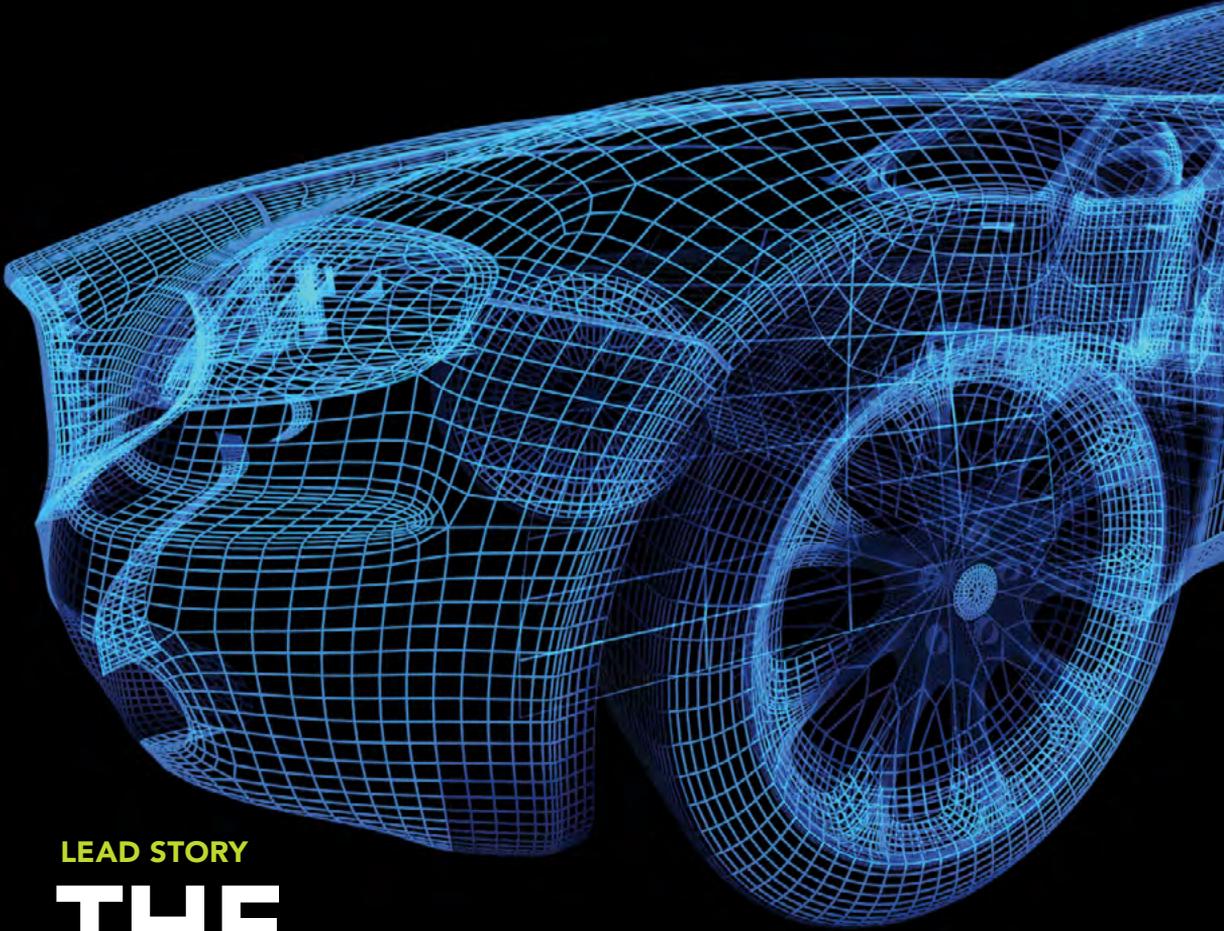


Grayway



LEAD STORY

THE INNOVATION RACE

Why It's More Important Than Ever for the
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THE STATE OF U.S. INNOVATION

WELCOME



Stephen Gray
Chief Executive Officer

In a world where product advancements are being made at a breakneck pace, it may be hard to believe that spending on R&D isn't what it used to be. Funding by the public sector has steadily declined for some five decades and, while private-sector R&D investment is growing at its fastest pace in history, these dollars are being dedicated to design and product development, rather than in basic research where the most revolutionary discoveries are made. In this issue of the GrayWay, we will discuss what's behind this trend and what the public and private sectors can do and are doing to ensure the U.S. remains the world's No. 1 innovator.

Gray practices methods
which protect our environment.



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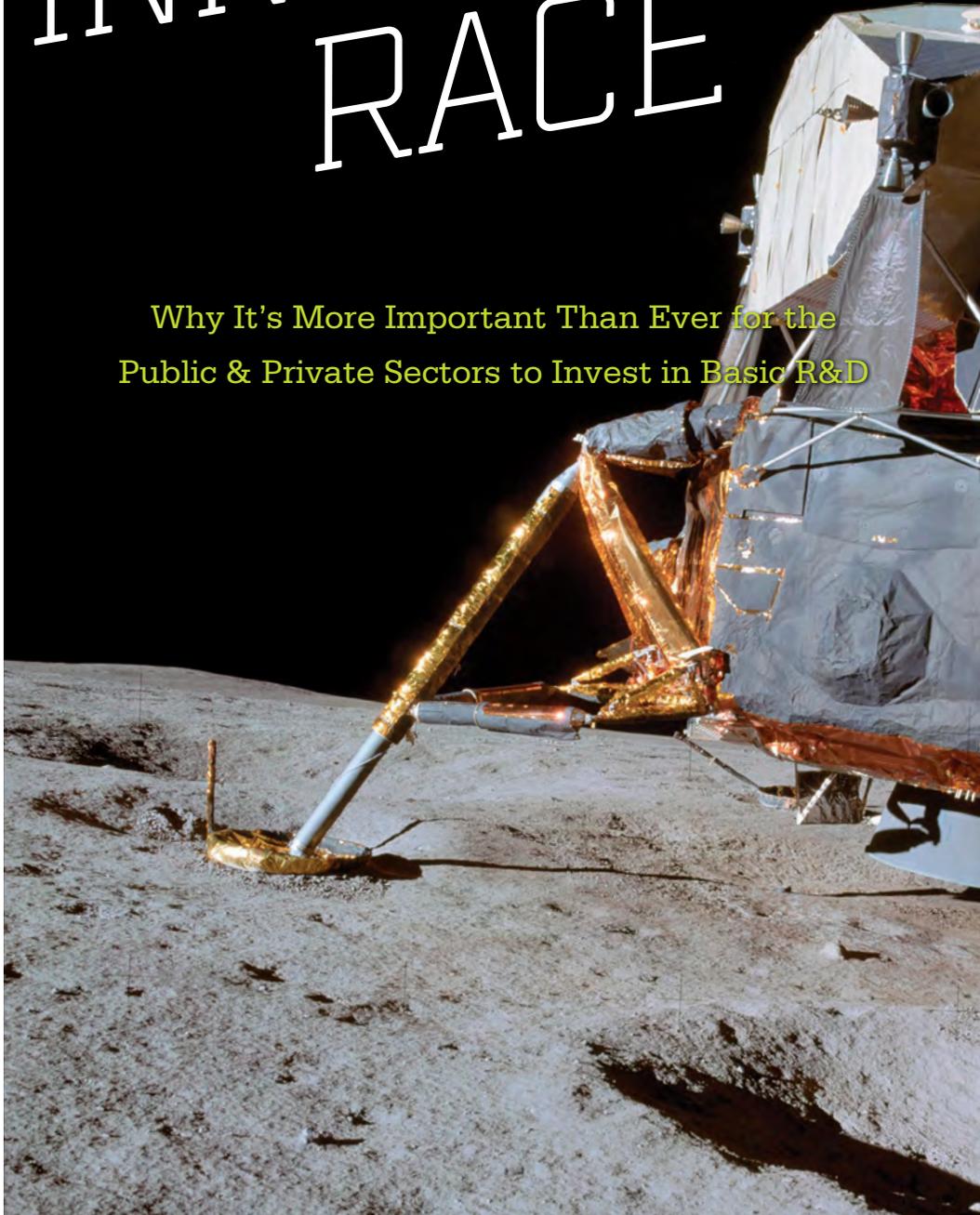


GRAY... WE'RE BUILDING

Cabela's Incorporated
Lexington, Kentucky

THE INNOVATION RACE

Why It's More Important Than Ever for the Public & Private Sectors to Invest in Basic R&D



WHEN THE U.S. WAS in a race with the Soviet Union some 50 years ago to put a man on the moon, spending by the federal government on what many call “basic” research and development (R&D) was at an all-time high. Basic R&D has no clear end-goal, but is the kind of research from which world-changing discoveries are made. It provides the building blocks for industry to conduct applied research to innovate and develop new, more sophisticated products and services. Without basic R&D, lifesaving cancer treatments may have never materialized. The U.S. would never have become the leader in silicon transistor manufacturing—think no Silicon Valley. And, the Internet may not exist.



Adams Nager
*economic research analyst,
Information Technology &
Innovation Foundation*

It is widely understood how important basic R&D is to U.S. competitiveness, but investment in this kind of research has plummeted over the last several decades, by both the public and private sectors. Federal spending on R&D has fallen from close to two percent of the gross domestic product (GDP) in the 1960s to 0.8 percent in the first quarter of this year.

Adams Nager, an economic research analyst for the Information Technology & Innovation Foundation (ITIF)—a non-partisan, non-profit think tank in Washington, D.C. focusing on technology, policy issues and innovation economics—says the U.S. cannot afford to lose its position as the world’s leading innovator.

“What I see in R&D that’s really troubling is the fact that government isn’t funding science the way that it used to,” said Nager. “If we stop striving to discover how to get to space, how to cure cancer, or how to get a car to drive itself, we fall behind,” he said. “You can bet that other countries are not going to stop the pursuit of discovery.”

Federal spending on basic R&D is down, however, investment by the private sector in applied research is growing at its fastest pace in five decades.



Volkswagen says its XL1 concept car is the world's most fuel-efficient and aerodynamic production car.

Top 20 R&D Spenders 2014

1. Volkswagen	\$13.5 bn
2. Samsung	\$13.4 bn
3. Intel	\$10.6 bn
4. Microsoft	\$10.4 bn
5. Roche	\$10 bn
6. Novartis	\$9.9 bn
7. Toyota	\$9.1 bn
8. Johnson & Johnson	\$8.2 bn
9. Google	\$8 bn
10. Merck	\$7.5 bn

Source: strategyand.pwc.com

A June 4 Bloomberg Business article reported that from November 2014 to March 2015, U.S. companies funded R&D at an annual rate of \$316 billion. That figure represents 1.8 percent of the GDP—the largest share ever for the private sector.

To keep pace with today's advancing technologies and remain competitive, international and domestic manufacturers are investing heavily in R&D spending. This is particularly true for automotive and technology key players like Volkswagen (VW) and Samsung.

German automaker VW has topped Strategy&'s Global Innovation 1000 list as the No. 1 biggest R&D spender for the last three years, offering

up \$13.5 billion in 2014. A significant portion of VW's continuous investment is occurring right here in the U.S. where Volkswagen recently announced plans to build a new R&D center in Chattanooga, Tenn. that will focus entirely on the needs of U.S. drivers. The center will be constructed as part of VW's \$900 million Chattanooga manufacturing facility expansion and is geared toward driving the company closer to the American market. According to VW CEO Martin Winkerchron, the R&D facility will provide the company with "more firepower" to help VW understand American tastes.

South Korean tech giant Samsung, the Global Innovation 1000's No. 2 biggest R&D spender for the last two years, spent a staggering \$13.4 billion in 2014. This type of investment is no surprise considering that Korea's R&D investment is rising faster than its peers. And, like VW, Samsung is also banking on the U.S. as a sound choice for an R&D center investment, announcing the \$250 million purchase of its R&D hub in Mountain View, Calif. in May.

But while U.S. industry investment in applied research is on the rise again, investment in basic R&D has all but disappeared. Corporate-sponsored R&D labs like Bell Labs and Xerox Parc have been greatly diminished, leaving industry dependent upon the federal government and universities to conduct basic research and fuel innovation.

What is behind industry's flight from basic R&D? In January 2015, Duke University's National Bureau of Economic Research released a white paper entitled, *Killing the Golden Goose? The Decline of Science in Corporate R&D* that offers theories on why this trend is taking place.

Theory No. 1: fierce competition from other countries has U.S. companies desperate to protect their intellectual property.

"Large firms may still be investing in science but may be publishing less, perhaps in order to patent or better protect their research findings," the paper reported.

Another theory blames competition from low-wage countries for the lack of R&D investment by U.S. companies. Why? Because competition from low-cost countries "can depress private investments in R&D by reducing cash flows, thereby reducing the amount of internal funds available to fund research."

Nager suggests a much simpler theory behind the lack of investment by the private sector: it simply no longer makes business sense.

"For instance, if a company had privately funded the human genome project and it cost \$10 billion, the value of that discovery is \$50 billion, but the company is only able to realize \$6 or \$7 billion, they've made a net loss," he said.

But perhaps what has economists and analysts the most concerned about the U.S.'s lack of investment in R&D is the impact it could have on labor productivity.

"The United States' manufacturing labor productivity rates have been stagnant, falling well behind growth rates in Europe and east Asia, and even declined in the first quarter of 2015," said Nager.

"As we look at how the U.S. is doing competitively with other nations, you can't just look at the unemployment rate and say we have a 5.3 percent unemployment, compared to Germany at 4.7. In many regards, that does not matter. What does matter

"If we stop striving to discover how to get to space, how to cure cancer, or how to get a car to drive itself, we fall behind. You can bet that other countries are not going to stop the pursuit of discovery."

—Adams Nager

is the growth of our labor productivity, which equates directly to how our technology is progressing. And, right now, we're slipping backwards."

So, what can be done to encourage more investment by U.S. industry in R&D? Nager says we can start by strengthening the federal government's R&D tax credit to create real incentives for companies to invest in both basic and applied research. The latest ITIF study found that the U.S. ranked just 27th out of 42 countries in terms of R&D tax generosity, and that ranking continues to slip.

Nager also noted strengthening the U.S.'s lab systems by increasing funding at research universities as another solution.

"We think a lot at ITIF about policies for how to transfer technology out of these labs and universities," Nager said. "Robust tech transfer strategies are needed to get research out of the labs and into the private sector."



PARTNERING FOR THE FUTURE

How the Public and Private Sectors Are Attempting to Breathe New Life into Manufacturing Innovation

IN THE U.S. INNOVATION game, there have always been several players on the field—from federal, state and local governments, to colleges and universities, to non-profits and industry associations, to corporate giants and their suppliers. Often, these groups partner in the interest of innovation, bringing together the country's best and brightest to generate the ideas today that result in tomorrow's technological breakthroughs.

In the early to mid-twentieth century, the federal government played an active role in research support for manufacturing, with investment in basic R&D peaking in the 1960s. Since then, federal spending on R&D has steadily declined.

Fast forward to 2001: the U.S. manufacturing industry as a whole experienced a sharp decline, losing a third of its manufacturing workforce when 55,000 factories closed, swinging the U.S. into a trade deficit across a number of manufacturing sectors it once dominated. To address this loss, President Obama put manufacturing on his priority list in 2011 and launched an initiative aimed at recharging the industry. He commissioned the President's Council of Advisors on Science and Technology, or PCAST, to study the issue and make recommendations on how to revive manufacturing. PCAST concluded that, in order to create high-quality manufacturing jobs and enhance America's global competitiveness, the U.S. must establish a strong national innovation policy.

As a result, the National Network for Manufacturing Innovation (NNMI) was created to ramp up advanced manufacturing technologies and processes, and address the widely reported talent shortage in the sector. Congress overwhelmingly voted to authorize a federal investment, which would be matched by private funds to create an initial network of up to 15 institutes that would focus on a specific area of study. The ultimate goal: to create some 45 institutes over the next ten years.

The innovation hubs will focus on educating and training workers in specific advanced manufacturing areas like 3D printing, digital manufacturing, light-weighting of metals, wide bandgap semiconductors, flexible hybrid electronics, integrated photonics, clean energy, and fibers and textiles—the areas that drive America's future economic competitiveness. It's been reported that nine of these hubs are slated to be up and running by the end of the year, so NNMI's mission is already well underway.



Mike Molnar
director, NIST
Advanced
Manufacturing
National Program
Office

Mike Molnar is director of the National Institute of Standards and Technology (NIST) Advanced Manufacturing National Program Office—the organization charged with supporting the development and execution of NNMI—and says NNMI institutes will catalyze the federal investment by creating a new space where industry and academia can work together on scaling up innovation.

“Currently, there are five institutes established and four more competitions underway,” said Molnar. “In the President's 2016 budget, there's a request for seven additional institutes.”

The institutes are public-private partnerships operated by an industry-led consortium. The government provides the startup funding over a five-to-seven-year period that must be at least 100 percent matched by the consortium. While partial funding is being provided by the U.S. government on a short-term basis, Molnar says the actual owners are members of the consortium that make up each institute.

“Let's use the Digital Manufacturing and Design Innovation Institute (DMDII) as an example,” said Molnar. “The operating team is UI Labs, short for University-Industry Laboratories—an organization established by the University of Illinois. They manage the institute on behalf of the overall consortium—all the members who chose to join the institute. These are industry-leading companies and their tier-one and tier-two suppliers such as General Electric, Procter and Gamble, Microsoft, John Deere, Boeing, Caterpillar. And it's academic partners like Illinois, Iowa State, University of Michigan, University of Cincinnati, Purdue University, University of Wisconsin, Ohio State, Northwestern. It's all of them working together.”

The idea, Molnar says, is for the government to help catalyze partnerships that will help manufacturing reach the big, audacious goals that no single company can achieve by themselves. In the [Advanced Composites Manufacturing Institute](#) for example, it is about scaling up the materials for significantly reduced cost, opening up new uses and markets.

“They’re asking, how do we develop the processes so that this composite can be made at 50 percent less cost, and increase recyclability up to 95 percent?” said Molnar. “If you achieve that, then suddenly the demand is established, supporting an expanded supply base, creating a manufacturing hub for new markets. No single company, university, or government agency can address that big challenge by themselves. But working together, we can.”

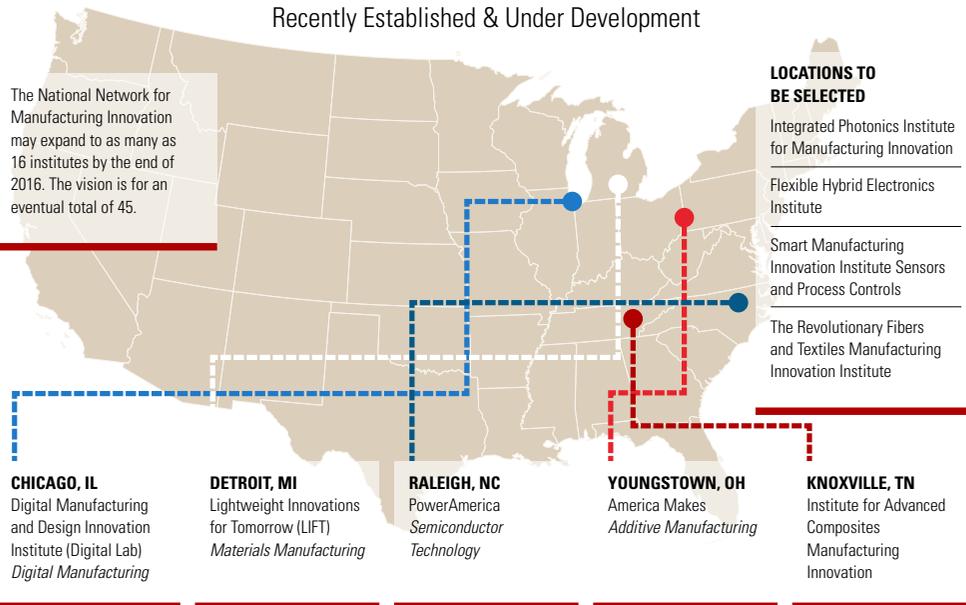
To take advantage of the nation’s potential to re-emerge as a world leader in manufacturing innovation, it seems the government should

also capitalize on regional opportunities for growth in the industry. For example, a recent [report](#) by The New England Council and Deloitte predicted that over the next ten years, a total of 105,002 job vacancies will go unfilled in New England as advanced manufacturing industries grow, but educational programs fail to fill the demand for new workers. To solve the problem, the New England Council and Deloitte recommend the region secure a federally funded advanced manufacturing facility to serve as a hub for innovation.

It is too soon to tell whether these hubs will succeed in producing the ideas today that will lead to tomorrow’s technological breakthroughs. While collaboration between the public and private sectors has been fruitful in the past, the U.S. must place a renewed emphasis on R&D to ensure its position as the world’s leading innovator.

U.S. MANUFACTURING HUBS

Recently Established & Under Development



Source: SME

THE NEW FACE OF MANUFACTURING

A Q&A with MedShape’s Ken Gall and Kurt Jacobus



Q: Tell us about how the idea for your company, MedShape, was born.

We met in the 1990s while studying mechanical engineering at the University of Illinois where we shared an interest in inventing new materials. After college, we reconnected when Ken, a former athlete, set out to make a product that created synergy between human performance and sports medicine. In 2005, we founded MedShape out of VentureLab, a Georgia Institute of Technology incubator that brings faculty, staff, and students’ research and ideas to market. Since then, the company has evolved into the leading manufacturer of orthopedic devices that utilize advanced material technologies. MedShape’s vision is to create innovative solutions to problems encountered with current orthopedic implants and surgeries.

Q: R&D played an important role in the startup of your company. Tell us more about that, and how important R&D is to your company’s success today.

Investing in research and development isn’t a luxury for us—it’s absolutely critical. Not only do we perform applied research to develop

new and innovative products for the medical industry, we conduct basic research funded by federal grants to support our fundamental business. Because of the unique technologies that underpin our products, our research often looks like basic science and our development looks like many companies’ research. We work hard to develop a fundamental understanding of our materials, products, and the surgeries that they enable.

Q: What advice do you have for innovators with big ideas but no experience in bringing a concept to market?

Have confidence and passion in what you want to achieve and bring on great people to work with you. There are a lot of ups and many more downs when starting a new business, but don’t be afraid to try new things. Make sure to properly finance your business, but always have a backup plan. Growing a business with limited financing sources is difficult. Ask for help when needed, or you may miss out on opportunities.



GRAY... WE'RE BUILDING

CABELA'S INCORPORATED

LEXINGTON, KENTUCKY

Gray has been selected to build a 70,000 s.f. store for sporting goods retailer Cabela's in Lexington, Ky. This is Cabela's third retail store in Kentucky.

The facility will feature Cabela's signature look and style, including an exterior built from log construction, stonework, wood siding and metal roofing. Inside will feature taxidermied wildlife, an aquarium and a variety of woods to create a rustic feel. Building construction will include installation of structural glulam timber trusses for the high-bay.

Cabela's is expected to hire 160 full-time and part-time employees, most of whom will be recruited from Lexington and the surrounding areas.

