Jessica LOVE: Innovation. You know it's a good thing: something that helps businesses (and entire societies) succeed. But how would you define it? And if you compared definitions with someone else, would they match? Innovation can feel like a big, unwieldy topic without a clear-cut definition or system of reference.

Ben JONES: The word innovation and creativity, they can seem almost magical, and seems like they might defy kind of systematic insight.

LOVE: But thanks to a whole lot of big data at researchers' fingertips, Kellogg professor Ben Jones says that's changing.

JONES: We just have great data suddenly, that we didn't have before. So we have data on every new business started in United States in the last 10 years. And every founder of all those businesses. We have data on every patent and all the inventors. We have data on every scientific article published around the world, and all the scientists, all the funders.

LOVE: And it turns out, all this data is producing some pretty interesting insights into where innovation comes from, and what we can do as a society to see more of it.

JONES: We have all of this information. And we're really just starting to unpack these boxes and really developing an exciting set of new insights. We really have a whole bunch of new facts that we can look at.

[Music interlude]

Welcome to The Insightful Leader, from Kellogg School of Management. In today's episode, we'll be hearing from Ben Jones, a professor of strategy at Kellogg, as he shares some of what he's been able to learn from mining this wealth of data.

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LOVE: When you think "successful entrepreneur" who do you picture? Maybe somebody young? Maybe someone unencumbered by tons of family responsibilities, who is able to take

risks, able to bring a brand-new perspective to existing problems. That's who a lot of us picture. But…is it correct?

Jones and his team decided to find out. They combined tax data, U.S. Census information, and other datasets to identify a list of everyone who founded new companies between 2007 and 2014. It was a pretty big list: 2.7 million people long. And then the researchers asked, who are these people?

JONES: So what we did is we got every new business in America, and we looked at how old were the founders? And what happened to the businesses? Were they successful? Were they have an IPO? Were they acquired? And just how did they grow? Do they reach kind of the highest echelons of new venture growth in terms of sales or employees that we see?

LOVE: The researchers were able to determine at what age, on average, entrepreneurs founded a highly successful, quickly growing business. And the answer was not a fresh-faced grad in their 20's, or a slightly more experienced practitioner in their 30's. They actually found the average age of these elite entrepreneurs was 45.

JONES: So it's considerably older than many people think. And it suggests a very different view of you know, what is it that makes a great entrepreneur?

LOVE: This finding, perhaps surprising on the surface, was actually consistent with other work by Jones, which has found that the average age at which scientists make pioneering discoveries is also increasing.

JONES: If you look at the ages of the individuals who make those breakthroughs, we see that's been going up a lot over time. Going up by about six to eight years over the last hundred years. So innovation not only is a sort of not a very young person's game in terms of the big ticket outcomes, it's increasingly not a young person's game. It's increasingly privileging those in middle age or beyond in terms of your likelihood of a great success.

LOVE: So why does innovation privilege those in middle age and older? What forces are at play?

JONES: Well, among one thing we accumulate, of course, is human capital and experience about how to run a business, about knowing an industry. We also build our social networks,

and we can build our own financial capital as well, which might be an important input, into innovation. But if you look at sort of where the high growth, the sort of one in a thousand highest growth companies come from, they tend to come from people who have been working in the industry for a long time.

It's people later in life who have more expertise, whether it's market knowledge, or more deeper scientific and technical knowledge.

LOVE: And if one of the advantages that comes with age is experience, another one – which might not feel like an advantage at the time – is failure, and how we learn and grow from it.

According to Jones, failure is an unavoidable part of entrepreneurship, and innovation more generally.

JONES: Some people talk about the US entrepreneurship culture as kind of almost celebrating failure, or recognizing and being very permissive of failure. And that makes a lot of sense, because, you know, most innovations fail. I mean, that's true at any of these, whether it's a new business, an invention, a scientific effort, in a lab, in a research facility. Most attempts fail. And so you're going to fail all the time. And so you have to be permissive to that. On the other hand, you don't want to fail too much, you know, there's a good piece of advice, which is it's great to fail, but just don't do it all the time.

LOVE: In fact, the key to getting failure "right" may be a lot about how you come BACK from that failure.

In another study, Jones looked directly at the career paths of individuals who experienced an early failure and compared them to the careers of similar individuals who narrowly succeeded. He found that those who missed out early on were ultimately more successful later in their careers. At least if they stuck with it.

JONES: We also see a very interesting countervailing force, which is that if you fail the first time and you choose to continue—so you're persistent and you show this key characteristic of what we could call grit—you actually become more likely to succeed than the people who succeeded at first.

So to summarize that, There's this old Nietzsche quote, which is, you know, "what doesn't kill me makes me stronger." And there's really some evidence for that in research certainly, where

it might kill you. Failure does seem to like, take people out of the system. But conditional on being able to proceed, you seem to do a lot better, even than all the people who succeeded in the first round. So that's good news for failure in a sense, but it requires grit. And, of course, we tend to think you know, more informally that that is a key characteristic of innovators and certainly of entrepreneurs.

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LOVE: So far, Professor Jones's research has found that many common assumptions about innovators and entrepreneurs are, well, not quite accurate. And he's got one more revelation to challenge our expectations.

JONES: We've seen a huge systematic shift across all forms of innovation, away from solo individuals, the singular genius, sort of doing it by themselves, to teamwork as driving all the big breakthroughs.

LOVE: That's right: forget about the lone scientist, toiling away in the lab. Over time, teamwork is getting more and more critical to innovation.

JONES: Teams are kind of like string quartets in innovation. Which is to say, if one player is out, playing off key, it ruins the whole effect.

LOVE: Which begs the question: how exactly do you create a good team? One that does what you want it to do and pushes human knowledge—or maybe just an important project—forward?

JONES: You don't want to just take your best people and spread them around thinking that they're going to drive these great teams. The reality is that you'd seem to want to put your best people together. But it seems like the real angle is in teams and in teams of putting A's with A's, with bringing complementary specialist knowledge together. And that seems to be the higher probability ticket to success.

LOVE: And remember – true expertise can be very narrow and specific – which means when you are building your team, you may need to cast a wider net than you think.

JONES: To tackle big problems, you can't just be very narrow, you need to have a wide set of expertise. And so we're seeing very, very large teams that are aggregating that kind of frontier level knowledge. It's not just technical knowledge, but also market knowledge about customers and institutions and trying to build that group human capital does seem to be essential. And that's really the right way to think about it at this point.

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LOVE: So now that we've learned about some of the current, and perhaps surprising, trends in innovation, let's explore what can be done at a policy-level in the US to boost innovation.

In September Jones and a colleague released a study that analyzed the return in terms of social benefit for money spent on research and development. They found that, for every dollar spent on R&D in the economy, per capita income increased between five and ten dollars. That sounds like a pretty FANTASTIC return, right? So…are we doing enough of it?

Not even close, says Jones. Only 2.7% of our GDP is spent on R&D. Jones thinks this is a big mistake, and that much more can be done to boost innovation and create returns for everyone.

JONES: So yeah, we seem like we do a lot. But when you think about it, we actually do very little. We could be having much faster, rising standards of living, much longer lives. We should be living longer already today if we'd done more in the past. We would have higher per capita income today, if we'd done more in the past. And we're just leaving enormous opportunities on the table.

LOVE: What kinds of R&D should we invest more in? According to Jones, all of it. Both private and public R&D investment are likely to build on each other, complementing one another to push innovation forward.

JONES: You might think, well, maybe it's the corporate R&D that matters a lot, or maybe it doesn't matter very much. Or maybe it's the basic research that matters a lot. And this is a hard question. And partly because they're very entangled with each other. Because one can sort of feed to the other. And so we don't know. I think the studies about the R&D tax credit, tell us that there is opportunity left on the table in the private sector. Because you increase that and you get a lot more innovative benefit. And I think the studies, the things like the NIH about

drug development say there's a lot more left on the table for basic research, too. So given the current state of knowledge, I would say, let's just do more of both.

Life is uncertain. We don't have to have full certainty. Let's just invest in all these different directions, because there's evidence that it could all help.

LOVE: And the evidence for needing more rigorous R&D investment has never been clearer than right now, after the events of the past year.

You don't know when a pandemic is going to come. We need more people around who are ready to go. And our whole footprint in science is just too small. And even ignoring the pandemic, we want to, as I said before, we want having much more science and innovation because it's going to pay for itself in ordinary times, because it's a high social return. That's also going to pay off in a pandemic cause you have that many more, virus researchers who can in fact jump in and bring those solutions forward in time.

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LOVE: In Jones' view, more government investment in R&D is just the beginning. There are LOTS of ways he thinks countries (and the policymakers who run them) can spur innovation. Like, taking a different approach to immigration.

In another study, Jones investigated the net effect of immigration on jobs here in the U.S.. Specifically, are immigrants job takers, as they are often portrayed to be, or are they on the whole job CREATORS?

To find out, Jones and his team scoured W-2 records and census data—including demographic information about where workers and company founders were born.

JONES: The really striking finding is that immigrants are extraordinarily entrepreneurial. They're more likely to start companies than US-born individuals. And then they tend to start companies of all sizes, including very, very big ones. And so the net effect is they actually create more jobs per immigrant in the workforce than compared to US-born founders and workers. I mean, they do both—they create jobs, and they take jobs, but on net, immigrants create jobs. And that means that the usual narrative is sort of exactly backwards. If you think

about it, in terms of job prospects for Americans, immigration on net is improving job prospects, and not worsening them.

LOVE: In another analysis, he found that immigrant-founded firms were more likely to pay higher wages than firms founded by people born in the U.S. They're also more likely to hold patents. Welcoming more immigrants to the U.S., then, has the potential to boost the economy, and innovation.

Another way to increase innovation, he says, is for the U.S. to invest in educating its youth.

JONES: Build your own human capital through the education system. And of course, you might do that with a PhD or a master's degree or a STEM degree, computer science in university. But of course, it also goes right back to the beginning. And you know, who's on the pipeline towards those careers.

LOVE: And by the beginning, Jones really means the beginning. With third-graders.

JONES: If you take third grade math scores of these kids. And you take all these kids who do really well - the kids who do really well in math tend to go more into innovation careers, and STEM degrees and things like that, eventually. But you have all these kids who do really well in math in third grade, but don't. And huge predictors of not doing that, not going to innovation are household incomes, gender, race. There are many things that seem to be interfering. We have all this talent in third grade, and these kids aren't migrating onto those career pathways. And I think the main conclusion is that we're leaving an enormous amount of talent out of the system.

I'm trying to now better understand, so what would be the levers more specifically, if you were to encourage more people into these careers. There's a lot to be revealed. But there's a lot of potentially very scalable solutions that could really relieve the obstacles that are at the heart of this problem.

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Love: Today's episode has challenged some popular assumptions about innovation: who it is coming from, and how we can promote more of it. But for those of you for whom this topic is

personal—perhaps people considering entrepreneurship for themselves—we'll leave you with a final piece of advice from Prof. Jones.

JONES: I think the thing to ask yourself, is not am I old enough or young enough. It turns out, you can do things at great ages. I mean, we have tons of successful entrepreneurs in their 50s and 60s, too and in their 20s. So the question is, "am I ready?" But it's because—do I understand something that most people don't? And do I have the requisite skills to execute against that? That's sort of the question you're trying to ask and that set of challenges you're gonna understand are going to evolve as you evolve, in your career and in your life.

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Credits

LOVE: This episode of *The Insightful Leader* was produced by Kevin Bailey, Kim Buikema, Jessica Love, Fred Schmalz, Michael Spikes, and Emily Stone. It was written and edited by Kim Buikema and sound designed and mixed by Michael Spikes.

Special thanks to Professor Ben Jones.

As a reminder, you can find us on iTunes, Google Play, or our website. If you like this show, please leave us a review or rating. That helps new listeners find us.

And, if you want more leadership tips from real experts, you should sign up for our free weekly email newsletter. It's packed with ideas and research from one of the world's top business schools…the Kellogg School of Management at Northwestern University. To sign up, go to kell.gg/email. Or check out our webinar series, the Insightful Leader Live, insight.kellogg.northwestern.edu/webinar. That's where our conversation with Prof. Jones was originally recorded.

We'll be back in a couple weeks with another episode of *The Insightful Leader*.