



Episode 17: The Neuroscience of Uncertainty, Creativity and Innovation

Guest: Thomas Ramsøy, Founder and CEO of Neurons Inc and Applied Neuroscience Company, author of bestseller book, Leading Transformation, former Head of Research at Copenhagen Business School, with a PhD on the neurobiology of healthy ageing, in conversation with Kris Østergaard on the neuroscience of uncertainty, creativity and innovation.

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Kris: So we're here on the Corporate Innovation Podcast with Thomas Ramsøy. Thomas is the founder and CEO of Neurons Inc and Applied Neuroscience Company. He's also the author of the bestseller Leading Transformation from Howard Business Press and an Introduction to Neuromarketing and Consumer Neuroscience from Oxford University Press, a former director at the Center for Decision Neuroscience and former head of research at the Decision Neuroscience Research Group at the Copenhagen Business School and has a PhD on the neurobiology of healthy aging. I'm talking to Thomas here today about the neuroscience of uncertainty, creativity and innovation. So first off, welcome on the podcast, Thomas.

Thomas: Hi Kris, I'm glad to be here.

Kris: Before we start talking about these different topics, it's always really interesting to learn a little bit about the background of our guests and also sort of the red thread, if there is any, on the professional journey. So what's your journey been?



Thomas: Yeah, it's been a pretty mixed up journey to be honest. I started, you know, originally I'm from Norway and grew up in Oslo and studied, you know, initially business and management and went over to philosophy. I didn't feel that business was so interesting. I was more into philosophy and psychology. It felt like it fit like a hand in glove, to be honest. And through my studies in psychology, I went more into neuropsychology. So I graduated as a psychologist with a specialty in Neuropsychology. And I've been working some years in Neuropsychology before I took my PhD in Neurobiology and NeuroImaging.

So what that means is that, you know, Neuropsychology is the use of testing tools to better understand the human brain and especially to help people with brain disorders and brain injuries to see, to better understand what their problems are, but also to help them, you know, basically train themselves to be, you know, get away from the horrible consequences of brain injuries.

And then when I started to study using imaging technologies such as MRI and EEG, I started to study both memory and consciousness and how we make our decisions through emotional responses. So as I mentioned, I went into Copenhagen Business School and I led a position that was with the university hospital and the business school to establish a lab that did multidisciplinary work on decision making and the brain. In 2012, I was contacted by a large U.S. company that was interested in, you know, trying to understand how they could use neuroscience to better understand consumers, but also their innovation process. And I basically left my tenure position in 2015 to focus 100 percent on Neurons Inc, and I've been there ever since.

4:06

Kris: So and just maybe the quick understanding of Neurons Inc and what kind of organization it is and what your focus is.

Thomas: Right. So you can think that, you know, what we are doing is to use neuroscience tools and insights to understand how consumers, but also people in general, how we think, why we decide this the way we do. And you can imagine, though, if you know behavioral economics, so you know why we have these deviations.

We are trying to kind of open the lid a little bit to understand when it happens, why it happens and how it happens and then how interventions can work. For example, then we have been fortunate to work with some of the largest companies in the world. So that means, you know, especially in the US, Facebook, Google, you know, in Europe, it's things like IKEA, Tesco and so forth. So the things we took to do is to run tests.

So we are using lightweight brain scanning technology such as EEG, together with eye tracking, to measure how people respond to new concepts or products or prototype to advertising, to walking inside a store environment, and to better understand how people respond emotionally to

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things and how, you know, whether they are overloaded with information. And, you know, also to understand how that can lead or also disrupt the decision making process.

5:31

Kris: And, you know, I have a background as a researcher myself. And what I find so fascinating about neuroscience and the things that you guys also are working at is that really it's the first time ever that we are able through technological development now to actually tap into the unconscious of the human mind, right?

While beforehand and what most research is still also about is about, you know, once something has been cognitively processed and the reflections of human beings, although, of course, then the observations that you are able to make and we know that are massively flawed. Right. So. Well. So actually, now this enables you to tap into the subconscious of human beings. Maybe share a little bit about what exactly it is that you're able to go into the brain and uncover that wasn't possible, let's say it's 10, 15 years ago.

Thomas: Yeah, exactly. And I think that, you know, we have been able to use this technology for maybe 20, 25 years at least, and actually much more than that. But, you know, it's been you know, the thing that we see through innovation is that, you know, technology has become much cheaper. It is much more scalable.

Well, we have much better understanding, you know, what the signals mean and also how to de-noise the signals, first of all. So that means that all of a sudden we are now having tools that, you know, 10 years ago, we couldn't have imagined that we would be able to send people into a store environment, testing how they responded unconsciously. And what we're doing is we are using EEG, which is basically electrodes that are put on a person's head.

And we'll be measuring basically the electrical discharges from the brains. They're very kind of vague signals that you can tap into. And it's almost like listening to a very vague radio signal. And what you can do is then translate that signal into different frequency bands. And then if you have more than one electrode, then you can, of course, look at where those different frequency bands occur in the brain. And by then doing studies, you can learn what the combination of frequency bands and positions in the brain are related to certain types of behaviors and certain types of responses.

So what we are measuring, we are translating, translating the responses into emotional responses. And what we call cognitive load. So that's information processing and then other things such as drowsiness and distraction, for example. And the reason we measure that is that we are just going to present here in Copenhagen at the Human Computer Interaction Conference



in a couple of weeks, is also a new measure that we have for stress. So we can measure people's stress from second to second.

8:20

Kris: That's very interesting, also because that's not even funny. We're living in a very stressful time right now - the COVID-19 pandemic, obviously that is putting a massive toll on all of us. And that is really also some of the stuff that we were going to deep dive into in this conversation, because the notion of uncertainty, which is also linked very closely to innovation, in fact.

But I guess we have a whole new level of uncertainty in the world than what we've all been used to for a very long time. And so, talking about this stuff, now that we are from a neuroscientific perspective, now that we are globally experiencing a pandemic and all the uncertainty that it brings with it. What does that do to the human brain? Living in environments like this?

Thomas: Well, I think that there's a multitude of things going on one side. We see that, as you say, it's uncertainty, the uncertainty level, and we don't really know what's going to happen.

The problem is that we don't only have a single crisis these days. We actually have three. You know, we don't see the third crisis with the racial issues that we see in the US. We don't see them as much in Europe, of course. But, you know, I would say, globally we still have three different crises. So we have the Corona crisis, the financial crisis and then the cultural, ethnic crisis. So we can label that.

And this leads to a whole new dynamic we haven't seen before. And it's unpredictable for everyone, basically what will happen tomorrow. So unpredictability is something that we know that the brain responds extremely strong to. Just give an example. If you have a part of the brain called the amygdala that we know is responding very strongly to emotional responses.

So that means if something is threatening, it will just respond instantly and it will send a cascade through the brain to say this is important. We have to switch to, you know, a fight or flight response. This is something that happens, for example, when you watch a horror movie. That part of the brain is even more engaged when you are uncertain about something. So if you feel that your situation is uncertain and unclear, then this part of the brain is actually even more active.

And the problem is that if that stress is sustained for, you know, for too long, it means that you will develop stress symptoms. So this is when you get stomach ulcers and things like that, for example, and all the consequences of stress. So, you know, the concentration, the first and foremost, the most important thing that is a problem is that we have an ambiguous situation. And that leads to strong emotional negative responses that ultimately can lead to stress. And, you know, the consequences of that.

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Kris: Do you know anything about how people in general tend to react to these situations of uncertainty? I mean, if there's a lack of fight or flight response and it's either/or, do we sort of go back and forth between those or do we as individuals tend to choose one path? And how does that split up a population, let's say? Do we know anything about that?

Thomas: I think it's more context dependent. So I think that on the one side, if you look at individual differences, we know that some people respond more strongly than others.

We know that, you know, earlier, there have been some studies suggesting that some genetic variation, just what you were born with, can explain 20 percent of the variation in why some people respond more strongly emotionally than others. So there's something to some extent that you're born with something. And then, of course, over time, through your upbringing, for example, there might be other things that lead you to also become more sensitive for some as well.

So we know that there are individual differences in how people respond. It depends to some extent on genes, but it can also depend on your learning. So if you are an expert within, you know, if you have been overexposed to certain types of stresses, then you get acquainted with them. And it doses down your response, so there are effects there as well. But when you are responding, what we typically see is that, you know, that the flight response goes in. The fight responses typically, you know, that's very rare that you see people fighting back, you know, especially if there's nothing tangible to fight against. Obviously, you know, they can be subtle things, such as just switching off the television or, you know, stopping the YouTube video or whatever goes on that triggers that response leads to an immediate avoidance response.

And very often we see that just as people switch away from something and because then there's no exposure to the negative thing. But it might be other things as well, that if you can't get away from this, you know, bombardment of negative news all the time, then that ultimately can lead to, you know, what can be learned, called learned helplessness. And then you get a really bad stress response.

13:25

Kris: Maybe unpack learned helplessness for us a little bit. What is that exactly?

Thomas: So when you have a learned helplessness, this is, you know, something from you know, I wouldn't call it agents, ancient psychology, but it's actually several decades old. There are studies in, you know, non-human animals such as, you know, everything from dogs, rats, primates, for example, that if you have a situation that you can't get away from, it leads to a much stronger stress response and resignation at the end, relative to if you have some level of control over the situation.



So, for example, if you can imagine in a situation, if you just cannot control the flow of information. In an extreme case, let's say that you're just bombarded with information. Everywhere you turn, there's information about the current crisis. Then in the end, you will develop a learned helplessness because you can't you're just basically risking resign because you can't really get away from the situation.

So that's why it's so important for us to instantiate control in these situations, for our own sake to say, you know, let me control the news coming in. Instead of having an RSS feed that just constantly bombards me with news about something, let me choose when I want to read something and take it away when I want to be free of it. So, you know, enforcing that you have control over things that can stress you is the first step in reducing distress.

Kris: And that then also means identifying what you may be able to control in an environment where some you may have immediate impact on, some you are not at all able to have an impact on. Or how would you go about that?

Thomas: Yeah, exactly. So it could be you know, these could be things like if there are people in your surroundings that constantly, you know, are encouraging these, maybe they're not as stressed as you are. But, you know, they are digesting every single news item there is. And they want to share that with you. For example, you know, you need to take that up with the person because, you know, maybe they are not stressed about it, but you are stressed about it.

So it can be personal, but it could also be you know, we take for granted that we control our phones. The problem is that the phones come built in with, you know, a disruption device for us. It distracts us every single time you install an app. Typically, by default, it will say, OK, I will just give you announcements all the time. So that means that every single time. If you have a news hub, for example, or an RSS feed or something about it will just ping in every single time. There's some news coming in and that alone can actually lead to stress in itself because you reduce the stress, you reduce the level of the information flow. So there are certain things that you can do both interpersonally, but also in terms of technology as well. I think that the interesting thing is that this is something that we have been talking about for a long time in terms of innovation.

You know, one thing is that we're currently seeing this in full display when it comes to, you know, not understanding, you know, how things you know, how information can affect us, how we need to be in charge of things, how ambiguity can actually be a negative thing. And for years, we have been touting that innovation can be stressful because it feels like you need to take this moonshot but it's so ambiguous that you actually get stressed out of it because there's no you know, you can't put crumbs or on the road to say, you know, we have to steps ABC. It feels like you need to jump from A-Z, for example.



So I think that this is very similar to what we see today is that, you know, the lack of oversight and overview on the current situations can lead to distress. And just the context is different. But the effect is the same.

17:16

Kris: So we're definitely going to come back to also talking about innovation as a theme in an in and of itself. But would you say that there are, I guess there must be right, levels of stress and levels of ambiguity and uncertainty. How does the human brain deal with that? I mean, one is I go to work every day and we have this new project and I don't know how it turns out versus the world is in lock down on pandemic. How does the brain deal with that or are we actually able to comprehend the scope of what's going on there?

Thomas: Right. So I think that there are at least two main levels of stress. So one is what we can call manageable stress. So having manageable stress is where you are, you know, lightly stressed. You have some deadlines. You have things to do. You know exactly what to do. There's endless things that you can do.

And, you know, you can actually work 24/7. But you are in control and you can prioritize your job laced into your list and things and so that is what we can call a positive stress. It's manageable and distributed, not leading to a negative stress response with no official logical and physical changes per say when what we see is that the bad the negative stress is when you lose control, when you lose the oversight, when you are not in control or when you lose, you know, you don't think you are in control at least. So those are the kind of the bad control instantiations.

And you know what we typically see when people have stress is that the first thing to do is actually to help them, you know, help to prioritize. So, you know, where do you have control? So you basically create a secure base, basically, that you are here, you have control. Hey, you can select. There are things that it's outside your level of control, but then you can still control other aspects that can kind of create a secure base for you. So I think that's kind of the two main levels and the way that you have to do this. You have to remember that, you know, this is something that is, you know, has been talked about for many decades already, is that we have at least kind of this subconscious part of a mind that is operating by itself is just some autopilot kind of response.

it's impulsive, it's direct, it's emotional and so forth. And that leads typically to decisions right away that, you know, might feel right immediately, but might not be a lot of good for you in the long run. And then you have a conscious route and very often logical system to doubt that, you know, leads you to allow you to kind of take a breathing time and think about what is the actual best choice to me, what feels wide, what you know, what is rationally the best way. How can I control my behaviors? How can I change my behaviors? And what do I need to do for that?

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And we will see that stress is typically this kind of system. One response to the subconscious response and what we need to them to do is to learn people to take a step back, you know, engage, to use the control system, so to speak, the system to and then to start looking at themselves almost as from outside and then look at what do I need to do to reverse myself from A to B to avoid this bad situation.

Kris: So the system one and system two thinking here, system one being the sort of subconscious, immediate, more impulsive responses and system two being the reflected actions.

Thomas: And they also need to know they have two different templates also. So the system one is typically very rapid and it's always on, so to speak and system two is slow and you need to mobilize the energy to actually get it going, so to speak.

Kris: And I know, so Daniel Kahneman, for instance, has written a book about this stuff, thinking fast and slow. So I don't think all of this thinking comes from him, but he's certainly done a lot of thinking about it and certainly also popularized the notion of System One and Two. I saw an interview with him once where he sort of said and I don't know how much he was joking that well, basically there's no way I can control system one, even if I'm reflective about that there is a system one and system two. What is your thinking about that?

Thomas: Well, I think it's to a large extent it's true anyway. One thing is that when you are watching a horror movie, for example and you have too strong of a response. There are, you know, there are a couple of ways that you could do so.

So one thing is that the response will always be there. You will still be scared when you watch a horror movie. What you typically can do is you can you know, your conscious mind can then start saying, you know, when there's a response, it can say, OK, I recognize that response or I start this recognizing that response before it starts to happen. You know, before it really starts to explode. And then you can kind of take the notch out of it. That's kind of a conscious route to controlling your emotions. So early detection and being conscious about what you're actually doing and the negative consequences.

The second is also to know if you want to change your habits. For example, if you really want to stop, say stop eating something unhealthy. What you need to do is then, let's introduce a couple terms. One is to increase the friction towards what you want to avoid. So by friction, I mean, you know, you can add some obstacles along the way. So let's say that chocolate is your desired object and you want to eat less chocolate.

The first thing you have to do is then to reduce the amount of chocolate you have available here. Now, that means move it away from the house or you go to a different room or put it under a lock



or something. So physically do something that makes it more obstructive, more hard for you to find that chocolate. So that's cutting friction. And then on the opposite, you should increase the flow towards things that and behaviors you want to reinforce. So let's say you want to go for a walk, for example, because you want to be more healthy. So what you don't do is then you put your clock to ring half an hour earlier in the morning, for example, or you put your running shoes or walking shoes very close to the entrance. For example, you just have reminders and again, that makes it easier for you to just put them on for a walk. Take a walk even just for 10 minutes instead of, you know, having to go and look for them. So you inverse the problem here. So that's one way to to, you know, control the behaviors that way.

Kris: So one of my favorite examples of working on this in an innovation context, I'm sure you're familiar, is the notion of the institutional yes. That's a method they're using at Amazon. Right. Which is really about introducing friction. So for those who are unaware at Amazon, they have what they call the institutional Yes. Which means that if a subordinate goes to a boss and proposes something, they have this idea and they want to try it out. Then they know the boss doesn't have to say yes.

But if the boss chooses to say no, the person has to write a two page argument for why they say no and posted on the Internet. And so that is really a case of putting in building in friction right. From that sort of immediate system. One response, which would be to say no, because the minute you say yes, everything becomes difficult and you have to find a body, you have to put a team together, et cetera, et cetera. So they're removing friction from the Yes and putting friction on the No. One that is really based on this type of thinking as well.

Thomas: Yeah, exactly. And this is an excellent example, because there's some of the reasons you can say no and anything that will they want to do is to basically change the reasons or limit the types of reasons for saying no and it's just an excellent example.

Kris: Yeah. And before we go more into talking about the sort of the dos and don'ts in terms of innovation in organizations. There is this other part of creativity that also plays a pivotal role when it comes to innovation. So what do we know about the human brain and creativity?

Thomas: Yeah. You know, first of all, I think that a fair amount of debunking is in its place. You know, the first thing you hear when you hear about the brain and creativity is that you have a laterality effect.

That's a left right difference, that the left is more logical and the right is, you know, the creative part, so to speak. And that's absolutely the bullet, you know. It's something that started in the late 60s and early 70s and neuroscientists have been, you know, shifting between, ridiculing it and trying to fight back and say, you know, listen, this is just an urban legend, has nothing to it, you know, but that's it.

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You know, we still have people talking about it now. Just move on with that. I think that what we know instead, sorry, is that there is a difference between the frontal part of the brain and the people part of the brain or the cortical and the deep parts of the subcortical, if you like.

So the cortex is called the brain of the brain. There's also layers of the brain. The way I see it. You have the gray matter, and then the white matter is, you know where at least the long distance cables go. So you can say that when we are studying creativity, there is a very clear pattern that occurs, and that is that the frontal part of the brain, especially on both sides, tends to be, you know, opposite to creativity. So the more engaged your front part of the brain is, the less creative you are.

And then what we will also see, you know, deep structures such as something called the hippocampus, which is typically called a kind of a memory structure. The more activity we see in this region during creativity, the more kind of crazy ideas and crazy associations people tend to come up with. And I think that, you know, when we talk about creativity, there are at least two different types of properties we need to have. So one thing is we need to have divergent thinking. So we need to be able to connect ideas that are not really not dumb. And the second thing is that we need to have convergent thinking. So we need to make those associations, those strange new ideas come together in a meaningful way. And the reason we have that second part is also that, you know, schizophrenic people, for example. They can make really kind of wide associations, connect things that don't really go together. That's why they end up as paranoid schizophrenic, for example. So it has to be useful for something as well. Interestingly, there are studies that also show that people that are in a family with schizophrenics. So that means that they share a certain amount of genetic makeup to the schizophrenic people. They actually go higher on creativity tests.

So that means that there's some component of their side. You know, at least they're able to have this divergent thinking, but then they're also able to have converging solutions to it as well. And what we see then is that when you have a good idea, a great idea, your eureka moment, it always tends to happen when you don't really think too hard about it. And typically, it could even work in the back of your mind because you're in the shower and you know you're doing something completely different. Just about the full force. And that's simply because the prefrontal cortex is then reduced in its activity, allowing the associative activity in the hippocampus to turn, you know, associations into, you know, together, so to speak.

And the second phase and when you need to turn that idea into something useful, that's when the hardware comes in again. And you actually start to need your prefrontal cortex again. So that's where you need to really kind of start holding onto that idea and directing your attention and directing your activities to do certain things in order to move from an idea to a concept and prototyping.

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Kris: So what does that say then about ideation processes that I'm sure most people listening to this have been part of, one way or another. And the whole notion of, you know, getting a group together and how much you do it individually versus you do it as a team, but also the whole notion of deliberately coming together to ideate. I would then imagine it means a lot of prefrontal thinking here, which actually is not good for creativity or how does that work?

Thomas: Yeah. I think that the way that we come to using ideation at this point shouldn't shouldn't really be used for ideation. I think ideation, the best way that it should probably be used is that you gather together to kind of sketch the ground, to lay the ground and also to sketch the problem you have at hand.

Basically activate those associations that you have and say, you know, these are the issues we have. These are the challenges we have. These are the you know, the you know, the groundwork, so to speak. We need to keep in mind and then either you then you people to go separate ways or you can do things together that has nothing to do with this work.

That means that you're distracting. There could be games. It could be, you know, mundane work, for example. What we know from psychology now, especially in the 60s and 70s, is something called tasks related to images and thoughts, which is also called mind wondering as well. So we need to highlight repetitive tasks. That's where you actually deactivate the prefrontal cortex and activate these creativity nodes. You're still the mind is still doing something. So it's preoccupied with something. But it allows your subconscious creative two tracks to start working so well.

What several people have found is then that, you know, when you give people a game because they're still preoccupied, but it's not overloading them or if that you're hiding tasks. Then if you already have loaded them with ideas, that's cool that the ideation phase, if you like. Then people start coming. When you then bring them back to the table for some time, then that's where you actually see some really great ideas coming up. So I think that, you know, the ideation should be rephrased a little bit. So one more way would be to have this kind of pre-ideation phase, then lead ideation to a phase of play or mundane tasks, and then go back again to the ideation phase and now try to come up with ideas. And then from there, you should start designating, you know, solutions and just.

Kris: Is there any research that suggests how long you need to be in the play phase or the phase where you're sort of moving away and doing other stuff?

Thomas: I think that both anecdotal and scientific evidence points to that. There is no, I wouldn't say there is no upper limit. But, you know, if you can imagine that you went to this ideation phase or you went to a great meeting and you talked about the problems, and then next day is when you



actually get the grand idea. And it's similar because the mind still continues working and it doesn't really give up.

And I think that, you know, I would guess that an upper limit will be a couple of days or something. If you don't really reinforce the network of ideas or problems you have.

Kris: Is there also a lower limit? We are also busy, right.

Thomas: Yeah. I think that definitely within the low level group. Just a couple of minutes or something of that. And I think that there is probably a sweet spot that is something like if you spend something like 10 minutes in a game or 50 minutes doing other things, you can actually come back and get substantially more and better ideas.

34:14

Kris: Yeah, that's interesting. And I'm sure that sort of would create a lot of thinking in regards to how many are conducting these innovation processes, which we will also get back to in a little bit. But I know you guys have also been working on something you call a creative potential battery where you are in fact, you better explain it than I explain it. What is that?

Thomas: Exactly right. So this is the work of one of our PhD students who did a PhD on the brain and creativity. And during his work, we looked at how we can collect different, you know, there are several tests that tap into different elements and different aspects of creativity. So, for example, your ability to think divergently. Your ability to connect ideas. Your ability to also converge on certain solutions.

And there's a collection of six different tests, five, six different tests that together provide both a kind of an overall scope. It also provides a profile of, you know, are you the kind of the ideator or are you actually the converter, if you like? So it gives you a good approach to understand how people are scoring overall and creativity, but also their individual differences on different elements and different aspects of creativity.

So this is you know, the battery is based on a well-established test in creativity. So, you know, anything like word mobilization and things to that as well, which are known to be associated with creative achievements. But then they're just put together into a battery.

Kris: OK. And so that means that you can sort of identify the sort of creative profile that an individual would have and then, you know, putting people together in a team in the right manner. Have they done any research into that as well?



Thomas: Yes. So we haven't done that. But there are several other researchers who have looked into how to optimize the group composition. Not specifically by using the creative kind of a potential battery, but by using some of these tests, or at least many know those tests in conjunction then with personality inventories. So if you really want to have a group, it just doesn't really work for a whole group to be, you know, scoring high and creativity. You also need to have, you know, the manager in the room that actually gets things done, so to speak. You know, throwing around gives us fun. But you need to have someone who prioritizes and, you know, comes through and says, this is what we need. So standard, good personality is also a good way to go to look into, you know, how people's executive function or are they good at making decisions on the good balance and risk and so forth. So that's something you have to combine this with as well.

Kris: And is there anything then in regards to also because the whole notion of setting the right team and even though I'm sure some of these things that you are mentioning here is also something that many people are aware of. Yes. It doesn't work to only have, you know, alpha people. It doesn't work to only have the moonshot people in one room. We need to sort of mix it up a little bit. But then the whole notion of actually identifying who those people are and then how to sort of composite the right team in terms of size and mix off, you know, how many radical people do you need? What's the relationship between the radical innovators and the more incremental innovators, if you like? Is there anything known about that?

Thomas: I think at first it does depend on the problem at hand. Do you really need to have a moonshot or are you doing incremental improvements on existing solutions?

You know, if you have incremental improvements, you don't really need to have someone who thinks disruptively, that would actually disturb the actual progress. Well, on the other hand, if you really want to have some, you know, a large part of the company needs to make substantial changes to the business model, then the ratio of people who are disruptive thinkers need to be much larger.

And I think that even at the top level, what we see very often is that we have this kind of, what we call a T personality, a people who have the one side, they have a broad interest, so to speak. So they know a little bit about many things, but they have a high specialty in one or two things. So you need that from a leader as well.

And I think that will be identified through our work with those and their innovation labs, for example. It's also that, you know, you need to have the disruptive thinkers, so to speak. You need to have another person who is a great communicator. And then, of course, you need to have, you know, someone with full executive control. Sometimes, you know, very rarely, but sometimes you are as fortunate to have, you know, all that in one person. I think, you know, people such as Elon Musk is, you know, someone who does this. So basically, you can balance all these things

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through things. But very often you need to have a team or some kind of constellation of people where they actually can understand each other and they can talk to each other. But then they have different roles to play.

39:51

Kris: OK. And so then this is also sort of driving us towards actually talking about the dos and don'ts in terms if you are designing for innovation in an organization. And before we'll just get to that. I just wanted to touch base on a final thing around that, the notion of creativity. I'm sure you also aware I can remember we've talked about this before, but, you know, in researching for my latest book, I came upon this remarkable longitudinal study over 10 years where they had taken - it was NASA study originally where they had taken sixteen hundred children and tested them for divergent thinking, and then they had hundreds of thousands of adults in the control group.

And they found out that at the age of 45 - 90 percent of the children were labelled creative geniuses, whereas, you know, in the adult group, it was 2 percent. And at the age of 10, it had dropped to 32 percent and at the age of 50, it had dropped to 10 percent.

And so the whole notion of well, I mean, yeah, no, I'm interested in actually your interpretation of that. Why is it that we are these creative geniuses at 5 and then, you know, very rapidly goes downhill?

Thomas: I think probably many things go on, but at least, you know, the first thing I would say is habit. Habits is that, you know, on the one side, the thing that we are making habitual choices, it might seem that that is one of the things we tend to have become in many things.

So it can be social conformity as well means that you learn certain ways of doing things and other, you know, ways to not do that. Children don't come with this. They come with an awareness and then alertness to learn the norms and the do's and don'ts in that culture. But they don't come with the norms. You know, I'm born with the knobs. So it means that when we test children, young children, they also when you test them on divergent thinking, for example. They come up with crazy ideas because nobody's told them that it's wrong to think, and that's the way they think. Also very often in terms of, you know, things that are not socially acceptable in their culture. So that means that they come up with things that are not limited by, you know, some cultural factor.

And over time, as we grow, we learn how to think, I think, and how not to think. And I would say I would also claim and I don't think this has been studied, but I think that in certain cultures and nations where, you know, freedom of speech is more hindered and other places, we would see that fact fact of being much larger in societies where we have a much free speech, as in Denmark, for example.

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So if you combine certain Asian countries or maybe Russia or some other places, are that or maybe some of the Arab countries, the ratio, the change in creativity will probably be even stronger in those countries than the rate of the sea in, you know, open societies such as Denmark. So I think that it's kind of habitual in a way that we learn to think of this way. But it's through social conformity. And I think that's the main part of it. Yeah.

43:03

Kris: Yeah. And so it's basically we learn to draw within the lines, right. Throughout our educational systems and so on. And obviously also back to what we just spoke about. I mean, you can have, you know, metaphorically, a whole group of four or five year olds go crazy on the innovation for your organization. Right. So you need to sort of find the right balance here. And so what seems to be the case, though, is that we become so good at coloring within the lines that, you know, it is remarkably hard for us to break out of this.

So with our status quo culture, which is a huge issue for innovation and in most established companies. But the silver lining is I think that if you can unlearn, you can also read or write, which then brings us to the do's and maybe also some don'ts about how you actually design for innovation. How do you relearn your divergent thinking? What are some of the tools we have here?

Thomas: The first thing you have to do is to start making up with every single habit you have. Personally, one place to start, is to say, you know, how can I make sure that I reduce as many habits as I have? And this is as nitty gritty details as which pocket do you put your keys in or which pocket you put your smartphone in.

That's the level of control you need to let go of it, because that's a habit, because as soon as you start changing. And this is what we also see, that when you learn more than one language as well, as long as you start learning new languages, it kind of changes both the brain, how the brain looks, how it works. It also gives you new ideas and new inspirations. So that means also that you don't get more creative by learning to go and just solving a group of puzzles. You get much more creative by challenging yourself in every way. And I mean socially. It means culturally. It means the level of your habits. If you have to wake up at seven fifteen every morning or when you have to wake up. So trying to change things around.

And that's definitely kind of a mindstate that I think that today we have the luxury in modern society to start thinking about doing this, because the payoff of doing that is much greater than keeping people from an 8-4 job. And I think that is. And I think that there are some, especially now during the crisis, we see a softening of those borders as well. So that would be my first, you know, individual recommendation.

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The second is more institutional and managerial. It's also to allow people to do that and also to reinforce that people do it. That also means that if people are OK with it, you can also start having more flexibility at work. And they see that, you know, people when they have more flexible but still safe places, they can go to certain places and have peace and quiet during the day. We need to work for that. But then still, they don't have to park the same parking lot every single time. There's flexibility to it then that can also lead to much more creativity.

And of course, this is not something you have to do for every single individual. It should be for the people that are going to come up with disruptive thinking and disruptive ideas and those that also need to make those decisions and accept those ideas from people. They also need to be, you know, divergent thinking as well, because they need to be able to understand the connection of the dots in order to converge on the decision instead of, you know, the novelty effect when something feels novel. Gut reaction is to say no. So, we also need to have people who are, you know, open to new experiences and open to new ideas. And there's a certain level of personality trait that you can even test for without which standard batteries.

Kris: But the key here is, is the novelty. I mean, regardless of who you walk with as an individual and as an institution is to design for novelty so that you are doing other things than what you are normally doing or exposed to other things than what you are normally exposed to. That then makes the brain connect in different ways.

Thomas: Right. And I think that what we see from brain studies is that novelty in itself. I talk about this kind of emotional structure of brain damage. Right. It actually responds to novel items. So that means that there is some negativity bias, that when something is novel, that's when we have a negative response to it. So novel things are by default treated as something that you should know, you shouldn't read accounts of much about it. You should look away. So to speak. And then through habituation, through multiple exposures, that's when we get used to it and we start to have a slightly positive attitude towards it. That's called the mere exposure effect, for example.

But we all know the brain responds negatively to novelty. And what we can do is then we can take down the barrier to what is novel, so to speak. So if you start, you know, feeling safe about novelty and novel ideas, novel ways of connecting things together and art is a great way to to approach that is, you know, learning things to, you know, understanding why people is is doing something that really disrupts your way of thinking because you have to put yourself in the artist place, for example. So modern art is a great example for, you know, challenging yourself with novelty, if you like.

48:34



Kris: So we don't like novelty, but in sort of rehearsing and creating habits around novelty, then it becomes more normalized to us. And that then ensures that we don't have to marshal that psychological uncertainty, which is another one of those big topics, right? If we need innovation to thrive. We need to feel a certain level of safety as well. And there seems to be a paradox here. So. So do you have other thoughts around that? Yeah.

Thomas: I think to navigate there, you know, there are at least two more things that are highly important for, you know, for boosting your creativity, both individually and also institutionally. One is, you know, I would say kind of call it mindfulness or some kind of level meditation or whatever, makes you more relaxed, so to speak. What you know, one thing is putting down the guards, if you like. But then also what mindfulness meditation actually allows you to do is also to become much more aware of your thoughts, your actions, for example.

So especially when you want to make a decision and they want to reduce that novelty effect, then, you know, being in a more mindful state and mind control state, your life is much better for that. Then you shouldn't over meditate, because then that also means you are activating your prefrontal cortex too much. That reduces your ideation a little bit as well. So use it with care. So mindfulness is not kind of the bill. It is the best solution, if you like, for four for boosting creativity. It depends on what you want. You know, you're focused attention for. If that's one thing. The other thing that is equally important and I've been alluding to that a couple times is reducing distractions, reducing distractions. Because if there's something that, you know, basically takes away, everything is between a modern workplace and modern work in general is that we have digital devices that are distracting us.

There are excellent devices, both distracting us. And I think that taking control and taking charge of that and just basically putting everything on hold and say, you know, it's only phone calls I will get through, for example, or only these two or three people that will get through to me because I know it's important. I need to answer when they write to me or call me - that's taking control.

And that will you know, over time, it actually takes some time for you to get used to that. And then over time, your mind would actually start to get much more relaxed. And, you know, you actually get much more used to focus.

And the reason I'm saying that also is that we have seen when we are measuring on people's brains, when they are picking up the phone. It doesn't even have to be in their own phone and the phone doesn't even need to be on. We see that the cognitive demands on those people's brains increases by 10, 15, 20 percent. That means that the brain already has learned to be disruptive. It has to kind of set aside 10 to 20 percent of the mental bandwidth for the digital device because it's going to disrupt them at some point. That means that it has learned that. And as you say, you can actually unlearn that as well. And that's what we need to take charge of.



51:45

Kris: And I guess another piece of this is also I mean, so in many ways, we have really trained constant interruption or disruption of whatever it is we're doing. Our digital devices is one. I mean, the open office space is southern one of my pet peeves as well, because I sort of like to joke that it's I mean, the only thing is really good for us, like conversation and coffee. But nevertheless, it's how most of us work all the time, right? So what are your thoughts on that?

Thomas: Absolutely agree. I mean, especially if you really need to focus and if you really want to know, good thinking and good creative thinking needs, you know, rest. The mind needs to be restful. It needs to be either doing something very repetitive or it needs to be totally resting in general. So, of course, I'm not a big proponent of this kind of open office space, and I think that there's too much distraction.

We also see that productivity and enjoyment work actually goes down as well. So I think that, you know, when I say that we can have more flexibility and the work at the workplace, it should not be equal to, you know, open workspaces. No, I think the business in general, in the name of COVID, will probably go out sometime. Right now, the offices are going to be redesigned.

But I think that, you know, with that in mind, we should probably redesign them for, you know, what you need to do. So, as you know, I hate to talk about the jobs that a product needs to do. I think that we should think of, you know, office space as a, you know, a job that needs to be done as well. So what do we order this office to do for us? What product do we need to do for us? So if I'm going to the office to solve some practical problems, I need one type of office, if I really need to be sitting down and just think freely, I need a different type of office. And I think that that will be something that can be, you know, designed as we know, you know, redesigning offices.

53:46

Kris: And so now that we are also in this peculiar time now with COVID-19 throughout the world, all that uncertainty it is creating, and you could argue that organizations by default are on the market, more stress and also much more pressure really to be innovative. But we also know from history that innovation almost always suffers during crises. I mean, we may see or we do see those remarkable stories, but generally speaking, innovation suffers.

We become much more risk averse. And so what's your great advice here for helping your organization and the people within it to actually, despite all our circumstances, be able to double down on innovation?

Thomas: I think that, you know, we've never. On the one side, we see that innovation is probably challenged these days. But I also think that we see extremely great examples of creativity in its



best time in its prime. Some bills that people have found solutions overnight, basically, you know, small challenged businesses that are changing from, you know, brick and mortar stores to going online just in the matter of a week, for example.

So I think that, you know, what we need to make sure is that that model that we are thinking is something that can be adopted at a larger scale in industries as well and companies. And the way to think about this is basically to take some of the advice as we've gone through today, you know, how can you actually bring people together? When should you bring people together? And of course, we are now already live in the new era of Zoom calls, right.

So, you know, how can we bring people together on the Zoom? How can we make tools for the Zoom call that actually can boost and, you know, make better ideation processes and concepts development and prototype development, for example. And I think that this is the time to do it, because now we have people in a different state of mind, you know, where every single habit disrupted to leave this one time in, you know, in our lifetime to really change our habits. It's now.

I think that we need to do that with an open mind and open eyes and really take charge with this kind of more conscious style, both about our emotional responses, but also controlling where we want to go. So, again, going back to what we talk about today, increasing the friction and flow to respect what you don't want, the one where you want to go, combined with, you know, kind of the team efforts that we can build into a company here that will be on the one side. And I think that, you know, it's suffice to say that, you know, some of the solutions proceed with virtual environments.

And a virtual relative example is something that is coming more and more now. And I think that the Zoom call, in its due time, will be replaced by or supplemented by virtual reality calls as well, because this will be something that everyone could actually tap into. Or, you know, some people can choose to be in person, others can choose to be in the virtual environment. But in the end, it can be something that we now create virtual spaces that we are together. So it's not social distancing, it's just physical distancing.

57:06

Kris: Is there anything we know about cognitively how the brain sort of reacts to our apps, to physical versus digital versus, you know, the potential of VR once it gets properly there and how the brain can handle it, can we easily jump from one to the other? Or are we preconditioned to always prefer physical? How is that?

Thomas: Yeah, it's a good question. I think that a couple of things that we already know. One is that if the technology is too disruptive to the novel, it doesn't really, you know, resonate with anything you've tried before, then people tend to be quite, you know, held back in terms of



adopting it. They tend to be very overloaded. You know, their cognitive demand levels will be too high. For example, they will have tentatively a negative experience with it and the learning curve can be really high.

But as soon as you start using tools that people are acquainted with or let's say that they have played some virtual reality games or do, then they understand the platform, then you can start introducing more difficult tasks to them in there. There are certain things that virtual reality has that is an advantage relative to a piece of screen. And there's simply that you're all embedded and embodied as part of a context and the brain just takes that illusion for granted. So as long as this solution has no glitches, so to speak, it actually works perfectly.

And it works much better than being on a Zoom call, actually. So we see that. And, you know, on the one side, we did a study for Facebook a couple years ago where we tested how people responded to having social interactions in person vs. in a virtual environment. And what we found was that people felt the virtual environment was almost as good as being in person. And there was a nuance there, as well as the people who will naturally introverted, actually preferred and have a much more kind of better emotional response in the virtual environments than extroverted and extroverted tended to prefer the in-person meetings. So there are certain nuances and who prefers what.

Kris: What was that virtual reality or was that any type of digital?

Thomas: Well, this was Oculus. We used Oculus devices and we used an environment where people could converse and they could see each other and they could hear each other as well. So that was a test of that. But, you know, there's always with technology, there's this challenge that, you know, we are suffering from. Now, if you start suffering from glitches, for example, or proof of performance of the connection or the computer oversample, then the brain really freaks out.

So we have also tested this for Ericsson, for example, where we tested how the what is the effect of basically what is the effect of glitches in virtual reality when you are playing a game, for example, conversing with others and the brain shows a really strong freakout effect that they actually it's compared to when they tested this. What we did was to test people's performance, and some cognitive tests afterwards. We saw that when people had experienced a delay, their cognitive performance dropped by 20 percent. So that means that it's extremely important to have a good connection so that people really don't freak out.

1:00:29

Kris: Well, what about - there's this new thing right, Zoom fatigue, which everybody is talking about. What is going on here?



Thomas: I don't know too much about Zoom fatigue, but I guess that in general, it's two dimensional, you know, in-framed experience. Right. And I think that there's another thing that is problem with Zoom as well, is that because it's not embodied or it's both, you know, although you can have a lot of meetings with a lot of people from different time zones, for example, then it becomes very often a cacophony or you end up with the inverse, which is only one or two people speaking out of 10 on the call.

So I think that what we are slowly starting to learn now is that there are certain upper limits or how many people should be on a call. How complex should the call be? The topic should be, for example, are certain topics that should be off limits for a Zoom call, for example. How long should the protocol be, for example? So it's a certain thing that we think now that we are reaching a barrier. It's typically kind of a cognitive barrier for how long people actually can endure on the call, and especially if you have sequence sequences of calls after each other. Then I think that there's definitely some learnings that are probably going to come up pretty soon. And that's all due to this kind of cognitive bandwidth that we have.

Kris: One of the things we've been experimenting with based off of qualitative feedback is the whole notion of that. You know, when you're on shoom or whatever technology you're using, that platform is that you're always on. Right. So it's like you are always in a frame. And that can actually be exhausting. Even if you're in a physical meeting, you can sort of speak to yourself and pick your nose without everybody looking at it constantly. So we started to in group meetings to sort of make out a norm that it's OK to go black and turn off the camera once in a while if you needed to, without questions being asked or without assuming that meant that people had checked out and weren't part of the meeting any longer. So I guess there's a lot of I mean, there are a lot of sorts of norms that, you know, are used to physical meetings. All of a sudden we have to really look at a lot of these behavioral things as well.

Thomas: Yeah, I think that there will be some people you know, there's probably ongoing at this point, you know, several people who are researching the dos and don'ts of of zoo meetings and, you know, different kind of online meetings.

And I think that right now, if there's any time that we can really learn to do some don'ts these days, because everyone is doing it and there is definitely a fatigue issue. And the only problem, you know, that's the only problem with, you know, few people feeling fatigue is also that, you know, they're probably to be performing, whereas it can even have a detrimental effect on people's, you know, social know, social interaction as well. And even, you know, as an employer, it might actually be bad for you to have people experiencing fatigue because it can actually have a negative halo effect over your brand as your customer or your employee brand. So there are several reasons for avoiding Zoom fatigue.



Kris: Yeah. And so the final thing that I want to be sure just to touch upon as well, while we are talking about how the brain works and how to design properly for innovation is sort of the core theme here. But I'm sure anybody who has children already before the pandemic spent a good deal of time thinking about how to properly educate my children or give them the proper context for actually developing into a world with exponential technology and a lot of uncertainty. And we don't know what kind of jobs they will have. And all of this stuff. And now we have a pandemic and a bunch of other crises, as you mentioned, that are going on.

So a lot of a lot of stuff going on in the world, a lot of uncertainty. And we have our school systems that, you know, are good at some things, but also have a bunch of limitations. So, again, from a sort of I and your scientific perspective, what's the best we can do for our children to be given the best possible context to develop us into this?

Thomas: I think you already provided a good example of a solution, but with the example of the NASA study of creativity changing from childhood to adulthood. And I think that what we should probably think twice about is instructing too much. I think that children already know, especially, you know, right. It depends on the goal. But if the goal is to make children more adaptive and more open to new innovations, new solutions, new new thoughts in general, that then we should do as little as possible, to be honest. We should steer as little as possible. What we should probably help with is to make children aware of, you know, there's certain limits, of course, that does things that there are certain things and certain pages and certain things you cannot do because it's just bad for you.

We know that's bad for you. You know, porn sites or, you know, adult content in general. There's certain things that we just have to put a border on. Then the next is then to, you know, you know, good awareness into their heads that, you know, where is the source of the information you get? Well, because I think that the problem today is not so much children being having a problem with new technologies. Quite the contrary.

They are the first first users of the new technologies. For example, I think the big problem we see is that they have, you know, not too many filters on where it is, this information coming from. And just because it's information, it doesn't necessarily mean that it's true, so to speak. So I think that some level of critical thinking about where this information comes from? What seems to be critical of credible sources and what to keep most people alive, not just having an awareness that there are different perspectives and there are certain perspectives are more representative than others and that more people are aligned on those. I think that will be the first place to start.

At least I'm not you know, I'm not sure how far we should go in just enforcing things on children. I take a relatively lax view without being less bad, but a relatively lax view on this, that there are certain things that we have to have rules but we shouldn't, you know, it's more like a guide rather



than being someone that points on something else and makes them aware of something rather than being instructive and decisive or something.

Kris: And I guess the whole notion of also the creating flow versus friction and action of being mindful of that, if we want to raise our children with strong, creative and innovative abilities to to actually figure out ways to build that into true life is as meaningful advice for raising the children as it is for creating the right work environment.

Thomas: Exactly. And I think that, you know, in the beginning, when children are small, we can, you know, we can be the ones that put the crumbs around the road there and the obstacles in the other direction. But over time, you know, we can only hope and try to introduce that thinking to children. I think that the problem is that, you know, even adults say we are too poor thinking about flow and friction. We are, too.

We take for granted so many things that we are in control and we really are not in control. And as soon as we realized what that actually means, not to be in control and how much the subconscious mind actually does for us and how that leads to, you know, are ourselves making poor decisions in the end, the more we realize that, the more we are able to kind of change our behaviors accordingly. And I think that the more we kind of early we can introduce the thinking in children, the better. There is a certain natural there is to it. You know, the prefrontal cortex is the latest to be developed in children. It develops until the early 20s. You'll be surprised, but it is actually the first phase of the brain that actually goes in healthy aging as well.

So in all this, there's work to do here. There's a little there's certain times where you just it's too early to introduce certain concepts to children. It's a moving target. So I think that, you know, introducing things with children, having talks with them and actually introducing things over time is probably the best approach.

Kris: Right. And with that wonderful advice on how to also think about your children in terms of brain development. I'll say thanks a million times for being here on the podcast. It was an absolute pleasure speaking to you. And I look forward to following what will happen within this remarkable space in the future as well.

Thomas: Wonderful. I appreciate it. Thank you.