Im a Mortal Episode 5: Dmitry Kaminskiy – Deep Knowledge Ventures

Speakers: Dmitry Kaminskiy (Guest), Sufal Deb (Host), Marvin Yan (Host)

[MUSIC - Im a Mortal Theme]

Dmitry Kaminskiy 0:14

Hello everybody. I'm Dmitry Kaminskiy. I'm a co-founder and managing partner of Deep Knowledge Group. This is a consortium of for and non-profit organizations, two investment funds in our group Deep Knowledge Ventures. This is DeepTech, AI focused investment fund and Longevity Capital, this particular investment fund is focused on longevity industry. We have a number of analytical subsidiaries, including Deep Knowledge Analytics, NeuroTech Analytics, and one of the best subsidiaries was the first longevity company in our group, Aging Analytics Agency. It was established back in 2013. For this analytical company—actually probably one of the most, one of the few in the world, which particularly focused on the longevity industry, aging research, longevity financial industry, the investment analytics looking at longevity, and even politics, longevity politics.

Sufal Deb 1:20

Thank you so much for coming on to our podcast, Dmitry. To start off, we've been asking this question to all our guests, our podcast is called Im a Mortal, a play on the word immortal. What does the word immortal or immortality mean to you?

Dmitry Kaminskiy 1:32

Well, I'm considering this topic from the point of view of engineering. The same as, for example, Elon Musk is considering space, not just space exploration. Whatever project he's doing, he's approaching those projects as an engineer. The very same could be and should be done in regards to longevity. To go back to your particular question, immortality. Well, Ray Kurzweil, his books and his projections predicted that, technically speaking, probably from a technological point of view, immortality will be achievable or possible in 2045. In the sense that, his predictions will be possible, so-called mind upload, in a sense that the transmission of all information in the brain is towards the computer.

Sufal Deb 2:23

Do you consider the mind upload a form of immortality in your perspective?

Marvin Yan 2:28

Would you want to undergo it as well? I know you're focused more on longevity, so this is a little bit of a sidetrack. But would you be interested in that sort of technology as well?

Dmitry Kaminskiy 2:35

Well, it will be in 25 years from now, if it will be. From a pragmatic point of view, we are much more focused on what will be in the next 10 years rather than the next 20 years, because by that time, 2045, there is too much uncertainty. We don't know exactly how it will be and in what form it will be

in. However, it is much more doable and much more practically applicable to predict what will be in the next two, three, five, or ten years.

Sufal Deb 3:04
In terms of longevity and all your work, what technologies are you and the world investing in right now and as individuals ourselves, how can we invest in it?

Dmitry Kaminskiy 3:13
When we entered this field in 2013—by the way, by that time the word longevity was not yet common. Longevity as a brand name means for this field of research and science technology—I think it started to be common, including the media, probably around 2017. Before that, the word anti-aging was much more common. However, it was diluted by different companies specializing at distributing different plastic, the products sounded like creams, so anti aging creams, so called anti-aging supplements.

Where am I reading this? Approximately in 2017, 2018, Aging Analytics Agency profiled what would be named longevity industry. We formulated this industry and we defined great framework, what does the longevity industry mean? What should be included? What sectors are actually somehow related to that and which sectors are not related? By now, we have added 520 sectors, and we also estimated the size for **[unintelligible]** positions—30, 40 years endorsed currently, including national healthcare budgets, which is a quite significant portion, including the budgets of financial corporations, such as insurance companies, healthcare insurance companies like life insurance companies, and pension funds.

This is all in some capacity, in some mode is related to longevity. Now, a particular biomedical, regenerative medicine, preventative medicine, pills, this is in total global scope, approximately two or three trillions of dollars. There is also the Age Tech sector. This is modern products and solutions for all people using innovative approaches at the intersection of elder care, and IT technologies so maybe some mobile apps. This Age Tech also works on two to three trillions of dollars on a global scale. To go back to your question, we have two priorities in terms of investment focuses.

We were focused on applications of artificial intelligence for aging research. First of all, its biomarker of aging and longevity, this is the bottleneck for the entire industry. Without those markers, without those metrics, you can't really estimate wherever any technology providing any beneficial effects in terms of rejuvenation, no resource allocation, or at least slow down aging. This is the number one priority.

The other priority is Longevity FinTech. Modern applications of financial technology, towards health longevity. One of the examples, one of the projects, which we supported, invested in, and now helping them to expand also towards the United States versus **(??)** longevity banking cut **(??)**. It's typical, quite modern FinTech solution, but with the focus on people who are actually pursuing a healthy lifestyle, willing to live longer, healthier, more actively, a more productive life. Basically, this is still the marketplace in the form of mobile app and desktop solution, integrated with MasterCard. This is one of the examples. There's also—we have some interest in ensuring that you know,

modern applications of healthcare insurance, but again, integrated with modern longevity FinTech and a number of our innovative applications, which tune towards longevity.

Marvin Yan 6:50

You mentioned a whole lot of industries there. Before we jump into them, because I know this is important for our listeners who might not know about the biology of aging, do you mind just telling us a little bit about some of the biomarkers? I think we've heard some things like telomeres, this senescent associated secreted phenotypes and stuff like that. Is there any particularly biomarker that the industry is particularly focused on right now?

Dmitry Kaminskiy 7:08

I'm not sure about telomerase as a relevant biomarker in regards to longevity. It was quite popular as you know. I will say a little bit over promoted as one particular sector, whereas in reality, we should talk about panels of biomarkers. I will say, the relevant panel to really measure what is happening, or if any given **[unintelligible]**, it should consist of at least 100 biomarkers, maybe several hundreds. Some of them require so called **[unintelligible]** tech. You can measure them with quite simple solutions without a significant test on silica equipment. Let's say you can do it at home, maybe with mobile apps.

Some of them actually, using just facial recognition, which is the future where AI achieves the best results in facial recognition. When you're looking at the person, at the face of any person, you just without any equipment, you can use your eyes and your brains to assess what is current biological age of the person. This is a very simple scheme. It's one of the best biomarkers. Now, let's say there are aging researchers' team recently published a new analytical report, I've actually also created IT platform for the review of the Longevity International website.

There's a system of biomarkers resource. They profile several hundred laboratories, several hundreds of scientists, important 100 companies doing some resources, some technology, so they already have some practical applications in terms of biomarkers or even panels for them. Now, some of the biomarkers requires deep resources, very expensive equipment. It will be done, let's say in specific clinics, where some of the markers does not requires complex movement or technology **(??)**.

This is the diversity of biomarkers and whenever you are assessing the actual biological age of any person, **[unintelligible]** assessing whether any specific interventions for specific drugs, pills, food supplements, our technologies, whether they're providing positive, negative or maybe neutral, like plasma. Because the bottom of that many food supplements, buy supplements, let's say many sellers, marketing as you know, as anti aging drugs. This is the best-case scenario which is not just possible, in many cases, they can degrade in the body, if you're taking for a long time, such you know, especially synthetic chemical-based supplements or maybe some kind of specific drugs and this could be accumulated and eventually provide negative effects. Not only neutral effects.

But to go back to biomarkers. In reality, the panels for the markers should be not only quite sophisticated, robust, and take into account multiple parameters. First of all, they should be personalized themselves. The panel biomarkers designed for me, it should be different, let's say with

you. Each person will have a little bit different measures and those biomarkers should be adjusted towards a particular person. Apparently, we're talking about data science, about p-values.

This will integrate what additional **[unintelligible]** in other words, it is impossible to assess panels for biomarkers, to measure them in order to track them without AI technologies. Plus, these panels should be not only adjusted towards a particular person, they should be adjusted from time to time in the sense that those particular metrics, they will fluctuate from day to day from week to week. For example, if you're in Toronto, now, and let's say you will move somewhere in Africa, or let's say another climate, another temperature, another humidity.

All of this will provide some input, and all these metrics will have to be adjusted. I think that currently there are at least 10 companies, which can provide more or less relevant balance of biomarkers for you to measure your current biological age and some kind of input for what you're doing. However, I think the market readiness, robust sophisticated balance of biomarkers will be market ready in around two to three years from now.

Sufal Deb 11:32
You mentioned earlier in the conversation that AI could be used, for example, for facial recognition, because skin is a great biomarker for aging. How else can AI be used to accelerate longevity research? On top of that, what is its relationship to personalized medicine? How can AI be used in relation to personalized medicine?

Dmitry Kaminskiy 11:50
I would probably ask this question in the other way. Can you give an example where research on human life extension would be without AI? I don't know such fields. In other words, if researchers don't use in the 21st century, if researchers are doing some significant research on human longevity. If they're not using AI, if they're not using data science analytics, I don't think this is serious research.

Sufal Deb 12:21
It's a new standard to use artificial intelligence and research for longevity.

Dmitry Kaminskiy 12:25
Absolutely.

Sufal Deb 12:26
In relation to personalized medicine, do you have any comments on that, artificial intelligence related to personalized medicine? Do we see any advancements right now?

Dmitry Kaminskiy 12:33
Once again, personalized medicine it's about—maybe we should start with personalized health. There's a term such as precision medicine, in terms of human longevity, much more than precision health, to maintain precision health, you need to know the data science of your health. You should be the CEO of your health, the director of your health. It's not that simple in the sense that to really be a data scientist for your health, you need to monitor your health in a very precise and very deep and

very personalized mode. This is again, when going back to this precise balance of biomarkers. Again, I don't see how that could be done without data science and data science nowadays cannot be done without artificial intelligence.

Marvin Yan 13:29
You've talked about how you've had some predictions for the next 10 years. I think you've written about it in one of your books, and you're going to continue talking about it. I think longevity industry 1.0 was just defining industry, 2.0 10 years, and I think there's a 3.0 eventually, as well as Dmitry? Possibly?

Dmitry Kaminskiy 13:42
Yes, I think there will be a 3.0—

Marvin Yan 13:44
Okay well we look forward to that.

Dmitry Kaminskiy 13:46
and probably 4.0.

Marvin Yan 13:47
Oh 4.0 as well. Could you just tell the audience right now, what you envisioned the next 10 years to be like, and how we can prepare as banks, insurance companies and even individuals—how we can prepare for this next decade?

Dmitry Kaminskiy 13:59
Well as you know, current times consider this as the time of the fourth industrial revolution. It's huge and let's say, a combination of multiple technologies into two super industries. For example, when we're talking about longevity, it's not only about science of aging, it's not only about biomedicine, it's not about precision medicine, preventive medicine, precision health. It's all about integration with as I mentioned, for example, with InsurTech, with FinTech, with health, with smartphones, with different wearables with different, let's say specific micro devices, which will be embedded into the body to measure to ensure and all the current state of health and I know we'll provide some red flags if there will be any specific issues.

We can estimate that by 2030, there will happen fifth Industrial Revolution where singularity will be achieved in 2045. That will be considered the sixth Industrial Revolution. 10 years from now, we can estimate that there will be this super—within the next 10 years, the progress and technology including longevity improvement, personalized biomedicine, precision health, there'll be incredible progress. During the next 10 years, the quantity of the progress which will happen will be equal to the previous 30, 40, maybe 50 years.

Currently, the speed of progress, especially at the intersection of science, technology, artificial intelligence, it's already incredible. But this speed of observation, it's a self-inducing cycle so the creation will exceed current pace of progress. Now, in terms of, forecasting technological progress,

it is quite doable to predict what will happen in five years, it's a little bit less doable to predict what will happen in seven, eight years. And soon, for more pragmatic technological point of view, what you could predict maximum horizons is 10 years from now. In a sense, predict and forecast in a tangible way, not theoretical abstract way.

The point is that by 2040, first of all, there will be achieved so called escape velocity. What does it mean in particular? For people of middle age, let's say I'm 45. 10 years from now, I'll be 55. But I'm quite sure that by the time the progress in science, technology, and medicine will be so significant, that age 55 will be my maximum age. In the sense that it will stay 55 and probably in 2040, and maybe even sooner, we'll be able to reverse, to decrease my biological age.

For you, because you're younger, this will happen even faster, whereas for people who are let's say now, in age of 70, 80 years, for them escape velocity probably will be shifting to 2035, 2040 in the sense that technologies which require for younger people, they're a little bit simpler technologies which require to freeze the biological age of all people already having tissues with health and immune system. Technology for that age category. Quite more sophisticated, more advanced, and this is reverse when your project is—in a sense, the younger you are, the easier, the sooner this will be achieved to the stage of this escape velocity.

Marvin Yan 17:31

Dmitry, you talked about the rate of rate of change is accelerating, so it gets faster and faster. I want to ask how you think different aspects of society, especially in relation to longevity, how they will change? I know you mentioned insurance companies and banks in your book a bit. I just want to know, to what degree can we expect the change? How should they prepare?

Dmitry Kaminskiy 17:51

Okay. So, no, five years ago, when you were talking about the people who live up to 120 years, you were considered as fringe. It was just five years ago. In 2015, I established the $1 million prize. It will actually be a gift to the first person who will celebrate his or her 123rd birthday because the previous life record belongs to Jeanne Calment who died back in 1997 in Paris at the age of 122 years and six months. Apparently, there's significant genetic predisposition to extra long living. However, this very simple logic, since 1997, the progress in biomedicine was tremendous and if Jeanne would live now, we'll be able to extend life at least for another six months.

Apparently, she would celebrate her 123rd birthday and most likely 125th birthday. From technological point of view, to celebrate 123rd birthday, it is doable already now. However, the perception of general public and media in particular, five years ago, it was somewhat unusual, because by that time, it was normal to talk that we will live up to 100 years. Then just within a couple of years, because a lot of media hype around the topic, now to speak that we will live up to 120 years is totally normal. Nobody confirms this.

Now many people, even serious people, even financial investors like financier's, bankers, they're talking about it, maybe we will live up to 150 years, up to 200 years. It became normal. In reality, the very same **[unintelligible]** even five years ago because technological progress in biomedicine quite **(??)**

already was quite significant. Technically speaking, the major difference with what happened in the last several years, it's quite significant progress in this field of research and development related to biomarkers of aging and longevity. This is very significant because this is the bottleneck of the entire industry. With this practical application of these biomarkers, this will adjust what real practical applications of human longevity, not animal models, human longevity. This is how all that research could be applied much more practically and much more tangibly towards humans.

Marvin Yan 20:18

Okay, we use this term Silicon Valley quite often. In terms of driving progress in longevity industry, I think you use the term Longevity Valley and there'll be some countries, which could be the longevity hub. Could you describe those two terms in more detail and what you think of them?

Dmitry Kaminskiy 20:31

Well, first of all I don't think that in Silicon Valley, there's real progress related to human longevity. There's a lot of progress towards mice longevity.

Marvin Yan 20:38

Yes, I know.

Dmitry Kaminskiy 20:40

There are other countries. There are some other regions where scientists and doctors are making a little bit more progress towards practical human longevity, rather than mice longevity. In Silicon Valley, from my point of view, they're yet more focused on mice longevity. In regards to Longevity Valley, I imagine that there will be no some particular, small smart region in the form of smart state or smart city, where everything will be tied towards the idea of extension of healthy period of life, healthy active period of life.

Currently, Singapore is number one in the world by healthy life expectancy. Hong Kong is number one in terms of life expectancy, of health life expectancy. It's a little bit different because DALY, disabled life years, this gap—for example, in the United States, between the healthy period of life and the unhealthy period of life is 10 years, even close to 11. Guess we **[unintelligible]** guess of most other developed countries, 10 years. This is the period of back when, people actually suffering, they're having a lot of, let's say, illnesses, a lot of pathologists, and eventually, they're dying from one of those diseases, age-related diseases.

Now, in case of Singapore, the gap is four to six years. In the case of Japan, the gap is seven years. In Singapore, people are living long, but also, they're living I think, up to eight to seven years on average, in health more. There, this kind of DALY, disabled life years, it's only approximate six years in the case of Singapore, in the case of Japan, seven years. The major idea that in case of really advanced, technology driven Longevity Valley, this gap will be decreased, even down to five years, maybe down to four years.

So, I think that some kind of particular countries, so Singapore maybe Switzerland, maybe some countries such as Liechtenstein can pretend that maybe that will be developed in the next five to 10

years. This kind of **[unintelligible]** system of most of last condition, most advanced medical disorders, healthcare technologies, data science technology is required for that, but also financial technology, because if you're going to live longer, you also should plan your financial wellness, also in advance and to maintain your finances in such a way that you will be able to pay for those advanced medical services, especially when you will be close to 100 years.

Sufal Deb 23:22

As you know, our interview right now is unfortunately virtual, but with COVID-19 and the pandemic going on right now, has it accelerated or slowed down research?

Dmitry Kaminskiy 23:30

It accelerated it and quite significantly because before pandemics, many people, including scientists, they were doing different resources not related to human health. Nowadays, many people including high level **[unintelligible]**, they start to understand that probably not wealth is the most precious asset, but health is much more precious. Many of what we do see, even particular 2020, a lot of investors support us, asking how they can invest into something related to human longevity in a tangible safe **[unintelligible]** mode.

We are designing such investment stages, the ones that during pandemics, people started to think less about luxury stuff such as super expensive cars or yachts, maybe real estate. This became less important. They kind of proportion how much people are thinking about this increased significantly. Go back to practical progress in science and technology. Well, COVID actually changed this more from too much speaking at the conference to different meetings.

This switched to towards a little bit more doing to be more focused on some practical results, instead of just socializing, for example, between scientists, which was quite common before pandemics. Nowadays, let's say people are working more and more tangibly focused on some practical results. For your understanding, a lot of other industries, they declined, but then it's worse. Biomedicine, biotech industry is one of the few industries probably along with anything related to such technologies for remote work including Zoom. This veer to technologies was significant but also biotech industry is very significant. Even 2020 and beginning 2021, because of **[unintelligible]** accelerator is another—

Marvin Yan 25:32

On the topic of this industry of longevity, you talked about a lot of the pros so far. I think the pros are quite obvious. Are there any cons or complications that people might not realize? Is there anything that in particular that people should know about, in that case?

Dmitry Kaminskiy 25:47

Yeah, it will take them years. It's already now the biggest industry, compared to the others. As I mentioned by our estimations, the **[unintelligible]** industry is 34 trillion, and it will grow. It has grown steadily, and it will grow more. Whereas other industries, which are not essential to humans, including maybe some luxury stuff, maybe some kind of, let's say outdated industries, so, they will

decline because many people and many investors will transition from those non essential industries to most important industry which is the longevity industry.

In other words, yes, there will be cons, and it will be more related to industries, which are not providing to humans, what is really important to them. I think that this will also provide impact on politicians and government officials, because in the next five, seven years, when citizens of many states will realize that actually, government, if it will be incentivized **[unintelligible]** will be able to stamp out the period of life of their citizens and citizens will demand from politicians to provide such solutions.

Normal states, normal governments in the next five, seven, ten years, it will be the norm that governments will declare that one of their priorities is to extend healthcare for the lives of their citizens. That will become for politicians, for governments, for Parliaments, this topic will become quite significant. If five years ago, it was strange to talk about life extension now became normal, you will see that in the next five years it will become normal on the level of politicians and governments to prioritize this topic.

Marvin Yan 27:38
Okay, so pretty much in the sense, not only will they it's not a matter of once the governments have an obligation to their people to almost put money and time into this technology.

Dmitry Kaminskiy 27:47
Exactly.

Marvin Yan 27:48
Okay. Okay.

Sufal Deb 27:50
This is just a little bit more of a personal question. Do you see everyday people, people who may not be in the biomedical field or longevity field, can you see the topic of life extension becoming a daily activity? As you mentioned, the government may push longevity for its people. Can you see people in daily life talking about it; it becoming a daily occurrence?

Dmitry Kaminskiy 28:09
Even without longevity, you can see how even the last five years, the topic of healthy lifestyle became, absolutely, one of the major topics for discussion, including, different diets, different fitness, running. It's now became quite central on the essential part of society, this topic. In the next five years, there'll be more and more practical applications for practical human life extension, people will start to talk, actually to think in such a way that they shall take care about their extension, extension for their healthy period life, productive period of life.

This will become maybe not in all societies, let's say **[unintelligible]** and people living in a developed country, so this will become the very same as now people think about health, lifestyle, and fitness, which is normal and many people you know, pursuing such a lifestyle, and the same way, in five years, they will talk, and use, and do human longevity.

Just because this fitness dies and all these simple methods of improving lifestyle and health so they will become data and science driven, because now it's absolutely horrific **(??)**. Doctors providing some recommendations, not knowing how **[unintelligible]** important in real mode, the health of their clients and patients. In five years, instead of doctors, AI with sensors, with biomarkers will really provide you recommendations, how to maintain your health, including fitness, sports and all that, and food supplements. So and so forth.

Sufal Deb 29:59

A collection of our data will help us with our own medicine. A question that a lot of people bring up, even myself at one point, with the idea of immortality, if suddenly everybody were able to live like 120, 150, 160 years, wouldn't there be problems such as overpopulation and things like that? In general, if there was a sudden increase in life expectancy, what negative side effects can we expect to see?

Dmitry Kaminskiy 30:21

No negative side effects, there will be no overpopulation. The quantity of people on our planet should be probably 25 billion. I think that 90% of the planet, they're not headed now, including desert simply, you know, north, or the south part of the plan. There's a lot of space where people can expand their living areas. Very same with food production, so there will be no problems with food because technological related food production, they of course, will exceed, far exceed any growth of actual population.

The only one problem is with pollution, which is increased. Indeed, the problem already now without overpopulation is a topic for first of all, right government amendments, because currently, most of the government's they don't care about pollution at all. This was second, the solution will be—there are a lot of progress and science research and development on the network, different types of efficient and utilization of pollution, including, for example, bacteria which are eating chemical pollution, including different new metals related to new materials, and maybe even now **[unintelligible]** and also robotic orders **(??)** and different drones and warmer **[unintelligible]**. I think that robots on a massive scale will be able to improvise pollution, including, for example, pollution in ocean.

Marvin Yan 31:55

Dmitry, we don't want to take up too much of your time today, we said it'd only take about 45 minutes at most. So, for people who are interested in your work, I know you have a bunch of books coming out, you already had Longevity Industry 1.0 2020 last year. For people who are interested in these books, could you tell us a little bit about them, what they can learn, and where to go to find them?

Dmitry Kaminskiy 32:14

Yeah, so, the next book will be Longevity Politics. After that, they will do Longevity financials here. Then there will be practical longevity, the practical guide helps you reach your 123rd birthday. I will describe technological time using from my life extension and eventually at the end of this year,

there will be Longevity Industry 2.0, deep tech engineering, the trajectory of human longevity. All these books you can find at longevity-book.com and our major site of our consortium is dkv.global.

Sufal Deb 32:48

For all of you guys listening, any of the links Dmitry just mentioned and discussed will be in the description below. Once again, thank you, Dmitry for coming on Im a Mortal, your source for all things immortal. We really appreciate you taking the time to come and speak with us today.

Dmitry Kaminskiy 33:00

Thank you. It was my pleasure.