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"Beyond the New Economy: The Other Technology Revolution" from The Entrepreneur's Intellectual Property & Business Handbook

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Beyond the New Economy:

The Other Technology Revolution

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This article is part of a series of book excerpts from The Entrepreneur's Intellectual Property & Business Handbook, which provides the business, strategy, and legal reference guide for start-ups and small businesses.

While the book refers to the Internet as perhaps the most significant technological change in the 21st century, computer technology, microbiology, and many other fields have undergone similar explosions in innovation.

A. The Unlimited Array of Innovation.

A look at the database of the National Inventor's Hall of Fame includes a wide array of inventions and their life-changing impact. These include Seymour Cray's Supercomputer; Gordon Gould's lasers; Bryan B. Molloy's Prozac; Baruch S. Blumberg's vaccine for Hepatitis B; Raymond V. Damadian's magnetic resonance imaging (MRI) scanner; James Fergason's Liquid Crystal Display; Donald B. Keck's Optical Fibers; Willem J. Kolff's Artificial Heart; and Stephanie Louise Kwolek's Kevlar. This is a small illustration of a list that has changed the face of medicine, technology, communications, and society.

Other inventions on the list are more complex but equally critical. Kary Mullis' Polymerase Chain Reactions to amplify DNA sequences have led to a host of medical breakthroughs in science, medicine, and criminology. Robert N. Noyce's Integrated Circuit led to the computer revolution that opened the door for most of the inventions described elsewhere in the book.

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The contributions of inventors are not necessarily linear, nor does the attribution tell the whole story. Theodore Harold Maiman is also credited for lasers, and there are many instances of inventors having added different contributions in collaboration or in competition that are necessary until the marketplace can take advantage of the innovation.

B. On the Drawing Boards.

Today, new work is being developed in areas of nanotechnology, pharmaceuticals, and genetics which may have the same revolutionary impact as that of the inventors discussed above. Others such as Dean Kamen are returning to older theories such as the Stirling engine to provide very low-cost power or purified water. The low-cost device has the potential to transform entire nations. Introducing low-cost water purification into regions that have little access to electricity or clean water has the potential to dramatically reduce disease and transform the quality of life. Work being done with polymers is hoped to be able to release the fuel potential of soybeans and other renewable sources to eliminate our dependence on fossil fuels. Nanotube technology has a similar potential to unleash solar energy and build new materials of unimaginable tensile strength. These technologies and inventions will, in turn, release a new wave of inventions and stressors that will continue to transform industry and potentially improve the quality of life for all humanity.

The commercial space industry is being made real by Elon Musk's SpaceX, Richard Branson's Virgin Galactic, new ventures Ad Astra Rocket Company, Xcor Aerospace, and other smaller enterprises joining stalwarts like Boeing and Airbus to build more efficient reusable vehicles, develop potential for mining operations, and add low-orbit routes to terrestrial travel. Some of the engineering successes are beginning to result in commercially viable initiatives.

1. Wearable Tech.

At a more practical level, there are many products that are in development and soon to be in the marketplace. Among those, wearable tech will mature as the next step in interactivity. A fully successful wearable device will include goggles or glasses to see the images, immersive virtual reality and augmented reality interaction, wireless network capacity, and input devices using a combination of voice, gesture, and text. All of the elements for this device are under development, but the actual product is not yet fully realized.

The first generation of wearable tech has already entered the marketplace. Apple has taken the lead with the Apple Watch, surpassing Fitbit as the largest supplier of mobile, wearable devices. These machines typically rely on the mobile connectivity of the wearer's smartphone, though other manufacturers are incorporating cellular phone functionality directly into the watch, bringing the Dick Tracy moment truly to life.

Companies are working on wearable clothing to provide kinesthetic feedback for directions, improved health monitoring on jewelry, social networking feedback to share information among participants on wearable devices, including augmented reality glasses, and increasingly secure payment platforms built into glasses, jewelry, or other devices.

For medical and disability accommodation, the potential is even greater. Improved monitoring of insulin, heart rate, and other health indicators is already on the market. Devices to assist with mobility, balance, and motor coordination are coming available. These tools have the power to transform the lives of those who need them.

2. Biometrics.

Improved technology, sensors, connectivity, and machine learning have empowered a renaissance in biometric recognition. Systems exist that rely on facial recognition, fingerprint recognition, voice recognition, palm print recognition, ocular print recognition, and even others. The quality of facial recognition from photographs and live images has brought crowd scanning software into reality. Even passport control may be replaced with simple facial recognition scans.

Biometric device improvements have also greatly reduced the ease of spoofing, whereby an imposter can fool a fingerprint reader with false prints, use a photograph to create a false identity, or wear a baseball cap to confound a reader. Improvements in software and hardware are helping with this problem. In the field, the use of multi-factor authentication works even better. Over time, that multi-factor authentication might include a body recognition at one control point and facial recognition later in the funnel.

Biometric scanning has a host of commercial benefits in terms of crowd flow, payment systems, risk management, education, and convenience features. It also has an increasing role in policing and

security. There are, of course, significant privacy concerns. These are magnified if the government can use these technologies to track individuals in the public sphere without due process protections. The law has not caught up with the technology and its potential for abuse. Nonetheless, the commercial, educational, and practical potential will drive ongoing development.

The ability to eliminate devices may be the only reason wearable tech might be limited. For example, a biometric-enabled payment system could have the wearer of glasses look into a machine. The reader would identify the person through facial or ocular recognition. Whereas the design for such a system might have once required a card reader or perhaps a digital handshake provided by the customer's glasses to select the correct account and confirm receipts, the biometric reader and pre-selections on an app can now accomplish such tasks.

3. Internet of Things.

Many of the innovations emphasized in the first edition of the book featured Internet-enabled businesses and technologies. Perhaps the greatest trend in the following decade has been the movement off the computer and into networked devices and machines. The Internet of Things (IoT) represents the largest expansion in this direction. IoT devices are those devices that use a variety of technologies to enable the device to be connected through the Internet as an appliance.

The term appliance may be literal for coffee makers, washers, dryers, and refrigerators that use Internet connectivity to enable remote programming, reordering of filters and other replaceable parts, to monitor functionality and order repairs, or serve other functions. More broadly, the term appliance simply separates computers, tablets, and phones that can be used as input and retrieval devices for generalized Internet content with other Internet-connected devices which communicate using the same technologies as the Internet but do not have input and retrieval functions.

Of course, these are general categories. A refrigerator remains a household appliance and remains one even if it is equipped with an Android tablet display in the door. Some IoT devices operate on mobile-to-mobile networks using other protocols. General Motors and Toyota,

for example, are developing and implementing technologies that enable cars to communicate directly to create a collision avoidance network.[1]

The most staggering aspect of IoT is scale. IoT's value is predicted to exceed $6 trillion by 2025, including the sale of the machines, the revenue generated through the technology, and the cost savings.[2] Geometric growth in the number of connected devices will result in an expansion of 15 billion devices connected in 2015 to increase to over 200 billion by 2020.[3] Large products like airplanes can include thousands of IoT sensors and devices within a single aircraft. This enables real-time reporting of performance data and safety updates for the wings, engine, and fuel supply. Farm equipment, vehicles, and even an individual's plants and animals are connected through the IoT networks.

Similarly, the RFID product tags can be used for far more than merely tracking the shipment of products and will invariably be incorporated into many other products. For toys, the technology will allow action figures or dolls to recognize each other and interact based on which other dolls are within range. The technology would also be adaptable to security systems, fire alarms, or even gym and bike locks.

The IoT infrastructure has similar cybersecurity concerns as the rest of the information economy, but it has one additional risk factor. Unlike computers that are increasingly pushed to update their software, the public is unlikely to update firmware on its appliances. The risk from a widespread breach into 200 billion devices could be devastating to the critical national infrastructure, banking sector, or other systems. As a result, the rapid expansion of IoT will also require a foundational rethinking of data hygiene in coming years.

C. From Innovation to Start-Up: Making the Invention Commercial.

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[1] Chris Neiger, *6 Internet of Things Facts to Make Investors Sit Up and Take Notice*, MOTLEY FOOL (June 9, 2018, 1:00PM), https://www.fool.com/investing/2018/06/09/6-internet-of-things-facts-to-make-you-sit-up-and.aspx.

[2] *Id.*

[3] *Id.* (*quoting* Intel).

In addition to the breakthroughs of the scientists and inventors of the 20th and 21st centuries, entrepreneurs provide another essential role in making the inventions practical. In bringing an invention from the laboratory to the market shelf, there are many decision points and processes which must be crafted to allow the product to succeed. Great chemistry that is too unstable or that requires too high a temperature or energy cost will not result in new commercial products. Dean Kamen's innovation in the Stirling engine is not to build a new invention but rather to make a 19th century invention practical using 21st century materials and processing.

Innovations in light bulbs, plastics, and food additives come from the invention of new products and the development of new methods of manufacturing. Other than Henry Ford's assembly line, there have been very few individuals recognized for adding to the efficiency of manufacturing, but the savings of even a few cents per unit may mean the difference between a product being viable or not.

Process innovation is one of the key stressors that entrepreneurs can seek to solve. The solutions can often create entire industries. The Internet and its disintermediation of media products does not suggest that processes are disintermediated in other fields. The U.S. Post Office, for example, has lost first class mail to the growth of e-mail. Instead, online retailers have made the U.S. Post Office very successful in the home delivery of retail packages. So long as the inventor's creativity is matched with the entrepreneur's knowledge of how to bring the product to market, opportunities for innovation are available in every field imaginable.

The Internet serves as a great illustration of technological and social change, but it is only one among many of the changes reshaping the world around us. New inventions can be extended into an unlimited range of products and services.

D. The Business Model Lesson: Exclusivity and Relevance in the New Economy Business Models.

Whether the business is an entirely disintermediated amalgam of outsourced contracts, or a restaurant keeping a single web page available to show the menu and driving directions, each business model must provide relevance to its target audience. If the business's web content is

sufficiently relevant, then Google will list it more prominently because others on the Internet are already linking to the website.

The domain name provides one simple form of exclusivity. Every web page has a unique number that allows computers to navigate and find the correct page. Because the numerical system is too difficult for humans to read, Internet designers added domain names to go along with the numbers, and these names must be unique.

In addition to the domain name, the content on each web page is likely to be protected by copyright, which allows the owner of a particular site to stop others from copying the text for their own sites. Links, in contrast, do not copy the text, so they are unlikely to create copyright problems for either party. Using trademarks on the website is another way to further differentiate one site from the next.

Through the domain name, copyrighted text, and use of trademarks, some exclusive material is likely used on every existing website. Together with the relevance of the content, this exclusivity will improve the effectiveness and success of the business.

In fields dominated by strong industry leaders, the entrepreneur will struggle to develop relevance unless the business model resolves significant stressors and generates great relevance. In contrast, patents may even be available for new business models that solve a problem in a truly new, useful, and nonobvious fashion. Patents on processes can extend even to business methods, so the development of these new websites can occasionally lead to patent-protected business models.

The business embracing new technologies must identify each opportunity for exclusivity in the business plan. The enterprise must look closely at the market to determine the relevance of the new product or service and how that product or service ties into the business model. The entrepreneur must identify the problem and solve it in a manner that appeals to consumers. Finally, the entrepreneur must ensure that the solution adopted is one that is difficult for competitors to replicate. If the entrepreneur meets those four goals, then the business will be successful. Without these steps, the business will be short-lived.

What the innovation companies truly have in common is the rapidity of change. Stressors are being introduced as fast as the solutions to the previous problems. The lack of reflection time creates new opportunities

to solve the next wave of changes and system inefficiencies. Entrepreneurs should be prepared to step into this gap to be successful.