

Spotlight on Future Workplace

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Introduction: A great place to think, work and do

Creating the workplace of the future

Most of us take our workplaces for granted, they are functional and aren't designed to help us do our best work. As the modern industrial economy went through its first and second industrial revolutions, the hyper-organized offices of ever larger corporations got bigger and more complex, but not necessarily more human. Great buildings were designed in fast growing cities which, on the outside symbolized energy and dynamism, but on the inside less care was taken to make the spaces human. Of course, there were notable exceptions. But, for most, the workplace was a purely functional set of spaces.

When most business was process driven, with many tasks simple, repetitive and mundane, the office reflected that fact. But now that the fourth industrial revolution is delivering digital freedoms

to workers through Artificial Intelligence (AI), Virtual and Augmented Realities (VR, AR) as well as algorithms, we have the chance to transform our workplaces to become creative spaces that free us to be more human, more collaborative, and to enjoy the time we spend in them.

'Enjoy' isn't a word that comes to mind when we talk about offices. But, it is the source of productivity as well as individual fulfilment. It's what drives innovation and growth. And making workplaces more human is vital in a changing economy: Fujitsu participated in a recent PAC report which showed that more than half of the workforces in major economies will be working in a freelance capacity by 2025.¹ That will contribute to the fact that a third of organizations will have over half of their staff working remotely.²

It's obvious that we can't be expected to do our best work and have our best ideas, if the space provided by an employer restricts us, dulls our senses, and makes us feel tired and de-motivated. That's why there is a revolution going on across the world. It's been spurred on by technology, but its source comes from within us. We crave spaces that support us as human beings.

The kind of office we work in defines how we work. If it does not inspire and support us, we cannot do our best. If it does, then the sky is the limit. In this Spotlight we're going to share ideas about how the future workplace can energize and drive your organization. At Fujitsu, we're committed to enabling you to take that journey and achieve your goals through co-creation.

¹ PAC estimate, Gallup 'State of the American Workplace' study, Feb 2017

² US Freelancers Union, 2016 – Quoted in PAC study: Workplace 2025 August 2017

Each workplace must achieve its own, unique harmony

Work can be a burden, or it can be a pleasure. It can fulfil us, or depress us. It is a necessity, but it can also drive us to achieve our ambitions. We are a working species; Homo Faber – man the maker. We are toolmakers who shape our world to transform raw materials into finished goods. And we all need places to work.

In fact, the place we do our work is just as important as the tools we use, or the colleagues we interact with. Work is, ultimately, a social endeavor. Inspiration and innovation are not solitary pastimes: One person might have an idea, but that idea is always the product of collaboration across a whole career. No one invents in isolation. Work is all about culture.

Our research reveals the surprising fact that organizations pay most attention to areas like facilities, technology and operations and maintenance which represent only 18% of the average costs associated with a building. People make up the other 82%! People drive revenues and profits. Buildings don't.

At Haworth, our work is backed up by deep research, but we have a simple vision: Workplaces are about enabling people to be happy and fulfilled in their work. They must facilitate physical and intellectual work. They must encourage collaboration, serendipity, and fluid movement between people, teams, departments and partners.

Once you've accepted the theory, then it's important to approach the creation of a great workplace in practical ways. We take a simple, process-driven approach which puts the user at the center of not just our thinking, but the office space itself. The furniture must free people not constrain them. It must be responsive to their needs. And it must be easy to get it out of the way, or reconfigure the way

it's arranged. That means every workspace can have multiple uses, and the ability to support both analytical and creative work.

Desks should respond to an individual's needs, allow you to sit or stand (at the height that suits you), get your head-down, walk around or brainstorm. The technology should be unobtrusive, intuitive, and secure. That helps you make the most of the space, and use less of it. That's more sustainable both in terms of cost and the wider environmental impact. Smaller desks, with less clutter, and greater access to collaborative technologies, means that you need one power socket, one USB, and one cable.

That's important because it removes clutter both physically and mentally. Your thinking becomes seamless because you're not spending half your time configuring your environment. It's either done for you, or an AI assistant has directed you to the right desk for the specific task you want to carry out.

Increasingly, we're not going to the same place each day. We work from home, go to different offices, and often work at clients' buildings. That creates a different working mindset. The 'workspace' is created by you, your devices and materials, and the colleagues you interact with. So, each place you go to needs to be suited to the requirements of the specific project you are working on, and the people you are working with and for. Each environment must contribute to developing and supporting a culture of human-centered culture of work.



By Stefan Kiss,
Senior Workplace Strategist, Haworth



What we strive to achieve at Haworth is the production of spaces that act as enablers. Different environments, often within one single building or site, that activates different mindsets: That could be a garage-like space for invention, a playful space for creativity, a simple space for process work, and a cool, analytic space for calculation. The space can shape the tasks and how they're achieved. But, fundamentally, their design must be aligned to the needs of the people who inhabit them.

People must come first. You decide about décor to support people. You choose furniture to enable people to work alone, or in teams. Lighting, power, communications technologies, recreation and refreshment areas all must be focused on how people can and should use them.

It's a collaborative approach. It's why we work with a range of partners. We know that, for instance, furniture alone can't help people work better if the space where the furniture sits isn't lit properly, or power sockets are awkwardly placed, or the wall color is off-putting, or there's no place to relax and think.

Enabling designers, builders, employers, workers, partners, suppliers, and customers to contribute ideas is also important. Each has specific needs, but there is a common need for mobility and collaboration that should be facilitated by digital technologies. Consequently, those technologies must be central to the design of human spaces.

Connecting people is vital. That's what generates the magic needed to thrive in a hyperconnected economy. And the right spaces spark

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ideas and valuable connections. Your physical surroundings help you see old problems in new ways, and understand new challenges through collaboration.

Office space that's on your side



A tour around the office of
the future with Dennis Stolze,

Project Manager
Office 21@, Fraunhofer

We're in an empty space. It's an unfinished office floor that's yet to be rented. Dennis Stolze scans the bare walls, the cold, grey concrete floor, and the high ceiling coiled with wires but waiting for fixtures. But, Dennis is excited. "This could be a wonderful place to work," he says, "But only if human beings make it one. It's up to us to do it. It's all about the choices we make."

Dennis is passionate about space. The spaces people need to work, rest and play. "In the end, work should be a combination of all three of those things," he says with a wry smile on his face. "But, the problem often is a lack of understanding of that simple fact by not just corporate boards and management, but office designers. In the age of digital that has to change."

It's an important point. The rise of digital technologies which can take over the more routine and repetitive tasks which used to characterize office work is a profound challenge to humanity. "If you think about AI and machine learning, clever algorithms and voice-recognition software that can manage 90% of the routine work which millions of people do each day... then what's left for the human beings to do?" Dennis worries that the hype around digital is too focused on productivity and cost-reduction: "Those things are vital, of course, they always will be. But, if you can't employ people then what's the point of running a business? Who's going to buy the stuff you produce?"

The priority Dennis believes, is to balance the benefits of digital with the needs of human beings. "You have to get your priorities right. The benefits of digital are both commercial and human. Each must be balanced by the other. So, if digital reduces repetitive, non-intellectual work, then it must be seen – and communicated

as – a means to free people to be more human, be more creative, and have new ideas that can transform our lives."

"The way we think about office space must be aligned with those priorities," Dennis says as he walks over to the lift-shaft. He stands, looks around, and then makes a motion with his hands that suggests where walls might be. "For instance, if you don't put doors but leave entrances open, you're sending a subtle, almost unconscious message, to the people who enter this space that they are free to come and go as they please, and free to open their minds to new ideas and possibilities." Dennis waits for that idea to sink in, then adds, "It sounds strange, but it's true. The space, the way it's organized, designed, and how its atmosphere is managed, can either inhibit creativity or allow it to thrive. It's organic."

The sun breaks through the thick clouds and, as if on cue, floods the space with warm light. It's as if we've stepped into a completely different universe. Dennis can see the effect it's had on me. "You see, just that change in the temperature and quality of the light has made you think more deeply about what we're talking about." It's true. It has. "That's what the office of the future will be able to do, not by chance, but by design."

Dennis, and his colleagues at Fraunhofer, a leading research organization based in Germany, have been working on developing work- and office-spaces fit for the digital age. They start from the proposition that the traditional office isn't fit-for-purpose in the 21st century. "It probably never was," says Dennis. "Many offices acted as brakes on innovation, creativity and the most important element in both those things – collaboration. We all know they did. How many times did we spend hours in an office and emerged into the fresh air feeling drained, bored and unfulfilled? Many times."



He's right. Most office spaces did not emphasize the human side of work, merely the functional aspects of it. "We don't need to wait for the future to understand that the need for innovation is urgent. Many businesses are being disrupted as we speak by businesses that work in garages or apartments or offices that don't look or feel like offices. They are collaborative spaces that energize the people working in them. That's what established, 'traditional' organizations must replicate."

Dennis sees a future of work spaces that are replete with sensors. They will be able to connect with wearable devices or other IoT enabled technologies to transform offices into multi-layered, multi-faceted work spaces. "We're not talking about designing office spaces

that are fixed and rigid, we're talking about flexible, intelligently equipped spaces that flex and change with your mood and your task."

There's research which shows that men are more creative when there's a hint of peppermint in the air, and women respond to lavender

That sounds like science fiction. "It's not, it's perfectly possible right now. It just takes some thought." Dennis moves to a corner of the vast office floor and uses his hand to wall off the space: "Right here could be a room for solitary creative work. It's got wood surfaces,

wood on the floor, on the walls – warm, organic colors, the specific aural atmosphere that wood creates, and even a simple fragrance of..." Dennis hesitates, and smiles. "There's research which shows that men are more creative when there's a hint of peppermint in the air, and women respond to lavender."

That's a surprising idea. Even smells can help you work? "Yes, but they have to be subtly done. Maybe that's a bit too complicated for our discussion right now." Dennis smiles and then turns and imagines another work space. Again, his gestures build the walls: "Here's a place for collaborative creativity. It's bigger. There's a good variety of plant. In fact, it's like a mini-jungle. We've found that organic materials create a grounded sense of work and focus which helps people generate ideas together."

All the time the sensors in these imaginary rooms would be picking up on light levels, temperature and noise. The data would be analyzed in terms of both teams and individuals. Algorithms would be able to learn what each person prefers, and which conditions generate the best results. The building – and each of its spaces – would then be able to automatically adapt to who is in the room and what they are doing. “Linking that data to agendas and diaries and even emails between the participants about a specific project, would enable the space to create the right conditions for success,” Dennis says.

So, it's all about data? Isn't that reducing people to numbers? “If it's not done in the right way, it can be,” says Dennis. “It's vital that we respect people's privacy and their rights under regulations like GDPR. So, there must be consent, and there has to be a right not to be subject to the system.”

Dennis looks out of the window, and he thinks for a moment, he says, “You have to understand the data and use it in human-centric ways. You need to change the way you measure productivity. That's important. If the AI is hugely productive in churning out forms or doing calculations, then you can't measure humans in the same way. The space has to free them to be autonomous, and they you measure outcomes such as customer satisfaction, or employee happiness, retention and development as well as the revenues that come from their ideas.”

Freedom, autonomy, and motivation are critical to Dennis's argument. “All the research shows – from the early years of the 20th century to the present – that if you give people the power to work as they choose, and the spaces and tools they need to unleash their



ideas and talents, then you will have a highly motivated workforce,” says Dennis. “Motivation is the key. If people don't want to work, but work just because they need the salary, then you don't get quality or productivity or innovation. You just get – work. Give them the power over their spaces and their time and they stop worrying or complaining about lighting or temperature or décor – they enjoy what they are doing, and the results are better.”

“Space should free you to do your best work. If it doesn't, it's dead space. The point is to ensure that your office space is on your side!”

You have to understand the data and use it in human-centric ways. You need to change the way you measure productivity. That's important.

Let there be light... and power

A conversation with

Jan Schulte,
Chief Representative, EVoline and

Max Essers,
Key Account Manager, Waldmann



Light and power, those are things we all take for granted; they're just functional elements in a building, aren't they?

JAN: Sure, they are functional. They are also fundamental. And we've been getting them wrong for a long time.

MAX: Right now, both power and light restrict buildings; they don't enable people. That sounds like a strange thing to say: Millions plug their devices into power sockets, and have the light to work... but both are barriers to productivity in most cases.

JAN: Think about where the cabling is! It's under the floor. There are millions of miles of cables within raised floors – which take up valuable real estate in expensive buildings – and the sockets and connections are either around the sides of the room, or fixed in specific positions. So, the room's layout – where people work – is dictated by where the power happens to be. Changing it is a big deal. You need to get people in to take up the floor. It's expensive. It takes time. It's cumbersome. The sockets seem more important than the people!

But people all over the world are used to working like that. Is it so important to change it?

JAN: At EVoline we believe it is. We always have. We want the power to serve people. To free them, not anchor them to the place where the sockets happen to be. And we can do that by cutting the amount of cabling a building needs by 80%! That saves a lot of money on cabling throughout a building, and it makes ecological sense. It also reduces the number of connections which cuts fire risks considerably.

MAX: The point is to think about a building as a place for PEOPLE to work, not as a set of walls, floors and windows which need services

like power and light. Think about how people want to work. The new world of business is about collaboration, mobility, and creativity. Teams of people are much more fluid, they interact across departments and functions much more than they did before. That means you need to start with the human – their needs, feelings and natural rhythms.

Feelings, needs and rhythms? They aren't usually factored into plans for lighting and power!

JAN: That's the problem. The days when buildings were designed or fitted-out without reference to changing human needs are over. Talented people are in demand. They won't put up with working in a place that doesn't help them do their best work. They just won't turn up. They'll work from home. Or, they'll find a company that has better work spaces.

MAX: The point is that most of us like going to work with other people, so we put up with bad buildings. If you can create a workplace that people WANT to go to, then their productivity will go up, and they'll stay loyal. It really is that simple.

OK, so explain how transforming the way people plug their devices in makes such a difference

JAN: As I said, you save money and increase the flexibility of both the space and the people working in it. The room is freed from fixed power units. You walk in, and you can move the furniture around how you want it for that meeting or project or whatever you're doing. That's because the power sockets are not around the side of the room, or fixed in plates in the floor. They are in the furniture. So, you can move it wherever you want it, and all the sockets you need are there. And they're flexible. Soon, they'll be a mix of sockets and wireless charging. Both will be standard in the future.



MAX: And the lights will respond to what's happening in the room. In fact, the light switch will become a thing of the past. The room will know what's happening, how many people there are, and match the light to the time of day to support their circadian rhythms.

That sounds like science fiction – how can the lights know how we're feeling?

MAX: Lighting is key to not just the atmosphere of a place, but also its visual, emotional and even biological aspects. That's the first thing to understand. We all know how it feels when we've been in a room where the lights are too bright, or they seem to flicker and buzz. You get dry eyes, you feel tired, and ideas are hard to come by. Everyone just wants to escape. No one does good work.

JAN: We've all been in rooms like that! Far too often!

MAX: That's because the lighting isn't human-centric. It's just there, it's not been designed to support people, just to... illuminate for the least effort and cost. What we do at Waldmann is see lighting as a technology that supports people just as smartphone or computers support them. The lighting is part of a holistic system based on sensors that not only control the lighting but also deliver valuable data about what people do, where they go, and how long they linger in different places. That makes the building far more intelligent and, in turn, means we can improve the office space for the people who use it.

Explain how the lighting supports people across the day

MAX: All the research shows that our hormones respond to the color intensity of light as they change across the day. Our brains have evolved to respond to those changes. It's a cold blue in the morning, which helps wake up and be alert. It gets more and more orange and warm as the sun sets, and that helps us wind down, relax and then sleep. Mess with the color of the light – for instance, by looking at screens that emit blue light after dark – and the melatonin that helps us achieve a restful sleep gets messed up. That's why smartphones now reduce blue light at night but boost it in the morning. The same is true of lighting in an office. If people feel too sleepy in the morning because the lights are too orange, they'll be less productive. If they don't get a good night's sleep, they don't do good work. It all makes sense when you look at it in... that light. Forgive the pun.

JAN: The future workplace must be an enabler for new business models. The digital age is changing the way we work, and our buildings need to reflect that. So, when you're thinking about re-fitting an existing building, or designing a new one, think about the next 20, 30 or even 40 years. More and more buildings will be technologically enabled, with robot check-in, personalized AI assistants, furniture that knows your specific needs – which is what Fraunhofer make – and achieving that holistic, digital environment takes an ecosystem of partners. That's why EVOLine, Waldmann, Fraunhofer and Haworth are key partners with Fujitsu. No one can do it alone. It's a team effort.

So, lighting and power make a building smart... or dumb?

MAX: Yes. Get the lighting wrong, and wire a building so people are tethered to specific activities or places within it, and you restrict productivity and creativity. People won't enjoy being in the building. They won't want to go there, and that undermines collaboration.

JAN: But, free people from cables and sockets and furniture that isn't easily moved, and you free their minds. You empower them – literally and metaphorically. They get the power they need where they want it, and the ability to transform a space to suit the needs of a project or team. More ideas, more collaboration, more fun.

The point is to ensure the workplace supports people by becoming almost invisible?

JAN: Yes. If people have to think too much about the work space and its limitations, their thinking is limited. Make the place free flowing and flexible, you make people more flexible.

MAX: Support their human needs by giving them the right light, natural light first and foremost, then artificial light that supports their biorhythms, and you'll enable them to focus on what's important: The business, their goals, and doing amazing new things.

The future workplace must be an enabler for new business models. The digital age is changing the way we work, and our buildings need to reflect that.



Inspiring working conditions: The Bosch model



By **Guido Neonati**,
IT Trend Scout &
IT Strategy Consultant, Bosch

Work should be inspiring

For me, that's a simple, but powerful principle which should be at the heart of every team and every workplace. It's what we are working to achieve for every Bosch associate. We have over 400,000 of them worldwide, so it is a huge project. And it's fundamental to our success now and in the future.

That's why we set out a journey a few years ago to modernize the way we work, and the places we work. Digital technology has changed both. We are all more mobile, able to do work wherever and whenever we want and need to, but the places in which we work haven't been changing as fast. Physical space takes longer to adapt. And it can't do so on its own. It needs to be transformed by people: Architects, designers, planners and management. But, they can't do it without reference to the most important element in the equation: The people who rely on those spaces.

Work must be people-centric

At Bosch, we have a people-centric approach to everything we do. Our associates do the work, have the ideas, and generate the innovative products that our customers want. So, it was entirely in keeping with our long history, that we started with them. Not with architects' drawings or the opinions of outside experts (important as they would be), but with the people who would be working inside those workspaces, and outside them too.

The blueprint for our Inspiring Working Conditions (IWC) project was an extensive one. It broke down the physical boundaries of the office space itself and considered the entire working ecosystem. And that's what it is: An ecosystem. Planes, trains and automobiles as well as

buildings. The home, the street, the café and even beach. Wherever, whenever, however. Work is no longer a fixed concept. People don't 'go to work' they just do work when it needs to be done. They are in charge of how they work and when they work.

The original Bosch workshop

Back in 1886 when Robert Bosch opened his first workshop in Stuttgart, he created a sometimes chaotic but always dynamic place to work. It was a tight-knit team of people which included inventors, experts, apprentices and ordinary workers. They created an organic space in which new ideas could be generated and fostered. Very quickly, the company discovered that the new and fast growing automotive industry was the ideal market for their products. So, they created ignition systems that beat the competition. That was achieved in this fluid, almost unstructured workplace. It was all about inspiration, dedication, and teamwork.

One of the apprentices who worked with Robert Bosch in those early days was Gottlob Honold, a man who understood how the world was changing: Cars, electric light, electric power to businesses and homes, and so on. Together with Robert Bosch, he could see that the technology would drive a new era of progress and that Bosch, the company, needed to be at the forefront of that change.

Get ahead of change

Now, we are at a similar turning point. The way we work must mirror the world outside, but also enable our associates to stay ahead of change and be inspired to innovate and deliver success – for themselves as individuals, and for the rest of the company, as a team. That's what our IWC project is all about.



Bosch's success is based on an ability to recognize the need for change and to act at speed to achieve it.

We set out to create new working environments that foster creativity, communication, and cross-functional collaboration as well as to enable our people to work independently. To do that we had to free people from the organizational constraints which, in the past, have stopped them from working anywhere they choose. In the past, they used to have to ask for permission to work from home. That's no longer necessary. Now, they are self-managed. They do what suits them.

When I first joined Bosch, I had to adapt to the way the company worked after years spent at IBM and HP, but I soon realized that Bosch's success is based on an ability to recognize the need for change and to act at speed to achieve it. And that change should always be people-centric.

What people really want is what matters

The IWC project is founded on what our associates really want. On their experience, desires, and ambitions. You can't inspire people from the outside. You must include them in the development of ideas and show them that their contribution has made a difference. That's how they take ownership of new ways of working, and make the best of use of them.

That is the biggest lesson I think that other companies can learn from what we're doing at Bosch. Yes, you need to adapt your work spaces to make them flexible, achieve the best lighting and temperature, deploy the right digital technologies so that the spaces are intelligent, adaptable, collaborative, and even decorated to support either analytical or creative work. But, all those elements can't come from the outside: They should come from the people who, ultimately, will work in those spaces for years to come.

So, we put together teams of people to think and talk about how they want to work. That was the foundation for the project. We asked, 'What would inspire you?' And they told us. It was amazing how many different ideas we got. 700 associates from across the world contributed to the first phase of the research. They told us their stories. We generated hundreds of pages of views, ideas and dreams. They talked about telephony, colors, desks, spaces, light and temperature, the ability to re-create spaces depending on the task or project, teamwork and lone-work, working at home, in a café or on the train. It was a rich stem of information and data. We were inspired by it.

Inspiration is a rich resource

All those ideas are a rich resource. And we've begun to implement many of them. The point I'm trying to stress is that the 'inspiration' that's at the heart of our IWC project came from our associates, not from outside. Their input inspired the architects, designers and consultants who were tasked with turning their ideas into practical

solutions, including Fujitsu. Our people asked for recreation areas and power-nap rooms, and more space for bikes, as well as the ability to control lighting, heating and cooling to suit different workstyles and activities. The focus is on collaboration, and a team that feels empowered to adapt the space in which they need to work is one that is more cohesive and focused. Simply, you get better ideas when you're comfortable and free.

The work continues. We're constantly talking to our people. Bosch has always been at the cutting edge of change – we are, after all, a company that produces much of the technology that underpins the Digital Age. Our focus is on not just products, but also software, sensors and services. With the rise of the Internet of Things (IoT), those three things are vital. IoT will also transform the way we work. It's already doing so. Add in AI and things like Augmented and Virtual Reality, and it's clear that the future workplace will constantly evolve. And we're ready for that.

Because we keep talking to our people, and make sure that they're helping us to adapt and change working conditions we can keep up with new generations of employees who have never experienced the old ways of working. That's important. We want the best talent, and we want to retain it. So, ideas like bringing kids to work, having childcare in our buildings, bringing pets even, are on the drawing board.

Inspire your people

You can only create a future workplace that inspires people if you involve them in its development from the start. Their ideas must be your inspiration. Do your research. Get ideas from associates and make them happen. That will foster a sense of ownership. Even if the

outcome is like what a consultant might have created, the small differences that came from your internal research will have a massive impact on your people. That's our experience. And link your vision to the culture and heritage of your business.

Inspiring Working Conditions are all about enabling people to be free to work their way and to flourish. If they can do that, you will be more productive, innovative, and get new products to market faster. You will also be happier.

You can only create a future workplace that inspires people if you involve them in its development. From the start. Their ideas must be your inspiration.



Virtual Reality: Real value

Virtual Reality (VR) and its close cousin, Augmented Reality (AR), started out in the gaming world, and have slowly, but surely, matured to become serious business tools. That doesn't mean they've lost any of their playful charm. On the contrary, they're bringing a whole new layer of experience and, dare I say it, fun, to the world of work.

Enterprises in all sectors are starting to see the value in re-defining what's real, and building on the world around us to deepen human interactions and boost creativity, collaboration and, ultimately, innovation. That's the real value of playing with reality.

At Nvidia, we've been improving the graphic power of VR and AR by working at the heart of an ecosystem of partners which are all focused on the same goal: Enhancing the way people can work together in the real world. Our customers for instance, in the automotive or architectural sectors are rapidly adopting new ways to design new products and buildings so that they can do more, do it faster, and cut the cost of developing and refining ideas.

In the future, the work space in which VR will play a key role, will become hyper-real. It will be all encompassing. Imagine this scenario:

A global firm of architects is working on a commission for a landmark building. Three of them are in London, two in Frankfurt, and one is in Tokyo. Their offices are future workplaces (as described in Heinz Wagner in this Spotlight). They agree to meet in a virtual meeting room. In each of the real rooms in their real buildings, they are equipped with a VR headset. It's lightweight, and is connected to a glove as well as a stylus.

The meeting starts, and a model appears. It's amazingly detailed. It's real. It feels real. Haptic feedback makes the participants think that it's made out of tangible materials – woods, fabric, metal, all aligned to what the final effect of the building will be. Only, the model has not taken weeks to build and cost a lot of money. It's been generated from the agreed design plans and is totally accessible and flexible.

One of the designers doesn't like the look of the roof tiles. She suggests another kind of tile entirely. That tile is called up from the tile database and immediately, in the blink of an eye, the roof tiles are replaced. Another of the architects suggests that the entrance of the building needs to be broader. The system responds. The Japanese architect wonders whether the stress of the new roof needs more supports across the frame of the building. The model explodes out to show the steel work, and more struts are added. Calculations are instant, and it turns out that the new roof does, indeed, need either more struts or thicker steels.

The model has not been remade at great expense. Fundamental decisions can be made collaboratively based on both physical experience (albeit virtually generated) and the precise computation. In real-time. The same thing can be applied to cars. No more clay models and time spent in a wind-tunnel. The VR system can do it all.



Andy Hendry,
Sales Manager, Nvidia

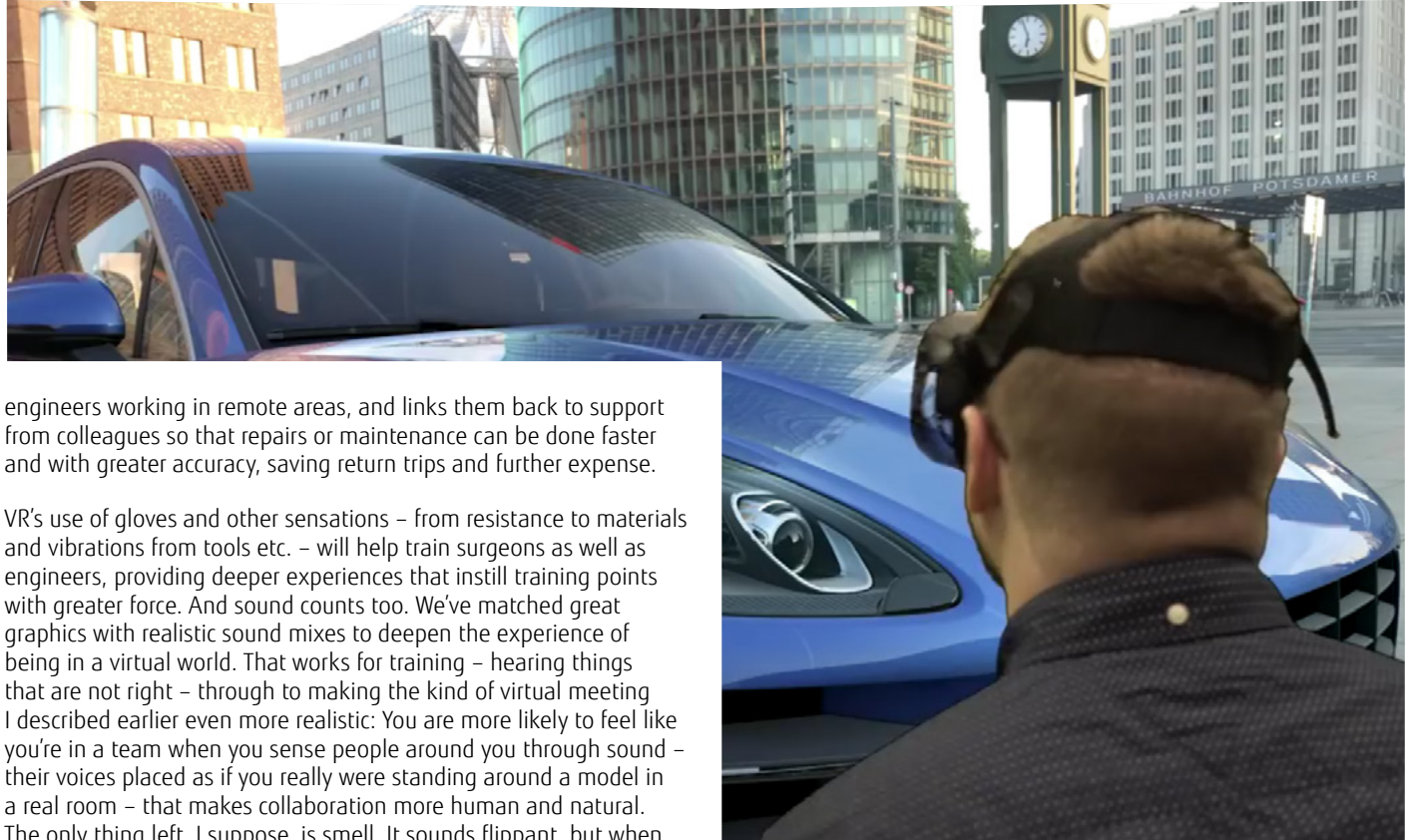


Of course, we don't have to imagine that scenario, it's happening already. But what's different is the quality of the VR experience. Ever more realistic visual detail fools our brains into thinking that what we're seeing via our headsets is actually there. That's key to the usefulness of VR. Our brains love photo-realism. They love bright, sharp graphics that offer minute details, like sunlight caught on a drop of water clinging to the curve of a car's wing mirror. If you can deliver that kind of detail then the human being will work more fluidly, naturally, and creatively.

Realism delivers feelings. The feeling of control, and collaboration and that anything can be tried, tested and boundaries pushed. But, and this harks back to VR's origins in gaming, fear also counts. If you can make a situation real, then you can train people to be wary of danger and follow best practice so that they and others stay safe.

VR's value extends far beyond creative designers working on big projects, to, for instance, workers in a fast-food chain's kitchens. I've worked on a system that creates a typical kitchen with all the detail possible, from shiny to greasy surfaces, to sharp edges, steaming cauldrons of water and sizzling hotplates. The point is to mix the visual with haptic reality to show trainee workers how badly they could hurt themselves and others if they don't know their way around the kitchen.

The use of VR in training is still in its infancy, but I am sure that the workplace of the future will soon feature regular VR based training sessions in all kinds of industries, from oil and gas facilities to factories, warehouses, chemical plants through to healthcare facilities. Of course, Augmented Reality will go hand in hand with VR. AR, overlays information on the real world rather than seeking to replace it entirely. It's less immersive, but it offers real-time data to



engineers working in remote areas, and links them back to support from colleagues so that repairs or maintenance can be done faster and with greater accuracy, saving return trips and further expense.

VR's use of gloves and other sensations – from resistance to materials and vibrations from tools etc. – will help train surgeons as well as engineers, providing deeper experiences that instill training points with greater force. And sound counts too. We've matched great graphics with realistic sound mixes to deepen the experience of being in a virtual world. That works for training – hearing things that are not right – through to making the kind of virtual meeting I described earlier even more realistic: You are more likely to feel like you're in a team when you sense people around you through sound – their voices placed as if you really were standing around a model in a real room – that makes collaboration more human and natural. The only thing left, I suppose, is smell. It sounds flippant, but when you're training people to beware of noxious substances on an oil rig or a similar installation, then adding scent will also add value. That will come.

Image courtesy of Autodesk

The workplace of the future will offer VR as a natural part of the daily working experience. For training, education, collaboration and even sales. In fact, sales are a key element in the value of VR. Automotive companies are already using VR to sell their high-end models, and that will spread to all classes of car very soon. Customers can 'sit' in their car before it's even manufactured. See what different qualities of seat leather look like, change the steering wheel, add functions to the dashboard, feel the car as it idles, then accelerates. All with a headset on.

New sports facilities, like the new stadium being built by Tottenham Hotspur in London, are using VR to sell premium seating. Potential season-ticket holders sit in a real seat, put on a headset and see the exact view of the pitch they will get for their money. It's not just a passive view: The experience is made deliberately immersive and emotional. Chanting fans, the rumble of the crowd's roar, the vibrations in the seat. It promises glory, and that's worth paying for. Or so the sales people hope.

In my experience, VR is becoming a mainstream technology. Its human value has been recognized. The fact that it's so successful in gaming is important. In the workplace, though, the quality of the graphics (sound and sensations too) need to be of the highest quality. That's what will set business VR apart from recreational VR. It will add value. As headsets become more user friendly, then widespread deployment of the technology in all the areas I've mentioned will become easier and more cost-effective.

The benefits of VR are real. At Nvidia, we're working with Fujitsu and other partners to bring them to all kinds of enterprises as quickly as possible. The future is closer than you think, and its benefits have never been so real.

It In my experience, VR is becoming a mainstream technology. Its human value has been recognized.



Toward a truly human work space



By Heinz Wagner,
Head of Future Workplace Offerings

We're not just looking forward to the future, we're building it

The old office is dying. You can't think about 'offices' anymore. You need to think about places. Places and Spaces. Highly flexible physical spaces with the right tools to support creativity, innovation and collaboration. That's the future.

The future will be highly flexible and fluid

We're moving beyond the idea that IT is all about delivering devices that are bundled with the user for a fixed time and within fixed parameters. We get what we're given, and we use it till we're told otherwise. That's already over in many businesses. Now, we're being given the freedom to use whatever device we want, in the combinations that suit us, and where and when we want to. IT supports us, but we're free to do what helps us achieve our goals.

That part of the future is already here. It needs to become better, more seamless, and easier to provision. But what's really changing is the workplace itself. It's being re-defined. At Fujitsu, we're part of that revolution. We're helping to drive it. Our vision is exciting.

It's not science fiction even though it reads like science fiction

Every day will be flexible. The tools we use and the spaces we go will support the needs of each task, project and idea. The technology will support us by doing every day essential but routine tasks.

Getting to work, for instance. If you drive, then an autonomous car will pick you up in the morning. It knows where you need to be because it shares your calendar. It's worked out the best route based on the traffic – and your preferences, you might want to stop at your

favorite café for a coffee to go (for which its allowed ample time) – so you sit in a comfortable chair, and you can start doing work, making calls, or just thinking while the computer drives the car.

You get to the office. It's a skyscraper, but you wouldn't know it. It looks like a two-story building. But, as you enter, holding your palm over a sensor which recognizes you and directs you to the best available workspace suited to your preloaded preferences (whilst also reminding you of your meetings and showing you who's in that day and where you can find them).

You go to the lift, which greets you by name and knows the floor you need, and takes you down to the 30th floor – underground.

Why underground? Because it's easier to cool and uses up far less energy than a building that rises high into the sky. But, surely, humans need natural light? They do. And amazingly realistic screens act as windows which pour just the right kind of light to suit each time of day.

The walls are screens too. They look like wallpaper – and you can change the design to suit your preferences – but when you need to show a video, do a conference call, or create a vast, room-sized interactive whiteboard for a brain-storm meeting, your AI assistant will set it up for you.

And, it's international. Language is no barrier. The AI translates different tongues instantaneously.

When you leave the office building? Well, it all comes with you: The Artificial Intelligence (AI) assistant, the data, the tools, and the ability to work anywhere and everywhere.



Your office isn't your office anymore, it's everyone's

More and more of us will be freelancers. Or we'll be employed, project by project, in a fluid way that respects our rights and our individual needs. The office must reflect that. So organizations, large and small, won't need to have huge premises that are exclusive to them. They can get together with other firms and build hubs that can be used by a wide range of people working for different enterprises.

Co-working offices will drive collaboration. And we know that collaboration is what drives innovation. And innovation drives... the future for all of us.

Are we close to the future? If we make it, we'll get closer

None of this is really about technology: It's about what people want and need to do. It's about their wellbeing and their happiness at work. Wherever 'work' needs to be done.

Even the instant translation I mentioned. That's an idea that's been around for a long time. In Star Trek back in the 1960's they had a program on the bridge of the Enterprise that translated alien languages. My inspiration is the Babel fish in Hitchhikers' Guide to the Galaxy, only you don't have to put a fish in your ear to benefit from it, Fujitsu AI Lifetalk does it for you.

Critically, the quality of voice recognition is getting better and better. Over the next decade it will get more sophisticated, and will be able to understand nuance and decipher conversations more accurately. We need to that to achieve the workplace of the future.

Human work spaces need to be created by humans using the right technology with security in mind

And, of course, security is a top priority. It has to come first. All the benefits I've mentioned can be vulnerable to hackers. It's an existential threat to the vision we all want to achieve.

Which is exactly what Fujitsu is committed to doing.
Now, and into the future.

But, fear can't slow progress. If we work hard to understand threats and create the right security to prevent it, we can keep the vision strong.

As this Spotlight shows, we're working to create those workplaces of the future right now. Fujitsu has brought together a broad ecosystem of experts and visionaries to accelerate its development. With the right partnerships across development and sales, we can make the technology work seamlessly (it doesn't right now) so that we can create the best user experience and vastly improved functionality that frees people to focus on what they do best. Our ecosystem is getting deeper and more creative all the time.

Contact us

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