The World Is Ours to Make: The Impact of the Maker Movement

The maker movement is driving engineering into the mainstream. Makers around the world are inspiring each other to create (or "make") smart gadgets, robotic gizmos, autonomous drones, and wearable devices. These innovations are no longer monopolized by multimillion dollar companies. Instead, makers work in home garages and collaborative workspaces with their peers. More importantly, they openly share their inventions online to inspire new innovations from other makers. This type of grassroots "viral innovation" is disrupting the status quo. Is this the beginning of the next industrial revolution?

The Homebrew Computing Club was founded in the 1970s by a small group of hobbyists building personal computers in their garages. They met regularly in Silicon Valley to share inventions and discuss new ideas. None of the members understood the historical implications of the meeting when two members of the club, Steve Jobs and Steve Wozniak, presented their new computer. It was the Apple I, and it helped deliver PCs to the masses and propel us into the information age.

Modern-day makers are the same as the hobbyists of the 1970s, just on a much larger scale. Nearly 200,000 of them attended the two flagship Maker Faire events, also known as the "Greatest Show and Tell on Earth," last year in San Francisco and New York. The Internet is fueling a maker community orders of magnitude larger than what was possible in the 1970s. As the maker movement continues to grow and garner worldwide attention, it is important to assess the impact it will have on innovation, economic growth, and our future generations.

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Consumer-Driven Innovation

The PC created a new generation of software developers who could innovate in the digital world without the limitations of the physical world. Through its inherent nature of virtually no marginal cost, software has become the great equalizer for innovation. It provides an open canvas for creativity that empowers individuals to make highly valuable products with the ability to disrupt corporate-driven products and business models. At no other time in history has it been easier for an idea to originate in the imagination of a single individual and spread to a mass market.

Advances in 3D printing and low-cost microcontrollers as well as the ubiquity of advanced sensors are enabling makers to bridge software with the physical world. Furthermore, the proliferation of wireless connectivity and cloud computing is helping makers contribute to the Internet of Things (IoT). IoT describes a world of interconnected devices that use sensors to interact with the people, environment, and other devices around them. This interconnection adds functionality and greater insight into an unlimited number of existing and new devices. By combining hardware and software, the maker movement will advance the IoT much like the open platform for mobile app creation has developed a new economy around smartphones. Examples such as an automated cat feeder, a smart air conditioner that learns from your living patterns, and an umbrella that alerts users based on the local weather report showcase the lifestyle improvements and niche solution development that the IoT will provide.

Democratization of Entrepreneurship

The Pebble E-Paper Watch raises $10M. The LIFX smartphone-controlled LED bulb raises $1.3M. What do these products have in common? They both secured funding through Kickstarter, a crowd-funding website that is changing the game for entrepreneurs. Both products were created by makers who seek to commercialize their inventions. These "startup makers" iterate on prototypes with high-end tools at professional makerspaces such as TechShop and FabLab. There, engineers and artists collaborate to create products that not only use advanced technologies but also feature polished aesthetics. They then secure funding through crowd-sourcing sites where success is based on

the mass consumer valuation of the product instead of the assessment of a few venture capitalists.

The maker movement is a catalyst to democratize entrepreneurship. For companies to remain competitive, they need to embrace the maker movement or leave themselves open for disruption. GE executives recently launched FirstBuild, a makerspace to engage students, entrepreneurs, and makers to co-create appliances of the future. FirstBuild has already generated new projects such as instrumented refrigerators, quiet-close microwave doors, and a smart water pitcher that automatically refills when it is in the refrigerator. By embracing the ingenuity of its own employees and the public, GE is enabling a new process of product development and capturing the creative energy surrounding its products.

Education Transformation

"Tell me, I forget. Show me, I remember. Involve me, I understand."—Chinese Proverb

As machines replace humans for manual and procedural work, education systems around the world need to shift focus from one-way lectures and rote memorization to collaborative, creative problem-solving environments. Learning by doing, iterating on ideas, and collaborating with peers are the hallmarks of the maker movement. This philosophy is exactly what we need to improve our education system. In fact, many parents have engaged in the maker movement with their kids because they know that the education system is not adequately preparing their children for the 21st century.

Education is ripe for transformation. PCs, the Internet, and mobile devices have changed every aspect of our lives except education. Technology adoption by schools has not changed the lectures and multiple-choice tests that make up the fundamental way we teach and assess our students; however, we have begun to see the first signs of a global trend in education. Schools at all levels are transforming traditional classrooms and libraries into collaborative makerspaces. MIT recently began accepting maker portfolios in its admissions process, UC Berkeley created a makerspace for students to collaborate, and nonprofit organizations such as the Maker Education Initiative provide blueprints for grade schools looking to implement maker-like learning environments. And this is just in the formal education system. Online education portals such as Coursera and edX offer free classes so anyone with Internet access can learn and build projects at home. Perhaps a cultural shift to the maker movement values will finally fuel a significant transformation of our education system.

The Future Impact

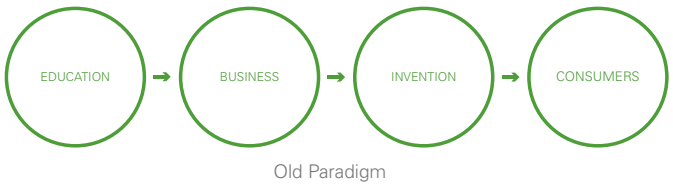
Humans are genetically wired to be makers. The maker movement is simply the result of making powerful building and communication tools accessible to the masses. It is a grassroots subculture that is enabling engineering innovation on a global scale. By democratizing the product development process, helping these developments get to market, and transforming the way we educate the next generation of innovators, we will usher in the next industrial revolution. The world is ours to make.

BOOM! THE IMPACT OF THE MAKER MOVEMENT

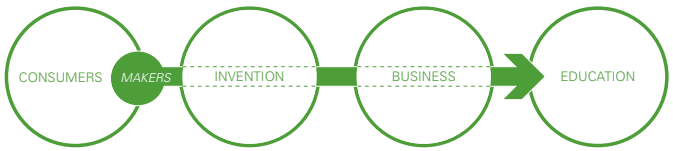
"When you create inside of a community, not only do you achieve your objective, you exceed it." Hear from TechShop CEO Mark Hatch as he discusses today's maker community.

youtube.com/nationalinstruments

Historically, the education system has produced graduates that went on to work for companies where new products were invented, then pushed to consumers. Today, consumers are driving the innovation process and demanding education, business and invention to meet their requests. Makers are at the center of this innovation transformation.



Old Paradigm



New Paradigm

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