.

We must also pay more attention to the infrastructure side, taking account of the need to construct new homes and facilities, retrofitting older buildings and changing building codes, whilst implementing new IoT (Internet of Things[2]) enabled technologies such as beacons, sensors, and domestic appliances and the related network infrastructure that seamlessly connects our homes with the world of advanced computing and telecommunications. It's a world buzzing with acronyms, slang and hollow phrases, but... if we want to tackle this challenge at scale, we need to integrate the built environment with IT infrastructure, software, cloud solutions and so much more. That said, the sheer unlimited possibilities of technology combined with infrastructure will raise even more challenging questions. How will we protect the individual when every little step, every detail is measured, monitored and stored? Where is the balance between convenience, privacy and public good and service? These are just the legal aspects. We don't even know for certain what we will have to put into these laws, because – let's face it – no one has a crystal ball to read the future. But one thing is sure. The future is coming...

Imagine a future in which there are smart devices connecting themselves to other devices to exchange information. The future will focus on communication: human-to-machine, but even more machine-to-machine. It sounds scary with robots taking over the world. It will probably not be in that shape, rest assured. But it will become even more focused on devices becoming really smart, not being controlled by an app. The concept of an app is outdated as it is, with just being an interface to 'something' in the backend. Technologies such as artificial intelligence, bots, computer vision and many more will unleash exciting new scenarios that we can't even conceive of today. The speed of change is increasing, and even though it might seem far-fetched, 10 years is not that long. It's amazing – and unpredictable – what the human mind is capable of. Or to quote Bill Gates: "We overestimate what we can do in a year, but underestimate what we can achieve in 10 years."

"THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT"[3]

Some of the latest digital solutions are stunning, and there are many more to come, revolutionising how we design and interact with everything, including housing for older adults.

Let's take a look at what's going on across the sector and consider how these developments could affect our smarter homes and Neighbourhoods of the Future – a future where our homes become part of the family, growing with us, listening to us, knowing what we like and when we like it, remembering birthdays and helping us buy presents, ensuring we never run out of milk or forget a doctor's appointment. It's Home 4.0 – or will it be 5.0? Or, indeed our preference: The Cognitive Home.

Looking as far ahead as 2033, Google chairman Eric Schmidt and Jigsaw (previously Google Ideas) chairman Jared Cohen wrote in their recent book The New Digital Age: Reshaping the Future of People, Nations and Business that:

"...information systems will free us of many small burdens that today add stress and chip away at our mental focus. Our own neurological limits, which lead us to forgetfulness and oversights, will be supplemented by information systems designed to support our needs."[4]

According to Maarten Ectors, VP of IoT at Canonical, through IoT and open source technology, our home appliances will become as adaptable to our needs as our mobiles have become. In the future, any manufacturer will be able to run their own interoperable app store which means appliances will no longer have just a single function. So, imagine being able to ask your fridge what is inside, and suggest recipes based on health plans recommended by your health care professional?

The IoT, says Ectors, will be huge:

"Over the past decade we have seen how big names lost out because of disruptive technology changes and almost disappeared. Kodak suffered from digital photos. Nokia from smart phones. Blockbuster from video on demand. Microsoft Windows is now the number three operating system, where they used to dominate the PC market. IoT is another such technology disruption that will create winners and losers."[5]

Tomorrow's World continued

THE FAMILY THAT PLAYS TOGETHER

AR (augmented reality)[6], VR (virtual reality)[7] and MR (mixed reality)[8] will mix 3D images with your home to stimulate your mind, and ensure you are never alone.

"As the population ages, we're going to see an increasing number of people either carrying on gaming into retirement, or perhaps discovering gaming in their later years. That's a huge market for developers to explore."[9] *Alison York, Research Director, Nickelodeon*

With big releases from Microsoft such as the HoloLens and Holoportation, and the hugely secretive Magic Leap still to come, home entertainment and indeed our work place is set to change beyond recognition. Supposedly, we won't need our TV or tablets to get our entertainment, as it will be beamed directly onto our retinas or glass eye wear. At Develop 2016, the annual game developer conference, it was predicted that VR – often criticised for being a solitary experience – will in fact bring us closer together.

"When you get two people together in a virtual space, and you actually get to see how they move and how they talk, and how they interact with the world, it lets you connect as if you were really actually in that room with them. And it's pretty powerful."[10] *Anna Sweet, Head of Developer Strategy, Oculus*

Chad Jones Chief Strategy Officer for Deep Information Sciences, sees Holoportation as a potential gamechanger. Commenting in a LinkedIn blog, he wrote:

"Holoportation is a new platform that will change the way we communicate, remember our lives and even view other's memories. What could a movie become in this new platform? Now imagine sensors (commonly referred to as the Internet of Things) that sense the target room's temperature, pressure, lighting temp, etc. then recreates those environment variables in your room. You could do heat, wind, cold, etc. Imagine virtually exploring a location, holodeck style, with sensory immersion! Want to see what it truly feels like right at this moment in front of the Taj Mahal, say in August? Yep, you'll get the full experience, heat and all!"[11]

And as VR continues to develop we'll be able to do more than see these virtual worlds. Thanks to developments like Intel's Project Alloy, we'll be able to feel them and even see ourselves and others, so we can share more experiences with one another from the comfort of our living room. Imagine the possibilities for older (possibly lonely) adults being able to not only connect with family and friends by voice command, but in a way that encourages movement and cognitive engagement. We'll also be able to talk to doctors remotely, even to a virtual doctor.

Tomorrow's World continued

Through immersive sound recordings, ultrasound haptic devices (which help users see and feel virtual shapes) and internet-connected scent cartridges, we'll say goodbye to simply watching TV. Instead we'll experience nature documentaries or travel programmes as a multi-sensory feast. In our cognitive living rooms there's no more nodding off in front of the TV.

TECH FOR ALL

Imagine being invited to dance with your walking frame, or reminded to take your medication? That's a world Robot Care Systems have imagined with their 'Lean Powered Assistant', by helping those with limited mobility to not only to walk, but also by encouraging (tailored) activities based on identified needs. This 'advanced walking frame' can measure posture and if necessary apply brakes to reduce falls, while scanning for obstacles and alerting carers to emergencies.

What if you need a prosthetic limb but are miles from your nearest hospital, or live in a part of the world where such things are not freely available? 3D printing is changing the world of prosthetics beyond recognition, with passionate amateurs like the UK's 'Team Unlimbited' being able to help children around the world (for free) from their garden shed, while making their plans open-source so others can do the same. This power to produce

will extend to every corner of the globe, so no matter your need for the day – a hard to open jar, a tricky to use tap – if you need it, you can print it on your 3D printer in the comfort of your own home.

And what about clothes shopping? No longer will any physical limitations stop you from finding the right outfit. According to Canonical's Maarten Ectors, in the near future VR will combine with advancements in robotics and automation to create a personalised, responsive 'try-before-you-buy' approach.

"VR will allow us to shop for clothes at home as if we were looking at ourselves in a mirror – changing the items we see. We will then order our preferred combination to be made bespoke and delivered the next day via an automated car!"

We already live in an age where people like Professor Stephen Hawking can communicate using just their cheek. But the next generation of technology such as powered wearables and exoskeletons will change how we move too, maybe giving the power of movement back to those who lost it.

HOW AM I DOING?

Digital health will make us active partners in our health, and with our health care practitioners.

Google's Deep Mind and IBM's Watson are using artificial intelligence (AI)[12] to revolutionise health care. But what can we do as individuals to better manage our health at home, and become more active partners with our health care practitioners?

In addition to the activity trackers such as FitBit, there are health platforms arriving every day to help us record specific health data to share with health care practitioners such as doctors or nurses. CloudCare2U for example allows those with mild cognitive impairment, chronic obstructive pulmonary disease and frailty conditions to record health data via a mobile device, to then share with their health care practitioner. Using AI, providers can then address identified issues by creating proactive health management plans such as fitness and activity monitoring, educational and cognitive games, sleep monitoring or medication reminders.

TytoHome now lets you conduct your own "comprehensive" health exam (including heart, lungs and throat) at home, for a later diagnosis by your HCP, while Vida, dubbed the 'Uber of care', is changing the care industry by using mobile technology to connect clients and carers based on skills, location, availability, culture and activities.

The Star Trek tricorder, which was a multifunction hand-held device used for sensor scanning, data analysis, and recording data, seemed like the stuff of dreams back in the 60s, but the decreasing cost of technology, along with Wi-Fi and more reliable recording technology, means we no longer need to leave home for a diagnosis. Nor do we have to wait to be told if something is wrong, but can instead check-in with ourselves and receive advice in seconds about what we should do next.

Once these capabilities have been connected with our daily exercise routines (possibly using VR), and diet (with our smart fridges), then health care will begin to make an inexorable transition from responsive to preventative.

2 Connecting physical devices and other items using sensors, to be sensed and/or controlled remotely across existing network infrastructure.
3 Cohen, WA. (2009). Drucker on Leadership: New Lessons from the Father of Modern Management. John Wiley and Sons, New York. [Copyright 2010]. (Safari Books Online; Accessed September 27, 2012 at safaribooksonline.com). Page 4
4 Schmidt. E, Cohen. J. (2013). Your life in 2033. [online] Available at: https://www.theguardian.com/technology/2013/apr/20/eric-schmidt-cohen-book-extract [Accessed Feb 2017].
5 Ectors, M. (2016). The Future of Your Smart Home. [online] Available at: http://www.huffingtonpost.co.uk/maarten-ectors/the-future-of-your-smart-_b_11874856.html [Accessed Jan 2017].
6 Computer generated sensory inputs such as graphics or sound that 'augment' a live view of a physical, real-world environment through devices like a mobile phone.
7 Software generated environments in which users can interact with the space and featured objects via a headset, or additional hardware to stimulate other senses.
8 Where digital images interact with physical objects from the real world.
9 Stuart. K, Webber. JE. (2015). 16 trends that will define the future of video games. [online] Available at: https://www.theguardian.com/technology/2015/jul/23/16-trends-that-will-change-the-games-industry [Accessed Jan 2017].
10 Webber. JE, Brewster. K. (2016). 11 video game trends that will change the future of the industry. [online] Available at: https://www.theguardian.com/technology/2016/jul/21/11-video-game-trends-that-will-change-the-future-of-the-industry [Accessed Feb 2017].
11 Jones, C. (2016). Holoportation: Incredibly Exciting...and INSANELY SCARY. [online] Available at: https://www.linkedin.com/pulse/holoportation-incredibly-excitingand-insanely-scary-chad-jones [Accessed Feb 2017].
12 Where technology exhibits intelligence.

DIGITAL DEVELOPMENTS:
SYSTEMS, SERVICES AND PRODUCT PROVIDERS

True Digitalisation of the housing, care and health experience is just around the corner. Digitalisation is the focus of leading companies in every sector – from engineering and airlines to insurance, agriculture and retailing. The implications for our age-friendly homes are summarised in the following pages.

HOW COMPANIES ARE PLANNING TO DIGITALIZE US AND OUR HOMES

The big four – Amazon, Apple, Google and Microsoft – are expected to lead a very strong drive, based on their giant user bases and deep insight into how their customers use their devices and what content they consume. They know baby boomers will be expecting to run their smart homes from mobile phones and tablets (usually combined), within the ecosystem that the user chooses (usually one or two of the above). Or, perhaps they will not, because there is a growing swell of opinion that suggests that the future may be relatively device-free, at least in terms of hand-held or desk-resident devices, with ambient developments based upon Apple's Siri, Microsoft's Cortana, Google's Assistant, Amazon's Alexia and Samsung's Bixby beginning to flex their digital muscles.

Talking with Marc Yvon, Director of the IBM Human Centric Innovation Center in Paris we learned that IBM is focusing on the idea of the cognitive house, which interacts directly with humans in a device-free way, using natural language interfaces driven by machine learning. IBM can be expected to work with any of the brands referenced above to supplement the use of analytics and provide deep insight. IBM's work is being led by a team of top software scientists, focusing on emerging technologies and working with diverse ecosystem partners in different countries. IBM told us that two particularly important components supporting their offering in this area are its strong relationship with Apple and its focus on robotics. IBM is currently working closely with Age UK, with whom they have developed a demonstration centre in Portsmouth,

and is also one of the sponsors of the Sphere project at the universities of Southampton, Bristol and Reading, which is developing home sensors to diagnose/manage health/well-being, to aid early diagnosis, lifestyle change and enhance the ability of older adults to remain in their own homes.

IBM's approach is in some ways similar to the heavyweight industrial software companies e.g. SAP and Oracle, who are mainly focused on the data that arises from smart homes (and from IoT in general) and how it can be analysed to allow customers to improve what they are doing, or give them help when needed or warn them. These businesses also help private and public sector providers of a wide range of services (e.g. insurance, health) meet their customers' needs and/or avoid problems, such as fraud, high service costs.

A variety of other electrical and electronic providers, such as ABB, AEG, Bosch, Cisco, GE, Honeywell, Mitel, Netgear, Omron, Philips, Samsung and Siemens will be active in this world, often in partnership with the above providers whose services they will be carrying. These providers will be delivering much of the hardware that may be needed at the level of individual homes or industrial scale developments, and in some cases expertise in different areas such as voice recognition and management, security, managing domestic appliances, energy efficiency, lighting or even the provision of short-range communications middleware. Taken as a group, these companies are announcing wave after wave of new ideas and products, but gradually converging on the mobile-based system, sometimes through simple synchronisation via an app (e.g. GE Wink), or involving establishment of a separate hub (as with GE).

One of the common factors in the approach of all the above suppliers is that the Cognitive Home, cognitive health, cognitive care, in fact cognitive anything, involves lots of data being extracted from customers, their homes and their equipment, being sent to the cloud real-time for analysis and action, and information or conclusions from the analysis

being sent back to the home or the customer. This is called cognitive computing. To be effective for the older adult, however, this process MUST constitute a true dialogue. This underlines the critical importance of the design of the Cognitive Home. Yes, on the surface it may seem a bit like the HAL computer in 2001: A Space Odyssey, but it is much friendlier and focused totally on meeting the needs of customers and making those customers feel that they are dealing with an equal which you can forget is not human.

Many of the above companies have developed special versions of their services to deal with health monitoring and coping with accidents, as they are all aware of the potential cost savings of earlier detection of problems and provision of improved solutions. In many cases, they are already deeply involved with meeting institutional requirements (hospitals, care authorities) and in these situations, compete with specialist health and care system businesses such as Tunstall in the UK.

Tunstall is a good example of a company that understands fully the need to combine Digitalisation with reliability. Kevin Alderson, UK Sales and Marketing Director told AAA that 100 per cent reliable connectivity was the core of its business, focusing on that segment of any generation which most needs this benefit and cannot rely on self-service. We may take digital technologies for granted, but 100 per cent reliable connectivity in the home cannot yet be guaranteed digitally, due to problems with mobile phone connections and broadband capacity limitations. When this 100 per cent reliability is achieved, Tunstall expects to focus more on the provision of managed care, partnering closely with digital technology organisations.

MOBILE NETWORK, TELECOMMUNICATIONS AND MEDIA COMPANIES

The likes of AT&T, BskyB, BT, Telefonica/O2, Deutsche Telekom/T-Mobile, Italtel, Liberty Global, Orange/France Telecom, Verizon, Virgin Media and Vodafone generally work from their core strength,

and develop a proposition from it. Some of them have focused strongly on the idea of 'owning the home', but their problem has been that they have done it from their own perspective, rather than focusing on the needs of the customer as described in this report. This is one reason why most mobile network providers have failed to achieve the leap from provision of the carrier network to any application involving significant content or interworking with other providers, and have now effectively been intermediated by apps, so that the work is done by the software, usually coming from one of the categories mentioned above.

The exceptions to this are those providers who have made very large investments in triple or quadruple play (fixed line, mobile, satellite or cable distribution and content (e.g. Liberty Global/Virgin Media, BSkyB and BT) and who therefore have a significant (paid) footprint in the homes of millions of customers, usually based on a hub of some kind (often also the router). However, these same companies have ensured that their products and services are distributable by, and can work well on, mobile handsets and networks, and compete with those of the giants (Apple, Amazon and Google) which also produce and distribute content. How this will play out remains to be seen, but we can expect that it will either lead to an emergence of a fifth or sixth serious giant player, whether in competition with or in alliance with one of the big four listed above when it comes to smart homes.

SYSTEM INTEGRATORS AND DISTRIBUTORS

There are literally hundreds of these globally, if not thousands. They see the very large opportunity arising from smart homes, particularly with older adults, and many of them are focusing on raising awareness of possibilities and distributing and installing the simpler smart home configurations (such as Apple Home), as well as educating customers how to do it themselves. Their future looks very rosy, as they are precisely the kind of companies that the likes of IBM has identified as critical delivery partners.

Digital Development: Systems, Services and Product Providers continued

UTILITIES (NON-TELCO) AND ALARMS

This is an interesting group of providers, who already have a significant paid footprint in millions of homes, generally through provision of one or a narrow range of products/services (e.g. ADT with alarms and British Gas Hive with gas, electricity and various maintenance services). As with the content providers above, they have generally adopted the mobile phone as their main control device, using an additional hub device, with each provider's system having particular strengths in terms of their core business (alarms, energy…). We can expect the offerings of these companies to continue to develop and perhaps even merge with those of the big four, with the strength of this category of providers being their access to and bond of trust with customers.

Talking of energy, Tesla founder Elon Musk recently presented new solar powered roof shingles which he plans to integrate into game-changing home systems.

Musk and other early movers have set their eyes on the 'Enernet', an emerging energy network which Brian Lakamp, writing in TechCrunch, envisages serving as the foundation for smart cities. Intel is a driving force behind the Enernet which it claims will give a much needed boost to IoT by stitching the pieces together and driving device penetration.

'RealValue' a €15.5m energy storage project funded by Horizon 2020 aims to put this theory to the test, employing a combination of physical demonstrators in Ireland, Germany and Latvia, to show how local small-scale energy storage, optimised across the whole EU energy system, with advanced ICT, could bring benefits to all market participants. Intel is providing the Enernet platform at the heart of the 3 year project, currently being trialed in 1,250 homes. According to Doireann Barry, Innovation Manager at project partner EirGrid, "the Enernet will unlock the value of demand side services".

So, this is the AAA tip of the day. If you are an entrepreneur or an investor you should be thinking about following the smart money and switching attention from the app economy to the Enernet.

SOCIAL ENTREPRENEURS, START-UPS, CREATIVE BUSINESSES AND SMEs

For social entrepreneurs, the ageing population constitutes both a major societal challenge and a significant window of opportunity. An opportunity recognised by funding agencies such as Innovate UK which has invested more than £5 million to kick-start a 'Long Term Care Revolution'.

The objective is to challenge the status quo and demonstrate that through innovations in technology, business and service models, dependent lifestyles **can become an engine for economic growth**, leading to a reduction in the financial burden on State and citizens.

According to Jackie Marshall-Cyrus, who led the programme for Innovate UK "By converting high growth potential into reality our innovative SMEs have the chance to improve quality of life and create a better, more sustainable future for those of us who will develop physical and/or cognitive conditions. The magnitude and ambition of our challenge is not to be underestimated. This is a unique opportunity to harness Britain's innovative capability and show the rest of the world what we stand for."

Revolutions invariably throw up exciting new ideas and opportunities and from a business perspective, the 80+ age group is the fastest growing in the UK, this represents an expanding market, currently estimated at £21.4 billion a year, or 1.6% of GDP.

When it comes to long term care, the supply side is significantly underdeveloped, and there is considerable scope for social, business and technological innovation. Not as isolated initiatives, but as a concerted programme focused on changing attitudes, pooling knowledge and resources, and integrating formal and informal solutions that will enable individuals with high level physical and/or cognitive requirements to live in their own home, rather than a setting run on institutional principles.

The demographic shift is not of course a peculiarly British phenomenon. The AAA has been developing Neighbourhoods of the Future in partnership with the European Commission's DG Connect and DG Grow. Here we speak with Connect's Peter Wintlev-Jensen about the potential benefits for small businesses.

"Our intent is to adopt a fresh and more holistic approach to what we call the Silver Economy, in considering the impact when you stimulate innovation on social, health and growth policies, and try to build more conscious collaboration across those fields.

"Clearly, it is time to innovate. For me, innovation is achieving something significant that would otherwise not happen unless you are prepared to take a risk and do something special.

"What new knowledge will our future policy makers need to facilitate innovation-that-makes-a-difference? How do we trigger innovation that will make care systems more sustainable, while improving our quality of life, and generating new jobs and growth? These are some of the questions we have been exploring through the Neighbourhoods of the Future roadshow, which we expect to inform a reference framework for age-friendly housing.

"We know that small businesses can be very innovative. That's why we are committed to supporting entrepreneurs and have promised to spend 20% of the whole of our Horizon 2020 R&D budget (around €70 billion) on smaller projects that can be driven by SMEs or SME oriented activities.

"But we realise that a business cannot thrive on grant funding alone. Most of the small companies I talk to have problems securing investment because their business models are not seen as scalable. It is really a pity when people are forced to take their ideas to the US and elsewhere in order to attract investors.

"Over the past 20 years we have funded a large number of research projects; many of them very good concepts, but we still do not see these ideas in the market today and that is a big loss. If we are to attract investment for our European companies and establish scalable markets across Europe we must learn how to exchange knowledge and build capacity to promote best practice in care innovation at home and in the community. And in parallel, small companies must also learn to look beyond their local markets in order to succeed.

"That is why we have launched an Innovation Partnership on Active and Healthy Ageing, involving more than 3000 stakeholders from across Europe and ACTIVAGE, a new €25 million Multi Centric Large Scale Pilot on Smart Living Environments. ACTIVAGE aims to build the first fully integrated and interoperable European IoT ecosystem -across 9 Deployment Sites – in seven European countries, to enable the deployment of innovative IoT based solutions and services, supporting and extending independent living for older adults in their homes and local environments, and responding to real needs of caregivers, service providers and public authorities."

COMING SOON TO A
NEIGHBOURHOOD NEAR YOU

Entrepreneurs have spotted an opportunity to develop new products and services that meet the needs of an ageing population. Here AAA highlights a selection of advanced concepts and solutions encountered on our travels.

INTEROPERABILITY IS KEY

Cheaper technology paired with AI will mean more personalised products.

The wealth of products making their way onto the market to satisfy every possible need in our homes is staggering. But, before we get too carried away it is worth pointing out that everyone we consulted agreed on the need for interoperability, whether through iOS, Android, proprietary or independent platforms specifically designed to get the best out of the Internet of Things.

One of the most promising of this new breed is the universAAL IoT platform, which started life as an international R&D programme funded by the European Commission and is now setting up an Open Source coalition for developers seeing to innovate in this space.
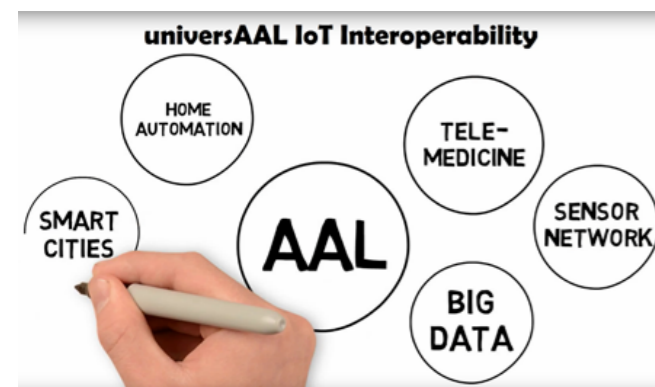
The rapid evolution of universAAL IoT ensures that new features and applications are regularly added to integrated systems, bringing endless possibilities for the development of intelligent products and services which are able to instantly interact via the Internet of Things. With users able to effortlessly share valuable data between devices and systems, there is the flexibility and versatility to build a completely bespoke lifestyle environment.

The universAAL team is currently working on a test site in Weiterstadt near Darmstadt, Germany, combining 22 apartments providing accessible housing for people of all ages. The infrastructure of the building is of high technical standard, so the future basic needs of residents within a service oriented, ageing society, are fully catered for by the building. As part of this setup, services such as alarms, fall detection and other monitoring services are offered via a centralised network structure and sensor technology in each apartment. Special care services when needed will be provided by external operators. The concept takes into account the local neighbourhood which will also benefit from the care services and in turn socialise with and support the inhabitants.

One stand-out feature of this holistic interoperable system is called 'CapFloor', a clever cost efficient alternative for converting the floors of buildings to an invaluable source of information on the basis of passive sensor systems. The floors provide an exact reference for indoor localisation and a solid basis for realising plenty of use cases, from light control for both energy efficiency and fall prevention, to house-leaving control (particularly important for people living with dementia) plus reminders about devices left on, adapting the heating system, and/or burglar alarms. Where traditional floor pad sensors are very expensive and need to be integrated during the build stage, CapFloor can be introduced at any time with limited physical disruption.

Staying with smart surfaces we have seen reports[13] of driveways tiles which "can turn your visitors' footsteps into electrical power", and weather monitors that regulate the watering of your lawn.

Thinking more laterally we quite fancy the idea of robotic chefs or laundry assistants, a 'smart body analyzer' that measures your body mass index (BMI), and an exercise machine that "combines your workout with a unique flying experience".

At the 2017 Consumer Electronics Show, there was an extraordinarily wide range of products that assist longer lives. This range will continue to expand. Fayet, for example introduced a GPS-enabled 'intelligent walking stick' that contacts carers if it falls over and uses AI to learn its owners' regular movements, such as what time they get out of bed normally, alerting carers if this changes.

For those with limited hearing, Oticon revealed a smart hearing aid which can be controlled via an iPhone and connects with smart smoke alarms or doorbells and even controls ambient noise in busy rooms. With safety in mind, General Electric introduced an oven that automatically turns off if it detects burning food, while Unibot is a handy system that offers vacuuming, air purifying/humidifying and home security in one.

The market for products serving older people is still young, increasing the need for champions. Karina Marcus is Director of the Central Management Unit of the EU co-funded AAL (Active and Assisted Living) Programme, which helps SMEs and researchers bring the most promising solutions to market, working with end users in innovation projects.

AAA asked Karina to identify products and services we should be looking out for. Some of the solutions listed here are available today, others are still works in progress, possibly looking for development and/or distribution partners.

"When AAL started in 2008, its mission statement was clear – and it still is. We focus on addressing the needs of our ageing population by developing ICT and other technologies to enhance the quality of life for the older person – and throughout the years we have seen some amazing products emerge from this innovation environment. Please visit the websites on the following pages and reach out to any of these projects, they will be delighted to hear from you".

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[13] Davis. N, David. R. (2015). Tech house of the future: take a look around. [online] Available at: https://www.theguardian.com/technology/2015/dec/04/tech-home-future-robots-living-smart [Accessed Feb 2017].

Coming soon to a neighbourhood near you continued

PRODUCTS AND SERVICES REVIEW
Focus on health and care

Activ84Health Explorer: Winner of the 2016 AAL Smart Ageing Challenge Prize for the best innovation that uses the Internet of Things to empower older adults to achieve the quality of life they aspire to, socially and independently.

The Activ84Health platform (pronounced: Activate-for-health) opens up a window to the world for older adults by bringing the joy and health benefits associated with cycling outdoors inside into the comfort of their own home. Each user gets a personalised experience to fit their needs, motivations, and abilities. There is total freedom to explore urban and rural environments. The user simply selects a street on a map and get the visual experience of cycling through that location, at each intersection they can choose in which direction to go.

Web: **www.activ84health.eu**

Care@Home: A personalised care portal

Bringing together a range of services into a personalised communication and service channel, Care@Home aims to enable older adults to continue living in their own homes in safety, comfort and independence. Using mobile phones, wireless wearables and fixed sensors, the project's open platform makes it possible to assess and manage risk by unobtrusively monitoring the home in real time, all the while functioning as a two-way communication channel for family, friends and caregivers. The project is now being tested in the Netherlands through a spin off social enterprise called Zo-Dichtbij. If it lives up to expectations, there are plans for an international roll out.

Web: **www.zo-dichtbij.nl**
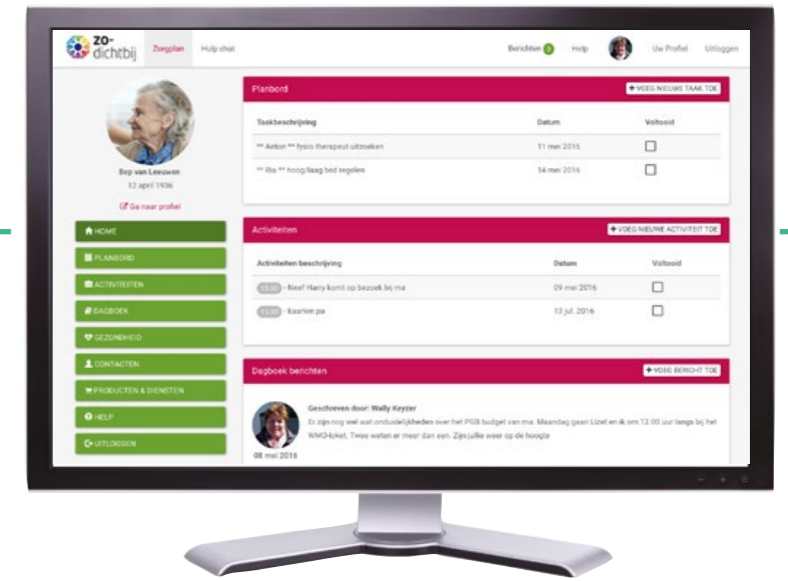
CloudCare2U: Supporting behaviour change

Make sure you move enough every day, don't stop using your brain, throw in some healthy food, and you are well on your way towards happy ageing. Simple, right? Well, if you've been trying to kick some bad habits, and adopt a healthier lifestyle, you might realise this can be difficult without some support. Fortunately, the market is flooding with apps that support healthy behavior one way or another. And now, CloudCare2U is bringing all these apps to your home, in an innovative interactive wall hanging interface. Easy to understand, easy to use, and customisable to your specific needs.

Web: **www.cloudcare2u.com**

Coming soon to a
neighbourhood near you continued

Focus on health and care

ConnectedCare: Enabling sociable and collaborative support

Today a range of mobile applications and devices are available to help older adults manage their life. Inspired by the social character of day-to-day caregiving, the ConnectedCare platform enables older adults to build their own network of family, friends, informal caregivers and professionals. Moreover, ConnectedCare provides integrated alarm buttons and home sensors – for example, a senior with mild cognitive impairments can now move outdoors more safely, since they can easily ask support from their network in case of incidents. Evidence shows that the platform improves communication and increases peace-of-mind. The platform is now being used by an increasing number of care organisations in the Netherlands, and organisations from other countries – including the UK – have shown interest.

Web: **www.connectedcare.eu**

Scenario | Daily Care Visit

1. Elsie is notified which Care Worker is visiting today.

2. Jenny the Care Worker checks her schedule on her Carer Mobile before leaving home.

3. Jenny arrives and logs into the Carer mode on the homePad and checks what tasks she has to do.

4. Jenny confirms that the tasks are complete.
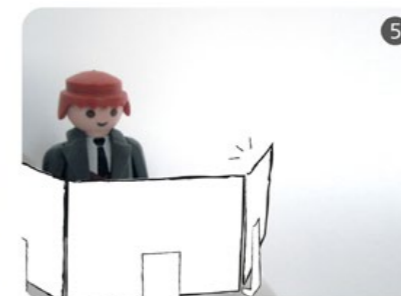
5. The Care Manager is notified that tasks are complete on Elsie's Care Record.

6. Elsie's homePad returns to Service User mode.

Inclusion Society: Coordinating care

Inclusion Society is a connected service system that aims to improve communication and coordination between sectors, friends, family and older adults for a better overall community care service. From a core device called the HomePad, the service user is able to monitor their own health data, which is collected from wireless medical sensors and stored securely on the system, available to medical professionals, friends and family members that the older adult has granted access to. On the other end are a variety of portals, such as the Third Party Services Portal and the Care Management Portal, through which information is easily pushed through to those who need it.

Web: **www.inclusionsociety.com**

Coming soon to a neighbourhood near you continued

PRODUCTS AND SERVICES REVIEW
Focus on health and care

RGS: Virtual reality for post-stroke care

Rehabilitation Gaming System (RGS), is a new integrated science-based approach towards the training of the brain. RGS comprises an expanding library of clinically validated protocols for the neuro-rehabilitation of motor deficits, affective disorders, cognitive and language deficits caused by brain damage.

"The basic idea from here is that we can talk to the brain systems affected by stroke and this will help it regain its functionality," explains project coordinator Paul Verschure. "It enables the patient to respond to things going on in the virtual world that are designed to stimulate communication between their perception, what they're seeing and what they're feeling and their motor mechanisms. The system adapts to an individual's specific needs learning as it goes." Currently deployed in hospitals, in the longer term, Verschure anticipates development of a more personalised system to be used at home.

Web: **www.eodyne.com**

Sansara: An innovative monitoring system without cameras

"The challenge was to develop a system suitable for people in different stages of dementia," explains Dr Irek Karkowski. "In all these stages there are different needs in terms of support and monitoring services in their daily life."

Sensara is a nonintrusive home-based sensory system that calibrates itself to the user and monitors sleeping patterns and daily activities so that caregivers and families of dementia sufferers can be informed on the development of the illness. As well as being able to monitor daily activities, the system also raises an alarm if it spots any serious deviations from normal behaviour that may indicate an accident or a fall. The following link is for the Dutch website. The English version will follow soon.

Web: **www.sensara.eu**

Coming soon to a
neighbourhood near you continued

iWalkActive: Enabling active living

Declining mobility isn't simply a barrier to performing the everyday physical activities of normal life; it is a loss of independence that is not always easy to accept and leads to growing dependence on caregivers. iWalkActive was born with the hope of restoring that independence. Conventional rollators and motorised "velopeds" are handy for getting about, but because they are quite basic ungainly tools, there is a stigma surrounding them. iWalkActive's aim is to expand on the more advanced version developed by Trionic. With intuitive sensors, e-drive functionality and cloud-based services, this active walker brilliantly combines an array of technologies to drag the rollator in to the twenty-first century.

Web: **www.iwalkactive.eu**

ConnectedVitality: A new level of communication

Older adults with mobility problems can have difficulties organising their social connections and lifestyle in the way they want, which puts them in a situation in which they are reliant on others. ConnectedVitality has developed a video communication network that enables immobile senior citizens to organise their social network, choose an activity and select levels of social interaction according to their individual needs, abilities and lifestyle.
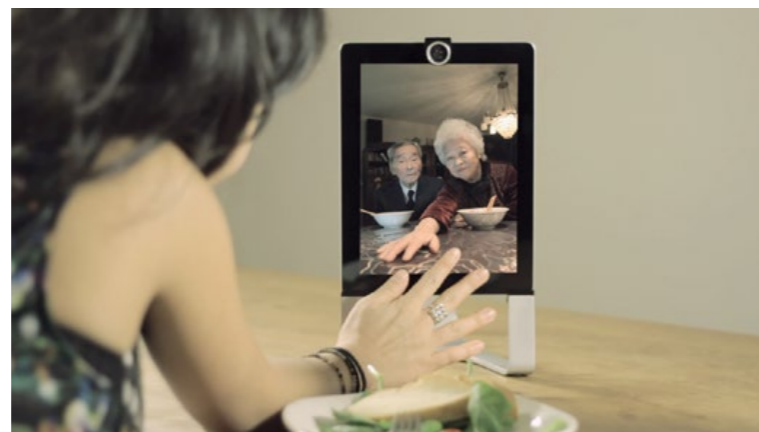
Web: **www.yooom.com**

DOMEO: Helper robots at home

A mobility assistive and companion robot providing personalised domestic services. Serving as a companion for older adults who are dependent and/or disabled, to help them to safely stay at home longer, DOMEO is permanently linked with the outside world and dedicated applications are integrated designed to help caregivers in their daily work.

Web: **www.kompai.com**
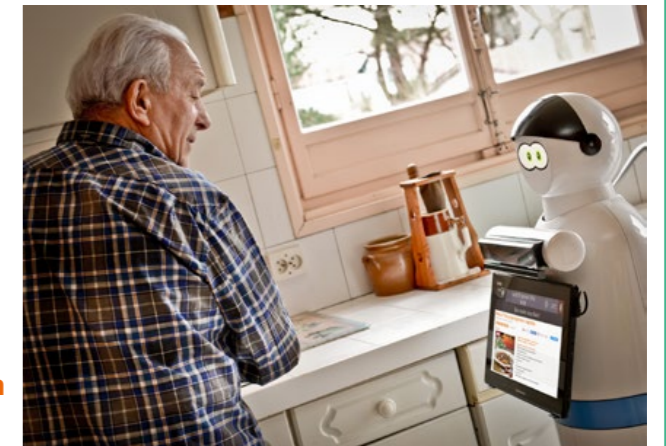
AXOSUIT: Modular full body exoskeleton for older adults

AXO-SUIT aims to deliver commercially viable assistive exoskeletons which will support older adults in their daily tasks and in participating in occupational and social activities. The project brings together academic and industry partners who are active and experienced in the assistive technology business to create a solution that meets older adults' functional needs at an affordable cost.

Web: **www.axo-suit.eu**

Coming soon to a neighbourhood near you continued

Focus on mobility and Domestic Support

IronHand: Smart gloves provide a firmer grip on life

Reduced hand function due to ageing or age-related conditions is addressed at home and at work, through a wearable soft-robotic glove with add-on exercise games. Martin Wahlstedt, a project manager with ironHand's partner Bioservo technologies, expands. "It is a slim glove with intuitive sensors on the fingers that detect when it is touching an object. It measures the force between the finger and the object. Through artificial tendons it then applies the necessary force. It is just like your own hand. You could work as a carpenter or hold an egg with the glove."

Bioservo is a partner in the Axo-Suit consortium and the robotic SEM Glove/Iron Hand can be integrated as an option to the Axo-Suit lower arm module.

Web: **www.ironhand.eu**

LEA: Autonomous personal care assistant

LEA – 'The Lean Empowering Assistant' offers support with daily activities including walking by detecting obstacles, measuring body posture and helping maintain balance. LEA also encourages fitness through dance – which she leads in the rhythm of your favourite music. If dancing is not your thing, LEA will personally guide and motivate you to train to specially designed exercises all in comfort of your home. LEA can also help with daily tasks and reminders of predefined activities including medication, food and water intake, whilst measuring activities (if requested) which can be sent in a form of report to relevant parties. In case of emergency LEA can trigger an alarm and video calling makes it possible to stay in constant touch with the older adult without compromising their privacy.

Web: **www.robotcaresystems.com**

Focus on security and inclusivity

Fearless: Safety through simplicity

A major issue with integrated panic buttons is that if the wearer loses consciousness as a result of a trip or a fall, they are not able to activate the alarm. Fearless Comfort System, is a contactless sensory system which can raise the alarm when it detects any serious deviations of behaviour from the primary end users. Coordinator Michael Brandstötter explains: "It sends out an infrared pulse and measures the travelling time of the infrared signal, and based on this we can reconstruct the living area. It's easy to install and compared with other solutions it's straightforward and cheap."
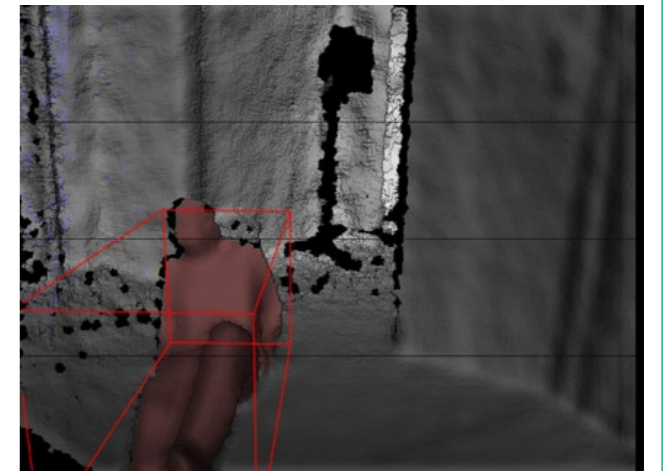
Web: **www.fearless-system.com**

Lipit: A hands-free interface

Tomas Brusell, a dentist originally invented the device to use his computer while working. He explains: "When you are with a patient and you have had your hands inside their mouth, it is not hygienic to use a keyboard or mouse. The technology we developed and tested has provided a method for basic input into the computer."

The technology, now known as Lipit™, connects wirelessly to Bluetooth enabled devices, allowing a person to control the device with their lips. Simple and intuitive lip movements do everything that would otherwise be done with a computer mouse. Worn on the head, it can help someone control a wheelchair, interact with smart environments, such as turning on and off lights, open doors, and access computers, offering an effective hands-free interaction aid.

Web: **www.lipit.net**

According to Yves Béhar, described by Forbes as the most influential industrial designer in the world, technology is our raw future, which has to be defined and refined by design. Here we look at how design led innovation can lighten the load of ageing.

DESIGN

DESIGNS FOR LIFE

User Centred Design is not a new phenomenon in health care – where success is as much about social outcomes as clinical – but all too often it's still noticeable by its absence, especially when it comes to designing products for older adults, possibly living with disabilities and/or long term conditions. This human-centred practice ensures that people's real needs are met, creating products and services that we might all aspire to use rather than just put up with.

Over the past few years Creative Skills for Life, the team behind the Agile Ageing Alliance has organised many events with a view to exposing multidisciplinary stakeholders to best practice and breaking down barriers through knowledge exchange. A common denominator at most of these events has been a focus on the importance of design when envisaging products and services intended for older adults. These sessions have involved leading practitioners including the Design Council, Arup, Glasgow School of Art, Copenhagen School of Design and Technology and the Helen Hamlyn Centre (HHC) at the Royal College of Art, a research group focused on design for our future selves. HHC Director Jeremy Myerson has curated an excellent exhibition 'NEW OLD' for the Design Museum, London.

In a conversation with AAA Founder Ian Spero, this is what Jeremy had to say about NEW OLD.

"For the past 30 years we have heard that demographic change is a ticking time bomb set to explode in our faces and that ageing is a burdensome thing. In fact, the faster we head towards an ageing society in which there are more old people than young, the more such thinking takes hold.

"The NEW OLD project seeks to reverse that mind-set, to give pause for thought with a simple message: design-led innovation can lighten the load of ageing. Through this approach, people facing greater longevity can enjoy fuller, healthier, more rewarding lives in the future – 'years full of life rather than life full of years'".

Myerson stresses that we should not ignore the medical realities of ageing – the physical, sensory and cognitive impairments that come to us all eventually. We must however recognise that many older people are disabled by the design of the environment around them, rather than intrinsically disabled. Designers have a responsibility to use all the advances in practice and technology available to them to reimagine products, settings, systems and services that will enhance the experience of later life.

He continues; "Our way of thinking about older adults has shifted radically. The change is not just in terms of what's possible technologically, but how we now think about ageing. People are staying active in society and the workplace for much longer, and it's about time our products and services caught up.

"The 'New Old' are tech savvy, mobile, often still in work, and simply won't put up with clumsy plastic loo seats and excessively padded shoes any more. This is the rock 'n' roll generation, they know about design and they're demanding more."

From robotic clothing to driverless cars, the Design Museum exhibition and the accompanying catalogue examines how innovation and design can reimagine how we live the later stages of our lives.

Courtesy of Design Museum and Royal College of Art

ASSISTED MOBILITY

Most experts agree that maintaining mobility is vital for an ageing population. As Jeremy says, "Loss of mobility has a direct impact on health and well-being. Being able to get around is important for practical reasons such as working or shopping but also for social connection, identity and self-esteem.

"Although people aged 50–59 travel more than other age groups, those aged 70 and over travel significantly less, covering only 64 per cent of the average distance travelled across all ages. Retirement to rural areas with poor public transport exacerbates mobility problems for older people without access to a car. Public spaces in cities that lack social amenities such as seating, toilets and step-free access put up further barriers to mobility for older people.

"Designers will be increasingly busy creating new mobility solutions for the "New Old". From electric bicycles and folding wheelchair wheels to fully autonomous vehicles, technology and engineering is setting the course."

Here we take a look at some of the products and projects featured within the NEW OLD exhibition.

Designs for Life continued
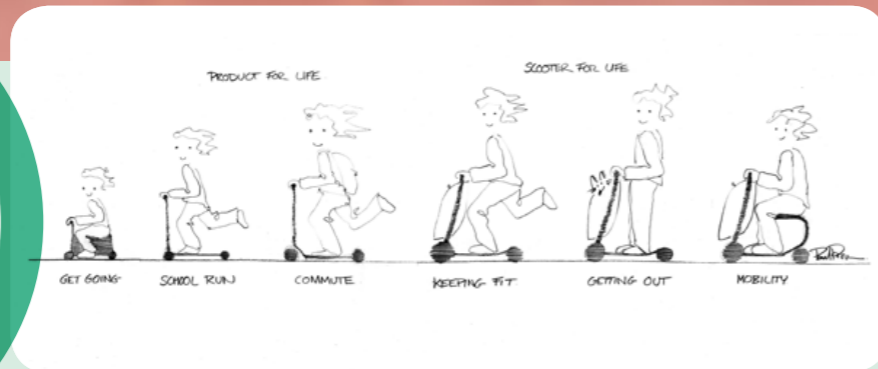
Scooter for Life

In response to a brief from the Design Museum to "design a future product, service or system that keeps people on the move as they get progressively older", PriestmanGoode has designed a Scooter for Life that can be adapted over time as our mobility requirements evolve, offering older users greater independence without the stigma associated with a mobility scooter.

The designers explain their concept:

"When we were commissioned to create a centrepiece about mobility for the NEW OLD exhibition, we immediately wanted to design a way to help people stay mobile for longer. Over the course of many brainstorming sessions, we came to a number of conclusions. First, we wanted to design something for all ages – a product for life, a brand that could follow you through life as your mobility needs evolve. Second, our solution should be a product designed to help people stay fitter for longer and provide older cohorts with independence as their physicality slows down.

"Indoor storage is particularly important from a safety point of view. At present, mobility scooters generally need to be parked outside the home, as they are often too bulky to be taken indoors or cannot be taken up the steps. This can introduce an unexpected safety issue. Parked in front of someone's home, a mobility scooter can highlight the fact that an elderly or less mobile person lives on the premises, potentially increasing the risk of crime. Based on these key considerations, we developed the Scooter for Life, a product for all ages that is highly adaptable and helps older people improve their mobility in a practical way."

MiRO Dog – Sebastian Conran/ Consequential Robotics

MiRO is a biomimetic robot companion designed by Sebastian Conran in partnership with Consequential Robotics, a spinoff company from Sheffield University. Designed to be friendly and approachable but not toy-like, MiRO interacts with sensors, wearables, a data hub and assistive furniture as part of a total home robot system – the Care Free Home System.
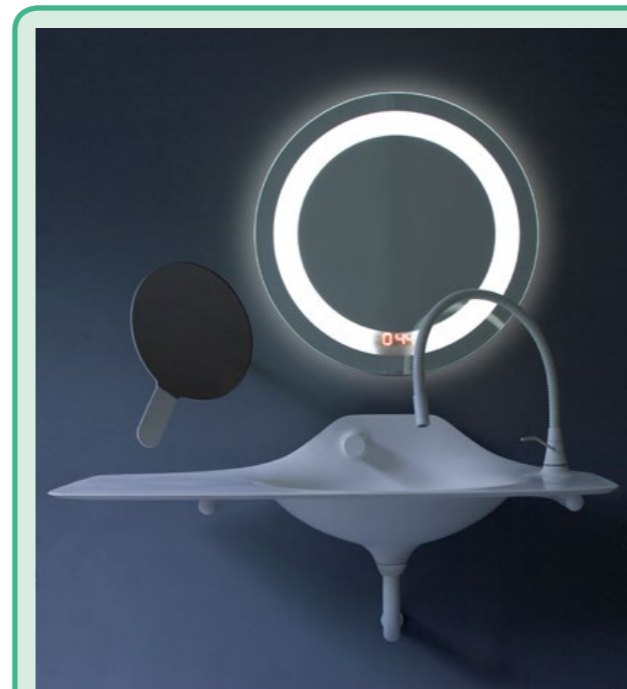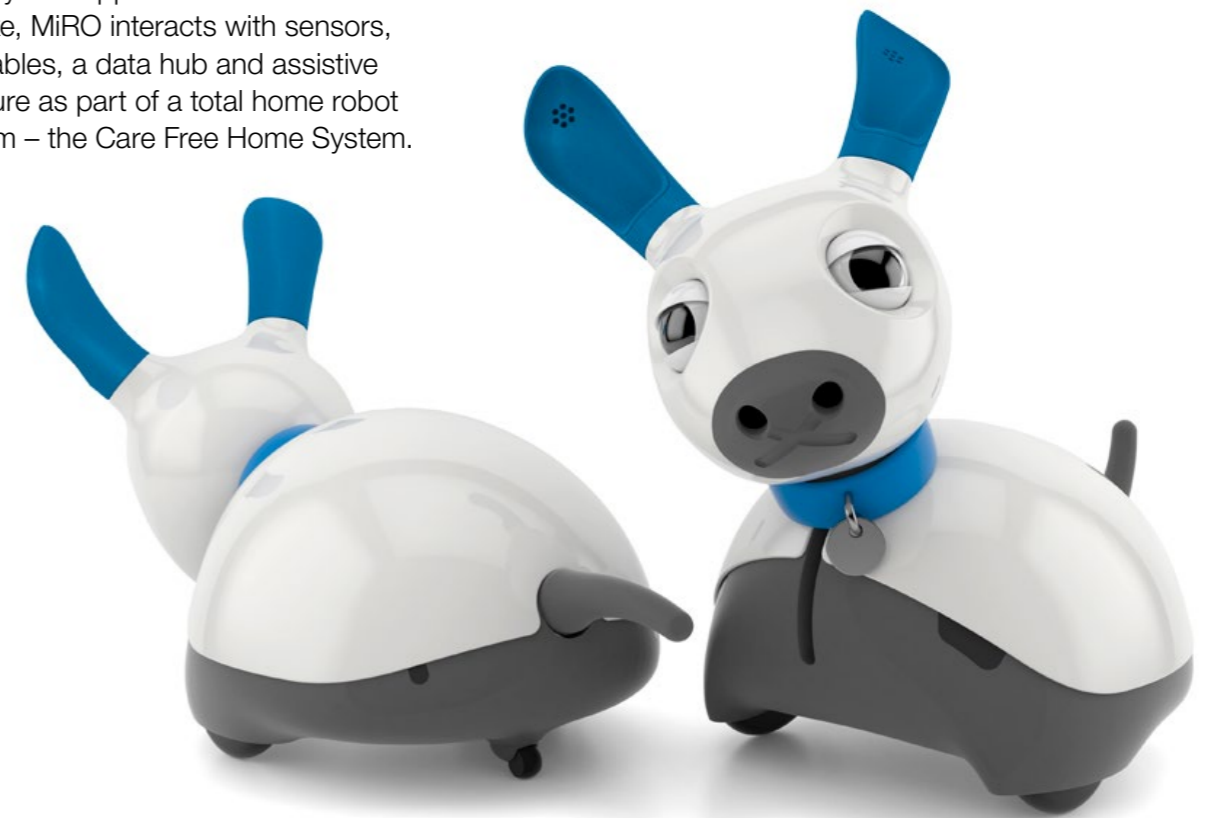
Beauty and ageing in the bathroom – Tomek Rygalik/Ideal Standard

Bathrooms that include the needs of older people usually focus on safety and sterility. This Royal College of Art project, based on research conducted in the dressing rooms of older theatre performers, explores how the mirror and washbasin could create a sense of indulgence and luxury with a series of floating, glowing and flexible elements.

Designs for Life continued

Power Suit

When it comes to radical disruptive concepts, the Aura Power Suit by Yves Béhar, Fuseproject and Superflex takes some beating. Here Yves Béhar talks about his concept for the Design Museum commission.

"All too often, lack of mobility due to muscle weakness, balance issues and coordination problems makes older people captive in their own homes. This has a cascade effect, increasing loneliness, isolation and depression. But what if technology could help us continue to move about the world and engage with it physically, socially and emotionally?

"Our goal in designing for this exhibition is to show what technology can do for an ageing population right now. To do this, we partnered with Superflex, a commercial start-up that began in the Robotics Lab at SRI. Superflex is developing a new category of powered clothing that aims to enhance our physical ability so we can continue to live actively, bringing profound physical and emotional benefits.

"With motors, sensors and AI embedded into a lightweight and flexible fabric, the Aura powered clothing provides support for the user's torso, hips and legs. It reacts to the body's natural movements, adding muscle power to complement the user's strength in getting up, sitting down or staying upright. In fact, powered clothing amplifies an individual's ability to move freely – actually improving muscle strength, balance and coordination. The Power Suit, including its embedded hardware, will weigh less than 1.4kg."

Designer Yves Béhar has also collaborated on another project for the Design Museum. ELLI•Q™ is an active ageing companion that seamlessly enables older adults to use multiple technologies, including video chats, online games and social media to connect with families and friends.

Produced by Intuition Robotics, a multidisciplinary team of gerontologists, roboticists, developers, industrial designers,
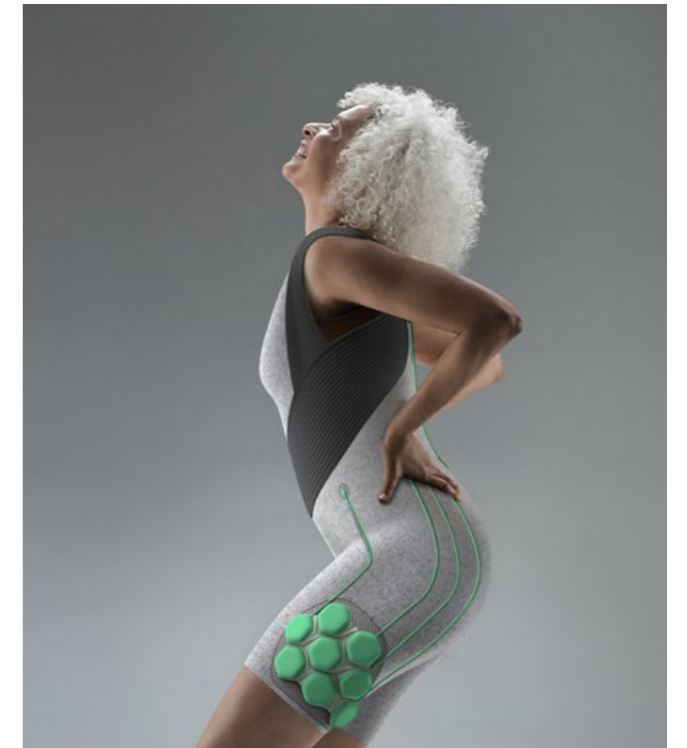
computer vision and machine learning experts, ELLI•Q aims to inspire participation in activities by proactively suggesting and instantly connecting older adults to digital content such as TED talks, music or audiobooks; recommending activities in the physical world, keeping appointments and taking medications on time; and connecting with family through the likes of Facebook.

Using "Natural Communication" such as body language that conveys emotion, speech interface, sounds, lights and images, ELLI•Q is emotive, autonomous, and easily understood. Using machine learning, to understand the preferences, behaviour and personality of the owner, ELLI•Q proactively recommends activities based on its learning and based on recommendations by family. ELLI•Q also has the ability to monitor wellness and the environment in the home.

Designs for Life continued
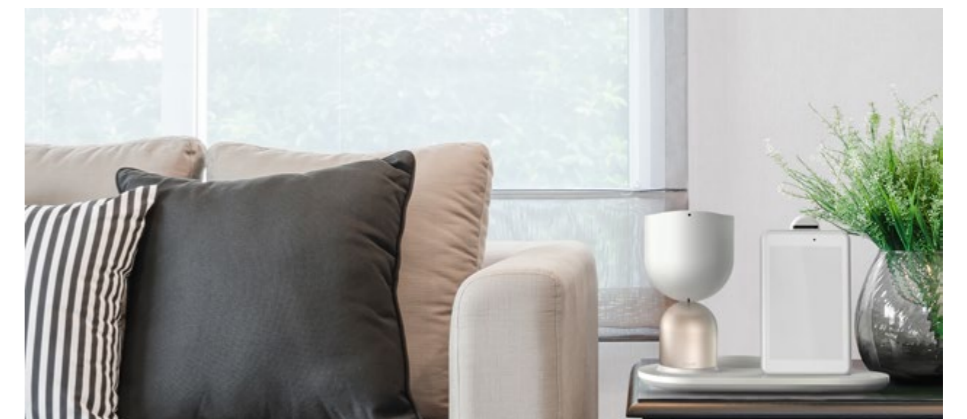
AMAZIN
APARTMENTS

Amazin Apartment – Sam Hecht and Kim Collin, Future Facility

According to Future Facility partners Sam Hecht and Kim Collin, "The world gets smaller and we increasingly rely on what we know, and what's local to us. We become less patient, less able to make decisions easily and less likely to wade through the conditions that shops and manufacturers require of everyday consumers. This puts the ageing population in a terrible position – abandoned at the precise time that they need increased assistance. Older people, alienated by the speed of change in trade, manufacture and technology, would benefit from a new way of maintaining independence. This is where Amazin Apartment comes in.

TOMORROW

"The technology company becomes the property developer and manager. Imagine a more digitally savvy ageing population who will be fully able to use the Internet and harness all the services and products it offers. This population is already comfortable with ordering, banking, communicating, managing health care and other services online. So it is not a far stretch to imagine communities of people relinquishing the servicing and procurement of their domesticity to a technology company.

In fact, one could go as far as entrusting a company with maintaining appliances, delivering consumables, managing utilities and providing entertainment – all with our best interests and health in mind. It does not become a question of when something breaks, it is invisibly fixed even before you realise it is broken, without someone even entering your home.

Amazin Apartment is a block where all apartments are serviced from an efficient network of unseen corridors, where appliances and technology are built into walls. These walls are serviced from the Amazin Service side by Amazin staff. Staff can replenish the refrigerator with fresh food, supply the washing machine with detergent, repair a dishwasher should it break, maintain the heating and air conditioning at optimum levels, all without entering the apartments.

Amazin staff receive and manage all goods and services as required, removing worries about maintenance and upkeep. Your experience with appliances is hugely simplified to their essential interface. The Amazin Service corridor, behind the apartment's walls, is organized like an advanced warehouse so that goods and services can pass through, be analyzed and replaced as needed with minimal impact on the apartment side.
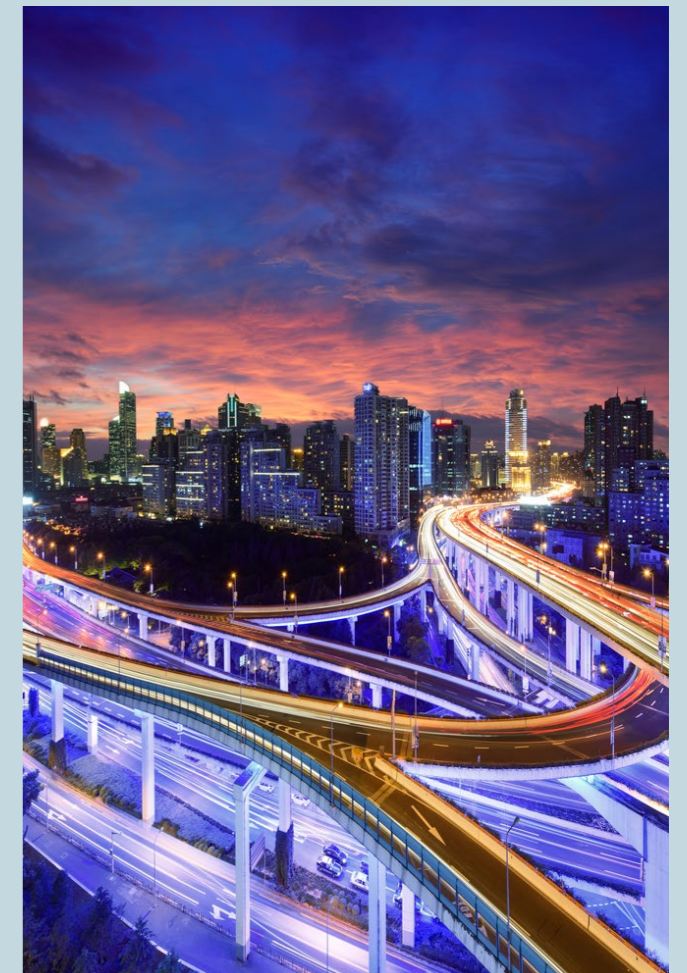
Designs for Life continued

All appliances are designed to have two sides – the customer side and the service side. This structure is not dissimilar to the way the Palace of Versailles or fictional Downton Abbey are arranged. The residents of these homes rarely saw the services or staff moving between rooms because of a network of service corridors and utility rooms hidden from the more formal public and private rooms."

AAA asked Sam and Kim what they had learned from this experience: "In our research we had discovered that when a washing machine or refrigerator breaks, these very basic daily problems can become significant earthquakes for older adults. It's partly to do with how manufacturers in combination with new technology have marginalised this section of society – and it is of our opinion that it is the 'old' economy manufacturers of white goods that are the cause. These companies are desperate to be a part of the new economy whereby their products and utilities are networked, and in so doing have created a new and somewhat frightening level of complexity – rather than the simplicity which they ostensibly propose. A service company however, has a starting point that is very different.

"The other important point is our proposition is all about 'independent living' – not elderly care. The later years of one's life should be fulfilling and easy – and networked service companies are perhaps better suited to provide this.

"Last, but certainly not least, we believe that the apartment can take on a much simpler and refined aesthetic whereby the inhabitant is seen as an 'operator' rather than an owner. It's a subtle difference but it means that all older adults can enjoy a heightened aesthetic that is normally reserved for the wealthy."

Hopefully, it won't be too long before we see these innovations enriching our Neighbourhoods of the Future.

For further information visit:
www.futurefacility.co.uk

> **" It's partly to do with how manufacturers in combination with new technology have marginalised this section of society – and it is of our opinion that it is the 'old' economy manufacturers of white goods that are the cause. "**

DESIGNING IDEAL AGE-FRIENDLY homes

A little bit of foresight
Sarah Harper Professor of Gerontology and Director of the Institute of Population Ageing at the University of Oxford, worked with Jeremy Myerson in a two-year Foresight project to give recommendations to UK policymakers on the Future of an Ageing Population (Government Office of Science, 2016). Jeremy said that this experience opened his eyes to the gap between need and provision for older people in the UK, in terms of housing, social connectivity, care, transport and much else besides, and the possibilities for new design to make a difference.

Jeremy and Sarah are both convinced, whether related to the built environment, technology or infrastructure, new design will be a major factor in how well we manage our ageing population and housing design is the most important element to get right. Jeremy invited Professor Harper to contribute to the NEW OLD catalogue, this is what she had to say:

"Appropriately designed life-long homes are the future. We are all different, with varying needs and desires. While the older population is so diverse that it is inappropriate and undesirable to suggest an 'ideal' home, the home should enable people to maintain a good quality of life across their lives, and be adaptable to suit our changing family, work, education, health and care needs.

Seriously old
In the next 25 years, the proportion of UK households where the oldest person is 85 or over will grow faster than that of any other age group, and many more households will have at least one older person. With the growing widespread use of technology, our homes will become increasingly important for health care delivery, among other things. Smart home technology can enable remote monitoring, giving older people and their caregivers a greater degree of flexibility and choice. Other potential benefits include health care professionals advising patients about how to address problems at home, reducing the frequency of costly emergency visits and unnecessary Hospitalisation.

A reduced need for face-to-face contact for routine diagnosis and monitoring could potentially lessen the burden on our stretched health care services and allow health care to take place in a familiar environment where older people feel safe.

Making homes places for successful health care delivery will require greater attention to housing infrastructure, design and technological changes. Homes that meet the needs of older people, particularly for health and care, will be in great demand. Homes may also increasingly become intergenerational living spaces. While we live in a society where independent living is prized, co-living may become more common with younger couples needing affordable housing and older generations nearby to offer and receive support as required. Good design and technology can help to create modern, flexible spaces that can be adapted for the eventual need for adult children to care for frail parents.

Flexibility is king or queen
In this new flexible world, homes will become increasingly important as places of work, both for younger and older adults. Older workers are already a fast-growing group of home workers – able to combine economic activity with flexible leisure in the same space. Again, innovative infrastructure, design and technological changes will be needed to make our homes successful places of work.

Future housing has the potential to do far more than today's housing, and design will be at the centre of this. If we get the design of our homes right, we will make significant progress towards addressing the challenge of the UK's ever-ageing population."

If you would like to learn more about NEW OLD, the excellent catalogue is available from the Design Museum shop online.

What new models of health and care are emerging to address increasing demand? AAA spoke with some of the stand-out stakeholders who are in the business of disrupting the way we currently engage with service providers.

CARE

HOW HEALTH AND CARE
PLAYERS **AIM TO SERVE US**

Though some of us will be lucky and sail into older adulthood and beyond with good, or even perfect health, sooner or later most of us will need to call upon both health and care services. There are some radical and positive developments, but also plenty of gaps.

So much of what is written and said about health and care is apocalyptic, with forecasts of massive excess demand and declining quality. It is not the task of this report to depress our readers with forecasts of the doom and gloom we will face if we don't act now.

Instead, we take the (avowedly optimistic) view that the forces of innovation (helped by the forces of competition) will come to our assistance, as they have done in many areas of human endeavour, although never without problems or without having to overcome the problems of professional conservatism and government caution. That is the nature of progress.

Just as in travel, with low cost airlines and app-based taxis, new business models of health and care are starting to emerge. In these new business models, information and communications technology is the enabler but not the main focus, for the services delivered are real, not virtual. In travel, it is humans moving from A to B and back again. In health and social care, it is humans living better, happier, safer and healthier lives than they would otherwise have done.

In health too, new models are emerging, not transforming every area, but certainly leading a more patient-centred and patient-controlled operation, though business model innovation, wherever it succeeds, balances the 'centricity' towards each category of stakeholders, to ensure that they each play their part in the most efficient, highest quality way possible, rather than shifting from being supplier to customer – centred.

In social care, for example, we are seeing the emergence of new models of provision (mostly app-based of course), by companies such as Vida and Supercarers. In the US, the new players include Honor, Hometeam and HomeHero. They follow a very different approach to the recruitment, training and efficient management of carers, to the matching of care clients with carers, to the involvement of families and to the provision of real time information providing improved communication and greater transparency. The net result is provision which is always higher quality and may if required be lower cost, sometimes with different payment models.

The good news is that care customers, whether individuals or organisations, and regulatory authorities such as the UK's Care Quality Commission (CQC), are responding favourably to this approach. When AAA interviewed Naushard Jabir, Founder of Vida, the home care start-up had just received approval from CQC, making Vida the first care technology platform-powered home care provider to be approved.

In a recent Financial Times article[14] Naushard explained the thinking behind his business. Britain's care industry has "hardly been touched by new technology. The company can afford to pay higher wages and offer training because it has reduced overheads, such as office space, by using new technologies. The minimum appointment is also an hour long, rather than the 15 minutes that most carers are paid to provide. Among the innovations at Vida are an algorithm to match patients with carers based on their location, skills, availability and expertise, as well as any cultural sensitivities or gender preferences.

"The carer receives the day's schedule via an app, which tells them how long it should take to travel to the appointment as well as the customer's profile, care history and requirements for that day.

"It also allows the patient and Vida to track the carer's progress, including after they arrive at the door. If there are any problems, the carer can raise a red flag via the app so the office can intervene and arrange, for example, more medicine or a doctor's appointment".

Until those who determine health and care provision policies (including governments) are attuned to the idea of business model competition, and are willing to help facilitate innovation, we cannot expect significant progress, even though the generation moving into the 'high health demand' phase of their life are much more likely to be ready for the new models.

ADDRESSING BARRIERS TO INNOVATION
We were reminded in an interview with Michelle Hawkins, the brilliantly titled 'Head of Futures' at Virgin Care, that helping older adults to make the most of their age-friendly homes is not just a question of health care, but about supporting their well-being. This includes the simple pleasures

How health and care players aim to serve us continued

in life that add joy to our day, a sense of feeling connected, staying in control and having a sense of purpose.

According to Michelle, delivering all this will require much better integration between professions, industry sectors and systems. Virgin Care is already working closely with partners in their value chain to deliver better, more integrated products and services that will provide a clear pay back in terms of cost-savings as well as people's experience and quality of life. Virgin Care expects big changes in the configuration of care, in line with Government policy, with hospitals changing and health care being delivered ever closer to where people live rather than the person having to travel far for treatment. This shift will be supported through the availability of low cost and highly effective remote care technologies, like Bluetooth blood pressure monitors and pulse oximeters and by offering patients the opportunity to take more control of their own health and well-being through self-management.

Michelle talked with pride about Virgin Care focusing on bringing a higher standard of customer service you would expect in hospitality to health and care. In terms of our Neighbourhoods of the Future, Michelle expects greater use of intergenerational community facilities that are desirable and welcoming for every age, with ever more blurred lines between health care, social care, communities and local organisations.

One of the problems with much of the evidence used in supporting provision of health and care services and older adults in general, is that it focuses on documenting average achievements, rather than supporting improvements or maintenance for individuals. AAA interviewed Marty Kohn of Sentrian, a pioneering US based company facilitating remote patient intelligence through machine learning and Big Data, supporting home care and preventing hospitalisation. Marty made it clear how far we have to go in moving from provision of advanced sensor technology to

being able to predict reliably imminent problems for an individual. Before we reach this stage, we need many more data sources, collected from many patients over an extended period of time, and advanced analytics to predict likely problems. For example, we are at the stage of experimenting with sensing all sorts of different events e.g. build-up of chest fluid, sudden increase in weight to indicate fluid retention, but we are still early in the goal of yielding better individual prediction, partly due to the number of false positives. Even when we achieve reliable levels of prediction, we still have to ensure that any system we use learns from success in prediction and applies this learning to future cases. Sentrian also identified that one of the biggest barriers to progress in this area was that **professionals tend to be closely wedded to practices which were not necessarily the best,** and that for progress to be made, practitioners would need to become comfortable with giving up ineffective processes, or de-innovate. Marty also pointed out that many experts working in the area have competing biases and have a tendency to embrace innovations – especially in digital health – prematurely, before they are properly tried and tested and shown to have worked.

According to Marty, the general use case is sometimes referred to as "Smarter Home" scenarios, supporting older patients so that they can continue to stay in their homes rather than in institutions such as nursing homes. Sentrian's model, **identifying patients who will get sick enough to need hospitalisation three to five days before it happens**, allowing the patient and care team to intervene to prevent the deterioration, is part of that "Smarter Home" concept.

This view of the failure of evidence-based policy-making has been echoed in our discussions with senior practitioners and academics and confirmed in many reports. One of the problems is there are too many pilot projects which are supposed to be based on evidenced need, and their outcomes then researched, but many are rolled out before

they are properly evaluated, and the roll-outs are in turn poorly evaluated.

WHAT'S IN AN APP?

Technology in the health sector, now coined healthtech, is one of the fastest growing in the UK. Almost at every turn, a new app is being recommended to improve our health and well-being.

Most of them exist outside the traditional health care ecosystem due to the complexities of engaging with the public health sector in general and medical practitioners in particular. Dr Morton's is a relatively new service leveraging a more traditional technology, the telephone. Founded by Dr Karen Morton, the company is run by a collective of visionary GPs, gynaecologists and specialist consultants who, frustrated by the current status quo have joined forces and established a medical helpline.

According to Dr Morton: "We are not just an app on an iPhone. The ethos of Dr Morton's is to give people speedy and direct access to a top GP or gynaecologist without a huge cost. Our website allows customers to access prescriptions, test kits and medical packs and it also contains important and up to date medical information.

"Callers can discuss the health problems that arise in their everyday lives and in most cases, avoid the need to join a surgery queue. All doctors are UK based and GMC registered and can prescribe for a wide variety of medical issues and arrange for medication to be sent to the customer's door".

WHO PAYS THE PIPER?

Our conclusion from these interviews is that supporting our health and care in the future, will be reliant upon radical new business models, just as the demand for improved communication and travel has been met by Apple, Google, Amazon, Uber, AirBnB and low cost airlines.

The shape of these new models is not yet clear. However, it is likely that they will involve a fundamental change to the value proposition (e.g. a shift towards self-service, which will of course also involve a big change in another component, the customer relationship), and the cost structure

(e.g. a significant cost reduction as activity is carried out much more by customers). This in turn is likely to disrupt revenue streams, (with less coming from public funding, for example, and more direct from customers or from partners), segmentation (perhaps focusing on those segments which are technologically most adept or which are most keen to serve themselves), and information technology (using the most recent platforms, particularly those best able to support self-service and cognitive developments). **Like most successful new business models, their design must start with a deep understanding of the needs of the next generation of older customers for age-friendly homes, and not with the needs of the suppliers, sitting in their different silos of construction, housing management, information and communications technology, care provision and health services.**

14 Crow. D, Plimmer, G. (2017). Tech start-ups try to fix ailing US elderly care sector. [online] Available at: https://www.ft.com/content/f026e228-e1a5-11e6-8405-9e5580d6e5fb [Accessed Feb 2017].

THE TIME LINE

Technological, social or economic forecasts are notoriously unreliable, particularly when it comes to the timing of change. Nonetheless, those involved in the provision of housing for the next generation of older adults could be assisted by an informed guestimate of how the next 20 years may play out.

THE ERA OF ACCELERATING CHANGE
Up to 5 years from now

- A wave of individual inventions, each making some aspect of living much better, but largely – with a few exceptions – using existing business models
- Move towards relatively deviceless aids, requiring simple voice control
- Emergence of IT platforms specially attuned to the needs of older adult housing
- Flowering of sensor technology, exploiting the Internet of Things and Big Data analytics

- Emergence of competition between dedicated platforms and generic platforms (e.g. iOS, Android)
- Appearance of the first new business models in which new technologies, processes and strategies are combined to provide much higher quality and/or much more cost effective ways of managing the care, health and well-being of older adults in their homes

THE DAWN OF NEW MODELS
5-10 years

- New models begin to take over from the old models with the forces of competition starting to stimulate the displacement of old entrenched interests in housing, housing management, health, care and IT, and companies surviving and prospering if they embrace the models
- The smart home for older adults has now taken shape, in the form of a combination of information and communications technology which is easy to use and completely customisable to the needs of older adults, using as much or as little in the way of devices as they want, and allowing people of all levels of understanding and familiarity with technology to improve their lives
- We no longer talk about the Internet of Things or the digital transformation of our homes and our lives, because we expect everything to be digital and Internet-linked
- Our homes are fully cognitive, not in a stand-alone sense, but connected to the world, with analysis of the information coming from our homes and built environments used to compare us to other homes, to keep us well, safe and secure, and improve our lives

THE NEW MODELS TAKE OVER
10-20 years

- The smart Cognitive Home and neighbourhood is standard, just like power supply and water. It is low cost, easy to install and effortless to run, and the big programmes to educate all users are completed, so that no one is confused. Collaboration among local authorities and smart cities is normal practice, leveraging shared digital infrastructure. The next generation of older adults has been included and they are also completely at home with the idea of participating in local area governance
- The new business models, exploiting smartness in the home and in the companies that provide these models, win, and we – the occupants – get dramatically better (higher quality, lower cost, faster, more complete etc.) solutions that make our lives much better than they would have been

THE
FUTURE IS BRIGHT

We conclude on an optimistic note. Our research bodes well for a brighter future. Older adults – especially younger older adults – are ready to embrace enabling new technologies. The big tech companies are investing in home automation. Health and care providers see digital health as a means of addressing the challenges facing public health services. Pioneering entrepreneurs and SMEs are innovating, there's a lot of interesting research ongoing and solutions are materialising which are not only practical but, they actually look good and should be fun to use.

More attention is being paid to the design of new products and services, taking account of the specific needs and desires of older adults, as reflected by the recent NEW OLD exhibition at the Design Museum in London.

Exhibition curator Jeremy Myerson explained to AAA's Ian Spero that he had personal experience of the housing challenges facing older adults, having helped his mother locate and move into a McCarthy & Stone retirement apartment in Liverpool, where she lived for eight happy years. According to Jeremy the property was well designed and included technological features which were innovative for their time. But, as Jeremy pointed out, his mother was fortunate, because there are far too few homes designed with the needs and desires of older people in mind.

AAA spoke with Andrew Robbins, Head of Technical, who leads the team responsible for the design of McCarthy & Stone's apartments. Andrew is currently looking at many innovations, including new methods of construction, which should enable the company to build smarter and faster to meet an ever growing demand. That said, we should not anticipate an overnight revolution as housebuilding is a heavily-regulated safety conscious industry, which means material changes are subjected to rigorous assessment and testing before being considered for application at scale. This can take anywhere between two and five years.

According to Andrew "Research involving our homeowner's shows there is an appetite for innovation that enables independent living. McCarthy & Stone are pioneers of retirement living and this report will provide our business with insights which we will use to explore the benefit of smart technologies in supporting and caring for older adults".

After reviewing a near-final draft of this report with Tracey McDermott, Chief Information Officer of McCarthy & Stone, these were her observations:

"This white paper covers much more than health and well-being – it's about fulfilment, enjoyment, security, peace of mind, opportunities to continue to learn and develop in a stimulating and inclusive environment. A finely balanced customer experience is incredibly important for our business and I can see inclusive design playing a more fundamental role in our planning moving forward.

"The Cognitive Home concept is an opportunity to develop a new kind of property: houses and apartments which get to know, serve and protect our homeowners, leveraging new technologies to support independent living. This can cover many aspects of life, from remotely managing health and care in realtime to smartly enabling short term consumption of a service, or changing the frequency of existing services, as well as the type of service. This is not just a question of provision of care, but also about how customers interact with anyone and anything, and how logical and easy it can become.

"Supplementing smart access to information and automation of routine tasks, poses endless exciting opportunities for enhancing lifestyles and driving fulfilment. This doesn't have to be at the expense of human beings and personal interaction, indeed it could well pave the way for richer more fulfilling relationships. To achieve this, integration and aggregation of information and services is critical.

"The bottom line is we recognise the potential of the Cognitive Home to revolutionise our industry and our Neighbourhoods of the Future. We are ready to act and we look forward to trialling some of the most compelling solutions in new McCarthy & Stone developments in the not too distant future."

The Future is Bright continued

One in five UK homeowners aged 55 or over considered moving in the past two years but have not done so. According to research from the Home Owners Alliance, a lack of the right kind of homes is the main reason for more than 500,000 older homeowners deciding to stay put.

Helping older people to move at the right time and in the right way, building more age-friendly housing, and escalating home adaption are key Government priorities, according to a recent housing white paper.

Finding sustainable solutions will require a collaborative approach involving a wide-range of expert stakeholders, including housebuilders (both specialist and mainstream); IT businesses and developers; mortgage lenders; insurance companies, clinical commissioning groups; housing associations and local authorities; and most importantly older adults and the groups that represent them.

A new paradigm is required, in which stakeholders break out of their conventional silos to consider the art of the possible. A group of passionate opinion formers and decision makers in the same room, talking the same language, sharing the same ideals, and committing to the same overarching goal, can transcend the barriers which generally impede progress.

Setting out on the process of research and consultation which led to this report, it came as no surprise to find that not all stakeholders were as receptive to our thinking as we'd hoped. Housebuilders in general are particularly conservative, so we were very pleased when McCarthy & Stone agreed to collaborate; opening their business to our researchers, contributing their own ideas and expertise, and responding enthusiastically to our recommendations. Indeed, we were delighted to learn that this white paper will inform future McCarthy & Stone designs, which should in turn help guide the housing designs

of the wider industry. As a next step, McCarthy & Stone will shortly be installing super-fast broadband as standard on every development and in parallel launching a working party to look at the role of smart technologies in the home.

Construction of more age-friendly housing is of course only part of the big picture. According to the UK's Centre for Ageing Better (CAB), 80% of homeowners aged 65 and over wish to stay where they are. Moreover, adapting their home could delay a move into residential care by up to four years.

The socioeconomic impact is significant. Research cited by CAB claims that relatively low cost home modifications can result in a 26% reduction in falls that need medical treatment, leading to annual savings of £500 million to the NHS and social care services across the country. Clearly there is an urgent need to persuade more local authorities to promote these types of modification.

The good news is that innovative digital health and assistive technology concepts and solutions are sprouting up across the world and costs of implementation are falling. We would like to leave you with one more taste of things to come: movement sensors that can predict when older adults are heading for a fall – up to 3 weeks before the event!

A recent study of independent living apartments by the University of Missouri employed sensors to predict when residents – average age of 85 – were likely to fall. According to Professor Marjorie Skubic who developed the system, they were able to remain independent for almost twice as long as those living in apartments without the sensors; 4.3 years versus 2.6 years.

Clearly, we are playing for ever greater stakes. So if you feel you have something to offer and would like to get involved with over 500 Agile Ageing Alliance stakeholders, please feel free to reach out. You will find our contact details at www.agileageing.org

NEIGHBOURHOODS OF THE FUTURE – A CHECKLIST FOR STAKEHOLDERS

After reviewing hundreds of pieces of research, here is what the current generation of older adults say they want in their homes and neighbourhoods.

HOUSING

Affordability, maintainability and running costs – especially heating and air-conditioning
- Initial costs
- Recurring charges/rents
- Care fees
- Maintenance services, including emergency rapid maintenance

Additional spaces/ facilities
- Exercise place – gym, pool
- Garden
- Garage and workshop

External communications and information
- Communications amongst older adults facilitated
- Wearable technology, permeable wall to home

Safety and security
- Monitoring
- Coded access for carers and family

Modifiability and planning issues
- Costs and difficulty of modification

Location
- Relative to urban villages in large cities
- Near family/friends, especially when downsizing

Modern methods
- Building automation
- Different business models for construction and occupation

Flexible, adaptable space, care-ready design
- Insulation and ventilation
- Windows viewable from chair
- Accessibility – internal and external
- Wide doorways
- Living space to entertain in
- Storage
- Accessible/safe bathrooms and wet rooms
- Bedrooms – allowing couples to sleep in separate rooms plus spare if needs be
- Passages/doorways wide enough for wheelchairs
- Safe, modifiable kitchens
- Provision for changing health state
- Better considered means of moving from floor to floor – e.g. stair lifts

NEIGHBOURHOOD

Pleasant, clean, secure, inclusive and suitable environment
- Age-friendly pavements, roads, crossings, ramps, elevators, escalators, non-slip flooring, stairs, rails, signage, etc.
- No queues, and seats where there are queues
- Meeting places and multigenerational spaces
- Resting – outdoor seats etc.
- Walking trails
- Protection from cyclists
- Outside lighting
- Cameras
- Accessibility of buildings
- Location relative to amenities e.g. rivers, parks, green spaces, countryside
- Toilets
- Not age-segregated, no age or ethnic ghettos

Access
- Health and other community services
- Public transport

Public transport
- Service frequency
- Reserved seating
- Routes to and access to amenities and town/village centres
- Drivers sensitive to needs
- Stations/stops seating
- Information
- Shelters

Private transport
- Charging for electric cars
- Parking
- Low (enforced) speed limits where appropriate

Activities and events
- Accessible
- Affordable
- Appropriate
- Interesting
- Developing and/or entertaining participation encouraged

Thanks