Stanford’s Ron Howard, one of the fathers of decision analysis, explains how it’s done.

JUSTIN FOX: Welcome to the HBR IdeaCast from Harvard Business Review. I’m Justin Fox, and I spoke a few days ago in Palo Alto with Ronald Howard, a professor of management science and engineering at Stanford University and the man who half a century ago coined the term “decision analysis.” Ron, welcome to IdeaCast.

RONALD HOWARD: Pleasure to be here.

JUSTIN FOX: So it’s 1964. Where did this decision analysis come from?

RONALD HOWARD: Well, it came from my being out here at Stanford for a sabbatical year way from MIT, which was my academic home at the time. And I had an opportunity during that year– I was primarily writing a book– but I had an opportunity to give a course on statistical decision theory and the GE nuclear plant in San Jose. They built nuclear power reactors. And so for a couple hours one day a week I went down there and started teaching this course.

Well, what happened was after the first three weeks of doing this– and it was a course primarily based on the academic theory of decision making– one of the people in the course, one of the engineers, said, you know, we have a major decision to make. Could we use what you’re talking about to actually make a decision like that. And I said, well, why not. Let’s try it.

So for several months, we worked on this decision, which was whether put a super heater on their nuclear power reactor. And we got into all aspects of it from the very technical ones of how well would it work, what are the challenges, material, for example, of the new design, to the market for it– how much would the customers whom they knew very well all over the world, but, particularly, in United States– how much would the customer be willing to pay for this plant with different kinds of more efficiency, but, perhaps, higher initial cost. That kind of thing.

And so we had giant computer models that were run, while we waited, since there was no idea of personal computing in those days. And finally, we pulled it all together. And what we found was that an issue that they thought was originally important, like whether this particular material would last in use long enough make it a good idea– that turned out to be not important at
all, when we finally pinned it down, because it could change the design in a way that desensitized it to the life of that material— but that the real question was one of time preference. Would this pay off soon enough to make it a good investment for the company?

So something they were not at all initially worried about— a preference issue— turned out to be important. Whereas an information issue about the life of the material turned out to be not very important.

JUSTIN FOX: And you figured this out by how you structured the process?

RONALD HOWARD: Yes, by representing the decision, including the three major factors— what kind of alternatives do you have, what information do you have, how does what you do change different things, which is uncertain, typically, and we model on uncertainty, and then what are your preferences. And so this issue of the discount rate on the payback, that’s a time preference issue, as opposed to a risk preference issue, which is do you have the stock for it, as opposed to can you wait for it.

So we call this risk preference as the trade-off between greed and fear. You want more, but you’re afraid of losing what you’ve got. Whereas time preference is about greed and impatience. We want more and we want it now. And both of those are important in any decisions that has both uncertainty and time in its outcome.

JUSTIN FOX: Back to 1964. So we do this class with the GE nuclear people. And then it’s done, and you think, this is something new and interesting that we’ve put together here?

RONALD HOWARD: Well, actually, you see, it wasn’t just the class. The class was the excuse. But then it became the math— several people involved in the analysis, going over several months. And then when I wrote it up, just write it up and then presented at a conference at the end of that academic year, which was the one I coined the term of “decision analysis.”

And they said, what we going to call it? And I said, well, I like analysis. And it was called “decision analysis colon applied statistical decision theory,” as this was the engineering of a decision. People might call it “decision
“engineering,” but “analysis” made it clear that you’re not trying to make some decision happen, forcing it, but rather, just understanding what the best way to go is.

JUSTIN FOX: So when you’re making a decision this way, you’re dealing with the— it’s the probabilities, the preferences, I’m trying to think what else—

RONALD HOWARD: It’s the alternatives.

JUSTIN FOX: It’s the alternatives.

RONALD HOWARD: Or the way I put it it’s what you can do, what you know, which means how what you can do might affect the future, including probabilities, and, finally, preferences, what you want in terms of this versus that, now versus in the future, and for sure and not so sure.

JUSTIN FOX: Are there issues if you don’t know the probabilities and you don’t really know your preferences?

RONALD HOWARD: Well, it is a Zen statement that the Great Road is not difficult for he who has no preference. You see, it just gets down to do you want to get what you want or do you want to want what you get? So if you have no preferences, then they’re perfectly happy.

So if somebody says to me, do you want to go to the movies? I say, yes. They say what do you mean, a Western? Yeah, that’s fine. Colored or black? I don’t care. Silent?

I don’t care what kind of movie it is, as long as there’s flickering images on the screen, then I’ll be happy, no matter what he brings back for me to watch. But you see, we really do have preferences, particularly here in the West. We prefer health to sickness and wealth to being poor, and so on. So we’re kind of stuck in this game of being sure we get what we want, rather than saying, hey, whatever I get is just fine.

JUSTIN FOX: OK, so we do have preferences. Sometimes you need to push to get them out of people, I would imagine.

RONALD HOWARD: Oh, you do have them. And once you do, then so we’re not saying it’s a great idea to have preferences, but if you have them
and you want to get closer to what you want, then we know no better way of doing it then using this logic that we’re talking about.

JUSTIN FOX: What about probabilities when you’re deeply uncertain?

RONALD HOWARD: Well, actually, if you’re completely uncertain, that’s the best case. So if somebody’s asking me to bet on the toss of a coin, heads or tails, I’m going to say in general, unless if I was a magician, 50-50. So that’s easy for me. So see, is that a lot of uncertainty, or if I got the uncertainty well characterized, I’m ready to go.

JUSTIN FOX: I guess that’s the question— it’s when you don’t think you know the probabilities, I guess.

RONALD HOWARD: Well, see, but the whole idea of probability is to be able to describe by numbers your ignorance or equivalently your knowledge. So no matter how knowledgeable or ignorant you are, that’s going to determine what probabilities are consistent with that. And then you’re going to make your best decision consistent with what you know slash don’t know.

JUSTIN FOX: What kinds of decisions does decision analysis best lend itself to? What are the best ones to use it on?

RONALD HOWARD: Any decisions involving your money, your health. I once had a student say, well, I can see using this for your financial decisions. But what about the health of your family?

And I said, well, if I had to choose one area in which I could use it, that’s the only one. I’d say the health of my family, that’s most important thing for me. And I’d get some financial advisor to manage my money.

But in fact, it applies to any decision. So any decision where you’re allocating a resource, your body being a resource. It only doesn’t apply to where there is no resource.

So deciding who to love somebody, you might as well love them, because you’ve got an infinite supply. You only get more by exercising it. So you never have to make a decision about whether to love somebody or not.
JUSTIN FOX: Bringing this to a more business focus–

RONALD HOWARD: Oh, there’s no love in business, that’s what they’ll tell you.

JUSTIN FOX: We’ll circle back to love.

RONALD HOWARD: The love of money, perhaps, the root of all evil.

JUSTIN FOX: What are the areas in– I mean, you started doing this project with a nuclear power group.

RONALD HOWARD: Yes.

JUSTIN FOX: And what are the other areas in which this approach has had the most success, had the most uptake?

RONALD HOWARD: Well, the two biggest areas, I think, of use are, first of all, oil and gas companies. And the second biggest, I think, would be pharmaceutical companies. And if you think about why those areas, they both have this characteristic of, first of all, billions of dollars often to get a successful drug or for you oil field.

Secondly, a long time between making the decision and seeing how it worked out. And thirdly, a lot of uncertainty. So if you put those three together, that’s prime hunting ground for decision analysis.

JUSTIN FOX: Any fields that you think ought to be using it a lot more than they are?

RONALD HOWARD: Well, when you say “using it,” you see, once you start thinking this way and, as a matter, what I call “getting clarity of thought about things,” because that’s a challenge. Once you have clarity of thought, you would use it everywhere you could. I mean, every day, no matter how simple it is.

Now, you don’t have to run giant computer programs to make most of the decisions we face. So even the people who do this for a living are not running giant programs to figure out which pizza to order when they go to the pizza parlor. But the concepts are what was there. And being able to think clearly in terms of these concepts will make most decisions for you
right away. And if then it gets complicated, you may get into computation and specification preference and so forth.

JUSTIN FOX: Here in the middle of Silicon Valley, the huge industry that has grown up here over the past 30 years, I’m sure there are areas like building semiconductors, where people had a decision process just like in oil—

RONALD HOWARD: Oh, yeah. Fab—building big fabrication facilities—very expensive, and competitive elements of which part is going to grow. Is it going to be the CPUs or is it going to be the storage areas. Yeah, those are areas—And people do use it.

JUSTIN FOX: But much of the ethos of Silicon Valley right now is oh, I’m just going to try something, and if it doesn’t work, I’ll try the other thing, and try the other—

RONALD HOWARD: Well, that’s fine as long as you’re not spending billions of dollars. But when you build a fab plant for silicon wafers, that’s a lot of resources being put in a spot on the earth, very expensive resources. And while they are, to some extent, you might say, flexible or used for some other purpose, not really. I mean, you’re not going to make washing machines in a fab plant. So it’s a big commitment, and usually for some period of time.

JUSTIN FOX: Things that look a bit like “decision analysis” have been used a lot in the financial world over the past few decades as well. I think some very successfully, others less so. Is there anything about financial markets that makes this process harder?

RONALD HOWARD: Well, I guess, it’s whether you believe that the stock market is a random walk. And we see those all the time. People say, well, I threw darts at the stocks, and here’s what I invested in. And you see that a lot of it is just chance.

In other words, the market probably has a lot of information built into it already. The chance that you’re going to do better than it, whether it’s the stock market or the commodities market, is pretty slim. Remember, once working for a company that used an awful lot of copper, and they had someone who would report back to them on the real road leading to a copper mine in Zambia, just all the time. If anything happened—well, the workers
are on strike—oh, well, OK, that’s going to change that. So if you're competing with someone with that kind of information when you get into the copper market, so, yeah, some people are much better informed than others.

JUSTIN FOX: So it’s the information more than the process that ends up winning out?

RONALD HOWARD: Well, the people with better information are the ones who are going to do best. So unless you are right in that [INAUDIBLE] and you know as much as anybody about it, you wouldn’t be wise betting against them.

JUSTIN FOX: Back to using this in personal life or just–

RONALD HOWARD: Absolutely.

JUSTIN FOX: —in your career as an individual, what are some of the ways in which you’ve done that over the years.

RONALD HOWARD: Well, let me tell you the most important thing about this whole field in terms of the takeaway. When I tell this to the people, if they come to the first class and they may be shopping for classes, and I say, look, if you have to leave, take this one thing away. And that is you can’t tell the quality of the decision you’re making by the outcome that will be produced. Or to put it in another way, you can’t tell by the outcome whether you’ve made a good decision.

So you can have good decisions having bad outcomes or good outcomes, and bad decisions having good outcomes or bad outcomes. And it’s just a logical mistake to say I got the good outcome, I must have made a good decision. And yet, that’s what everybody thinks.

So and in exports particularly, you’ll see a situation, say, in football, where the coach has decided to run for the two-point conversion. That’s at the end of the game, and he wants to be sure he gets two instead of one. And it doesn’t work.

And the announcer say, ah, that was a bad decision. It’s completely illogical. You can’t tell whether it was a good decision by how it came out.
JUSTIN FOX: Well, that’s something, there are some economists and statisticians who, for the past 5 or 10 years have been trying to persuade the football coaches that it--

[INTERPOSING VOICES]

RONALD HOWARD: But this is any decision. And let’s take, in medicine, there’s something that people used to say, sort of as a joke in medicine, the operation was a success, but the patient died.

There again, the operation could have been done perfectly. It could have been a good decision to have the operation. And sometimes patients die. Not because you left a knife in them or something, they’re just, that’s what happens sometimes.

JUSTIN FOX: So do you judge the quality of the decision by the process that was used to get to it?

RONALD HOWARD: Exactly. [? The ?] correctly [? encodes, ?] first of all, has the right frame. The frame is the most important thing, and it’s the one that’s talked about the least.

So see, if you think of moving to Palo Alto, when you say, I’m going to rent a place, that’s a completely different frame from I’m going to buy a place. So different information, different preferences, different alternatives-- so till you get the frame right. And the frame could be even bigger– I ‘m going to rent or buy, I’ll look at them both.

So that’s the most important thing– to get the frame right. So otherwise, you’re going to get the right answer to the wrong problem. Once you got the frame right, then it’s a matter of characterizing the alternatives you have. And maybe you’re being creative about them, if you can be. Sometimes you can, sometimes you’re kind of stuck with what you’ve got.

Unlikely, you’re going to be telling the eye surgeon a new way to operate on your eyes– and probably not– then you are going to have to say, OK, what are the chances of different things happening-- dying from the operation to being cured, or if it’s by drugs and [INAUDIBLE] of side effects. So that’s all characterizing the information that you’ve got. I finally got the preferences. You could have different states of health, how do value those preferences? Which is best?
In other words, questions that get down to you would you rather have a punch on the jaw or a kick in the shin, right? That kind of depends on the situation, right? And how big the other person is. So yeah, so once you’ve got these three things, which are called the decision basis—what you can do, what you know, and what you want, then you’re dealing in the right frame. You’re good to go. The rest is just logic.

JUSTIN FOX: Ron, thanks again for talking with us.

RONALD HOWARD: It’s been a pleasure.

JUSTIN FOX: That was Ron Howard of Stanford University. For more, go to hbr.org.