UBS

Humans and Machines

A critical appraisal of the future

Preface

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Are machines the better advisors?

There does not seem to be a single service nowadays that cannot be digitalized, including banking. Customers rightly expect to be able to conduct business anywhere and at anytime, and intelligent machines are performing more and more complex tasks. Asset management has traditionally been a people business. Recently, for example, the personal contact rate with our customers even increased by a double-digit percentage. We are therefore convinced that it is not about replacing man with machines, but more about finding ways in which man and machine can complement each other in the best possible way. UBS Global Wealth Management's innovation laboratory is tackling just that with the *UBS Companion* experiment.

In collaboration with IBM, FaceMe and HV Italic, "Fin," a human digital assistant, and a digital copy of Daniel Kalt, Chief Economist of UBS Switzerland, were brought to life. UBS client advisors are now testing this digital team on interested customers. "Fin" consults on handling banking transactions, and Daniel Kalt's avatar brings the knowledge of our Chief Investment Office to the table. This experiment gives us multiple responses and informative insights into how customer interactions can be shaped in the age of digitalization.

Just as important as the experiment is a critical examination of the complex subject of man and machine. Will machines be able to experience human feelings, develop creativity and be able to recognize relevance when they see it? Will they be able to explain why certain things happen, or perhaps even tell us what *should* happen in the future? What are the consequences of using intelligent machines? What ethical aspects should we pay attention to? What is the status of security?

Selected experts from various disciplines – from economists to ethicists to psychologists – will deal with such questions on the following pages. This book is intended to provide food for thought, and we are convinced that critical voices will help us find a respectful and responsible way of dealing with intelligent machines.

We hope you enjoy reading this book.

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UBS Companion

The Experiment

***UBS Companion* was created in collaboration with the following companies:**

IBM supports companies of all sizes in the digital transformation of their business models to help them make the most of the opportunities offered by digitalization.

FaceMe makes digital conversations more human by using digital assistants to drastically improve the customer experience.

HV Italic connects code, design and content to generate digital products.

The way in which humans and machines work together is constantly changing. Around 100 years ago, tabulating machines used punch cards to carry out mathematical tasks. Fifty years later, the invention of screens and microprocessors led to new application possibilities aside from military and economic uses and unleashed the Digital Age. Only 20 years later, a mouse and a graphical user interface made the first personal computer available to the masses. This technology slowly but surely caught on in both professional and private spheres. Today, all that is required is a glance, a word or a touch to operate machines.

At present, we may well be on the cusp of an even bigger change: if machines become intelligent, are able to develop a life of their own, become less obvious or even invisible and perhaps even empathetic – how can data and emotions interact? Do machines only have answers, or do they also help us to ask better questions? When is it the right time to use digital, analogue, or both together?

Let us imagine that the year is 2023. "Fin," a friendly digital assistant, supports you and your advisor when taking care of simple tasks, such as ordering a new credit card or asset statement, for example. Data on the economic situation and the financial markets is displayed on an interactive map of the world. You can also interact directly with a digital version of an expert, such as Daniel Kalt, Chief Economist and Regional Chief Investment Officer Switzerland, if required. Eye contact and a voice command are all that is needed to enter into a conversation with *UBS Companion.*

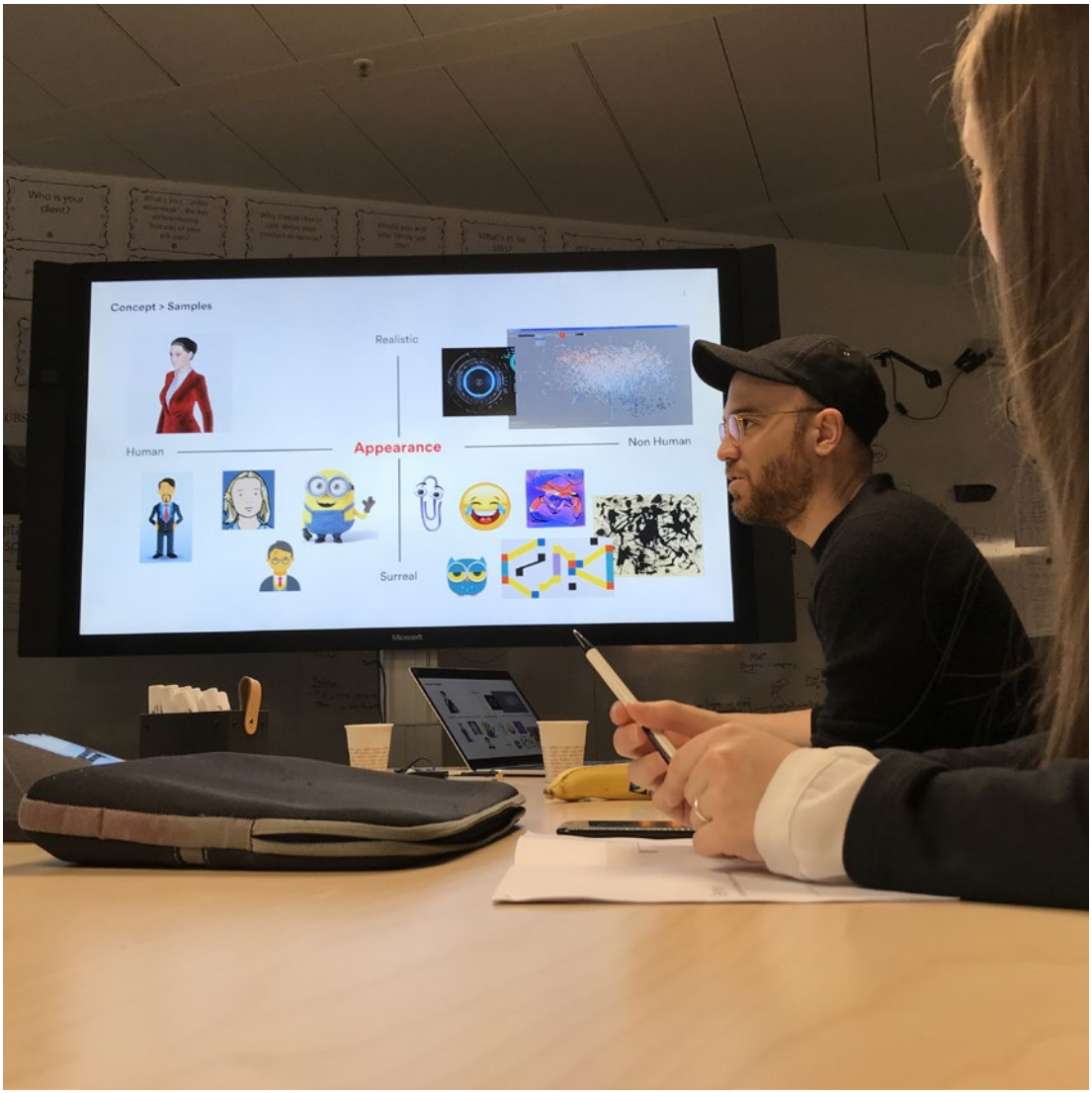
While these scenarios sound like the future, they are already a reality today: for three months in 2018, UBS customers at Bellevue can take part in the *UBS Companion* experiment in the Zürichsee meeting room. The advisory context was chosen as one of the most important interaction points between clients and the bank, with the latest technologies being used as specifically and carefully as possible.

The Design

Seven months. Four companies. Three continents.
One visual documentation of the design process.

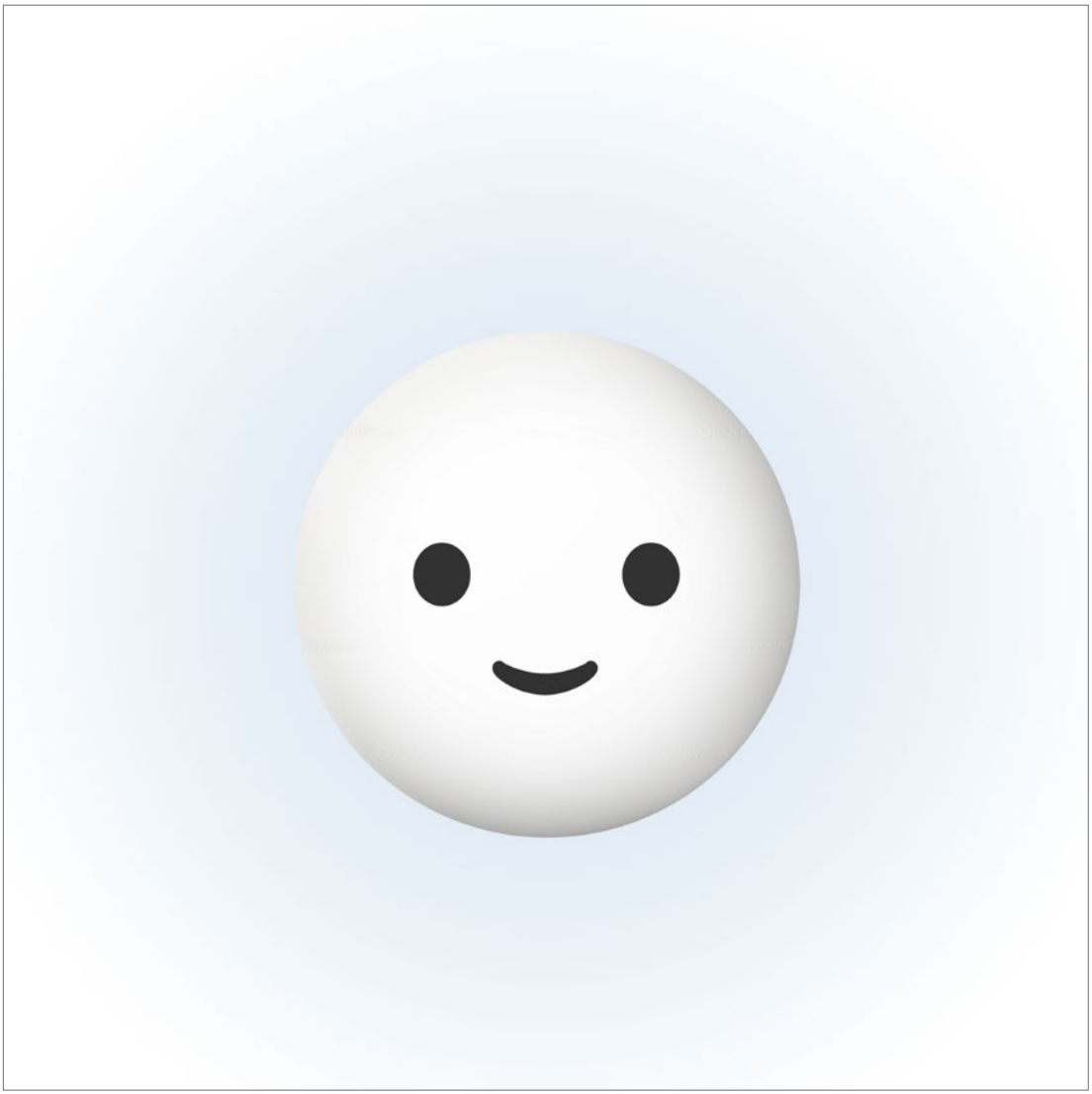
Silicon Valley or the Swiss Alps?
Instead of an existing avatar from the well-known technology companies in Silicon Valley, something new and more human should form the basis for the experiment.

Realistic or abstract?
The team discusses the possibilities.



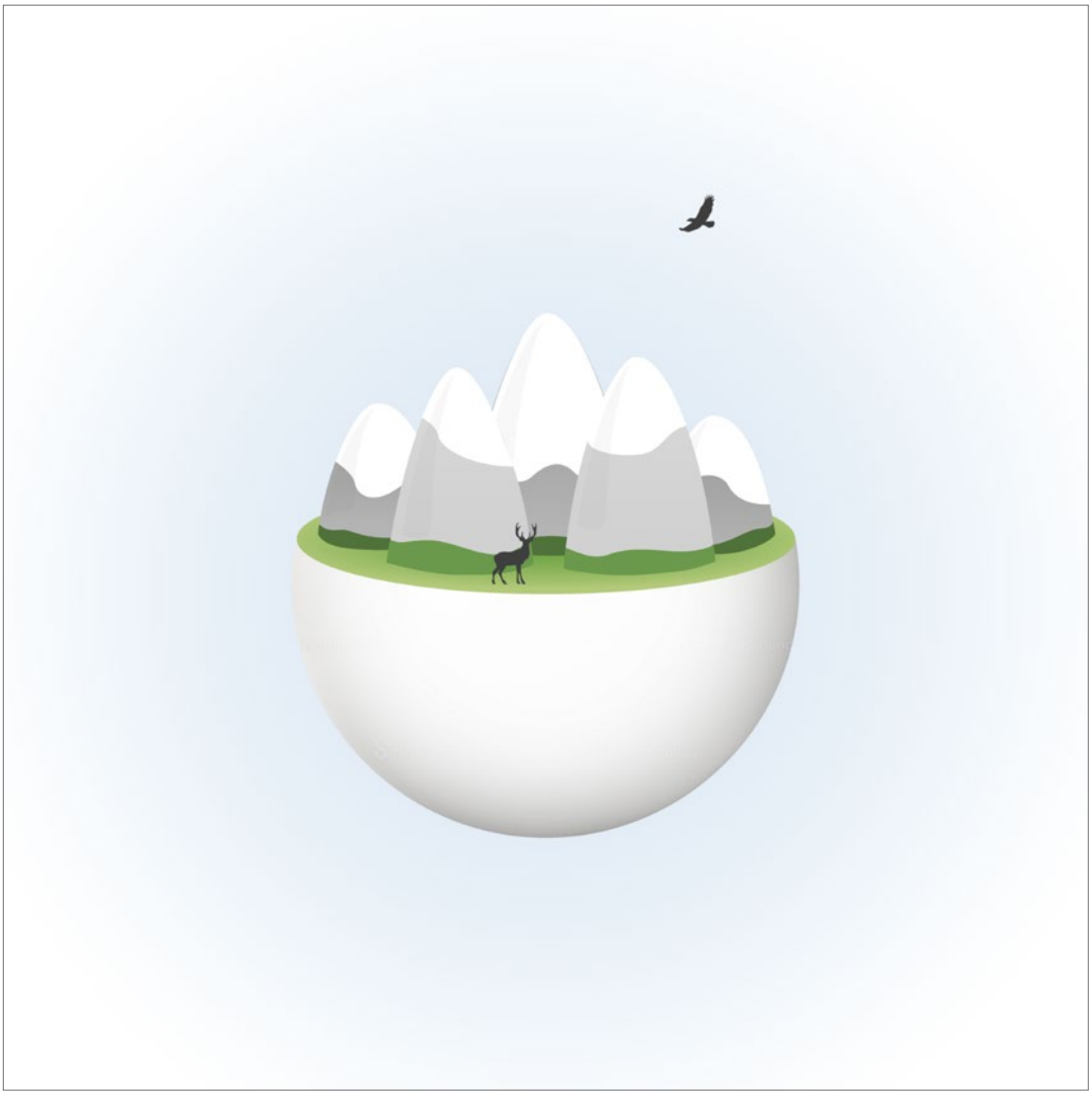
Serious or playful?
The first concept for the avatar's appearance.

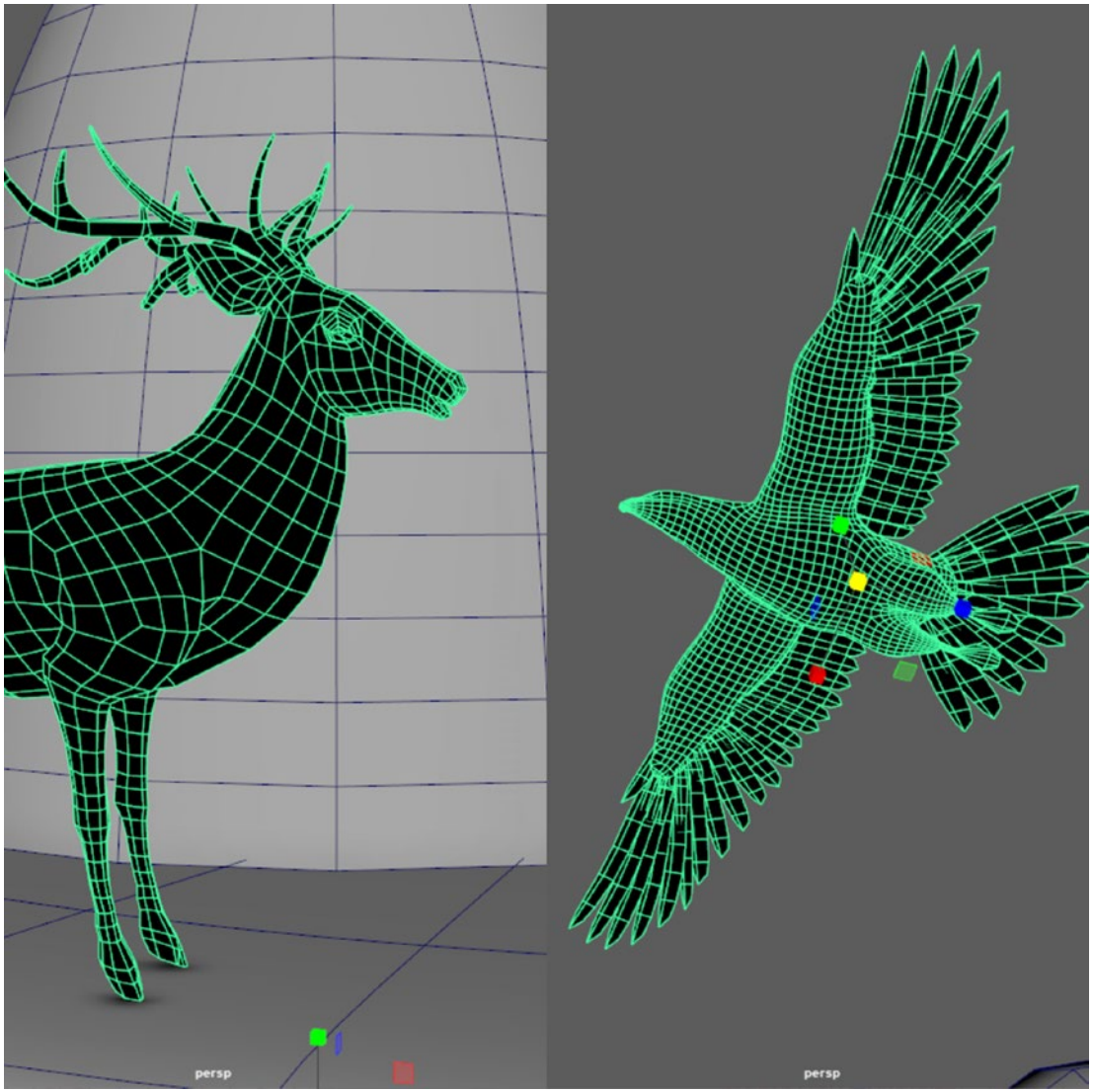
Familiar or new?
"Fin," the friendly little helper.



Lively or calm?
The use of colors and shapes allows "Fin" to express himself visually.

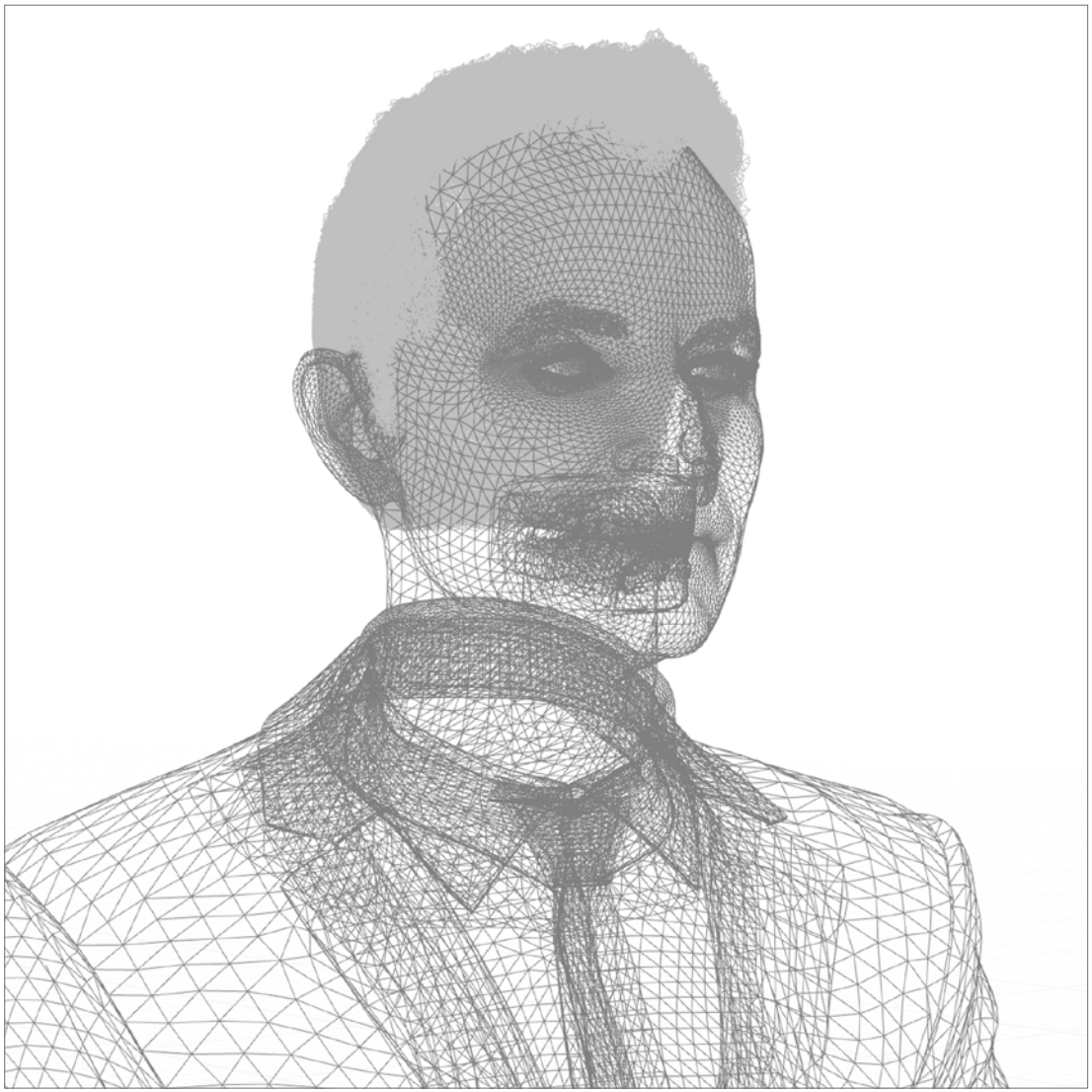
Permanent or discreet?
When not in use, "Fin" pulls back and offers a glimpse inside his head.





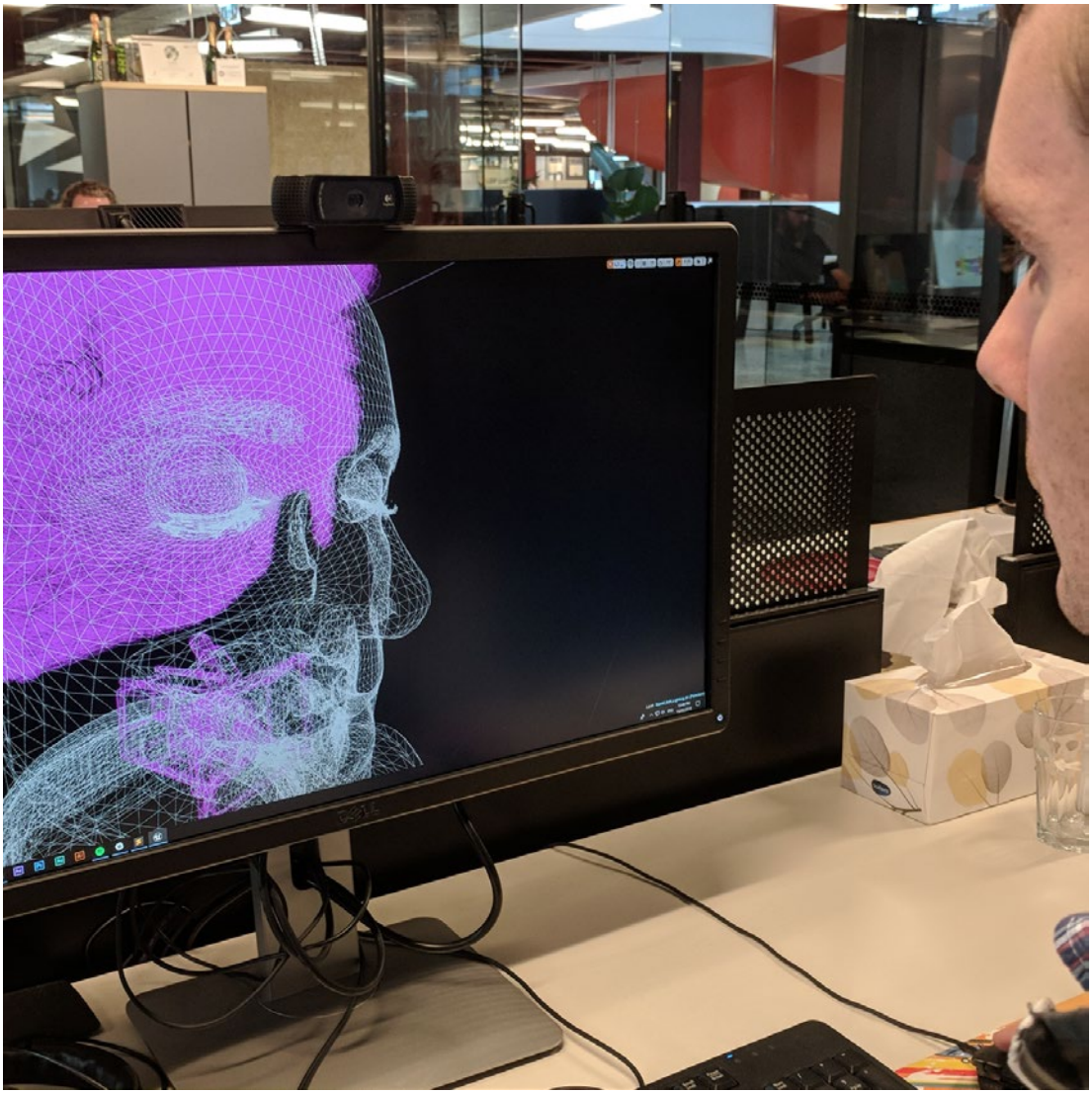
Detailed or visible?
The 3D world is gradually modelled and designed with the greatest care and attention to detail.

Real or artificial?
Daniel Kalt, Chief Economist and Regional Chief Investment Officer Switzerland, is prepared for photogrammetric scanning using 100 high-end, digital SLR cameras in a specialized lighting setup.



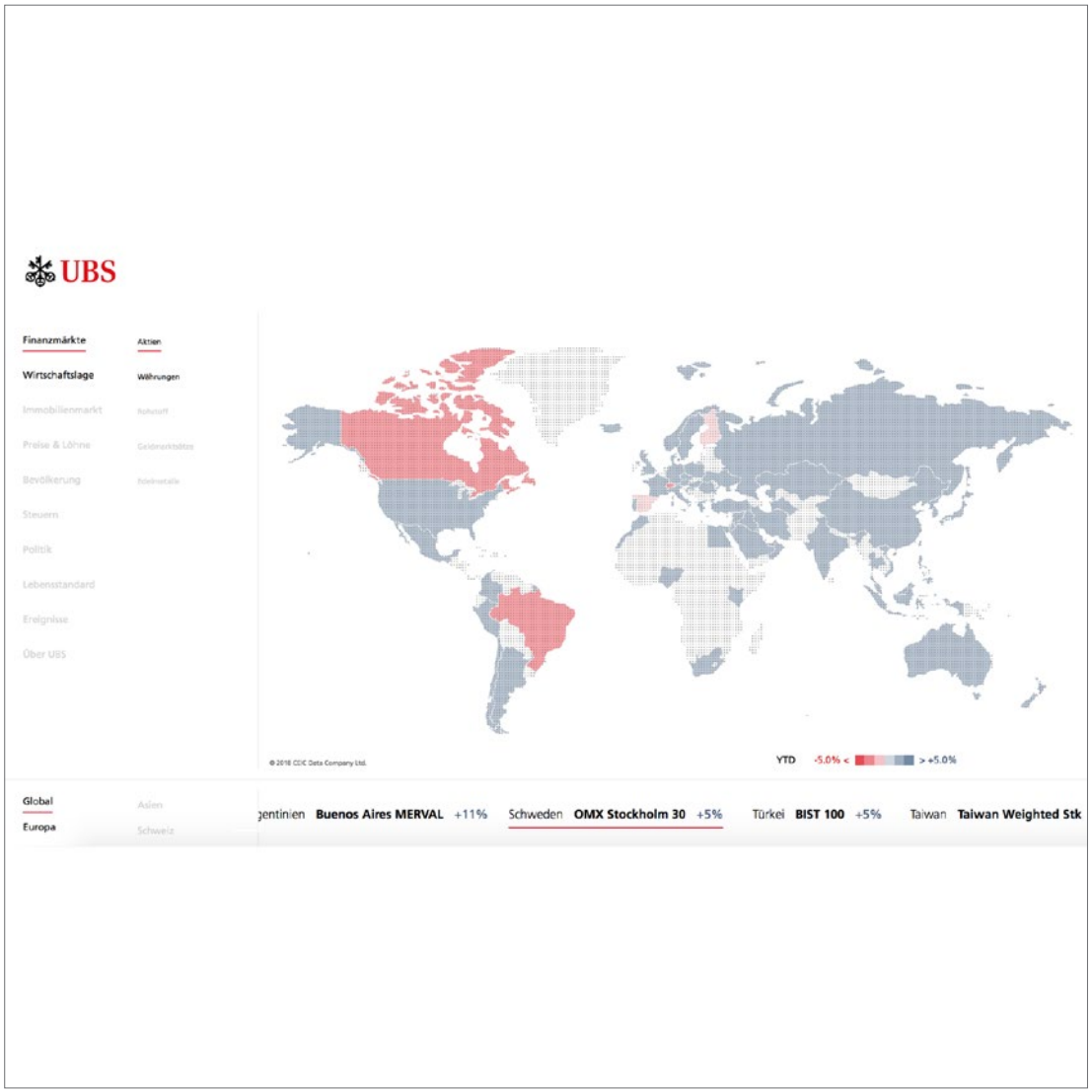
Pixels or polygons?
High-resolution scans are converted into a 3D mesh that can range from 20,000 to 40,000 polygons.

Tie or no tie?
FaceMe specialists put the finishing touches on the 3D model of Daniel Kalt.



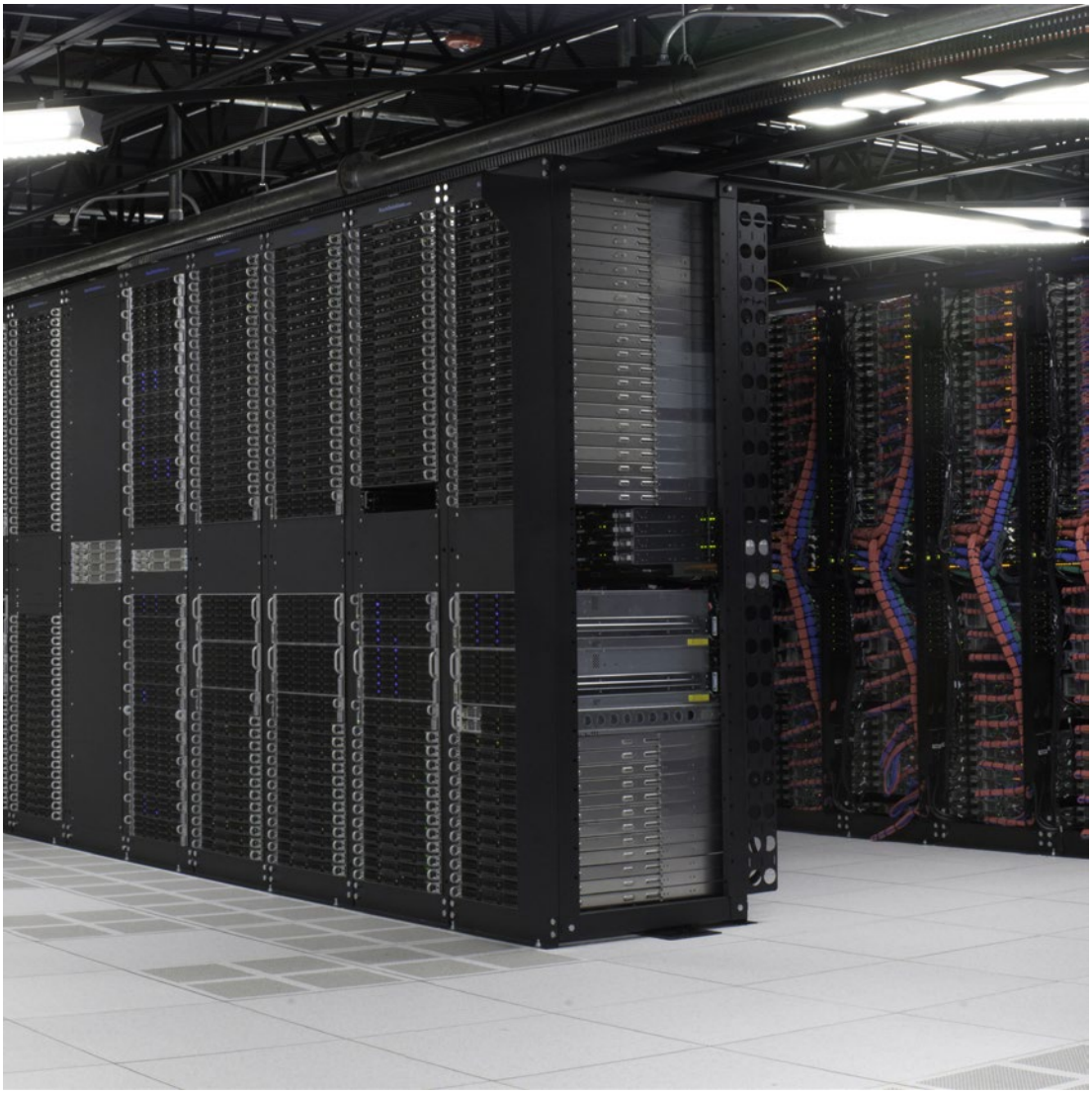
Laughing or smiling?
Lighting, blood circulation and muscle articulation are captured to recreate the face as realistically as possible in both its static and animated forms.

Matte or gloss?
The computer generates a rendering of Daniel Kalt on-site in real time to achieve the best approximation of real-life skin and its interaction with light.



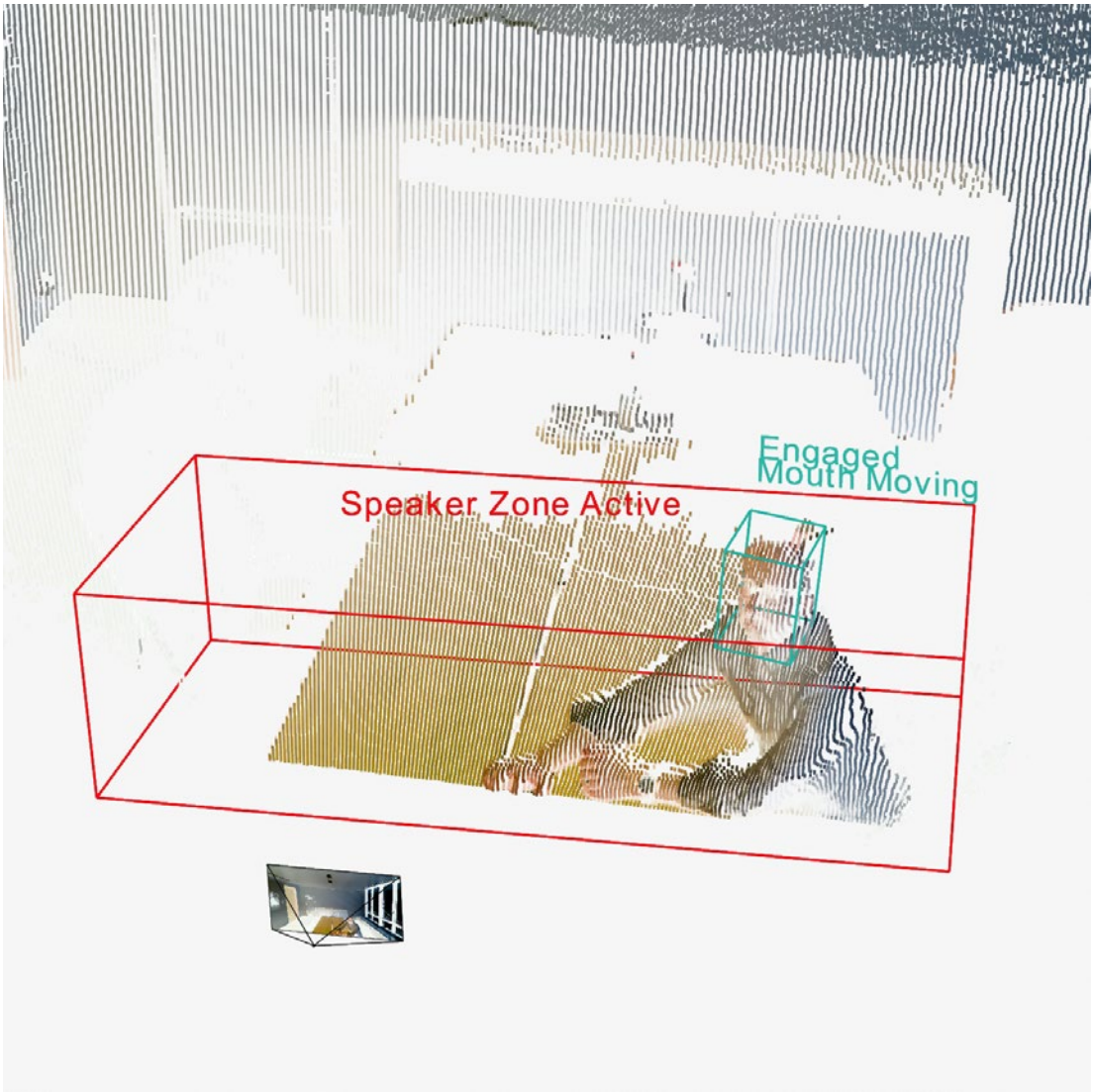
Data or knowledge?
Using "Earth View," data on the financial markets and the economic situation is made available on a world map, offering you information that you can use in your consultation.

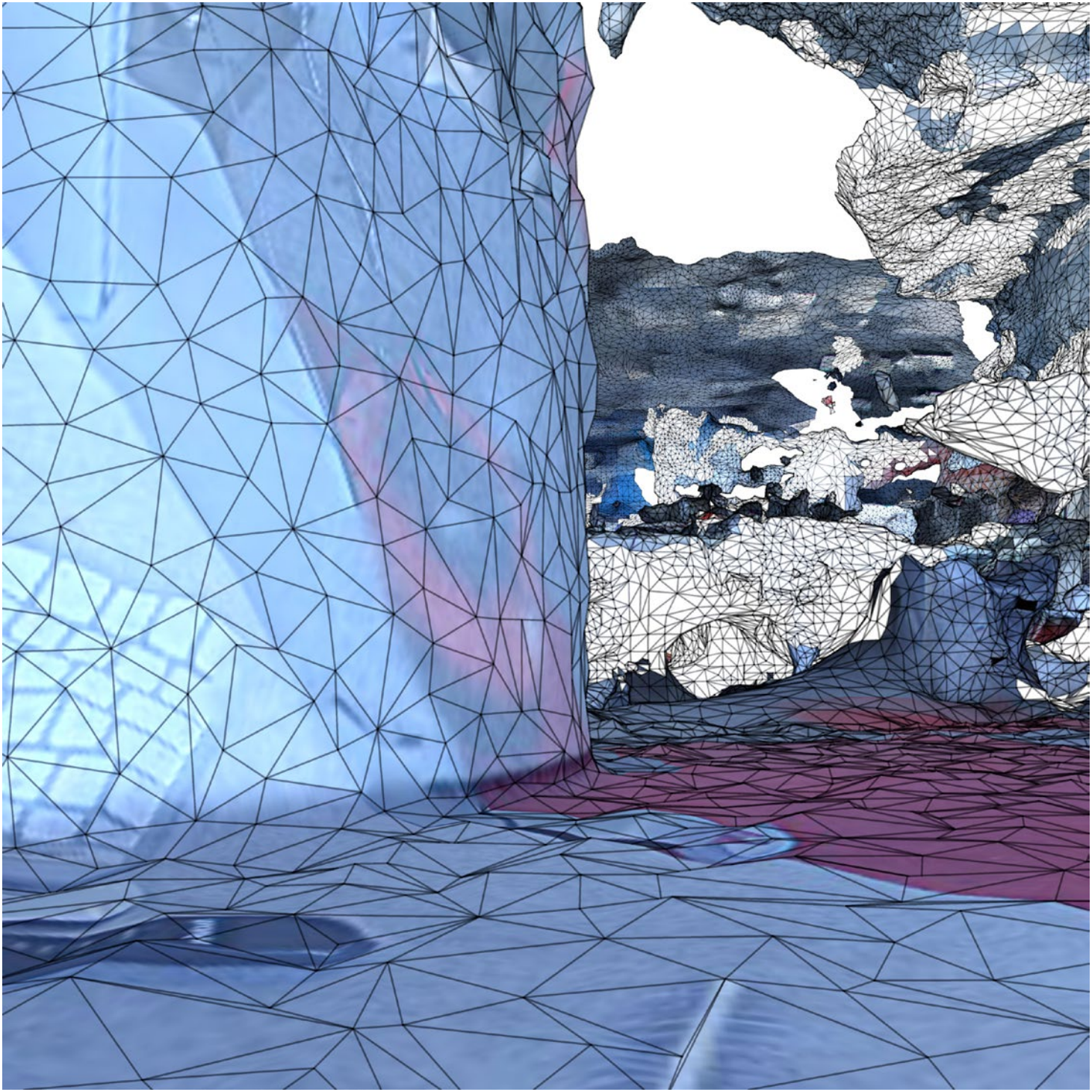
Teraflops or petaflops?
The speech and dialog processing pipeline has been optimized for speed, as well as accuracy, and is made available from a cloud data centre, such as this one from IBM.



Hands-free or a call button?
The Zürichsee meeting room at UBS Bellevue has been fitted with sensors and a touchpad as a call button for the experiment to optimize the experience and security of the consultation as far as possible.

Blind or all-seeing?
Facial recognition technology is used to recognize users as they enter the room so that the avatar can make eye contact with the client and advisor.





Reflection

"Transparency also means that it must be communicated clearly that it is not a real person, but a bot simulating the real person."

Elisa Mekler
Psychologist and Director of the Human-Computer Research Group, University of Basel, https://mmi.psycho.unibas.ch
Dr. Elisa Mekler heads up the Human-Computer Research Group at the Department of Psychology of the University of Basel. In her research, she addresses how humans build up an emotional connection to virtual characters, for example in digital games, and what constitutes a meaningful user experience when dealing with interactive technology.

The history of virtual agents has always been closely linked to psychology. ELIZA, one of the first chatbots in the world, amazed as early as the 1960s with "her" empathic and simulated Rogerian psychotherapy. Recently, a study[1] proved that *Woebot* significantly eased the complaints of patients suffering from depression. Beyond clinical psychology, we tend to treat computers as social actors and ascribe them human characteristics. Have you ever found yourself praising or insulting your computer?

Countless psychological studies also show that a feeling of relatedness creates enjoyment, value and relevance. This feeling not only applies to our interpersonal relationships, but also influences whether certain products appeal to us. Yet unlike on a computer, digital assistants create a personal connection where otherwise rather cold and impersonal user interfaces are often found. Indeed, linguists from the University of Basel have shown[2] that online reviews that describe Amazon Alexa as a person and not as a product – "her" instead of "it", for example – yielded positive assessments.

Is a positive customer experience guaranteed when the digital assistant is particularly "human?" What does a human digital assistant look like and how does it behave? Is it able to build trust?

Into the uncanny valley

According to the Japanese roboticist Masahiro Mori, our affinity with robots – that is, how connected with them we

1 Fitzpatrick KK, Darcy A, Vierhile M. (2017). Delivering Cognitive Behavior Therapy to Young Adults With Symptoms of Depression and Anxiety Using a Fully Automated Conversational Agent (Woebot): A Randomized Controlled Trial. JMIR Ment Health;4(2):e19 2 Duman, SE (2017). Alexa, Do I Understand You? https://medium.com/sci-five-university-of-basel/alexa-do-i-understand-you-ad3ac01a626f

want to feel – includes how human-like they seem to us. Put simply, the more human robots look, the more they appeal to us. While robots may appear "human-like" – almost photorealistic – it is not quite the case. Their looks are blank and facial expressions are wooden. They work in an eerie fashion and our affinity decreases as a result. This so-called "uncanny valley" effect has already been proven in several empirical studies[3]. It is for that very reason that despite realistic features and high emotional expressive qualities, human characters in Pixar's popular animated movies still look a little like cartoon characters. A careful balance is therefore required when designing human digital assistants: How far can a digital human resemble a real spitting image before we start to feel queasy looking at them? A childlike yet competent character could – at least according to the preferences of the customer segment – create a higher degree of relatedness.

However, the uncanny valley effect is not only limited to a virtual agent's visual appearance. Through our daily interactions with other people, we have internalized many social customs and patterns. Should these expectations not be met, a digital assistant can come across as strange or even spooky due to its speech or behavior. When we have a chat, we sometimes take a short pause; with chatbots it takes time to type our message out. A human digital assistant – which takes a short and hardly noticeable pause and does not provide its answer within a nanosecond – does not only seem to be more human, but also more reflected.

Functionality and authenticity

How can you create a successful customer experience with human digital assistants? The video game industry and its research offer a number of possible options. The industry is developing increasingly realistic and emotional characters, and many game characters have proven especially popular for years, despite some unimpressive beginnings from a graphical point of view. Our own research at the University of Basel shows that many people build up a strong emotional connection to characters in computer and video games and value these so-called "parasocial interactions" highly.[4] Their relatedness comes about in two different ways and it always take time.

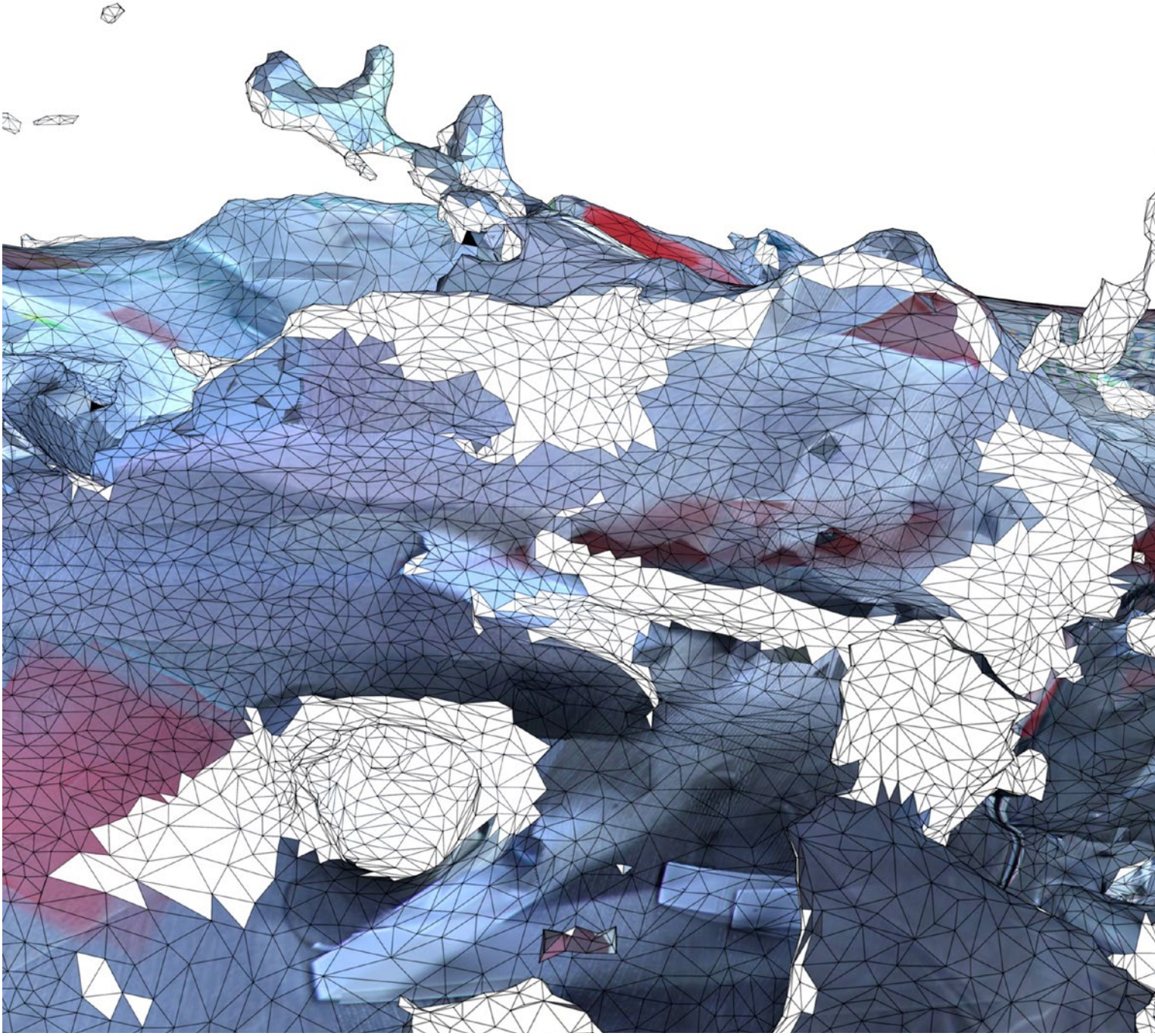
Fundamentally, the functionality of the character determines how effectively gamers overcome challenges in the game, and ensures that the character does not get in their way or stop them from fulfilling their mission.

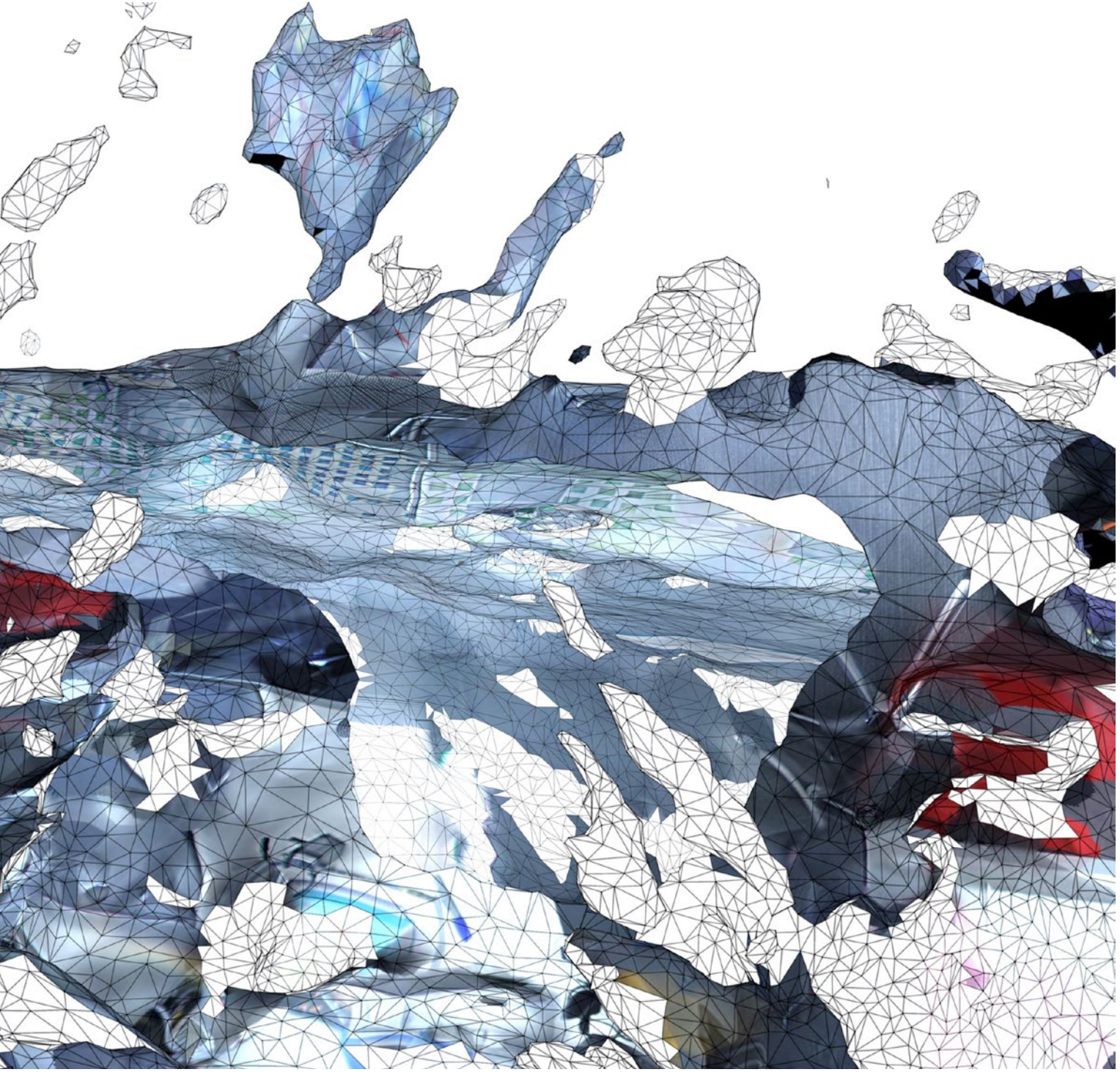
3 Strait, MK, Floerke, VA, Ju, W, Maddox, K, Remedios, JD, Jung, MF, Urry, HL. (2017). Understanding the Uncanny: Both Atypical Features and Category Ambiguity Provoke Aversion toward Humanlike Robots. Front. Psychol., August 30, 2017.
4 Bopp, JA, Mekler, ED, Opwis, K. (2016). *Negative Emotion, Positive Experience? Emotionally Moving Moments in Digital Games.* Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems.

Advanced gamers are often annoyed with the "dumb" artificial intelligence of game characters. It is therefore important to convey to gamers the abilities or features that make a character stand out and which problems they allow us to solve. This recognition of the functionality of game characters should also be of importance when designing human digital assistants. Which assistant or "thought leader" can help me further with my question? And how do I know whom to ask? How do I ensure that it does not constantly get in my way when I know exactly what I need to do?

Furthermore, likable game characters often stand out due to their authenticity. As mentioned above, this likability can refer to their appearance or the quality of (para)social interaction – if characters react to players' actions in an authentic and predictable manner, for example, if they respond when we speak to them or thank us after we have saved the virtual world. Over time, game characters can appear more trustworthy once we get to know them and learn what they do or do not like, as well as their motives, all of which is reflected in their behavior.

What implications does this behavior have for the design of human digital assistants? First of all, it is important to create transparency, both as far as the abilities and the aims of human digital assistants are concerned. In addition, the interaction should be consistent with customers' expectations of the various digital assistants. I place considerable trust in the expertise of a thought leader, but it would not be appropriate and would only inspire limited confidence if their answer to my question included several smiley symbols. There is undoubtedly a need for further research in this area, for example, as to whether customers feel an abstract assistant is as authentic as a realistically designed digital human with a high recognition value. If that is the case, does it apply for all customers? Yet transparency also means that a human digital assistant must not only be authentic, but it must be communicated clearly that – as with the virtual Daniel Kalt – it is not a real person providing customers with expert advice, but a bot simulating the real person. Otherwise, you run the risk of customer trust being abused. The recent uproar surrounding the Google Duplex demonstration proves that we do not appreciate it when we are led to believe something is human, particularly when it appears very realistic. Human digital assistants only enable a positive customer experience when the preferences and expectations of different customer segments relating to visual and spoken behavior, functionality and authenticity are systematically studied and considered.





Interview with Daniel Kalt

How are you feeling right after experiencing your digital self in action?
I am very excited to see how the experiment will be received. I see myself every day in the mirror, I know myself well, and there are various aspects of the avatar's behavior where you can see that it is not me, but an artificial reproduction. Of course, someone who does not know me so well personally would barely notice these details. Yet it is still apparent that this avatar is not a real person. It will likely take some time before we are at the stage where we will no longer be able to tell the difference between a digital likeness and the real person. On the other hand, there are already videos out there which seem so deceptively real that you do not notice they were manipulated. However, an artificially generated avatar with such a high resolution as in *UBS Companion* does not give you that impression. What I find particularly fascinating is how easy it is to interact with *UBS Companion.* You actually find yourself having a conversation.

Are you in the "uncanny valley"?
I do not feel uncomfortable with what I have already seen, even though it still seems very artificial. Admittedly, there are a couple of things I would like to see improved. For example, I noticed that the avatar often raises only one eyebrow. I do not do that – not that I can actually do it in real life!

In the demo, we also intentionally made your avatar show emotion – how did that affect you?
Even though the emotions may be sometimes exaggerated, it does not faze me and I do not feel awkward.

Do you identify with the avatar – is the digital Daniel Kalt more a "he" or an "I"?
At the moment it is still quite clearly a "he." There is still a certain distance. I still need to get to know my digital likeness myself, so to speak. Depending on when I see how clients interact with the avatar, perhaps I will identify more strongly with it and also be able to accept it taking my place in client interactions. At the moment, it still feels a bit odd.

How do you feel about the idea of your avatar perhaps working in dozens of conference rooms worldwide at the same time?
I have to admit that is a special concept. It reminds me a bit of the song *Bim Coiffeur* by the Swiss songwriter Mani Matter, which describes how a man's head with an open mouth is reflected so many times in the mirrors opposite that a whole men's choir appears. On the other hand, my picture already appears in various print and online publications, and I am increasingly being told that someone has "seen" me. So I am used to being seen by many people, even though I have never actually met them in person. However, the "autonomous" vitality of *UBS Companion* is already adding a further, completely new dimension.

How do you think your wife and children will react to the avatar?
I have actually got mixed feelings about this! I imagine that the children will react rather critically. Or perhaps they will simply just laugh about it. That said, they are already used to digital likenesses from the gaming world.

How do you think our clients will react?
I think they will be pleasantly surprised by how well we can produce and present content in interactive ways. *UBS Companion* could especially astonish people who are not technologically savvy. Ultimately, opinion will undoubtedly be divided on the issue. Some will find the experiment exciting, while others may feel uneasy about it.

What do you like the most about the experiment?
I find the link between different elements impressive – from speech recognition to the intelligent retrieval of relevant information and the conversion of text into spoken language, combined with the moving avatar. When I think about what all comes together here, I find it fascinating how we are already getting closer to the vision of realistic artificial intelligence.

Is there anything you would like to change?
Any changes that need to be made will only become apparent in interactions with clients. I think it is important that additional optical elements are offered alongside the avatar, as is already the case with Earth View, for example. Otherwise, clients' enthusiasm could disappear quite quickly.

Something that has not come up at all in the current experiment is non-verbal communication with hands, which I deliberately use in my presentations. Bearing in mind how important non-verbal communication is, we should think about whether this should be considered in further development steps. But that would doubtless mean significant additional costs.

In addition, I always flexibly adapt my presentation style to my audience. The avatar cannot do that at present.

After everything you have experienced, would you take part in the experiment again?
Of course!