

Ep 11 – What Shape Us with Mr R A Mashelkar

Recorded on May 15th 2026

[Vidya Mahambare] (0:13 - 2:14)

Welcome to What Shapes Us, a podcast of Great Lakes Institute of Management. I am your host Vidya Mahambare. In this series, we try to unravel complexities of life with a framework of five E's.

These E's are endowment, environment, education, effort and equality of opportunity. My guest today is India's one of the most consequential scientists and science policy leaders. Government of India has honoured him with three of the highest civilian awards for his exceptional service to the nation, Padmavibhushan in 2014 and earlier Padmabhushan and Padmashree.

He is among only one of the three Indian scientists as a fellow of royal society since its inception in 1600. And I understand he is the only Indian from India to be on the list of US Academy of Inventors. He has written several acclaimed books, hundreds of research papers.

He has guided numerous PhD students. But his most well-known achievement is a transformation of CSIR, Council for Scientific and Industrial Research, which is the umbrella of 40 plus national laboratories in India for innovation. He transformed it.

He is a pioneer in the process of what we call public-private partnership in science in India. He pioneered Gandhian engineering. As name suggests, he believes in bringing innovation to the common man and transforming millions of lives.

His latest book and we have it here, More from Less for More. We will talk much more about it.

His is a story of rags from riches, but riches of a different kind -wealth of knowledge, innovation and a service to humanity. He is Dr. Raghunath Anand Mashelkar.

[Mr R A Mashelkar] (2:14 - 2:15)

Namaskar.

[Vidya Mahambare] (2:15 - 3:38)

Namaskar. Thank you very much for giving us your time today. Your life is a live case study, which keeps on unfolding.

So you are in an institution in itself. So we will take part by part. Because we look at life journeys, maybe we will start with the first E, which is endowment.

So by endowment, what we mean is some sort of birth lottery. How we come into this world, which is not under our control. A place we are born into ..maybe in India or abroad, or maybe in rural India or urban India, even gender, because that matters in a country like India. It can be the family background, you know the education of parents or wealth, which is not in our hands. It also includes our inherent traits, which we realise much later on.

But maybe some talent, memory, health, some of these things may come naturally to us. So you were born in Goa, Mashel, in North Goa. If you could tell us more, what you can recollect and what you learned from that endowment as you grew up.

[Mr R A Mashelkar] (3:38 - 8:35)

Yes, first of all, I must say it is a great honour and a privilege to be on this series. And the five E's that we are talking about are really the essence of life's journey. And I am very happy that we are starting with the endowment itself, because that is something I did not have.

I was born in a very poor family. My father died when I was six. And my mother brought me to Mumbai in search of a job, search of living.

Two meals a day was a challenge. She had to seek a job every day, some stitching, something here and there. She was not educated.

She never went to school. I walked barefoot until I was 12. I studied under streetlights.

So you can see that in terms of endowments, in terms of access to things one should naturally have at birth, I had practically nothing. But the greatest endowment that I had was my mother. She was a great woman.

A lot of people give me credit for lots of things. As our interviewer, I will explain to you what role she has played in what I have become famous for, so as to say. I think that was sort of a very, very powerful endowment that I had in terms of my mother's resilience, her determination.

She actually was the embodiment of the fact that scarcity and aspiration is a deadly combination. We had scarcity, but she had an aspiration for me and that worked very well. I mean, for example, I always stood first in the class and that endowment came to me sort of naturally in the form of some talent, I would say, some intellect.

But she would set very high standards. For example, in maths, I would always get 100 out of 100. Occasionally, I will get 97. I was happy. She would make me sit and say, where did you lose those three marks and why? So I was looking at 97 and she was looking at the three that I lost.

That's a big lesson as a matter of fact, to achieve the best that you can. Right from my childhood, I think that was something that I must say was very, very important. The generosity of the people who helped me was another endowment that I would have because you need help when you're struggling.

For example, I remember I went to a municipal school, studied in Marathi and always stood first and in 7th standard, I had some 87, 88 percent marks and so on. And I had to go from a primary school to a secondary school. Now, that required 21 rupees because I didn't have shoes.

I had to wear shoes. I didn't have a uniform. I had to have a uniform, school fees and the rest of it.

So my mother took around three weeks to actually gather that 21. And you know, where does money come from? From a housemaid who was working with a rich Gujarati family in Chowpatty.

It was her savings that she gave me. So having such kind people who would give their savings for you, I would say is also an endowment, having that particular part, being surrounded by kind people, generous people, people with big hearts, givers, not just takers. So I look at the brighter side of that.

I always say that where you are born, to whom you are born, under what conditions you are born, just doesn't matter. Your destiny is in your own hands and it is what you do out of it as you move on.

[Vidya Mahambare] (8:36 - 8:59)

Yeah, that reminds me. I think you spoke about aspirations that your mother had for you.

I remember reading about your mentor, Dr. Rao. I think when you told him when you got elected as a fellow of the Royal Society, he said just like that. Not good..or just okay.

[Vidya Mahambare] (9:00 - 9:16)

He wasn't like very ecstatic or something because his opinion was or his view was essentially there is a, this is just a journey. Like you're on a journey of excellence. So if you, if you something, if you achieve and you feel that you're at the pinnacle of your this thing, then how will that journey continue?

[Mr R A Mashelkar] (9:17 - 9:22)

Yeah, yeah. You're right actually. Let me sort of narrate that story to you.

Professor Srinath Rao is a Bharat Ratna. But he set the same standards for me as my uneducated mother, so as to say. Okay.

So what you're referring to is the following. You know, engineers don't get Nobel Prizes. The highest honour that they can get is becoming a fellow of the Royal Society. And it's a great thing. You sign in the same book that Newton has.

[Vidya Mahambare] (9:53 - 9:54)

Yeah.

[Mr R A Mashelkar] (9:55 - 10:43)

And today there are only three living engineering scientists who have become fellows of Royal Society. I happen to be one of them basically. So I remember when I called Professor Srinath Rao to say that I would become FRS.

His answer was not bad. Then I became a fellow of the American Academy of Arts and Science - it was formed in 1760 by George Washington and Benjamin Franklin. And only seven fellows (of Royal Society) had become fellows of that.

[Vidya Mahambare] (10:44 - 10:44)

Okay.

[Mr R A Mashelkar] (10:44 - 10:53)

Basically. And I called him and say that I will become one. And again.

[Vidya Mahambare] (10:53 - 10:54)

Not bad.

[Mr R A Mashelkar] (10:56 - 11:34)

Then I said the third or seventh doesn't work. So when I became the fellow American, I meant the National Academy of Inventors. Yes.

I was the first Indian, by the way, to become one. So I said becoming first would please him. So that is when I called him, I expected him to at least say I'm happy.

Then he said not bad. Then I said, sir, what is it that I can do which will impress you? So he told me, you know, my name is Raghunath. But people close to me call me Ramesh. So he said, Ramesh, you are climbing on a ladder of excellence. Which has no limit.

It's a limitless ladder of excellence. Accepting the limit you put on yourself. So as to say.

Okay. Now that's a big lesson which I always give to young people also. That no matter what we achieve, you have to say my best is yet to come.

So my message to them generally is when you get up in the morning, whether you are 18 or 80, it doesn't matter. You should say my best is yet to come. And today is the day.

And keep on doing that. That was the lesson.

[Vidya Mahambare] (12:21 - 12:21)

Right.

[Mr R A Mashelkar] (12:22 - 12:33)

So it is amazing that two people in my life, Bharat Vatna Professor Srinarao, who is the ultimate. Yes. And an uneducated mother.

Both propelled me.

[Mr R A Mashelkar] (12:35 - 12:38)

You know, to achieve whatever I have achieved.

[Vidya Mahambare] (12:38 - 14:02)

With a similar message. but for your mother, I'm sure that time there would have been tremendous pressure and she was working and poverty and she was struggling.

And I suppose people would have told her, what are you going to do by educating him? He can start working. But not to give in to that societal pressure and ensure that you continue to, you know, studies like tremendous endowment, as you're saying.

So, with that's your endowment and as you said the environment where the people helped you, lot of generous people helped you. You came to Mumbai.

Second E is environment. So, I suppose that changed your environment. You came from Goa to Mumbai and you did well in schools and so on and then you got a scholarship with which you did your higher education.

What, how did that environment change and did that environment where you went into higher education, your peers and all that, what exactly happened that you decided that you will become a scientist? You always had that, you know, aspiration that you want to become a scientist or something happened, your teachers or even before that maybe. I remember a story of Bhave sir.

[Mr R A Mashelkar] (14:02 - 14:02)
Bhave sir.

[Vidya Mahambare] (14:03 - 14:15)
Yeah, convex. So, what are the teachers, what was that environment that really influenced you in the, on the education side from teachers or from peers that you eventually decided to become a scientist?

[Mr R A Mashelkar] (14:16 - 14:19)
Continuing with the thread, that 21 rupee thread.

[Vidya Mahambare] (14:20 - 14:20)
Yes.

[Mr R A Mashelkar] (14:20 - 14:40)
Where, as I said, she took 21 days to get 21 rupees. All the admissions to good schools were closed. Okay.

Wilson High School, Chikitsak High School, Aryan High School, etc. And I went to a poor school, Union High School.

[Vidya Mahambare] (14:41 - 14:41)
Okay.

[Mr R A Mashelkar] (14:41 - 21:41)
Where people from the backward communities, they would come, you know, resource poor people, their children and all that. So, it was a poor school, but with rich teachers. One of them was Principal Bhave.

Okay. He later on became principal, initially was a science teacher. He made a big difference to me.

What he would do is, he did not believe in chalk and talk. He believed in learning by doing, learning by watching, absorbing and so on. For example, soap making.

The standard way will be, the teacher goes to the board, writes the formula and shows how to make a soap. At the end, they might take a Petri dish and some raw materials and put them and show how soap is made. But he did not do that.

He took us to a soap making factory. That was Hindustan Lever in Sivri. And we went by tram, I remember.

And he was the one who paid for my ticket. Even that I could not afford those days. And that had a big impact in terms of how the entire process works.

He took us, for example, to the Vimco factory in Amarnath, which used to make matchboxes. So, right from taking wood, cutting it and how to put sort of the combustible part with sulphur in it and so on and so forth.

The entire process we could see. So, when we take a matchbox, I was seeing how that would be made.

So, he believed in that. And one day he did an experiment, which changed my life. He took us out into the sun and wanted to show how to find the focal length of a convex lens.

So, it was a convex lens. So, he did it like that. There was a piece of paper and he moved the convex lens up and down and the brightest spot came.

When the brightest spot came, he said this distance is the focal length. And then he held it for some time and the paper burnt. For some reason, he turned to me and he said, if you focus your energies, you can achieve anything.

Now, that had a great impact on my mind. Focus, concentrate on the aim and the objective that we have. The second is, as I grew, I saw more lessons in that.

For example, a convex lens, if you look at it, the sun's rays are parallel. And the property of parallel lines is that they never meet. They meet at infinity.

What do the convex lenses do? It makes it meet. Even those lines which are not supposed to meet, you bring them together.

That is leadership. Because if you look at race, religion, language, we all get divided, basically. A great leader brings them all together.

Like Mahatma Gandhi, for example, and others. And those lessons helped me. Later on, when I became the director of the National Chemical Laboratory, I saw there were divisions, divisions, and divisions.

Inorganic chemistry, organic chemistry, polymer chemistry, biochemistry. And none of them would talk to each other. They were like parallel lines.

I said nothing bad. And we created interdisciplinary projects, special funding for those, getting the entire laboratory together, one NCF. Later on, earlier you mentioned CSIR transformation.

That also came from this. We had 40 national laboratories. National Chemical Laboratory in Pune, National Physical Laboratory in Delhi, National Aeronautical Laboratory in Bangalore, like that.

There were 40 laboratories. And they wouldn't talk to each other. They were like individual laboratories.

I brought them together. I said team CSIR, one CSIR. In fact, 11 May 1998, is celebrated as Technology Day. On that day, I remember we had the director's conference, all 40 directors together.

And 1995 had taken over. This was in 1998, within three years. And I remember at the end, they signed a document called Team CSIR. All 40 of them signing it. And there was a Bangalore declaration. The Bangalore declaration was India matters to us. We want to matter to India more.

Can you just imagine that transformation? And later on, I became the president of what is called as Global Research Alliance. Just as we have CSIR India with 40 national laboratories, there is a CSIR Australia, CSIR South Africa, Fraunhofer Gasserschaft Germany, VTT Finland, DTI Denmark, TNO Netherlands, Battelle US, CIRIM Malaysia.

60,000 scientists from 9 countries, from Asia Pacific, from Africa, from Europe, from the US. And I became the president. 60,000 scientists.

Now, there is no commonality between them. Our GDP per capita at that time was 400 dollars. And something like Finland will have 50,000.

You get the point. There was no similarity. So, they were also parallel.

I brought them together. Global research through global funding for global good. That was innovative.

And for 10 years, all these so-called dissepate laboratories worked together. So, can you just imagine the influence of a simple experiment in school? That is why I said that school teachers are the most influential ones.

And we have to give respect to them. We have to ensure that the children have the best teachers who will motivate them. Because that one small lesson, you can see, led to that so-called convex lens leadership.

On which now management books are written.

[Vidya Mahambare] (21:43 - 22:49)

You also mentioned that you studied in Marathi, a vernacular medium. But that hardly matters. Because nowadays (people say) you must have English education from very early on. I studied in Marathi medium. I do feel that because in primary school, secondary school, I studied in Marathi medium.

My basics were much better done, I felt. And the teachers are the ones who finally mattered. Whichever medium of education you are in.

And also these 40 laboratories independently. So, it is like that typical story. If you have one stick, it is easy to break.

But if all 40 come together, the strength is just vast. And at the global level, it becomes a global public good. Science finally is, I suppose science and innovation is like a public good.

So, that is how later on, just what happened in your school days, how influenced you. And you still continue to use it for all this. What do you think of the environment, because you are talking about E, second E, which is the environment.

How do you think the environment for science and innovation in India has changed over the years? And how is it currently you feel?

[Mr R A Mashelkar] (22:50 - 27:25)

Let us say a few decades ago when I did my research versus now. These are vast differences. There is no question about that.

I mean, I still remember when I joined the National Chemical Laboratory in 1976, which is precisely 50 years ago. I remember wanting to be trained in a field called rheology and non-Newtonian fluid mechanics. And I needed an equipment called Weissenberg rheogonometer.

And it would take me 2 years to get it. The reason was there was a shortage of foreign exchange. And therefore, for any imported equipment, there was a big process.

Digitally clearance, not manufactured in India certificate and so on so forth. And therefore, I said that that door of opportunity is not opening. So, I always tell young people that you keep on knocking on the doors.

They do not open, create your own door. And that is what I did. I asked myself, what is the equipment I have?

And I went into mathematical modelling and simulation. Because that is all that you require. Do not require any sort of hardware and so on so forth. And I remember that work got me the highest science prize within 5 years. In 1977, I started work.

I got the S.S. Batnagar prize, which is considered the highest science prize up to the age of 45. Had I been waiting, I would not have got it. Now, consider those conditions where it would take 2 years.

And consider what it is now. So, in terms of equipment, in terms of facilities, the world has changed dramatically. You remember those days, supercomputers, for example. I was a member of the science advisory committee to the prime minister for almost 30 years, beginning with Rajiv Gandhi, when he was the prime minister. And I remember his asking in the very first meeting that we are a poor country. There must be something where we are strong.

What is it? Where we can be ahead of the world. And it was Professor Rudram Tansiva, who by the way was one of the fellows of Royal Society, who is no more.

He said, we are good at this. So, what do you do with it? And that time, the supercomputer was denied to us.

And he said we can build our own supercomputer, but in a different way. That is the parallel processing architecture. And at that time, everybody was at the same level there.

And then Rajiv Gandhi approved it on the spot. 10 million dollars and 3 years were given to us. 10 million dollars at that time was 37 rupees per dollar.

Now it is 96 rupees per dollar. So, and he delivered it within the budget and within the time. Because normally publicly funded projects take time and all that.

And to an extent that when he created the Param series of computers, Param 10,000 for example. I remember the same craze, who had denied us that a computer came and said now we offer it. So, that is what I call a 'denial driven' innovation.

Apna Hath Jagannath, Atman Dhirbar Bharat, our Honourable Prime Minister keeps on saying. I think it is very important actually. We saw that recently for LPG, what happened, the matter of fact, etc.

So, we must build our own science, our own technology. So, I think in terms of facilities that are available, the best computing facilities are available, and the best of equipment are available. I think what we need is that aspiration to go higher and higher and higher up and not stop.

I think that is what is sort of required.

[Vidya Mahambare] (27:26 - 27:55)

So, I have a couple of questions around this based on what you said. How do we decide which are the kind of technologies which are already invented or available already elsewhere. And we should use those rather than spending millions more.

And which are the technologies we must develop on our own, like based on national security or what are the parameters that should be used. Because for everything I suppose we would not advocate that we should reinvent everything.

[Mr R A Mashelkar] (27:56 - 29:54)

That is a very good question. As a matter of fact, when it comes to technology, and I gave this in the C.D. Deshmukh Memorial Lecture called Economics of Knowledge that I gave at India International Centre in 1998. That was 28 years ago.

As far as technology is concerned, your question is right. There are five options. The first is buy.

You buy a technology when you have dollars and when people are prepared to give it to you. Even when you have dollars, there are technologies that people will not give by the way. Because they want to keep the monopoly.

Second is make. And we have made everything from pins to missiles, everything. The third is make it better to buy.

Like if Vijay Bhatkar and his team had not developed the supercomputer, Cray would not have come. So that is making to buy better because you show strength.

The next one is buying to make better. So what you do is that technology which can be commercialised is at what are called as a TRL 9 stage. What is TRL? Technology Readiness Level 9.

So when you start, actually you are at TRL 1 which is proof of concept. You are doing an experiment in a beaker or a flask or something like that. Then TRL 2 at a bigger scale, TRL 3 scaling up, TRL 4, 5, 6, 7 design proving it in a semiconductor and finally commercial.

That is the way. Now TRL 9 is what the industry wants. But there are many technologies around the world which are at TRL 3, TRL 4, TRL 5.

You can buy them and build them.

[Vidya Mahambare] (29:55 - 29:57)

So you do not need to start from scratch.

[Mr R A Mashelkar] (29:57 - 33:52)

You do not have to start from scratch. And we can do both. For example, I was speaking in the condolence meeting of Ravi Pandit yesterday.

As you know, he was a great leader. KPIT technologies he led. And he believed in Atmanirbhar Bharat and so on and so forth.

So one of the technologies that he developed was, you know, we use these lithium ion batteries. But for lithium we have to depend because we do not have that source. In China and others etc.

So he said why don't we go for a sodium ion battery. Now in the sodium ion battery he has brought it to TRL 7. It needs to be TRL 9.

What did Reliance do? They said we will take it from Faraday and they bought it. And then they are building it to TRL 9.

So KPIT did it in one way. Reliance is doing it in another way. None of them is wrong.

Both of them are right. So you cannot have a kind of one size fits all. It depends upon the availability, the path that others have travelled.

How do you benefit from that and so on and so forth. But I think what is important to recognise is that innate strength that you have. Basically when you build something of your own.

I will give you an example. For example, I was on the board of directors of IPCL Indian Petrochemicals. And we wanted technology on alpha olefin sulfonate.

Alpha olefin sulfonate is a detergent. But it is biodegradable and therefore environmentally friendly. We did not have that technology of making alpha olefin.

So we went to Idemitsu in Japan. They had the technology. They would not give.

Went to Shell in Europe. They would not give. US, they would not give us.

Means we had money but they just would not part with us. They would not give it because they did not want to look at India as a bottomless pit of demand and then just master the technology and sort of. Anything that we do, we can do affordably.

So we make it cheap and all that. So none of them would give it. So we said in IPCL we will start.

And we had people like Dr. Sivaram who later on became director of NCL leading it. And we went up to the pilot plant but it was not funded for further. So once I was travelling with a representative of Shell and he said we are keeping a close watch on you.

Had you gone for that pilot plant, we knew that you would succeed and you would become competitors and we would have given you the technology. So like Dr. Kalam used to say, you can extend your hand and say shake hand but they will look at the strength of your hand and decide whether they want to give it or not. The same thing with Ranbakshi.

They wanted a technology that was denied to them and they developed their own and started competing in the marketplace and beating the people who had not given them the technology and they came back and said no, here is a technology. So I think there is no substitute for remembering Apna Hath Jagannath.

[Vidya Mahambare] (33:53 - 34:03)

The only reason I asked is because there are trade-offs involved in terms of time, effort and as a typical economist we look at trade-off and hence how to decide.

[Mr R A Mashelkar] (34:03 - 34:19)

So what every country does is buy, make, make to buy better, buy to make better and make it together. So there are five different ways of doing it. And a country does not follow just one path, all paths.

[Vidya Mahambare] (34:21 - 35:11)

And the other question I had about the environment, about innovation in India, is about risk taking. So R&D will fail several times. So maybe after several, several failures only there will be something that will succeed.

Typically culturally I suppose we are, we grow up or we are told you know the FD kind of a thing, your fixed deposit is better than taking any risk with your capital or something. So that way the risk taking environment has changed and you know you do not like the word failure, you know so it is a stepping stone. Has that changed in India and our young people are now rewarded for taking risks even if there are several setbacks?

[Mr R A Mashelkar] (35:12 - 37:18)

The answer is yes and no. I will explain to you the yes part of it as well as no part of it. I will give you an example.

When I was the DJ of CSI, we created what is called a New Millennium Indian Technology Leadership Initiative. The key was leadership. How it happened was interesting.

Yashant Sinha who was then the finance minister actually called me in the year 2000 and said now we are beginning the new millennium. He said in my budget I want to give something which will excite the scientific community. So give me some ideas on what we could do.

So I said sir how much time do I have? He said 30 minutes.. So I called my secretary and dictated New Millennium Indian Technology Leadership Initiative.

I said we cannot be just followers and copiers. Basically you know we have to lead and for leading we have to take risks. And the Indian industry will not take risks.

So let the government take risks on those projects which can make a difference for India. And articulated the case, sent it to him. I got a call.

FM loved it. The only thing he asked was how much. So there was a technology development board which used to have 50 crore budget per year.

But that was for safe technologies, proven technologies. So I said why not 50 crore for gambling. And I said 50 crore and that was done.

And he announced it in the parliament. The Minister of Science and Technology heard of it.

[Vidya Mahambare] (37:18 - 37:19)
For the first time.

[Mr R A Mashelkar] (37:20 - 37:42)
Planning Commission, they checked it out for the first time. But that is the issue of trust and how it sort of moves. Now through that project, what we did was that we moved the quadrant in which we are working.

Indian industry always worked in that quadrant where technology was known and markets were established.

[Vidya Mahambare] (37:43 - 37:44)
So no risk.

[Mr R A Mashelkar] (37:44 - 37:46)
All that we had to do was to copy.

[Vidya Mahambare] (37:46 - 37:46)
Right.

[Mr R A Mashelkar] (37:49 - 38:39)
We said we will work in a quadrant where technology is not known and markets are not established. So you are betting on a completely unknown. Fear cells which people talk about were not even talked about in 2000.

And we went into fear cells. Ravi Pandit who is unfortunately no more. He was the private sector partner.

Dr. Ashish Lele, a genius engineering scientist who is the director of NCL. He became another partner. Sikri Karayakudi and etc.

So this was a public-private partnership. Today what is the result? India has its own fear cell bus which was launched three years ago.

Okay. Completely indigenous. Ahead of the rest of the world.

[Vidya Mahambare] (38:39 - 38:39)
Right.

[Mr R A Mashelkar] (38:39 - 41:29)
In terms of technological features and its much lower in cost. Our Honourable Prime Minister launched this catamaran, the ferry which carries people. Cochin shipyard built it with this technology.

The Nimitli technology which will run on what is called a proton exchange membrane fear cell. And it runs on hydrogen and therefore hydrogen when combusted gives water. So it is pollution free.

Now this has been commercialised in Varanasi already. Now you can just imagine all our waterways basically can have such a sort of catamaran. That means they will be so Harinauka is what they call.

Green. But how did this come? Because we took risks at a time when nobody even talked about it.

Technologies were not known. And we created a sort of very high science. So I think this is the issue about risk taking.

Public-private partnership. I think it is the issue of talent, technology and trust. India's problem is not the budget deficit.

It is a trust deficit. And we have to trust startups. We take pride in the fact that in 2016 we barely had less than 500 startups registered. In 2021 we had 70,000. Can you just imagine less than 500 to 70,000. In 2016 we used to have one unicorn per year.

A unicorn is a billion dollars. In 2021 we had one unicorn per week. Not exactly because 52 weeks requires 52 for 44. So almost. You can see the progress that we are able to make. Why?

Because the government started this Startup India programme. And the startups were encouraged. Things were made easier for them so as to say in terms of patent filing, venture capital and the rest of it etc.

And you can see the results today. We are the fastest growing sort of startup. So it's a question of that trust.

[Vidya Mahambare] (41:30 - 42:11)

Yeah but on that note if we see because this is what sometimes we talk in the classrooms. If we see the list of unicorns in India it's great. Means from where we were to where we have come.

But most of the unicorns or successful startups still seem to be some kind of service or the platform economy and we still do not have startups or unicorns enough in say manufacturing or process because make in India means of course services are also made in India but large part of make in India also was like building you know manufacturing things or the products. How do we make that you know happen?

[Mr R A Mashelkar] (42:11 - 43:34)

What is still remaining? Your question is absolutely right. Finally, in manufacturing we have to win and already there are things that are happening in manufacturing.

I will give an example because you talked about risk taking. Maharashtra state you know the story begins with the Prime Minister's National Innovation Council that was in Dr. Manmohan Singh's time. I was a member of that and we said that everything cannot be centred.

States must get involved. Right. So, we created the State Innovation Council.

So, Maharashtra State Innovation Council I was the co-chairman and the other co-chairman would be the minister of skill development entrepreneurship and so on and in 2018 we created our own startup policy. Okay. And there actually I remember the meeting where I said that Sachin Tendulkar scores a century when he is 15 and he immediately gets into the test.

Nobody asked him where his 10 year experience was.

[Vidya Mahambare] (43:35 - 43:35)

Right.

[Mr R A Mashelkar] (43:36 - 43:47)

But when it comes to startups you ask for 10 years experience. This is not done. Okay.

So, we created a system where the current tendering system will not operate.

[Vidya Mahambare] (43:48 - 43:48)

Okay.

[Mr R A Mashelkar] (43:48 - 44:34)

Because the current tendering system will always ask for experience proving itself. By definition we are a startup. Yes.

So, we changed Maharashtra state and the results were astonishing because what we would do is there was a particular framework that was created. My own book leapfrogging to pole vaulting had given a framework because somebody said you know this is called assure framework affordable scalable sustainable user friendly rapid excellence in terms of technology and distinctive

[Vidya Mahambare] (44:34 - 44:35)
and

[Mr R A Mashelkar] (44:35 - 45:01)
all these seven parameters could be quantitized basically for any technology that you have we said let that pass through that and if it passes through that we find because we did not want because when a civil servant signs and says he does not want to have a knocker on his door after 10 years how did you give that money it was related to you

[Vidya Mahambare] (45:01 - 45:03)
we have

[Mr R A Mashelkar] (45:03 - 45:27)
to write on paper and actually write you know so we did that and the results were astonishing I will just give you one example you know during Ganesh Chaturthi now that has stopped but previously the rivers of Pune would be sort of flooded with the material that is left

[Vidya Mahambare] (45:27 - 45:29)
after resurgence

[Mr R A Mashelkar] (45:30 - 45:43)
and there was this Sagar defence where created drones which normally go in the air but these were on which could move on liquid surfaces

[Vidya Mahambare] (45:43 - 45:44)
and

[Mr R A Mashelkar] (45:44 - 45:45)
clean things

[Vidya Mahambare] (45:45 - 45:46)
clear things

[Mr R A Mashelkar] (45:46 - 46:02)
pick up this so Pune Municipal Corporation PCMC using that framework that was there that passed it so they funded him not following

[Vidya Mahambare] (46:02 - 46:03)
the

[Mr R A Mashelkar] (46:03 - 46:04)
normal tendering

[Vidya Mahambare] (46:04 - 46:05)
process it would not have gone through the

[Mr R A Mashelkar] (46:05 - 46:21)
today you know he has become the greatest supplier of certain special type of vehicles to the army not only that Boeing a few months ago

[Vidya Mahambare] (46:21 - 46:22)
there

[Mr R A Mashelkar] (46:22 - 46:33)
that advanced liquid robust problem sort of project they made in the partner now
somebody took a risk opened the doors

[Vidya Mahambare] (46:33 - 46:34)
for him

[Mr R A Mashelkar] (46:34 - 46:35)
and he got orders

[Vidya Mahambare] (48:12 - 48:13)
from

[Mr R A Mashelkar] (48:28 - 48:32)
the army

[Vidya Mahambare] (48:32 - 48:33)
to the

[Mr R A Mashelkar] (48:33 - 49:07)
doors for him got from which makes you take a risk. I will tell you why.

Because the current innovation is more from more for less and less people. iPhone 5, iPhone 10, iPhone 17, they become more and more expensive. So, less and less people.

So, it is more for less and less people. We are talking about more from less for more people. That means use the least resources, get more out of it.

But because you are using the least resources, it can be more affordable.

[Vidya Mahambare] (49:07 - 49:08)
Affordable.

[Mr R A Mashelkar] (49:08 - 50:07)
Okay. So, in my mother's name, I created Anjani Mashelkar Foundation, which creates this affordable excellence, which aims at making high technology work for the poor, which aims at giving access equality despite income inequality. This is the 15th year.

And then the stories of some of these winners, where risks were taken in terms of thinking of technology, because as I said right in the beginning, I do not believe in best practice. Because I am following best practice, it is following. I want you to create the next practice, which will become best practice for others.

I want my India to be the leader. That is risk taking. Correct.

So, these are stories of risk taking. In fact, you will find chapters and what they had to go through, by the way. It is not easy when you take risks.

[Vidya Mahambare] (50:07 - 50:08)

Cannot be easy.

[Mr R A Mashelkar] (50:08 - 50:10)

Right there in this particular book.

[Vidya Mahambare] (50:10 - 50:42)

Yes. I think we should try and integrate somehow in the school curriculum. I feel at least from secondary school when the kids are growing up.

So, one last question about the environment before we move on to education. You have lived most of your life now for several decades in Pune as a primary. Is there anything in Pune's environment or the cluster whatever, is this something that like why you continue to live in Pune as an environment?

[Mr R A Mashelkar] (50:43 - 50:45)

Oh, that is a very interesting question.

[Vidya Mahambare] (50:45 - 50:52)

I have lived in Pune, I know the history, but just for everyone else, what would you think of the characteristics of Pune?

[Mr R A Mashelkar] (50:52 - 54:44)

I had a fascination for Pune right from my childhood. During summer holidays, we used to come here. And it was a peaceful, tranquil city.

And look at the culture, look at, I mean, take any field, you will find tall people in this. In fact, I chair the Purna Ocean Award Committee. And I was saying on the other day that Pune is so rich in terms of people who have achieved so much in every field, every field, you name it and in that field, you will find 12 people.

And also the overall sort of environment, that of tolerance, that of scholarship, that sort of intellectual leadership, I think that makes Pune strong. In fact, I will tell you the way I came back to India. I was in England.

I was doing very well. I had started this group on non-Newtonian fluid mechanics and rheology with Professor Olbrecht. And very quickly it had become quite famous.

And I remember Dr. Naidumar, the then Director General of CSIR came and he was talking to Mrs. Gandhi, because she was bothered by the fact that top scientists come and they don't get jobs and then they go back. And Professor Khurana, who was denied a job here and got the Nobel Prize. So, she said, just offer them jobs in, you know, sports and so on.

So, I got a telex. At that time, there was a telex. Young people now would not have even heard of it. The telex was I should meet Dr. Naidumar. And I went and met him. I was barely 32 at that time.

And I was doing well. I had offers from some top other universities also and so on. And then he painted a picture of India, what it could be with young people like you can come and join.

And I remember, I think from here, not from here. I said, yes, I will come back. And in the evening, I called Vaishali.

And she has always been with me, my wife. And she said, the nation is calling us, let's go. And that's how I came on a princely salary of 2100 rupees per month.

And I described to you the conditions as a matter of fact. But the interesting part of it was that Dr. Naidumar had a piece of paper on which there was some information on me that was supplied by NCL. And there he just wrote in a corner, he is fantastic, grab him.

And that went to Dr. Tirath. That was my appointment letter. Those days we used to do appointments like this.

Talent, technology and trust. But I remember as a CSI, DG, when Dr. Naidumar asked me that you can be placed in any of the 40 laboratories. I said, no, sorry.

I will come back only if it is Pune. Because I was in love with Pune. And that love has increased over a period of time, not decreased.

I think it's a special city.

[Vidya Mahambare] (54:44 - 55:08)

Then is it just all the history and culture or can we really develop several Pune's or it will just happen over the years only? Because normally there is a discussion, how do we build new clusters and how do we come up with new cities? But then you don't have all this history and culture and tradition when you build new cities.

[Mr R A Mashelkar] (55:09 - 57:35)

Well, I think Bangalore competes with us and in many ways it is doing better than us. I think Pune has a long way to go. Just as I give this talk about how great Pune is, I can give you another talk about what Pune can do better.

You see the rapid rise of let us say multi-storied buildings and unplanned, there is a lot that we need to traffic and the rest of it. I know the government is trying to do its best to sort of build it. We need to have some tolerance over a period of time.

So, I think an ideal city is one which fulfils certain conditions and those conditions are like it has to have Santulan balance, it has to be Samruddha, Suvidya in terms of education, innovation, it has to be Sushasit well-governed and most importantly it has to be Svanandi, happy, happy cities. Where does happiness come from? From the environment, physical environment, the cultural environment and so on and so forth.

I am very proud to say that when the nation was burning because of problems, Pune was quiet. For example, when Babri Maharshi took place, all over India, you know the kind of problem. Pune was quiet.

Look at Bombay blast, I remember I was director of NCL, NCL was running, Pune was working basically. So, there is a certain amount of tolerance that our people have, richness

of heart, multiculturalism, etc. I think that part is very much something that Pune should never lose.

[Vidya Mahambare] (57:35 - 58:02)

Yes, indeed. So, moving on to education. So, one is formal education, the other is a lot of the things which happen outside classrooms and all sorts of informal education.

Which part of education would you give? Is it a balance that through formal education you get technical expertise and stuff and then from the real world you get your observations and ideas and then you combine or how would you?

[Mr R A Mashelkar] (58:02 - 59:02)

No, that it has to be integrated, like when people say Google is my guru, Google cannot be just the guru. Because you require other skills, you require critical thinking, creativity, cognitive flexibility, emotional intelligence, compassion and so on that Google cannot teach. All right.

And therefore, my model is not a digital school or a physical school, but a physical school. Physical means both. Because it is all about, education is all about learning, doing and being.

Learning you can do on the internet and you can take the best of MIT courses or so on so forth, Khan Academy and the rest.

[Vidya Mahambare] (59:02 - 59:03)

Right, they are all available.

[Mr R A Mashelkar] (59:04 - 1:00:10)

Doing, you have to do with your own hands. So, there is no substitute to that. And for being a good human being, all that I required, I will mention.

Compassion, empathy and a sort of being a part of a civil society becomes important. And that has to be actually outside the school. It is a blend of the two that is very, very much required.

See, for example, the National Innovation Foundation, I have been this chairman for 18 years. I stepped down three years ago. Professor Anil Gupta is the vice chairman, but Professor Anil Gupta is really my guru.

And he believes, I believe that everyone is someone, minds on the margin are not marginal minds and so on. So, grassroots innovation and so on. So, we award these people who could be a farmer or this, that and the other.

[Vidya Mahambare] (1:00:10 - 1:00:10)

Right.

[Mr R A Mashelkar] (1:00:11 - 1:00:15)

So, they may not have had formal education, but they have that talent.

[Vidya Mahambare] (1:00:15 - 1:00:15)

Yes.

[Mr R A Mashelkar] (1:00:15 - 1:01:13)

In terms of creativity. Right. All right.

We also give awards to young people. They are called Inspire awards, named after Dr. Kalam. And there what we do is that, we let us say select 30.

We will get them two, three days in advance of the award ceremony. And the awards were given by the president. Now, unfortunately, that is not the case.

And what we do is that, we send those 30 children to slums. Then the following day, they will make a presentation. What did they see?

What problems did they observe? What would be the solution they will get? And then we will select 10 out of them.

That is the learning. Because some of them will be so rich that they just do not have any idea about how.

[Vidya Mahambare] (1:01:13 - 1:01:15)

Never seen even this.

[Mr R A Mashelkar] (1:01:15 - 1:01:17)

How Bharat lives, not India.

[Vidya Mahambare] (1:01:17 - 1:01:18)

Yeah, how Bharat lives.

[Mr R A Mashelkar] (1:01:19 - 1:01:20)

That is part of the education.

[Vidya Mahambare] (1:01:21 - 1:01:37)

Yeah, many times even in India, we say that so many different Indians like when a person says, I am middle class. Actually, most of the time people are upper middle or rich, but they just feel they are middle class because they have seen only the people above. They have never seen the majority of India live as Bharat.

[Mr R A Mashelkar] (1:01:37 - 1:02:30)

It is that compassion that matters. And I think this is a good time for me to say something about young people who are actually not going for valuations, but for values. Young people who want to bring smiles on the faces of a billion rather than become billions.

These are values. In my mother's name, I have created the Anjani Mahashankar Foundation. And as I said, it is for the next practice, not the best practice.

And we are focussing on diagnosis. Okay. Because early diagnosis saves not only your life, but saves your savings.

Because of one big sort of illness.

[Vidya Mahambare] (1:02:31 - 1:02:32)

Wipes away the debt.

[Mr R A Mashelkar] (1:02:32 - 1:02:33)

Yeah, wipes for poor people.

[Vidya Mahambare] (1:02:33 - 1:02:34)

Even the debt, yeah.

[Mr R A Mashelkar] (1:02:34 - 1:02:48)

So, we are sort of believers in that and I mentioned affordable excellence. So, we have created what is called as FX Healthcare Kit.

[Vidya Mahambare] (1:02:49 - 1:02:49)

Okay.

[Mr R A Mashelkar] (1:02:50 - 1:02:52)

Now, what is FX? Affordable excellence.

[Vidya Mahambare] (1:02:53 - 1:02:54)

Okay.

[Mr R A Mashelkar] (1:02:54 - 1:03:11)

Making high technology excellence work for the poor, affordable. But it is not just affordable, ultra-affordable. Okay.

Let me show you because this is also linked to the startup problem and what problems India should be solving.

[Vidya Mahambare] (1:03:13 - 1:03:16)

So, this is for a healthcare professional to carry?

[Mr R A Mashelkar] (1:03:17 - 1:03:51)

Yeah, I will explain that. What this kit does is measure 20 of your parameters, blood pressure, haemoglobin, sugar, heart murmur, lung condition and so on, 20 parameters. You know how much time?

10 minutes. And for how much money?

How much do you pay? 100 rupees, 1 dollar.

[Vidya Mahambare] (1:03:52 - 1:03:53)

For all of this?

[Mr R A Mashelkar] (1:03:53 - 1:04:04)

All of this. And I will show you some of the demonstrations. For example, ECG.

What will you do? You will go in a hospital, lie down.

[Vidya Mahambare] (1:04:04 - 1:04:05)

Yes.

[Mr R A Mashelkar] (1:04:05 - 1:04:07)

A nurse will come, put 12 leads.

[Vidya Mahambare] (1:04:08 - 1:04:08)

Yes.

[Mr R A Mashelkar] (1:04:09 - 1:04:11)

Okay. Will take half an hour.

[Vidya Mahambare] (1:04:11 - 1:04:11)

Yeah.

[Mr R A Mashelkar] (1:04:11 - 1:04:14)

You will be charged some 1000 rupees and all that.

[Vidya Mahambare] (1:04:14 - 1:04:14)

Yes.

[Mr R A Mashelkar] (1:04:15 - 1:05:13)

This is a portable ECG. You put your two thumbs here for 15 seconds. Here is a sensor.

This is your heart. 15, 15, 15 seconds. 15, 15, 15 seconds.

And if you have downloaded an app called Sanket Life, you will get a medical grade ECG on your mobile phone. What does it mean? That means if a woman in a village, an old woman in a village has a challenge at midnight, she does not have to put on a motorcycle or a jeep or a bullock cart or whatever.

Right there, she can do that. And the best doctor in Pune can sort of say, look at that medical grade ECG. This costs around 4000 rupees, but will last forever.

[Vidya Mahambare] (1:05:14 - 1:05:16)

So, simply a family can have it, right?

[Mr R A Mashelkar] (1:05:17 - 1:05:20)

Anyone can. For monitoring, for example.

[Vidya Mahambare] (1:05:21 - 1:05:21)

Yes, yes. Correct. Yeah.

[Mr R A Mashelkar] (1:05:22 - 1:05:22)

Yeah. Okay.

[Vidya Mahambare] (1:05:22 - 1:05:24)

So, are these now available in the market?

[Mr R A Mashelkar] (1:05:24 - 1:05:26)

They are in 16 countries now.

[Vidya Mahambare] (1:05:26 - 1:05:27)

Wow.

[Mr R A Mashelkar] (1:05:27 - 1:05:28)
FDA approved.

[Vidya Mahambare] (1:05:28 - 1:05:30)
And in India also anyone can buy just from them.

[Mr R A Mashelkar] (1:05:31 - 1:05:34)
Yeah, through the FX Healthcare kit. Haemoglobin.

[Vidya Mahambare] (1:05:34 - 1:05:34)
Amazing.

[Mr R A Mashelkar] (1:05:37 - 1:05:42)
Haemoglobin, what happens? Somebody comes in the morning. Takes the blood, yes.

[Vidya Mahambare] (1:05:43 - 1:05:43)
Blood sample.

[Mr R A Mashelkar] (1:05:44 - 1:05:45)
Send it to the lab.

[Vidya Mahambare] (1:05:45 - 1:05:45)
Right.

[Mr R A Mashelkar] (1:05:46 - 1:05:48)
By 4, 5 you get the results.

[Vidya Mahambare] (1:05:49 - 1:05:49)
Right.

[Mr R A Mashelkar] (1:05:49 - 1:06:06)
Do not have to do that. This is called an easy check. You put your finger here, basically.

And of course, there is a very sophisticated technology that is there, which will give you the haemoglobin reading within 30 seconds.

[Vidya Mahambare] (1:06:07 - 1:06:09)
Does it take blood?

[Mr R A Mashelkar] (1:06:09 - 1:06:11)
No, no, no. No blood. No blood.

[Vidya Mahambare] (1:06:11 - 1:06:11)
Okay.

[Mr R A Mashelkar] (1:06:11 - 1:06:12)
Non-invasive.

[Vidya Mahambare] (1:06:12 - 1:06:13)
Non-invasive.

[Mr R A Mashelkar] (1:06:13 - 1:07:13)

Completely non-invasive. Okay. So, we are discovering new things.

For example, Sarupu Vardhini, which is a great organisation which works for the poor and their education. I just stepped down as a president a couple of years ago. Vivek Sawant has taken over, a fantastic leader.

So, in my last speech, I have said, because by this time, this award was given. So, I said, you look at the health of these also, apart from this, because now that this is available. We just tested, just cost 10 rupees.

That is all. They did 15,000 tests. In the city of Pune, 15,000 tests, 62% of them were anaemic.

What does that mean? Low haemoglobin levels. It is an oxygen carrier to the brain.

[Vidya Mahambare] (1:07:13 - 1:07:13)

Yes.

[Mr R A Mashelkar] (1:07:13 - 1:07:14)

The brain will not develop.

[Vidya Mahambare] (1:07:15 - 1:07:15)

Yes.

[Mr R A Mashelkar] (1:07:16 - 1:07:24)

So, we are building young children whose brains are not developing, two-thirds of them. What kind of ricocid Bharat are you talking about?

[Vidya Mahambare] (1:07:24 - 1:07:25)

That too in Pune, in the city.

[Mr R A Mashelkar] (1:07:25 - 1:07:33)

That too in Pune. It is not some tribal area. You get the point.

I will just give one more example, because there are.

[Vidya Mahambare] (1:07:33 - 1:07:39)

So, one second. So, in that, the person can see what is haemoglobin level or it goes somewhere?

[Mr R A Mashelkar] (1:07:40 - 1:07:42)

Yes. No, no, you yourself can. No, this is all on a digital platform.

[Vidya Mahambare] (1:07:42 - 1:07:47)

Right. So, if you have that software, you can see what the value is.

[Mr R A Mashelkar] (1:07:47 - 1:07:47)

Absolutely.

[Vidya Mahambare] (1:07:48 - 1:07:48)

Okay.

[Mr R A Mashelkar] (1:07:49 - 1:08:20)

Absolutely. Oral cancer. Normally, in a village, do you know every 12 minutes, one person dies of oral cancer in India.

There are statistics, mostly from villages. In the village, somebody has ulcers, which are painful. He goes to the dentist.

The dentist says, oh, biopsy karo. Takes 2,000, 3,000 rupees. Has to be done in the city.

And he does not go alone.

[Vidya Mahambare] (1:08:21 - 1:08:24)

Yeah, you have to take someone. They have to sleep on the footpath. Yeah, yeah, yes.

[Mr R A Mashelkar] (1:08:24 - 1:09:19)

None of that is possible. This is something that has been developed. If you move around, basically, there is a spectrum of light that is thrown.

And the cancerous tissue, basically, is identified. There is an image. There is a high fidelity camera in this, basically.

And artificial intelligence is used to find out whether it is cancer or not. Can you just imagine? Completely non-invasive.

Okay. Similarly, we have other thing. I would not have time to show you all, but this is the ECG one.

You put your finger in, you get your BP as well as 2-lead ECG. And if you connect it with the other device, you get 12-lead ECG. That is all.

So, I think the main point is 20, 10, 100. 20 parameters in 10 minutes for 100 rupees.

[Vidya Mahambare] (1:09:19 - 1:09:22)

But then why this is now, how do we get this into all hospitals?

[Mr R A Mashelkar] (1:09:22 - 1:09:24)

No, no. That is what is happening now. That is what is happening.

[Vidya Mahambare] (1:09:25 - 1:09:25)

Okay.

[Mr R A Mashelkar] (1:09:26 - 1:09:33)

Goa government, as we speak, is working on this to include them in their public health centres.

[Vidya Mahambare] (1:09:33 - 1:09:34)

Yes.

[Mr R A Mashelkar] (1:09:34 - 1:10:35)

Maharashtra government is working on this. Madhya Pradesh is working on this. Superb.

And there are companies like Tata Power, Tata Motors, through their corporate social responsibility, they are promoting it. Corporates are using, I mean, are going for it. Like Berkeley Bank wants us to use it for 10,000 of their employees.

Because although the medical tests are free for them, compliance is very low. People do not want to spend the whole day in hospital. This is a hospital that goes to you.

You do not go to the hospital, hospital goes to you. Okay. You can imagine.

And if successful, they will spread it all over. So, like that, this is spreading now. But the main point I wanted to talk to you about is that all those who develop these, finally, they are giving services, which are 1 rupee, 10 rupee, 1 dollar.

[Vidya Mahambare] (1:10:36 - 1:10:38)

Where they could have not actually been.

[Mr R A Mashelkar] (1:10:38 - 1:10:40)

They could have. You get the point?

[Vidya Mahambare] (1:10:40 - 1:10:41)

Yes.

[Mr R A Mashelkar] (1:10:41 - 1:11:50)

One of our awards went to Bandicoot. They were Kerala students, undergraduate students. And they developed robots.

Because they said manholes are a bad idea. Because man should not go in the hole, machines should go. So, they created robots, which do the cleaning that the manual scavengers do.

Because as you know, every week there is a manual scavenger who dies, basically. And now it is in 20 states, in 5 countries, basically the undergraduate students from Kerala.

Now, they could have gone for industrial robots and made a lot of money. They did not, because their hearts were touched. So, when you talk about education, compassion, empathy, emotional intelligence, they are the ones that need to be met.

Basically, these are kind of role models. And in our book, we have covered their stories.

[Vidya Mahambare] (1:11:51 - 1:12:16)

Yes, yes, yes. And it is amazing to hear about these stories of young people. Because currently the image of the young generation for many people is not so good.

That the young generation is not hardworking and the generation is glued to this thing. But there are so many young people who are doing fantastic work and that needs to be known much more than just this part.

[Mr R A Mashelkar] (1:12:17 - 1:12:19)

These cases should be in their textbooks.

[Vidya Mahambare] (1:12:19 - 1:12:22)

Yeah, yeah. Because everyone just keeps blaming young people nowadays.

[Mr R A Mashelkar] (1:12:23 - 1:12:35)

You give examples of great industrialists, that does not impress them. They should be able to relate. They should be able to relate to all these young people who are in their late 20s, early 30s who did this.

[Vidya Mahambare] (1:12:35 - 1:13:27)

So, just tying up with this, but a little bit now more explicitly towards effort, your own efforts in some other area and maybe efforts of a few other people that you have talked about. You had a long legal battle which you won for establishing the right of Indian traditional medicine, right, and it was turmeric. And I understand a wrong patent was given by the US, granted to someone.

And you did not take that decision because you are a representative of a government or something. You just said you made a decision as an Indian. So, that was a massive effort, right, to go through that long battle.

And so, what happened? What had...

[Mr R A Mashelkar] (1:13:27 - 1:13:29)

There again I have to give credit to you.

[Vidya Mahambare] (1:13:29 - 1:13:40)

Because you now talk about traditional medicine, modern medicine and modern science. So, you believe that just because it is not created in a laboratory, it is still a knowledge and it is...

[Mr R A Mashelkar] (1:13:40 - 1:16:11)

Yeah, well, again I give credit to my mother. I will tell you why. See, when I was the director of NCL, I remember it was a summer evening and myself, my wife, my son Amey, we were sitting on a terrace in the director's bungalow.

And a bird came and fell. His wing was broken. And my mother ran down, brought turmeric paste, haldi and applied.

And the bird died after a couple of hours. Amey was feeding him with water and all that. And we all cried, I remember.

Now, that memory was there with me. I asked my mother during dinner, I said, look, what applies to humans because when you have... You want to stop blood and all that, you put haldi.

No. How do you know that it will apply for a bird also? So, that so-called uneducated woman had the greatest wisdom.

She told me that all living beings are the same. Whether it is a tree, whether it is a bird, whether it is a human, whether it is a fish and so on and so forth, you know. So, that had stuck in my mind.

So, when this wrong pattern was given, N. Suresh of Times of India carried that news in Times of India. And I was reading the newspaper in the morning and I saw that.

I said, come on, my mother knew about it. My mother's mother knew about it. This traditional knowledge and how you can take patent rights on that.

So, in the evening, I was giving the National Physical Reporting Hussain Zaheer Memorial Oration and I declared that I am going to fight it. I had done something wrong. You know why?

Because as DG of CSIR, I had all the freedom in the world. But as Secretary to the Government of India, I had no freedom. Unless the minister says, I could not.

[Vidya Mahambare] (1:16:11 - 1:16:13)
You should not announce these things.

[Mr R A Mashelkar] (1:16:14 - 1:17:17)
But I think from here, the only permission I needed was this. That is all. Nobody else's permission.

That is what I have been. So, I declared that. And of course, elbow close, how can you do that and all that.

There is also a press conference by the way. Has anybody won against you? So, I said, please write down and report tomorrow that if I lose, I will leave this job and go back to Pune.

Yes, I said that. And anyway, the nation trusted me. So, we moved on.

In fact, it took 14 months basically and it was not a big story made out of it. It is not a big story. All that I had to do was to get evidence from Sanskrit literature and there were papers in the Indian medical research journals, in Urdu, in all languages.

[Vidya Mahambare] (1:17:17 - 1:17:18)
Establishing the...

[Mr R A Mashelkar] (1:17:18 - 1:21:13)
Yes, establish. So, I had to say that all this knowledge exists here, basically. So, this is a prior knowledge and you cannot give a patent.

And that patent was revoked. Now, but that was historic because that was the first time such a challenge was done. And then there was a lucky breakthrough I had.

There is the World Intellectual Property Organisation, WIPO, which operates from Geneva, Switzerland. And I became the chairman of their standing committee on information technology. There were 176 nations.

And then this patent was revoked. That happened during that time. So, I addressed the assembly and said, that you think the knowledge generated by Oxford, Cambridge, Caltech, Stanford, MIT is knowledge.

And knowledge generated by my predecessors in laboratories of life is not knowledge. That is not wrong. Now, the problem was, they used to go by what is called an international patent classification system.

And there was no traditional knowledge. They did not recognise traditional knowledge at all. Then we formed an IPC reforms committee with 5 nations, India, China, Europe, US and Latin America.

And then there were 200 plus subgroups that were created. So, that was the first recognition that traditional knowledge is knowledge. Now, what has happened is that I got to know the American representatives.

So, I found that it was not only the turmeric patent. There are hundreds of other wrong patents that were given. So, I took a sample of 10.

Sushul Shloka is English translation and their patent and went and visited US patent office. And I showed to them that this is what you thought was new. But look at this.

This is the English translation where what you claim is novel is not novel. It has been done. So, I showed them these 10.

And they were also nice. They took me around and said what do we do when your turmeric patent comes? We sat on our computer.

We have our own database. We would turmeric, hondeling, powder. Nothing came on the screen.

Why? Because that knowledge was up there in your heads or in your old books. We did not have access to your heads nor to the old books.

So, I came back and I must give credit to Dr. Gupta whose idea it was that we will create a traditional knowledge resource classification. And he got a team of traditional knowledge digital libraries. So, he got a team of 100 people, including school scholars, Ayurveda experts, IT experts, IP experts and so on and so forth.

And close to 30 million pages of traditional knowledge digital library was created. But in a language which the patent examiner will understand. Yeah.

[Vidya Mahambare] (1:21:13 - 1:21:15)

So, everything translated from Sanskrit and all.

[Mr R A Mashelkar] (1:21:15 - 1:21:54)

And then what happened was that we had an agreement with 17 countries, different patent offices that before giving a patent, they will refer to our TKDL, traditional knowledge digital library. Like when Dr. Manmohan Singh as a Prime Minister went and met Obama, the earlier

day, there was an agreement that was signed between our patent office and US patent office that they will do it. And then of course, 17.

So, the net result of this now is the following. Number 1, all this scattered knowledge attached together in the traditional knowledge digital library, number 1.

[Vidya Mahambare] (1:21:54 - 1:21:56)
And anyone can access it now online.

[Mr R A Mashelkar] (1:21:56 - 1:22:05)
Anyone can access. Number 2 is that wrong patents are not being given. Because they are stopped immediately.

[Vidya Mahambare] (1:22:05 - 1:22:06)
Yeah, they can check first.

[Mr R A Mashelkar] (1:22:07 - 1:22:25)
Third is that the multinational companies are not applying for these patents. Because they know they will be caught. Previously that fear was not there.

But I am still not happy. Why? Because that traditional knowledge digital library has so much experiential learning.

[Vidya Mahambare] (1:22:26 - 1:22:27)
Which cannot actually be you.

[Mr R A Mashelkar] (1:22:28 - 1:23:11)
Yeah, which on which we can build modern sort of medicine. You get the point? Yes.

Yes. So, when we completed 25 years of celebration of this so-called victory, they call it. I think it was Swaminathan in times of India called it.

So, at that time I said use AI now, artificial intelligence to get clues based on this in terms of new medicines for new. That work has started now.

[Vidya Mahambare] (1:23:12 - 1:23:36)
But just a couple of thoughts, one is someone who is seeing it from outside and does not know the way you are explaining. Scientists will think from here (brain). But you are again and again saying many of the decisions you have taken from here (heart).

So, there is no conflict as such between the scientific brain and the decisions from the, from heart.

[Mr R A Mashelkar] (1:23:36 - 1:23:40)
Absolutely. This affects healthcare. 20, 10, 100 in 100 rupees 20 days.

[Vidya Mahambare] (1:23:40 - 1:23:41)
Yes.

[Mr R A Mashelkar] (1:23:41 - 1:23:43)

In 10 minutes comes from here.

[Vidya Mahambare] (1:23:43 - 1:23:43)
Yeah, right.

[Mr R A Mashelkar] (1:23:44 - 1:23:44)
Otherwise.

[Vidya Mahambare] (1:23:45 - 1:24:14)
Right, right. No, what is from the, you know, someone see, people may say, right, like see the, you know, top scientist and, you know, thinking from taking decisions, you know, wonderful. Second is about the patents themselves.

So, this has been done for India, but I am sure similar traditional knowledge exists in Latin America. Of course. You know, elsewhere, elsewhere, which is still not, you know, what we, you have done for India, it is not happening.

So, in that respect, still wrong patents must be getting given, there should be some limits.

[Mr R A Mashelkar] (1:24:15 - 1:24:20)
No, there is a, no, there is an error down, no, because it was not only turmeric, later on Basmati.

[Vidya Mahambare] (1:24:20 - 1:24:23)
That is for India, but it could be in the other.

[Mr R A Mashelkar] (1:24:23 - 1:24:24)
Neem, Neem, for example.

[Vidya Mahambare] (1:24:25 - 1:24:25)
Yeah.

[Mr R A Mashelkar] (1:24:25 - 1:24:48)
Neem was not fought by me. Neem was fought by an NGO, which are all sort of international organisations. Okay.

Basically, you know, so there is a, it is a question of creating awareness. Right, right. Then the patent offices also, you know, are careful in terms of searching, but I think what is important is documentation.

[Vidya Mahambare] (1:24:49 - 1:24:49)
Right.

[Mr R A Mashelkar] (1:24:49 - 1:24:53)
One of our problems has been, Yeah. Our knowledge is oral.

[Vidya Mahambare] (1:24:53 - 1:25:23)
They cannot verify, yeah. So, the verification is not possible, yeah. But what should be the limits of patents?

Means where should the intellectual, because then the cost increases, right. If you give, keep on giving more and more, slightly different question, not about the traditional medicines, but in general, if, if more and more patents are granted, the, the one who comes up with it also, he also needs to, he or she also needs to get some, you know, return from it, but then it becomes unaffordable, maybe for the duration of the patent that you have, what should be?

[Mr R A Mashelkar] (1:25:24 - 1:25:35)

In fact, I have written a lot about this. In fact, there is a paper, intellectual property rights and the rights of the poor. Right.

It is not intellectual property rights versus the rights of the poor. Right.

[Vidya Mahambare] (1:25:35 - 1:25:37)

Both needs to be there, yeah.

[Mr R A Mashelkar] (1:25:37 - 1:26:09)

So, therefore, this debate, particularly with regard to medicines, you know, and making them affordable, etcetera, is very important. You see, there is, you have to look at the following. The drug discovery and development process is very expensive, because you have to do clinical, then phase 1, phase 2, phase 3, it takes 10 to 12 years and you spend a billion dollars plus.

So, you have to recover that.

[Vidya Mahambare] (1:26:09 - 1:26:15)

And many of them, many of the drugs will fail during the process. So, it is many billions when one drug comes out.

[Mr R A Mashelkar] (1:26:15 - 1:26:16)

Actually, the probability is very high.

[Vidya Mahambare] (1:26:16 - 1:26:17)

Yeah.

[Mr R A Mashelkar] (1:26:17 - 1:26:22)

So, therefore, for people to invest in it, they must get returns.

[Vidya Mahambare] (1:26:22 - 1:26:22)

Reward, yes.

[Mr R A Mashelkar] (1:26:23 - 1:26:46)

So, what we have to do is to create a kind of a balance, differential pricing, for example, for the poor as well as this. Then there are some drugs which are absolutely essential. So, compulsory licencing, particularly those who are life-saving, you know.

You cannot make Viagra, for example, as life-saving.

[Vidya Mahambare] (1:26:46 - 1:26:47)

Yeah, right.

[Mr R A Mashelkar] (1:26:48 - 1:26:57)

Let them make profits there, it does not matter. But cancer, for example, or things like that. So, there is an understanding that has been reached now.

[Vidya Mahambare] (1:26:57 - 1:26:58)

Yes.

[Mr R A Mashelkar] (1:26:58 - 1:27:09)

What is called a Doha sort of declaration on creating that particular balance. With several instruments, which takes care of the challenges that I have talked about.

[Vidya Mahambare] (1:27:10 - 1:27:10)

Yeah.

[Mr R A Mashelkar] (1:27:10 - 1:27:13)

I myself have been involved in many of these.

[Vidya Mahambare] (1:27:13 - 1:27:42)

Right. you have seen several young people with tremendous effort and coming up with this, innovations, affordable innovations and so on. But I think when the COVID hit we had to develop our own vaccine and something.

In Pune, you had a head of your scientific team who was a woman and who. No, no. So, that is, you know, where did it happen?

That is like a tremendous effort.

[Mr R A Mashelkar] (1:27:42 - 1:28:02)

No, Serum Institute, Serum Institute, who are, I am very proud to say, is a pride of India, pride of the world. They are actually, in terms of vaccines, they are masters. And they licenced out technologies.

[Vidya Mahambare] (1:28:02 - 1:28:03)

Yes.

[Mr R A Mashelkar] (1:28:03 - 1:28:27)

Basically, to create the COVID vaccine. But at the same time, Krishna Ella, you know, of Bharat Biotech, he created his own vaccine, which is totally indigenous, totally Indian. So, we had both, one based on the imported one, the technology, as well as one that is based on indigenous technology.

And they just did not save the Indians.

[Vidya Mahambare] (1:28:27 - 1:28:44)

Yeah, we exported in a massive, yeah. So, maybe I vaguely remember something. There was a, in that process, there was a woman scientist who was expecting a baby and she did not, until she finished that whole thing, she did not get admitted in Pune.

[Mr R A Mashelkar] (1:28:44 - 1:28:46)

Oh, that was diagnostics. That was a diagnosis.

[Vidya Mahambare] (1:28:47 - 1:28:49)
Yeah. So, it is a heroic effort of so many.

[Mr R A Mashelkar] (1:28:49 - 1:28:52)
No, that was a diagnosis, right there on Banerjee Road.

[Vidya Mahambare] (1:28:53 - 1:28:53)
Okay.

[Mr R A Mashelkar] (1:28:53 - 1:29:28)
Yeah, yeah. So, that, what happened was that the screening, initial screening, whether you have COVID or you don't have, we did not have those kits, basically. They were one of the first ones to do that.

And she was pregnant. And finally, the total data sheet had to be submitted. So, she postponed going for her pregnancy by a day or two till that was done.

So, that is a heroic story.

[Vidya Mahambare] (1:29:28 - 1:29:32)
So, we are. So, efforts of so many such individuals are, you know.

[Mr R A Mashelkar] (1:29:32 - 1:29:34)
Absolutely, absolutely. They are all heroes.

[Vidya Mahambare] (1:29:35 - 1:29:43)
Yeah, they are heroes. Yeah. So, that leads us to, of course, equality of opportunity.

And so much we have already talked about, you know, the equality of opportunity.

[Mr R A Mashelkar] (1:29:44 - 1:29:46)
That. Access equality despite income inequality.

[Vidya Mahambare] (1:29:48 - 1:29:48)
Right.

[Mr R A Mashelkar] (1:29:48 - 1:30:02)
That is it, you know, and affordable excellence. Excellence means world class. Right.

But affordable for us. In fact, they are not affordable, they are ultra affordable.

[Vidya Mahambare] (1:30:02 - 1:30:03)
Ultra, yes.

[Mr R A Mashelkar] (1:30:03 - 1:30:08)
It is not 10 percent less. It is 10 times, 100 times less. Yes, yes.

[Vidya Mahambare] (1:30:08 - 1:30:15)

So, making high technology, you know, the latest technology or the best technology making it, you know, available.

[Mr R A Mashelkar] (1:30:16 - 1:30:46)

We talk about AI, artificial intelligence. Right. One of the things here is your own mobile.

You cough into it and you know where your TB are not. How is it done? By using artificial intelligence.

Using cough as a biomarker. Because the signature that you get when you have asthma is different from when you get TB.

[Vidya Mahambare] (1:30:47 - 1:30:47)

TB.

[Mr R A Mashelkar] (1:30:47 - 1:31:07)

It is different from when you have something else and so on and so forth. And this is based on such high science that the papers have been published in journals like Nature, you know. And see the difference it makes as a matter of fact.

Because for TB normally you will go for an x-ray.

[Vidya Mahambare] (1:31:07 - 1:31:07)

Right.

[Mr R A Mashelkar] (1:31:09 - 1:31:47)

You will go for a sputum test. You will do the culture which results will come after 2-3 weeks. Here it is instant.

Use a spirometer, what is called a spirometer for detecting COPD. That is a constructive pulmonary sort of disease, that describes the condition of the lung for you. The instrument costs one and a half lakh of rupees.

Villages will not have it. But villages do have the phone.

[Vidya Mahambare] (1:31:48 - 1:31:48)

Right.

[Mr R A Mashelkar] (1:31:48 - 1:31:50)

On which they have to download the app.

[Vidya Mahambare] (1:31:50 - 1:31:51)

App. That is all.

[Mr R A Mashelkar] (1:31:53 - 1:32:05)

Spirometer will take almost 45 minutes for testing. Here it is instant. Spirometer because there are technicians involved.

[Vidya Mahambare] (1:32:05 - 1:32:06)

Yes.

[Mr R A Mashelkar] (1:32:06 - 1:32:12)

You will pay 1000 rupees around. Here it is 10 rupees. You can see the difference.

[Vidya Mahambare] (1:32:13 - 1:32:13)

Yes.

[Mr R A Mashelkar] (1:32:13 - 1:32:20)

Actually, you know. So, the most important part is that these are all non-invasive. You cough.

[Vidya Mahambare] (1:32:20 - 1:32:22)

Yes. You touch. Yes.

[Mr R A Mashelkar] (1:32:22 - 1:32:38)

You see and you know. And a very high level of physics is used. Things like photoplethysmography and so on.

They sound like big words. But that is what our young people have done. Making high technology work for the poor.

[Vidya Mahambare] (1:32:38 - 1:32:53)

Poor, for the poor. Yes. And that in itself, I think, will also contribute to lowering inequality.

Because you have, you know, better health, great health, and save money. So, automatically you can even work better productivity, everything.

[Mr R A Mashelkar] (1:32:53 - 1:33:16)

Diabetes, for example. We now have a device where you just put your finger and you know your sugar. Now, what difference does it make?

Supposing you want to find your sugar, you take a prick and use a strip. And then you will get a reading.

[Vidya Mahambare] (1:33:16 - 1:33:16)

Right. Correct.

[Mr R A Mashelkar] (1:33:17 - 1:33:34)

But the strip will cost 15 to 25 rupees per test. Here, on the average, over the lifetime of a diabetic is 25 paise. Very 25 rupees and plus non-invasive.

You get my point?

[Vidya Mahambare] (1:33:34 - 1:33:42)

Yes. Non-invasive is very important. Many people are simply scared even of, you know, just seeing a drop of blood.

It is like a real phobia.

[Mr R A Mashelkar] (1:33:42 - 1:33:51)

No, we found that in the Swarupardini children. Initially, they were afraid, but once they came to know all that I have to do is to put the finger.

[Vidya Mahambare] (1:33:51 - 1:33:51)

Correct.

[Mr R A Mashelkar] (1:33:51 - 1:33:59)

In fact, there is a competition. His reading is better than mine, do it again and so on so forth. You know, that psychological change.

[Vidya Mahambare] (1:34:00 - 1:34:44)

So, within equality of opportunity, you also do a lot of other philanthropic work and, you know, you provide for scholarships from different funds for the education of. But at the other end, when someone is in that situation, you said you should keep on knocking doors and what should exactly they do? Because there will be still millions of kids in India who do not have that endowment, right, and who need that, you know, opportunity.

What should they practically do? How does, means you explain how you went about it during those times. But today, if someone is in that situation and listening to us, what exactly should they do so that they stumble upon this opportunity?

[Mr R A Mashelkar] (1:34:44 - 1:34:53)

I think the fundamental is that everyone is someone. The fundamental is that minds on the margin are not marginal minds.

[Vidya Mahambare] (1:34:53 - 1:34:54)

Yes.

[Mr R A Mashelkar] (1:34:55 - 1:34:56)

The fact that you are poor.

[Vidya Mahambare] (1:34:56 - 1:34:56)

Yes.

[Mr R A Mashelkar] (1:34:56 - 1:34:57)

Does not mean anything.

[Vidya Mahambare] (1:34:57 - 1:34:58)

Yes.

[Mr R A Mashelkar] (1:34:58 - 1:35:13)

As a matter of fact. In fact, in our grassroots innovation movement led by Professor Anil Gupta, we have found that most uneducated sort of people are the most creative as a matter of fact, you know.

[Vidya Mahambare] (1:35:13 - 1:35:15)

Because they have to come up with the solution.

[Mr R A Mashelkar] (1:35:16 - 1:35:36)

They have to. So, I think your mindset has to be not being a part of a problem, but part of a solution. Given a problem, how do I find a solution?

And most creative solutions come under the circumstances of scarcity. Scarcity and aspiration. Deadly combination.

[Vidya Mahambare] (1:35:36 - 1:35:41)

Yeah, we are back to scarcity and aspiration. So, then the teacher's role is even more important, right, at that age.

[Mr R A Mashelkar] (1:35:41 - 1:35:41)

Absolutely.

[Vidya Mahambare] (1:35:41 - 1:35:44)

As it happened in your case also.

[Mr R A Mashelkar] (1:35:44 - 1:36:12)

Yeah, that is right. I was lucky to get the kind of teachers, you know, including my mother. She said not 9700 because you are capable of doing that.

So, I think it is a question of rising to one's potential. That is number one. And number two is that you can do anything, but not everything.

And therefore, focussing on what you are good at.

[Vidya Mahambare] (1:36:13 - 1:36:13)

Right.

[Mr R A Mashelkar] (1:36:13 - 1:37:37)

So, as to say, you know, Sachin Tendulkar is a great scientist, but I do not know what kind of scientist he could have been. I am a good scientist, but what kind of a cricketer I would have been, basically. And today, the fields are so open, you know, previously it was engineering, medicine, they were at the top.

But today, the number of fields that have been opened up are so amazing. In fact, Professor Negvekar is no more, but he had created an institution, you know, on graphics design and so on and so forth. Basically, he was telling me that the best solutions are coming from villages.

So, a young poor boy from a village can become the best graphic designer and become a multimillionaire, so as to say. Do not forget that when we talked about unicorns, and I said by 2021, we would have one unicorn per week, actually 44, not 52. 50% of them came from tier 2 and tier 3 cities.

Why? Because there is a digital access to them. Why?

Because people like Mukesh Ambani created Jio, 4 rupees per GB, voice free, half a billion customers, you know.

[Vidya Mahambare] (1:37:37 - 1:37:40)

Access was just democratised because of that.

[Mr R A Mashelkar] (1:37:40 - 1:37:46)

Access, it was. So, once you give that, if that was not the case, would the tier 2, tier 3 people be there?

[Vidya Mahambare] (1:37:46 - 1:37:46)

Yes.

[Mr R A Mashelkar] (1:37:47 - 1:38:08)

So, it is a question of opportunity. I always say education is equal to the future, but that is incomplete. Education plus opportunity is equal to the future, you know.

There is no use PhD applying for a lower division clerk position. He has to get an opportunity to use the skills that he has learned.

[Vidya Mahambare] (1:38:09 - 1:38:59)

So, that is one of the challenges that we as a nation need to overcome because we have so many millions now with degrees and even PhDs and so on, but applying for the jobs which are not as they aspire to. So, we have talked about all 5 Es. They are interlinked.

Nothing is separate, but if you had to say list and if you see around you, yourself and others, is there any one or two Es that stand out which say in what shapes life, say effort or equality of opportunity, anything that you feel is like a must for someone to overcome everything else?

[Mr R A Mashelkar] (1:38:59 - 1:39:20)

No, I think all 5 are important, very frankly. They are all interlinked. One without the other will not do basically.

You may be highly educated, you might have the right environment and everything, but you do not put in effort.

[Vidya Mahambare] (1:39:20 - 1:39:21)

What else?

[Mr R A Mashelkar] (1:39:22 - 1:39:52)

You have seen that. The best of them, the kind of effort that they put in. Bhimsen Joshi gets Bharat Ratna, but people do not realise he used to get up at 3, 4 in the morning and do Riyaz for 3 hours.

We all talk about Sachin Tendulkar, but the number of hours he spent in this thing, we talked about Muhammad Ali and the great boxer, 20 kilometres a day he would run.

[Vidya Mahambare] (1:39:53 - 1:39:56)

So, only endowment is never enough, it has to be supported.

[Mr R A Mashelkar] (1:39:56 - 1:41:14)

So, therefore, I always tell young people, there is like instant coffee, there is no instant success. There is no substitute for hard work. In my life, I am now 83 going to 84.

I work 24 into 7, day after day, week after week, month after month, year after year. At 84, this is a national bestseller we have produced. Of course, most credit goes to my co-author, Sushil Bode, who is extraordinarily talented.

But the basic point is that age is only a biological number. I think that is what you have to realise. I take inspiration from people like Hildebrand, who wrote a book when he was 100.

Sir J. I. Taylor, who wrote a breakthrough paper, single author, when he was 93.

I take inspiration from Professor Siena Rao, who is 93 and still today goes to the laboratory.

[Vidya Mahambare] (1:41:15 - 1:41:45)

Wow. So, when work is passion, there is nothing, we do not need work-life balance. Because your work itself becomes your life.

So, there is nothing, because we hear so much about work-life balance. But if your work itself, if you see it as your life, there is nothing called required work. Thank you very much, Dr. Mashelkar. It was an honour speaking to you. I learned so much in whatever time we have spent now. Thank you very much.

[Mr R A Mashelkar] (1:41:45 - 1:41:48)

Thank you. Namaskar. Thank you so much.

Thank you for having me.