Innovation's Rewards and Trade-Offs

Interview by Karen Christensen

Describe the 'norm of collectiveness' that is replacing the age-old tradition of the individual genius in the realm of innovation.

Most innovative and scientific endeavours are now collaborative ventures, with many diverse people contributing to them. Our familiar image of **Einstein** working alone in his lab and coming up with the *Theory of Relativity* doesn't happen nearly as often today. **Walter Isaacson**'s book, *The Innovators*, emphasizes that collective development has become the norm, particularly for digital and Internet technologies.

What are the implications for organizations who want to continuously innovate?

The implications are that integration and ensuring cross-functional interaction are critical for innovation. Silos may be individually creative, but really aligning innovation with your organization's goals is a collaborative effort.

You have noted that in this environment, knowledge workers face an important trade-off between *credit* and *collaboration*. Please describe it.

Despite the shift towards collective innovation, the rewards from innovation still accrue mainly to individuals. If you are a business person forming a startup with some co-founders, you can agree up-front on an equity split, and as things change, you can adjust it. So, entrepreneurs get quite a bit of discretion as to 'who gets what' in terms of shares in a business. But when it comes to more research-oriented and scientific endeavours, you don't get to decide on those shares.

For example, the 2013 Nobel Prize in Physics was awarded to **Peter Higgs** and **Francois Englert**, who were responsible for developing key concepts in the theory that predicted the Higgs boson. Only these two individuals were honoured, despite the fact that it took decades of effort by thousands of scientists to find the boson. Work by scientists at **CERN** and at the Tevatron particle collider at **Fermi National Accelerator Laboratory** developed the search techniques and eliminated a significant fraction of the space in which the boson could hide, allowing experiments by Higgs and Englert to finally find the elusive particle.

Do you see this as unfair?

Yes, it is unfair, because the big rewards in science come from this recognition. But on the other hand, there is some reflected glory, so it isn't all that bad. This is a tough issue. Not everyone can get a prize, but perhaps these things should be awarded to groups.

Studies – including your own – show that creative outputs accomplished by a large number of people tend to be of higher quality; why is that?

Clearly, many heads working together can solve more problems. In our study, we looked at projects that people had to actually *choose* to be a part of. They could have decided to

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Higgs and Englert shared the 2013 Nobel Prize in Physics, while the thousands who helped them went unnamed.

collaborate or to tackle the subject on their own. So, they had to consider the both costs and benefits of being part of a collaborative project.

As indicated, collaborative projects will likely have a greater overall impact, so that's part of what attracts people to them. But there are also some constraints to consider. One is that collaboration is hard: you have to talk to people and participate in meetings, and then there is the attribution aspect we just talked about — a consideration of, What reward am I going to get as part of a team versus being out on my own? If you're on your own, the credit goes entirely to you; but if you're part of a team, the results will likely be more impressive — and therein lies the tradeoff.

Our study looked at the behaviour of MIT scientists and the choices they were making. In any given year, scientists will choose to be part of some collaborative projects and to do some of their own. We were able to measure the impact of those different endeavours by looking at citations, using 50 years of data. We found that while collaborative projects carry more total value, scientists were not joining them because they were considering how much credit they would get. Clearly, this has implications for the progress of research and innovation.

Do you recommend agreeing on credit allocation in advance?

One interesting thing is that it is not obvious what the formula for the allocation of credit is. If you have ten people working on a project, you might think, 'Whatever the value of the project is, each person should receive one tenth of the credit'. But as indicated, it's not like divvying up shares in a company. Conceivably, everybody could get the full value of the project credit.

What would that look like?

It is a bit like everyone getting a prize. Rewards are just paper, so you can just print more. But like currency, doing so can devalue it. Moreover, you might end up with too many people collaborating in name only; so it is tricky.

You found that the best scenario is actually somewhere in between; how so?

We actually found a precise formula for it: one over the square root of the number of collaborators. You wouldn't want it to be *one over ten*, because that would mean there's no benefit to collaborations — no synergies to be had; and you wouldn't want it to be *one*, otherwise everybody would be clamouring to get in on every project.

In another recent study, you looked at how entrepreneurs go about forming 'cooperative strategies' with incumbents. What do these look like?

Basically, if you're an entrepreneurial firm, one of the choices you make in terms of commercializing your technology is to 'choose' who your competition will be: you can take your product directly to market and compete with established firms, you can license your product by forming an alliance with Company X, or you can be acquired by Company Y. The latter two choices are forms of cooperative ventures, and we regularly see examples of both. For instance, **WhatsApp** recently came out as a competitor to **Facebook**, but it was acquired by them. These broad choices are open to entrepreneurs, and we studied what drives them to go one way or the other.

You note in your paper that disruptive technologies can be difficult to commercialize in a cooperative setup. Why would this be?

Disruptive technology, according to its traditional definition, has two features. The first is, when it comes onto the market, it doesn't appeal to most people. We studied the speech recognition industry — think **Siri**. In this industry, technologies were introduced that had faster processing: you speak into

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it and it can respond more quickly; but these faster answers may not have as big a vocabulary.

Imagine a new technology comes into the market, and you get a quicker response from it, but it doesn't have as many words. Over time, the product that prospers will be the one with a bigger vocabulary and the faster response speed at the same time. But at the outset, you don't know whether this will happen.

If you are an incumbent firm and you see an entrant like this, what do you do? You can pour your resources into following it over time, which seems wasteful. The alternative is to wait and see, and down the road, say, 'Great, that technology panned out. Now we can acquire that company and enjoy all the benefits of it.' It will cost you a bit more now, but that's the price you pay for waiting.' We found that, particularly for disruptive technologies, incumbents tend to follow this wait-and-see approach.

How do you define 'Model-Based Problem Solving'?

Models are theories about how the world works, and they can be used to solve problems. If you say, 'The sun always rises', that's more of a prediction — albeit a good one. To create a theory, you have to actually understand a bit of the mechanism: the sun always rises because the Earth is rotating. That's more of a theory. Even if you don't know *why* it's rotating, you know that it is rotating. Based on this theory, if the Earth stopped rotating, we would not see the sun.

In the Social Sciences, we look at how people behave, and what predictions we can make based on that. With regard to investigations of entrants coming in with disruptive technologies, we had to consider all the possible options. We came up with a theory that for disruptive technologies, the entrants would enter and begin to compete, and the incumbents would wait and see and then, when they prove successful, acquire them. That prediction didn't come about because we thought it was a good prediction. It came about because we considered all the elements — what new entrants do, and what *could* they do? Well, they could compete or cooperate, and then they could change their mind. And, What could the incumbents do? Well, they could try to track the entrants or try and compete with them, or they could change their minds. As it turned out, our theory predicted this pattern of entering, then competing and then cooperating.

In short, models are designed to uncover some truths of the world. Of course, the world changes constantly, so some of the parameters of every model will change; but what we're looking for are models that can explain *a good chunk* of what we see, so we can rely on them to make decisions.

Describe the model you created to describe an individual's quest to manage the collaborative aspects of their knowledge-work portfolio.

That model was pretty simple: it specified what individuals get from collaborating with others, and what properties might that entail? Also, what are the costs associated with it? Essentially we came up with the mathematical formula I mentioned earlier, but it was from the point of writing that down that we realized, Okay, now we've got to think about the individual's decision to participate in a project, as opposed to doing something else; we had to think about what that something else might be. The data we accumulated allowed us to address aspects of the decision, and it also included some unknown variables. But because we had a model, we could ask the question, If the data is what it is, and our model is what it is, and admittedly, we don't know everything, what levels would those quantitative measures have to be at, in order for the model to be consistent with the data? Whether you are an economist, an academic or a business leader, you need to come up with theories about how the world works. ***RM***

Joshua Gans is the Jeffrey Skoll Chair of Technical Innovation and Entrepreneurship, Professor of Strategic Management and Area Coordinator for Strategic Management at the Rotman School of Management. He serves on the editorial board of *Management Science*, as managing director of the Core Research consultancy and blogs at Digitopoly.com. Rotman faculty research is ranked #4 globally by the *Financial Times*.