Beyond Patents: A NEW AGENDA FOR INNOVATION RESEARCH

If patent analysis is a smoke screen that has prevented scholars from improving their understanding of innovative processes, how should they address innovation instead? Although there are many possible alternative avenues, here I focus on a new agenda for productivity that is being advocated by a small number of scholars such as Robert Gordon and Tyler Cowen, but is largely neglected by most innovation scholars.

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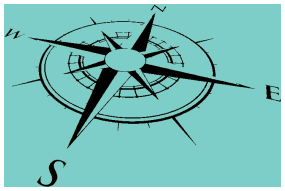

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Description:

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Stakeholder(s):

Robert Gordon

Tyler Cowen

Scholars

Vision

Innovative processes are better understood

Mission

To propose a new agenda for productivity

Values

Innovation

Research

Productivity

1. Products, Services & Processes

Determine the extent to which new products, services, and processes have emerged and are currently emerging.

Stakeholder(s)

Scholars :
Scholars must understand the technologies that form the basis for the new products, services, and processes, a research activity that is very different from statistically analyzing large databases.

A first set of questions involves the extent to which new products, services, and processes have emerged and are currently emerging. GNP data tell us some of this, but not anywhere to the extent that is needed.

1.1. Databases

Develop databases that better highlight changes, particularly in the early years of new products, services, and processes.

We need databases that better highlight these changes, particularly in the early years of new products, services, and processes. This includes science-based technologies such as superconductors, quantum computers, nanotechnology, synthetic food, glycomics, and tissue engineering; new forms of digital products such as augmented reality and drones; and new forms of internet services including those that are free, such as music and user-generated content.

Stakeholder(s):

Market Research Organizations :
A possible source of data is the growing number of market research organizations that provide regularly updated data on new technologies. The challenge is to integrate these data with traditional GNP data because this integration requires a different set of skills.

1.2. Emergence

Understand the extent to which new products, services, and processes have been emerging.

Without data on recent products, services, and processes, it is difficult to understand what has emerged in the past 20 to 40 years, the period that is the most important to analyze. Fine-grained sales data from this and previous periods can help us understand the extent to which new products, services, and processes have been emerging and help us analyze the impact of changes in regulatory policy and in university and government R&D policy on the emergence of new products, services, and processes, particularly recent ones.

1.3. Policy

Analyze the impact of changes in regulatory policy and in university and government R&D policy.

Stakeholder(s):

Regulatory Agencies **Universities**

2. Origins

Determine where new products, services, and processes come from.

Second, once we know what is coming out, we can address where these new products, services, and processes come from. Do they come from existing technologies or new technologies? If they come from existing technologies, what enabled them to emerge when they did? Was it changes in regulation, consumer demand, or cost and performance of existing technologies? If they are from new technologies, how did these new technologies emerge? What were the changes in cost and performance that enabled them to emerge, and were there advances in science that formed the basis for the new products or that helped the improvements to occur?

2.1. Processes & Influences

Understand the overall processes and influences that lead to the emergence of new products, services, and processes.

Addressing these questions will help us understand the overall processes that lead to the emergence of new products, services, and processes, along with the factors that influence the processes. Currently, there is little agreement about where new products, services, and processes come from, a seemingly basic issue.

3. Connections

Determine how economically important products, services, and processes are connected to publicly funded scientific research.

Stakeholder(s)

National Science Foundation

National Institutes of Health

Government Agencies

Google

Stanford University Researchers :
In a blog that accompanied the above-mentioned Science paper, the authors illustrated the importance of indirect linkages between science and technology by invoking the necessity of Einstein's theory of relatively for the Global Positioning System and thus Uber. But such high-level, general linkages to paradigm-busting geniuses such as Einstein tell us almost nothing useful about knowledge flows, innovation, or science policy options. Einstein's theory of relativity was published in 1916.

Techno-Optimists :
Techno-optimists might argue that the boom is coming soon, but we need better data and analyses to test such a hypothesis.

Third, researchers should be looking the opposite way. How are the new types of products, services, and processes that are economically important today connected to the many types of scientific research that have been funded over the past 20 to 40 years by the National Science Foundation (NSF), the National Institutes of Health, and other government agencies? Most funding agencies and analyses of this research merely focus on academic papers as an output, but what matters is the research that eventually leads to new products, services, and processes. This analysis should go beyond the standard litany of anecdotes (by now everyone knows that the Google algorithm was developed by NSF-funded researchers at Stanford University) and be able to trace the linkages between specific advances in science and the eventual products, services, and processes, including the intermediate steps of new product concepts and improvements in the cost and performance of the resulting technologies... What we need to know is the extent to which recent advances in science affect new products and services. We already know that most of the world's products and services depend on past advances in science and that these advances are cumulative. We want to know how many advances made since 1980, 1990, or even 2000 have had a major influence on new products and services. This type of data is needed to understand the bottlenecks for innovation. Patent analyses suggest that advances in science have been making direct contributions to every new product and service, but this conclusion seems unlikely given the successive productivity slowdowns in the US economy since 1970, even as government support for academic basic research increased more than tenfold (after inflation) between 1950 and 1980. These increases in basic science should have led to a productivity boom in the late twentieth century, one that rivals the late nineteenth century.

3.1. Policies

Analyze the effects of various policies on the linkages between advances in science and new products, services, and processes.

Among other things, we need such data to analyze the effects of various policies (such as the Bayh-Dole Act of 1980 that incentivized university patenting) on the linkages between advances in science and new products, services, and processes.

3.2. Linkages

Link advances in science with real products and services.

Linking advances in science with real products and services requires a completely different form of research than is currently done in patent analyses. Rather than do large-scale empirical analyses, one must understand many intermediate linkages through detailed case studies. What types of new explanations did these advances entail? What types of new concepts or what types of performance and cost improvements in the resulting

technologies did the explanations enable? What types of products, services, and processes emerged from these technologies, and what were the time lags?

Stakeholder(s):

Innovation Scholars :
This type of research changes the focus from statistical analysis that searches for perhaps nonexistent general trends, to a real-world, case-based understanding of science and the emergence of new products and processes, such as the work pioneered decades ago by innovation scholars such as Kenneth Flamm on computers, Nathan Rosenberg and David Mowery on aircraft, Yujior Hiyami and Vernon Ruttan on agriculture, and Richard Nelson on transistors.

Kenneth Flamm :
on computers

Nathan Rosenberg :
on aircraft

David Mowery :
on aircraft

Yujior Hiyami :
on agriculture

Vernon Ruttan :
on agriculture

Richard Nelson :
on transistors

3.3. Scientific Disciplines

Understand from which scientific disciplines the new products, services, and processes have emerged.

We also need to understand from which scientific disciplines the new products, services, and processes have emerged if we are to make better funding decisions and if we are to help engineering and science students make better career decisions in an ocean of hype about the value of science, technology, engineering, and mathematics (STEM) education.

Stakeholder(s):

Engineering Students

Science Students

STEM Students :
The current system makes little attempt to help students understand what types of innovations are occurring, what fields of science are making the most useful contributions to innovation, and thus which courses of study offer the most opportunities.

4. Productivity

Determine why some sectors have faster productivity growth than others.

A fourth set of questions revolve around why some sectors have faster productivity growth than do others. Because most economic and management research focuses on organizational factors such as employee performance measures, incentives, and skills, and uses patents as a surrogate for innovation, the reasons for the differences between sectors is largely being missed.

4.1. Moore's Law & New Materials

Look across industrial sectors and classes of technology to understand the overall impact of Moore's Law and new materials on differences in productivity.

For example, the mechanics of Moore's Law, the role of smaller scale, and the impact of this smaller scale on rapid improvements in cost and performance of information processing technologies are well documented, but little systematic effort has been made to look across industrial sectors and classes of technology to understand the overall impact of Moore's Law and new materials on differences in productivity, or to identify other specific pathways of innovation on productivity.

Stakeholder(s):

Industrial Sectors

4.2. Pathways

Identify pathways of innovation on productivity.

Patent analyses gloss over these details and leave us with a vague feeling that innovation is occurring, science supports this innovation, and as long as we have more of both, everything will be okay.

4.3. Slowdown

Understand the reasons for the productivity slowdown and how it can be fixed.

Innovation scholars should be trying to better understand the reasons for the productivity slowdown and how it can be fixed.

Stakeholder(s):

Innovation Scholars

4.3.1. Data & Information

Consider multiple types of data and information.

Identifying and analyzing these reasons will require scholars to consider multiple types of data and information, much of which cannot be placed in a spreadsheet and analyzed with sophisticated statistics, and will not likely be found in academic journals.

4.3.2. Advances

Understand the specifics of new advances in science, new technologies, and their resulting new products and services.

Scholars will have to get their hands dirty, understanding the specifics of new advances in science, new technologies, and their resulting new products and services. They will have to make judgments, create new definitions, identify new linkages, and begin building new bodies of data... Ultimately, such research can help inform a more constructive discussion about fostering economic opportunities across all levels of society.

Stakeholder(s):

Scholars

Charles Darwin :
Just as Charles Darwin left home to understand the real world, innovation scholars need to do the same, leaving the safety of existing databases and theories so that they can start collecting new data and generating new hypotheses.

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