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Technology and the Police

Oceane TANNY

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Technology and the police

By

Oceane M. A. Tanny

April 2017

An Undergraduate Thesis Submitted in Partial Fulfillment
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University Honors Scholars Program
Honors College
and the
Honors-in-Discipline in History
Department of History
East Tennessee State University

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Dr. Daryl A. Carter, Thesis Mentor   Date

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Dr. Elwood Watson, Reader   Date

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Dr. Keith Johnson, Reader   Date

<u>Abstract</u>

"Technology and the Police" primarily seeks to underline the importance of the role technology plays when it comes to law enforcement. As agents of law enforcement, police are needed to protect and defend society. From the use of DNA to video surveillance and tracking tools, technology helps police officers achieve their goal. Furthermore, technology may also serve as a means of control to make sure police are doing their job effectively. Another purpose of "Technology and the Police" is to show that unlike popular belief, the study of history does not start and ends in the past. It is a continuous process from which many lessons can be learnt and understood, it is timeless. Hence, this thesis also attempts to challenge ideas that history and technology cannot blend together because one represents the past and the other represents the present and the future.

<u>Acknowledgements</u>

I would like to thank my family, teachers and friends, especially Ms. Khady Ouattara, Mr. Darack Nanto and Mrs. Rhonda Dawson, for supporting me during my years in college. They made troubles look smaller than they were and helped me redefine the concepts of courage and persistence. I will forever feel blessed to have met such amazing people in my life.

I would like to present sentiments of gratitude and respect to my mentor Dr. Daryl Carter for guiding and advising me for this project. Also, thanks to Dr. Keith Johnson and Elwood Watson for being my thesis readers, I deeply appreciate their time and devotion.

Again, I would like to thank Mrs. Maria Costa, the ETSU Honors College and the ETSU International Programs and Services for being a family to me when home is miles away. Lastly, I would like thank everyone that I did not mention that helped me directly or indirectly for the accomplishment of this thesis.

<u>Dedication</u>

I dedicate this thesis to my family, teachers and friends. In addition, I dedicate it to the Police Staff that works hard every day to keep our world safe.

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Chapter 1: Technology Development

The advancement in technology has made life considerably easier than it was years ago. Tasks that were thought of as being cumbersome to perform are now completed more simply. Activities such as shopping, traveling and communicating have become less complicated. For example, nowadays, one does not need to leave the comfort of his or her own home to shop. If a person living in the United States needs to buy a product from Japan, all they must do is get access to the internet and use sites such as Amazon or eBay to order the desired product. Not only can they have access to a variety of goods from all over the globe, but they can also rest assured that the goods they order would be delivered to them fast enough. In this example, technology can be found everywhere, from the use of internet to make orders and facilitate communication to the use of machinery and transportation to deliver the goods. In addition to communication and transportation, technology has also been useful to medicine, education and mostly, law enforcement.

Technology and Medicine

Technology has granted the medical field with several advantages. The mid-twentieth century witnessed a lot of progress in medicine because of technological advancements. Vaccines such as the Polio vaccine were developed. In addition, there were a series of successful organ transplants not only because of surgeons' talents but also because of the availability of adequate tools. For instance, the advent of tissue typing helped people in the medical field know whether or not donor tissue was compatible and safe for transplant in another person.

One of the first successful organ transplants was carried through in 1954. It was a kidney transplant and was performed by surgeon Joseph E. Murray and his colleagues at Peter Bent Brigham Hospital in Boston.[1] Today, it is possible to perform full face transplants. Other devices introduced in the mid-twentieth century that are still very useful nowadays include the implantable cardiac pacemaker.

Cardiac failure was a major problem. A lot of scientists had attempted to fix it by creating cardiac pacemakers. Prior to 1958, only external cardiac pacemakers were used. This was not very convenient. Thus, some scientists kept making experiments to find a way to make implantable pacemakers. After several attempts, on October 8th, 1958, the first pacemaker implantation was performed. It was done in Sweden and the patient was a 43-year old engineer called Arne Larson. Larson suffered from Stokes-Adams attacks. He had an average of twenty to thirty attacks every day. The idea of an implantable cardiac pacemaker was very attractive to him. The men who collaborated to perform the implantation on Larson were the surgeon Ake Senning and the physician inventor Rune Elmqvist. Unfortunately, the first implanted cardiac pacemaker failed after a couple of hours.[2]

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[1] "Organ Procurement and Transplantation Network." Learn about the History of Transplant - OPTN. Accessed April 8, 2017. https://optn.transplant.hrsa.gov/learn/about-transplantation/history/.
[2] Aquilina, O. "A brief history of cardiac pacing." Images in Paediatric Cardiology. 2006. Accessed April 8, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/.
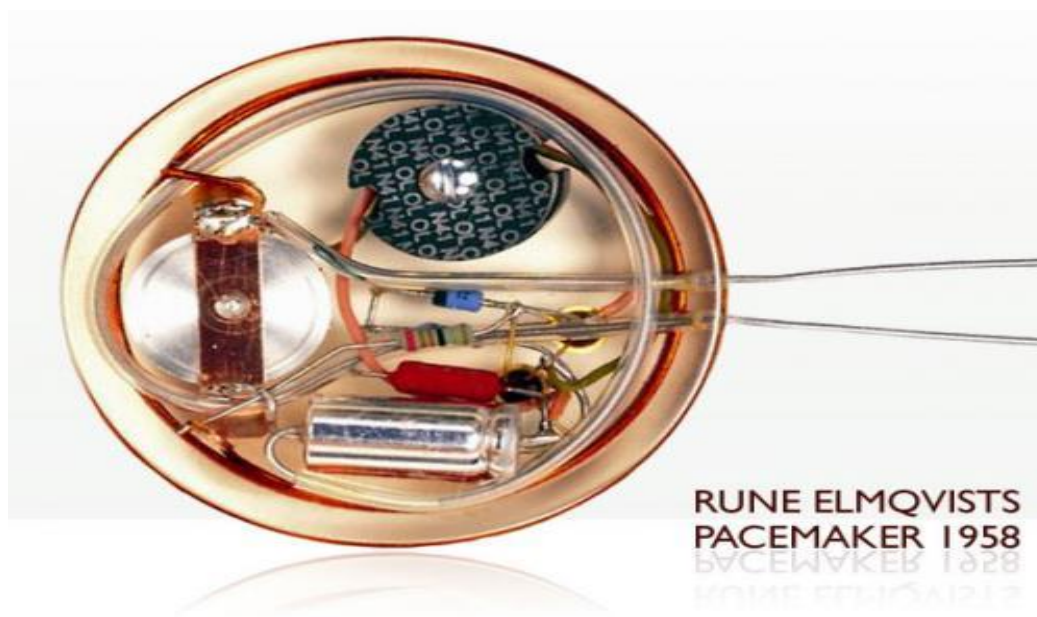
Figure 1.1: First internal pacemaker 1958.[3]

However, in 1960, Wilson Greatbatch, an electrical engineer teaching at the University of Buffalo, discovered a way to make an implantable pacemaker.[4] There were still some problems with these pacemakers. Nevertheless, scientists and engineers kept looking for ways to improve the implantable pacemaker over the years. For example, In the mid-1980's rate-responsive pacemakers were designed. Later, in the 1990s, microprocessor-driven pacemakers were introduced. These were very complex devices capable of identifying and saving events using several algorithms. They could automatically modify their internal pacing parameters per the changing needs of the patient and to the patient's activity level. In the early 2000s, more modifications were made to the implantable cardiac pacemaker to make it better. Now,

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[3] Aquilina, O. "A brief history of cardiac pacing." Images in Paediatric Cardiology. 2006. Accessed April 8, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/.
[4] Aquilina, O. "A brief history of cardiac pacing." Images in Paediatric Cardiology. 2006. Accessed April 8, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/.

pacemakers can "upload data telephonically to a central server through the internet,"[5] making

follow-ups easier and faster.

Figure 1.2: Modern internal pacemaker.[6]

There are various new commodities in the medical field. A significant change in the

medical field brought about by technology is the use of electronic health records instead of paper

and pencil records. Electronic health records make it less time consuming to collect information

about a patient's health. Apart from that, there is an increase in the use of new technologies such

as three-dimensional printing and modeling (3D printing and modeling), as well as robotics.[7]

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[5] Aquilina, O. "A brief history of cardiac pacing." Images in Paediatric Cardiology. 2006. Accessed April 8, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/.

[6] Aquilina, O. "A brief history of cardiac pacing." Images in Paediatric Cardiology. 2006. Accessed April 8, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/.

[7] "Top 20 Medical Technology Advances: Medicine in the Future." Accessed April 8, 2017. https://www.bing.com/cr?IG=54BB1C2DBB144D298E8A7025047B0460&CID=3A45BD6ED8776AC32E54B71ED9E76 B94&rd=1&h=csHXqZXMz8WMwV3H7Vyb26tylhZ7DICjk9YMfy0kYn8&v=1&r=https%3a%2f%2fmedicalfuturist.com %2f20-potential-technological-advances-in-the-future-of-medicine-part-i%2f&p=DevEx,5063.1.

There has already been a wide use of 3D printing in the medical field. One of the biggest

advantages of this technology is that it provides clients with customizable products at a decent

price. This is significant because creating customized products usually requires a lot of time and

costs a fortune. Considering this fact, it is not surprising that 3D printing is gaining ground in the

medical industry, where patients often require devices that fit perfectly. A practical example in

the use of 3D printing in medicine is the manufacturing of hearing aids. According to Kyle

Maxey in his article "3D Printing for the Hearing Impaired," ninety-five percent of all the

hearing aids available on the market today are 3D printed.

Another use of 3D printing in medicine is the printing of teeth-straightening braces. One

of the leading companies in digital dentistry, Align Technology, prints about "650,000 pairs of

Invisilign teeth-straightening braces a day."[8] Again, using 3D printing, engineers and physicians

can create adequate prosthetics for patients. Moreover, there is a high chance that organs would

be printed in the future. The idea of printing organs sounds absurd and unattainable, however, a

California-based research company called Organavo has "printed human liver tissue for drug

toxicity testing purposes."[9] Organavo's ultimate goal is to "build living human tissues that are

proven to function like native tissues."[10] If research undergone by Organavo and other

companies interested in organ printing lead to positive results, there would be an incredible

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[8] Forbes. Accessed April 8, 2017.
http://www.forbes.com/forbes/welcome/?toURL=http%3A%2F%2Fwww.forbes.com%2Fsites%2Fstevenkotler%2F
2013%2F12%2F19%2F5-medical-technologies-revolutionizing-
healthcare%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A%2F%2Fwww.google.com%2F.
[9] Forbes. Accessed April 8, 2017.
http://www.forbes.com/forbes/welcome/?toURL=http%3A%2F%2Fwww.forbes.com%2Fsites%2Fstevenkotler%2F
2013%2F12%2F19%2F5-medical-technologies-revolutionizing-
healthcare%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A%2F%2Fwww.google.com%2F.
[10]Forbes. Accessed April 8, 2017.
http://www.forbes.com/forbes/welcome/?toURL=http%3A%2F%2Fwww.forbes.com%2Fsites%2Fstevenkotler%2F
2013%2F12%2F19%2F5-medical-technologies-revolutionizing-
healthcare%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A%2F%2Fwww.google.com%2F.

evolution in the medical industry. This is so because a lot of patients rely on organ donors whilst there is a limited supply of organs to match demands. Even when organs are available, problems of compatibility may arise. As a result, some patients die while waiting for a life life-saving donation. Organ printing could limit these complications and save thousands of lives.

Just as 3D printing, robots are increasingly being used in medicine, especially in surgery. The da Vinci Surgical System — used in cardiac, colorectal, general, gynecologic, head and neck, thoracic and urologic surgeries — is "powered by robotic technology that allows the surgeon's hand movements to be translated into smaller, precise movements of tiny instruments inside the patient's body."[11] It has performed more than 20,000 operations since its launch in the 2000s. The use of robotics in the medical industry is expected to grow as years go by. A reason for this is that robots facilitate the work of doctors and enhance their precisions. There is also a possibility that hospitals would start using service robots that would distribute medication to patients and perform other tasks usually carried through by nurses. Although this may cause some apprehension because a lot of people feel like robots would take their jobs, in this particular case, they would mostly serve as a helping hand because there is always a need for human monitoring for robots to perform what they are programmed to do.

Recently, a young man called Andy Sandness enjoyed some of the benefits brought forth by technology in medicine. In June 2016, Sandness received a full-face transplant at Mayo Clinic in Rochester, Minnesota. Sandness describes this operation as a miracle. Ten years before, in December 2006, Sandness had tried to commit suicide in his house in Newcastle, Wyoming. His

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[11] Forbes. Accessed April 8, 2017.
http://www.forbes.com/forbes/welcome/?toURL=http%3A%2F%2Fwww.forbes.com%2Fsites%2Fstevenkotler%2F2013%2F12%2F19%2F5-medical-technologies-revolutionizing-healthcare%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A%2F%2Fwww.google.com%2F.

life had been going down the hill and he suffered from depression. Under the influence of alcohol, he grabbed his rifle, placed it under his chin and shot. However, he was found alive and transferred to the Mayo Clinic after visiting local hospitals. In this incident, Sandness lost his nose and all his teeth but two. His jaw was destroyed and his vision was severely affected because of nerve damages below his eyes. He described the incident as a terrible mistake. Over the course of ten years, Sandness underwent various reconstructive surgeries, but the one that completely changed his life and restored his will to live was the one where he received the full-face transplant. He received the cheeks, nose, jaw, mouth, lips, chin, and the teeth of his donor.[12]

Dr. Samir Mardini, together with nine other surgeons and forty staff members, worked on the face transplant for more than fifty-six hours. It was a very stressful operation because the doctors had to identify facial nerve branches on both Sandness and his donor and stimulate them "with an electric current to determine their function." According to Dr. Mardini, what made the surgery successful were the expertise and determination of the surgeons as well as the use of 3D imaging and virtual surgery. In a footage delivered by the Mayo Clinic, Dr. Mardini states, referring to the surgery performed on Sandness, that "using this technology of 3D modeling, printing, our virtual surgical planning is extremely beneficial. They would have cutting guides for us, that we would clip on the bones, that would give us the exact location of the cut, the exact angle of the cut, so when we took the donor's face and put it on the recipient, it would fit perfectly." Thanks to technology and the incredible work of doctors, Sandness is hopeful for the future and looks forward to getting back in the world.[13]

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[12] Ap. "Twin tragedies give survivor a new face." CBS News. February 17, 2017. Accessed April 8, 2017. http://www.cbsnews.com/news/face-transplant-mayo-clinic-twin-tragedies-give-survivor-a-new-face/.
[13] Ap. "Twin tragedies give survivor a new face." CBS News. February 17, 2017. Accessed April 8, 2017. http://www.cbsnews.com/news/face-transplant-mayo-clinic-twin-tragedies-give-survivor-a-new-face/.

Figure 1.3: Andy Sandness, before and after face transplant in 2016.[14]

An additional device that could enhance the medical field is the needle free diabetes care.[15] It is no news that diabetes self-care is extremely wearisome. People suffering from diabetes constantly have to draw blood to test for glucose and must get insulin shots daily. Not only is it painful, but it is also dangerous because there may be risks of infection from always using needles, especially if they are not sanitized. To better diabetes self-care, Echo Therapeutics—based in Philadelphia, Pennsylvania— is developing devices that would eradicate the need for needles. The plan is to replace the needle with a patch. The company is currently working on a transdermal biosensor that reads blood analytes directly through the skin. The technology "involves a handheld electric-toothbrush-like device that removes just enough top-

[14] Ap. "Twin tragedies give survivor a new face." CBS News. February 17, 2017. Accessed April 8, 2017. http://www.cbsnews.com/news/face-transplant-mayo-clinic-twin-tragedies-give-survivor-a-new-face/.
[15] "Top 20 Medical Technology Advances: Medicine in the Future." Accessed April 8, 2017. https://www.bing.com/cr?IG=54BB1C2DBB144D298E8A7025047B0460&CID=3A45BD6ED8776AC32E54B71ED9E76 B94&rd=1&h=csHXqZXMz8WMwV3H7Vyb26tylhZ7DICjk9YMfy0kYn8&v=1&r=https%3a%2f%2fmedicalfuturist.com %2f20-potential-technological-advances-in-the-future-of-medicine-part-i%2f&p=DevEx,5063.1.

layer skin cells to put the patient's blood chemistry within signal range of a patch-borne

biosensor."[16] The role of the sensor is to collect data and send it to a remote monitor, allowing

patients to track their glucose levels.

Technology and Transportation

Transportation is very important not only because it helps people to move from one place

to another but also because it sustains economic development by facilitating trade and exchange.

In this era, most countries are inter-dependent. Every country has needs but does not always have

the resources required to meet these needs. Therefore, trade with other countries becomes

necessary. Transportation allows trade to happen because goods can be sent from country to

country with the use of boats, airplanes and trains. Another way transportation favors economic

growth is by smoothing the way for tourism, and for some countries like Seychelles, tourism

contributes to 24.7% of the total Gross Domestic Product.[17] The advancement in technology has

promoted improvement in transportation means and increased its advantages for entire countries

and for individuals. There are a couple of emerging technologies in transportation. One of the

most recent emerging technologies in transportation, one that will presumably have a great

impact on society, is the self-driving car.

Self-driving cars are often confused with autonomous cars. However, they are different.

As The Economist points out, autonomous vehicles can carry out a few tasks for the driver, such

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[16]"Top 20 Medical Technology Advances: Medicine in the Future." Accessed April 8, 2017.
https://www.bing.com/cr?IG=54BB1C2DBB144D298E8A7025047B0460&CID=3A45BD6ED8776AC32E54B71ED9E76
B94&rd=1&h=csHXqZXMz8WMwV3H7Vyb26tylhZ7DICjk9YMfy0kYn8&v=1&r=https%3a%2f%2fmedicalfuturist.com
%2f20-potential-technological-advances-in-the-future-of-medicine-part-i%2f&p=DevEx,5063.1.
[17] "The Economy of the Seychelles." So Seychelles. July 16, 2015. Accessed April 8, 2017.
https://www.seychelles.org/seychelles-info/economy-seychelles.

as braking[18]. Nevertheless, the driver can take control at any time. With self-driving cars, the

concept is different. A self-driving car does not need any human intervention. It can guide itself.

In recent years, the excitement around self-driving cars has increased. The idea of vehicles that

do not need to be controlled by a human driver intrigues more than one. However, according to

Marc Weber in the article "Where to? A History of Autonomous Vehicles," the dream of having

self-driving vehicles has lived through science-fiction ever since 1935. In the same article,

Weber quotes David Keller who wrote in "The Living Machine (1935)" that "Old people began

to cross the continent in their own cars. Young people found the driverless car admirable for

petting. The blind for the first time were safe. Parents found they could more safely send their

children to school in the new car than in the old cars with a chauffeur."[19] Now, it seems like the

dream is coming closer to reality.

Today, many companies invest in projects of self-driving cars. One of these companies is

Cisco Systems. Cisco Systems is the biggest networking company in the world. It is thus not

surprising that it is interested in the development of self-driving cars. Since it is an important

networking company, most of its investment will be to improve or create software that cars will

need to be self-dependent. Another company working towards the realization of self-driving cars

is Delphi. Unlike Cisco Systems, Delphi mostly deals with car parts. According to Fast

Company, Delphi "is working on a multi-domain controller designed to do the same work as

multiple electronic control units"[20] that "will reduce the complexity of the system, cost and

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[18] "Why autonomous and self-driving cars are not the same." The Economist. July 01, 2015. Accessed April 8, 2017. http://www.economist.com/blogs/economist-explains/2015/07/economist-explains.
[19] "Where to? A History of Autonomous Vehicles." Computer History Museum. Accessed April 8, 2017. http://www.computerhistory.org/atchm/where-to-a-history-of-autonomous-vehicles/.
[20] Tannert, Chuck. "10 Autonomous Driving Companies To Watch." Fast Company. January 07, 2014. Accessed April 8, 2017. http://www.fastcompany.com/3024362/innovation-agents/10-autonomous-driving-companies-to-watch.

weight."[21] One more developer of self-driving cars that is yet the closest to its goal is Google. As underlined by Fast Company, Google "seems content to develop the software (i.e., the complex set of algorithms) the machines need to think and react smoother and faster than a human driver."[22] Google's Self-Driving Car Project has gone through a lot of progress and some of this is outlined on Google's website.

Google started working on its Self-Driving Car Project since 2009. In the beginning, the team working on the Project used already existing cars to test their self-driving features. In 2009, they "started testing their self-driving technology with the Toyota Prius on freeways in California."[23] By 2012, they had tested their self-driving for 300,000 miles on freeways. After that, they started testing the emerging technology in cities. This is because the self-driving car will have to drive in places that are more cumbersome than freeways. In December 2014, "after months of testing and iterating,"[24] Google "delivered the first real build of its prototype vehicle,"[25] entirely made of self-driving technology. The self-driving prototypes do not have steering wheels or pedals and work solely relying on software, sensors and electric batteries. The sensors help the car to be aware of its environment and decide on what to do depending of what situation arises. For example, the sensors will help the car know if there if someone crossing the road. The software will help the car work upon its decision. So far, Google has "self-driven more

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[21] Tannert, Chuck. "10 Autonomous Driving Companies To Watch." Fast Company. January 07, 2014. Accessed April 8, 2017. http://www.fastcompany.com/3024362/innovation-agents/10-autonomous-driving-companies-to-watch.
[22] Tannert, Chuck. "10 Autonomous Driving Companies To Watch." Fast Company. January 07, 2014. Accessed April 8, 2017. http://www.fastcompany.com/3024362/innovation-agents/10-autonomous-driving-companies-to-watch.
[23] "A new way forward for mobility – Waymo." Google. Accessed April 8, 2017. https://www.google.com/selfdrivingcar/where/.
[24] "A new way forward for mobility – Waymo." Google. Accessed April 8, 2017. https://www.google.com/selfdrivingcar/where/.
[25] "A new way forward for mobility – Waymo." Google. Accessed April 8, 2017. https://www.google.com/selfdrivingcar/where/.

than 1.5 million miles and is currently out on the streets of Mountain View, CA, Austin, TX,

Kirkland, WA and Metro Phoenix, AZ."[26] Although this sounds amazing, it does not fully

explain why self-driving cars are relevant.

Figure 1.4: Google self-driving prototype vehicle.[27]

There are a lot of anticipated advantages of self-driving cars. First, in the light that most

self-driving cars will rely on electric batteries, pollution caused by vehicles will reduce

significantly. Conforming to the Union of Concerned Scientists, "in 2013, transportation

contributed more than half of the carbon monoxide and nitrogen oxides, and almost a quarter of

the hydrocarbons emitted into our air."[28] The use of self-driving cars over traditional cars could

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[26] "A new way forward for mobility – Waymo." Google. Accessed April 8, 2017.
https://www.google.com/selfdrivingcar/where/.
[27] "A new way forward for mobility – Waymo." Google. Accessed April 8, 2017.
https://www.google.com/selfdrivingcar/where/.
[28] "Cars, Trucks, and Air Pollution." Union of Concerned Scientists. Accessed April 8, 2017.
http://www.ucsusa.org/clean-vehicles/vehicles-air-pollution-and-human-health/cars-trucks-air-
pollution#.V3wEipMrJE4.

help reduce the deterioration of the environment. Also, as reported by The Inquirer "according to the US Department of Transportation's National Motor Vehicle Crash Causation survey, 94 percent of road accidents are caused by human error, and it is said that driverless technology will drastically lower, if not eliminate this factor."[29] Therefore, self-driving cars can reduce the risk of road accidents.

Self-driving cars are not expected to help only with the preservation of the environment and the prevention of road accidents. Apart from that, people who usually must depend on others to drive them will be able to move easily. To illustrate this, one can think about the elderly who usually need to be driven around by other members of the family. Since schedules may not always match, if there is a self-driving car, they will not need to worry about getting a ride from anybody else. Again, there is the possibility that traffic congestions will be decreased because the self-driving technology will know the right path to take at the right time. Moreover, the use of self-driving cars might create new jobs, especially in the making of the software and development of the cars. However, there also exist possible negative effects in the case self-driving cars become well-established and get used on a large scale.

Technology and Education

Education is most definitely one of the building blocks of society. It is important because it provides people with skills that would help them survive in a world where working is indispensable to make a living. Schools, with the help of teachers, provide students with the skills needed to survive in society and to work in the fields that interest them the most. The

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[29] "Humans vs robots: Driverless cars are safer than human driven vehicles | TheINQUIRER." Http://www.theinquirer.net. September 23, 2015. Accessed April 8, 2017. http://www.theinquirer.net/inquirer/feature/2426988/humans-vs-robots-driverless-cars-are-safer-than-human-driven-vehicles.

digitalization of the education system makes it easier for students to retain and enhance the skills that they are taught. The availability of online classes facilitates learning for students who do not want to go to classrooms or cannot make it to classrooms.[30] At East Tennessee State University (ETSU), there is a wide range of courses offered online. People who do not live around the main campus in Johnson City but wish to take ETSU's classes can simply enroll in online classes instead of worrying about having to move.

The advancement of technology and the digitalization of the education system and have made distance learning possible. Although the concept of distance learning is something that is mostly attached to the 21st century, it was developed in the late 20th century and bettered throughout the following years. As related by the Foundations of Distance Education, "The possibility of teaching face to face at a distance was achieved by an electronics revolution in the 1980s. The deregulation of the telecommunications industry allied to the speeding up of chips and the introduction of broadband technologies brought about this veritable revolution."[31] By the end of the 20th century, distance learning had become a central piece of many education systems. Not only did it help in managing large numbers of local students, but it also helped people living out of the United States have access to one of the best education systems in the world.

Today, online classes are still very convenient for out-of-state students and students who have too many responsibilities but limited time to attend on-campus classes. Online classes relieve students from the stress of having to be present at a given time on a given day is because people can go online whenever they are free, whether it is early in the morning or late at night.

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[30] "Use of Technology in Teaching and Learning." Use of Technology in Teaching and Learning | U.S. Department of Education. Accessed April 8, 2017. https://www.ed.gov/oii-news/use-technology-teaching-and-learning.
[31] Admin. "The Evolution of Distance Learning." Florida National University. June 30, 2016. Accessed April 27, 2017. http://www.fnu.edu/evolution-distance-learning/.

Besides, the website for ETSU's online classes, Desire 2 Learn (D2L), assists teachers in recording grades and analyzing overall class performance with graphs that show class averages. Moreover, with services like Turnitin, teachers can help check and prevent plagiarism. Other advantages that technology grants to the education system is the availability of digital resources. In the past, students heavily relied on books and articles that they could not always access easily. Nowadays, finding books and articles is not as big of a problem as it used to be. The internet can be used to find almost anything and the accessibility of electronic books and articles via search tools like JSTOR takes away a heavy weight from students when they must complete assignments.

Technology and Communication

Technology has improved the way people interact with one another. Years ago, it was difficult to get in touch with family or friends who lived in the same country but in different cities. It was even more difficult to get in touch with those who were staying abroad. Nowadays, people can communicate with their loved ones even if they are in remote places. They could either use the telephone or other technologies introduced by the internet. For instance, I often use applications such as Skype and Facebook to stay in contact with family members that do not live in the United States of America. I use these because they are cheaper to utilize than roaming services provided by telecommunication companies. In fact, they are free to use. The major prerequisite to make use of such applications is to have internet connection, but this is not a very important issue because most places offer free internet access. Also, social media helps individuals in making new friends and have an insight on other cultures without having to travel.

Social media very useful when it comes to informal communication. However, it is not always the best method to use for formal communication. Whenever there is something very

important to discuss, people can use electronic mails (e-mails) through services like Yahoo, Gmail and Hotmail in lieu of social media platforms. In addition, is easier and faster to use electronic mails instead of posting letters. In addition to applications that promote socializing, there are also applications that may ensure safety, like SecuraTrac. SecuraTrac is a Global Positioning System (GPS) tracking mobile application that parents may use to know where their children are.[32] These applications usually have maps that show red zones and notify parents if their children are in a dangerous area. Parents could therefore rescue their kids or call the police if problems arose. Communication technologies are likewise useful to businesses as they are to individuals.

Businesses use communication technologies for various purposes. With advertising via television, the radio and even social media, businesses today can reach an incredible number of potential consumers at once and easily inform consumers about the goods and services they provide. In the past, businesses sometimes had to engage through door to door marketing. This could be annoying both to the people carrying out that task and to the people who felt like their time was being wasted by marketing agents coming to their residence. Nowadays, media platforms enable businesses to advertise their products without using door to door marketing. Media platforms also make it easy for businesses to interact with consumers to get feedbacks. For example, the fast food restaurant chain Wendy's has a twitter account where consumers can discuss what they like or dislike and get prompt responses from Wendy's employees. One more way technology enhances communication for businesses is by means of videoconferencing.[33]

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[32] Ramey, Karehka. "Use of Technology in Communication." Use of Technology. April 12, 2017. Accessed April 8, 2017. http://www.useoftechnology.com/technology-communication/.

[33] Ramey, Karehka. "Use of Technology in Communication." Use of Technology. April 12, 2017. Accessed April 8, 2017. http://www.useoftechnology.com/technology-communication/.

Videoconferencing makes it easy for representatives of businesses to have meetings even when

they are physically separated by long distances. Furthermore, it can be used to perform

interviews with applicants located in remote places.

Chapter 2: Technology and the Police

For any society to be functional, it is essential for it to have laws. Laws help to regulate behavior of members of society and maintain social order. If there were no means of social control, everyone would act as they wished and this would create chaos. Still, no matter how important they may be, laws can only be effective if they are enforced. If not, they are just a set of useless words. Police officers are needed in the community to make sure that laws are enforced. They have a lot of responsibility in keeping civilians secure and fighting crimes. For example, to protect drivers on the road, they give tickets to people who drive over the speed limit and try to stop people whom they suspect are driving under the influence of illegal substances. Also, they investigate crimes and often find and arrest criminals. As society expands and new types of crimes arise, it is important for police officers to be equipped adequately to fulfill their mission. For many years, technology has provided police officers with the tools they need in order to perform the tasks they are assigned more comfortably and effectively.

Technology and the Police in the 20<u>th</u> century

The early twentieth century saw a boom in technology growth. As a result, police officers frequently turned to technology to improve their competence. The birth of fingerprinting in the 1900s, the entrance of crime laboratories in the 1920s and the increased use of vehicles in the 1930s in addition to deoxyribonucleic acid (DNA) technologies in the late twentieth century are all examples of technology tools that enhanced the capacity of police officers to fight crimes.[34] One of the most important tools implemented in the 1960s that helped both civilians and law

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[34]POLICE TECHNOLOGY - History of Technology. Accessed April 10, 2017. http://www.police-technology.net/id59.html.

enforcement agents to report and prevent crime is the three-digit telephone number "9-1-1."[35] This number was selected as the universal emergency number. It enabled citizens to request assistance faster and have easy access to a Public Safety Answering Point (PSAP). Today, it is almost impossible to imagine requesting emergency assistance without calling 9-1-1.

The first known attempt at implementing a national emergency number came into place in the United Kingdom in 1937.[36] It came about in response to the cry for an emergency number after five women died in a devastating fire in 1935, in London. In the United States, the first call for a nationwide emergency telephone number was in 1957, when the National Association of Fire Chiefs suggested the use of a single number to report fires. A decade later, in 1967, the President's Commission on Law Enforcement and Administration of Justice recommended that a "single number should be established"[37] nationwide to report emergency situations, instead of using different numbers for specific emergencies. The main reason for that was because using "different telephone numbers for each type of emergency was determined to be contrary to the purpose of a single, universal number."[38] Various Federal Government Agencies and officials showed positive sentiments towards this recommendation. Since the call for a single national emergency number became louder, the President's Commission on Civil Disorders looked to the Federal Communications Commission (FCC) to resolve the issue.

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[35] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.
[36] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.
[37] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.
[38] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.

In November 1967, the FCC met with the American Telephone and Telegraph Company (AT&T) to find a way to establish a universal emergency number that could be applied rapidly. In 1968, AT&T announced that it would establish the digits 9-1-1 as the emergency number throughout the United States. There are a couple of advantages to this number. First, it consists of only three digits. This makes it an easy number to remember and to dial. Additionally, since "it is a unique number, never having been authorized as an office code, area code, or service code, it best met the long-range numbering plans and switching configurations of the telephone industry."[39] The United States Congress supported AT&T's proposal and passed legislation that solely allowed the use of the number 9-1-1 when creating a single emergency calling service, henceforth rendering 9-1-1 the standard national emergency number.

Senator Rankin Fite completed the first 9-1-1 call in the United States on February 16, 1968, in Haleyville, Alabama. On February 22, 1968, 9-1-1 was actualized in Nome, Alaska. In March 1973, "the White House's Office of Telecommunications issued a national policy statement which recognized the benefits of 9-1-1, encouraged the nationwide adoption of 9-1-1, and provided for the establishment of a Federal Information Center to assist units of government in planning and implementation."[40] By the end of 1976, 9-1-1 was used by approximately 17% of the population of the United States. By 1979, nine states had enacted 9-1-1 legislation and about 26% of the population of the United States had access to 9-1-1 services. A lot of modifications were made to 9-1-1 services to ensure that they were always better. In the late 1970s, the service was growing at the rate of seventy new systems per year and by 1987, those

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[39] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.

[40] 9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017. https://www.nena.org/?page=911overviewfacts.

figures had expanded to show that 50% of the United States population had access to 9-1-1

service. Today, nearly 96% of the United States territory is covered by 9-1-1 service. Moreover,

Canada has adopted 9-1-1, giving it an international standing. In an ever-growing society with

increased probability of crime due to increased population, 9-1-1 has established itself as one of

the best existing emergency report method.[41]

Technology and the Police Today: What's New?

There has not been a lot of new police technologies. Most of police technologies

available now are better versions of what existed already. However, the few prevailing

innovations are truly amazing. Referring to the advancement of technology in the police, Dr.

Patrick Solar, assistant professor at the university of Wisconsin-Platteville states: "When I

started my career in law enforcement nearly 35 years ago, the only 'technology' we needed was

the police radio and the location of the nearest pay phone. Today police radios scan 30 channels

and officers typically have in-car video cameras, traffic monitoring radar units, in-car computer

data terminals with Internet access, body cameras, a department-issued cellphone and, of course,

personal cellphones."[42] In these few sentences, Dr. Solar summarizes the computerization of the

police over more than thirty years. New technologies as the body-worn camera, 3D crime scene

imaging and through the wall radar are already expected to help officers serve their communities.

In recent years, the public has been calling for police officers to wear body cameras. The

constant request that officers wear cameras came because of growing complaints about police

behavior. Throughout the United States, citizens have denounced police brutality and have

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[41]9-1-1 Origin & History - National Emergency Number Association. Accessed April 10, 2017.
https://www.nena.org/?page=911overviewfacts.
[42] "How Technology is Changing Law Enforcement." Police Magazine. Accessed April 10, 2017.
http://www.policemag.com/blog/technology/story/2015/12/how-technology-is-changing-law-enforcement.aspx.

demanded a change. In May 2015, the Washington Post studied the 385 fatal police shootings in the United States that had happened since the beginning of that year. Based on the number of fatal shootings, The Post concluded that the shootings in the first months of 2015 were "more than twice the rate that the government had recorded over the past decade"[43] and that minorities were three times more likely to be killed than whites. Alton Sterling and Philando Castile are two of the men who lost their lives to police officers. Their stories were heard of mainly because there were witnesses around them who recorded their murders, A lot of victims did not have the coverage Sterling and Castile had because unfortunately, there was no one around when they were being attacked. For some other victims, even if they were witnesses, their statements could easily be debunked because it was their word against officers' words. Therefore, guilty officers could justify their actions as they wished and consequently get away with murder.

Alton Sterling was a 37-year-old father and husband. On July 5th 2016, he tragically died after being shot several times while held on the ground by two Baton Rouge Police Department officers. The officers had received a call from someone reporting that there was a man selling compact discs outside of the Triple S Food Mart and that the man was armed. This man was Sterling. When the police officers arrived, one pushed Sterling to a car before both tackled him to the ground. As both officers immobilized Sterling on the ground, one took his weapon and shot multiple times in Sterling's chest. This incident was recorded by a bystander and posted on social media, for everyone to see what had happened and judge for themselves. Videos recorded

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[43] Katmarwong. "10 Police Brutality Statistics That Are Absolutely Shocking." Mic. December 09, 2015. Accessed April 10, 2017. https://mic.com/articles/129981/10-police-brutality-statistics-that-are-absolutely-shocking#.sTBeLsAP7.

by the shop owner also surfaced later.[44] The day after Sterling's death, on July 6th 2016, Philando

Castile was fatally shot by Minnesota police officer.

Castile was driving with his girlfriend, Diamond Reynolds and their daughter when he

was pulled over and asked for his license. As soon as Castile stopped his car, his girlfriend

started recording the interactions between him and the officer because she was scared due to the

high number of police shootings she had read about. She thought that recording their interactions

would be a smart move in case something vicious happened. The following events showed that

Reynolds was right. When the officer came up to Castile and asked for his license, Castile told

the officer that he would give him his license and he also decided to inform the officer that he

had a gun in his car but also had a license to carry a firearm. As Castile reached for his license,

the officer shot him seven times. Castile died twenty minutes after being shot. The video

recorded by Reynolds was posted on social media and had people crying for justice. The video

was also accepted as evidence against the officer who killed Castile. Subsequently, the officer

was charged with one count of second degree manslaughter and two counts of dangerous

discharge of a firearm.[45] The cases of Sterling and Castile are recent, but police brutality is not

something that appeared in recent years.

In 1991, a videotape showed three Los Angeles Police Department officers severely

beating an African American, Rodney King. A few months after the incident, the officers were

brought to a trial then acquitted. The outcome of the trial, deemed unfair, unsettled a lot of

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[44]Richard Fausset, Richard Pérez-Peña and Campbell Robertson. "Alton Sterling Shooting in Baton Rouge Prompts Justice Dept. Investigation." The New York Times. July 06, 2016. Accessed April 10, 2017. https://www.nytimes.com/2016/07/06/us/alton-sterling-baton-rouge-shooting.html.

[45] McCarthy, Ciara. "Philando Castile: police officer charged with manslaughter over shooting death." The Guardian. November 16, 2016. Accessed April 10, 2017. https://www.theguardian.com/us-news/2016/nov/16/philando-castile-shooting-manslaughter-police-jeronimo-yanez.

people and engendered riots in Los Angeles within hours of the verdict.[46] Therefore, it can be said that people have waited a long time for officers to wear body cameras. The national call for body cameras has now been heard and could make a huge difference in monitoring behavior of officers who break the law. There has been hatred directed towards officers because there is always the impression that incompetent and violent officers have a way to run away from justice. As a result, some people distrust the whole system and believe all police officers and other law enforcement agents are corrupt. Body-worn cameras could help single out the few officers that do not do their job appropriately. Apart from that, footage recorded by the cameras could also provide evidence to protect officers against false claims of wrongful actions. In addition, these footages could also be used to train other officers, serving as practicle examples of what to do or not to do during arrests.

Figure 2.1: Police body-worn cameras.[47]

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[46]"LAPD (King Beating)." Famous Trials. Accessed April 10, 2017. http://www.famous-trials.com/lapd.
[47] "How Technology is Changing Law Enforcement." Police Magazine. Accessed April 10, 2017.
http://www.policemag.com/blog/technology/story/2015/12/how-technology-is-changing-law-enforcement.aspx.

Other relatively new technology tools increasingly used by the police are "3D Crime Scene Imaging" and "Through-the-Wall Radar."[48] 3D Scanning technology take three-dimensional scans of whole crime scenes, thus limiting the need for photographs and sketches. Through-the-Wall-Radar technology use radio waves to discern movements through walls. This new radar technology can help officers know what kind of things may be in buildings they must enter. Having this kind of information can help officers predict what threats they could face and lead to successful operations. There have been concerns raised about the fact that this type of technology conflicts with privacy rights and the Fourth Amendment which establishes the right for "the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."[49] It is understandable that people fear their rights may be breached. However, if it is kept under control and used in cases of extreme importance, radar technology can prevent a lot of harm and facilitate the work of police officers, who are responsible for society's safety and the preservation of rights.

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[48] "How Technology is Changing Law Enforcement." Police Magazine. Accessed April 10, 2017. http://www.policemag.com/blog/technology/story/2015/12/how-technology-is-changing-law-enforcement.aspx.
[49]Staff, LII. "Fourth Amendment." LII / Legal Information Institute. February 05, 2010. Accessed April 10, 2017. https://www.law.cornell.edu/constitution/fourth_amendment.

Figure 2.2: Through-the-Wall Radar.[50]

Technology does not only help with current problems or cases. In recent years,

technology has been used to solve cold cases and provide justice. Law enforcement agents

usually turn to fingerprinting and DNA technologies to solve cold cases. For instance, "the FBI's

Integrated Automated Fingerprint Identification System (IAFIS), which houses known records

for approximately 73 million criminal subjects, is used daily by local, state, tribal, and

international law enforcement for current cases, but increasingly for help in solving cold cases as

well."[51] One of the cold cases solved with the use of fingerprint technology concerns the murder

of a sixty-one-year-old man. In 1978, Carroll Bonnet was stabbed to death in his apartment in

Omaha, Nebraska. The victim's car was later found in Illinois. Although police collected more

evidence from the car, the evidence they had did not help them pursue any lead. Thus, the case

was classified as a cold case.[52]

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[50]"How Technology is Changing Law Enforcement." Police Magazine. Accessed April 10, 2017.
http://www.policemag.com/blog/technology/story/2015/12/how-technology-is-changing-law-enforcement.aspx.
[51] "30-Year-Old Murder Solved." FBI. February 16, 2017. Accessed April 10, 2017.
https://www.fbi.gov/news/stories/30-year-old-murder-solved.
[52] "30-Year-Old Murder Solved." FBI. February 16, 2017. Accessed April 10, 2017.
https://www.fbi.gov/news/stories/30-year-old-murder-solved.

The case was reopened in 2008 and the prints collected on the crime scene back in 1978 were searched using IAFIS (which did not exist in 1978). In just a few hours, the software returned a few people for possible comparisons. Police thoroughly examined the prints and finally found someone whose prints matched up with the ones on the crime scene—Jerry Watson. In the meantime, Jerry Watson was serving time in an Illinois prison on burglary charges. After some time, police discovered that Jerry Watson used to live near the place where Bonnet's car was perceived, in Illinois. Omaha police's cold case squad's Doug Herout traveled to Illinois to interrogate Watson and collect a sample of his DNA. Further testing revealed that Watson's DNA matched DNA collected at the crime scene. This information together with Watson's spotted prints lead to an imprisonment for murder. Thirty-three years after he was assassinated, Bonnet finally received justice as his killer was sentenced to life in prison.[53] Another cold case solved with technology's helping hand is that of nineteen-year-old Mary Sullivan, raped and strangled to death in her apartment in Boston, Massachusetts.

Sullivan was found dead in January 1964. She was one of the Boston Strangler's eleven victims. For years, police tried to put a name and a face on the Boston Strangler.[54] A man called Albert DeSalvo, who was sentenced to life in prison for rape charges, had confessed killing the eleven women. However, since he retracted his confession, experts were debating as to whether or not he committed these murders. Evidence proving that DeSalvo was the Boston Strangler eventually surfaced forty years after his death. In 2013, Boston authorities exhumed DeSalvo's body to collect DNA samples for testing. The DNA "extracted from a femur and three teeth

[53]"30-Year-Old Murder Solved." FBI. February 16, 2017. Accessed April 10, 2017. https://www.fbi.gov/news/stories/30-year-old-murder-solved.
[54] "Solving Cold Cases with DNA: The Boston Strangler Case." National Institute of Justice. Accessed April 10, 2017. https://www.nij.gov/journals/273/Pages/boston-strangler.aspx.

yielded a match — specifically, DNA specialists calculated the odds that a white male other than

DeSalvo contributed the crime scene evidence at one in 220 billion — leaving no doubt that

DeSalvo had raped and murdered Mary Sullivan."[55] Technology does not only help to convict

criminals; they also help in saving people who have been wrongfully condemned.

DNA technologies have saved a lot of lives ever since they have been implemented. For

example, Illinois Governor George Ryan "applied DNA testing to death row inmates in 1998 and

found that thirteen out of the twenty-five could be exonerated by the results."[56] He responded to

these results by promptly suspending executions. Another example where DNA testing has saved

the lives of people unjustly accused is the Central Park jogger case. This case concerns the attack

and rape of a 28-year-old woman named Trisha Meili. Five young males were charged for this

crime and were sentenced to serve from five to fifteen years in prison in 1990.[57] Four of these

juvenile males were black and one was Hispanic. In 2002, a man called Matias Reyes confessed

that he was the one who raped Meili. His confession led to DNA testing. The results of the tests

supported Reyes claims and proved that the men who had been sent to prison for the rape were

indeed innocent. Five men had spent between six and thirteen years in prison because of a

judicial "mistake." This case suscitated many concerns about racism in the judicial system.

Today, despite the evidence against Reyes and his own confessions, some people argue that the

five males previously convicted must also be guilty and should not have been released.

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[55] "Solving Cold Cases with DNA: The Boston Strangler Case." National Institute of Justice. Accessed April 10, 2017. https://www.nij.gov/journals/273/Pages/boston-strangler.aspx.

[56] Team, The Forensic Outreach. "5 Real-Life Cases Where DNA Profiling Changed Everything." The Forensic Outreach Library. October 09, 2013. Accessed April 10, 2017. http://forensicoutreach.com/library/5-real-life-cases-where-dna-profiling-changed-everything/.

[57]"The Case of the Central Park Jogger." The New York Times. August 18, 1990. Accessed April 27, 2017. http://www.nytimes.com/1990/08/19/nyregion/the-case-of-the-central-park-jogger.html.

<u>**Chapter 3: The Rise of Cybercrime**</u>

Even though technology has granted the world with many advantages, it also carries with it a couple of problems. The internet is used increasingly throughout the world, making the world significantly smaller than it actually is. Yet, the growth of the Internet has enabled the rise of a new type of crime: cybercrime. Cybercrime, in its most simple definition, is any crime that is committed over the internet. It is a major problem mainly because it is a little different from other types of crimes we usually hear about. Unlike "traditional crimes," cybercrimes do not require criminals to be physically present. Criminals can perpetuate their crimes from places that are far away. These crimes may target individuals, companies, property or even the Government. A basic example illustrating cybercrime is someone living in Pennsylvania hacking into the computer of someone living in Tennessee to access their personal information with the help of the internet. Types of cybercrimes other than hacking include: theft, malicious software, online harassment and identity theft.

<u>**Some Types of Cybercrimes**</u>

Theft can occur when people illegally download software, movies, music and even games. There are a few websites that allow people to share various files, henceforth violating copyrights. These websites are often referred to as peer-to-peer file sharing (P2P). One of these websites was LimeWire. LimeWire used to run on Windows, Mac OS X, Linux, and other operating systems that were supported by the Java software platform. On October 26, 2010, U.S. federal court judge Kimba Wood issued an injunction forcing LimeWire to prevent "the searching, downloading, uploading, file trading and/or file distribution functionality, and/or all

functionality"[58] of its software in Arista Records LLC v. Lime Group LLC. As a result,

LimeWire ended the distribution of the LimeWire software. Consequently, newer versions of the

program have been disabled. Malicious software are internet-based software or programs that are

used to disrupt a network and gain access to important data. Sometimes, they are used to cause

damage to current software in the disrupted system. Online harassment and identity theft are

more targeted at individuals and as research show, have made countless victims.

Victims of online harassment are usually subjected to a myriad of offensive and

threatening messages or emails. In 2014, the Pew Research Center's American Trends Panel

conducted a national survey about online harassment. According to Maeve Dungan, "this survey

was conducted May 30 – June 30, 2014 and self-administered via the internet by 2,849 web

users, with a margin of error of plus or minus 2.4 percentage points."[59] The aim of this survey

was to understand the extent to which online harassment is a problem, who is more affected by

it, and what type of harassment is the most common. As demonstrated by *figure 3.1,* 60% of the

respondents have declared that they had not experienced online harassment. Still, "73% of adult

internet users have seen someone be harassed in some way online and 40% have personally

experienced it."[60] Apart from that, the results have also shown that age and gender are most

closely associated with the experience of online harassment.

Young adults, especially young women, experienced severe harassment at

disproportionally high levels (see *figure 3.2*). However, as can be seen in *figure 3.3*, young men

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[58] Halliday, Josh. "LimeWire shut down by federal court." The Guardian. October 27, 2010. Accessed April 16, 2017. https://www.theguardian.com/technology/2010/oct/27/limewire-shut-down.

[59] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

[60] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

experienced more harassment in the following categories: called offensive names, purposefully embarrassed, physically threatened, and harassed for a sustained period. When asked about where they had been harassed, 66% of those who had personally experienced online harassment said that it happened on social network or social websites.[61] Although 2,849 respondents may be seen as a relatively small sample of the U.S. population, it is still a significant sample and the results of this research can be generalized. To some, the results may not be alarming because the percentage of those who did not experience online harassment is high (60% compared to only 40% for those who experienced online harassment). However, 40% still represents a significant number of people, and it would be better if this number could be kept as low as possible because online harassment is a real problem. In fact, 79% of those who experienced online harassment reported that it was upsetting.
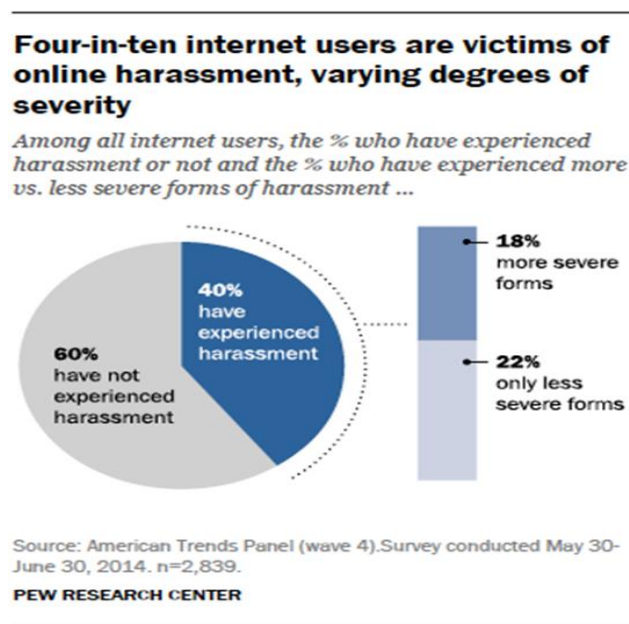

Four-in-ten internet users are victims of online harassment, varying degrees of severity

Among all internet users, the % who have experienced harassment or not and the % who have experienced more vs. less severe forms of harassment ...

60% have not experienced harassment

40% have experienced harassment

18% more severe forms

22% only less severe forms

Source: American Trends Panel (wave 4).Survey conducted May 30-June 30, 2014. n=2,839.

PEW RESEARCH CENTER

Figure 3.1: Percentages of internet users who have experienced and not experienced harassment online.[62]

[61] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

[62] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

Young women experience particularly severe forms of online harassment

Among all internet users, the % who have personally experienced the following types of online harassment, by gender and age...
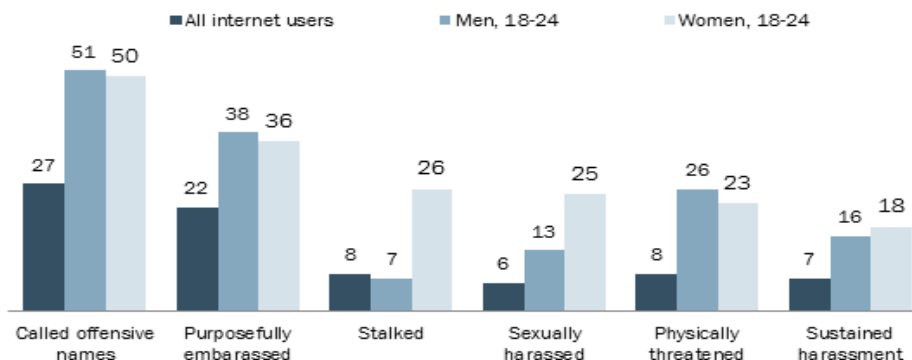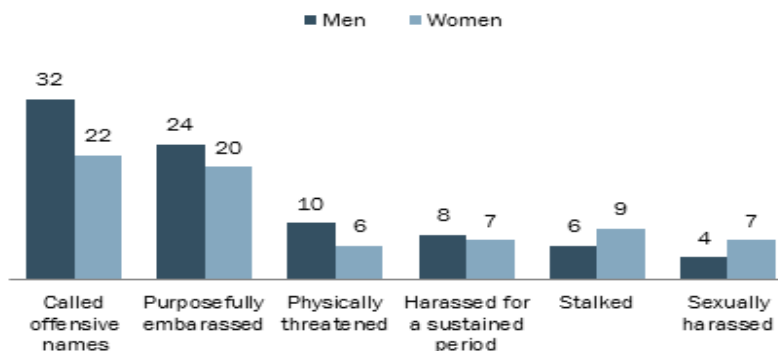
■ All internet users   ■ Men, 18-24   ■ Women, 18-24

Source: American Trends Panel (wave 4). Survey conducted May 30-June 30, 2014. n=2,839.
PEW RESEARCH CENTER

Figure 3.2: Different types of harassment as experienced by internet users.[63]

Men and women experience different varieties of online harassment

Among all internet users, the % who have experienced each of the following elements of online harassment, by gender...

■ Men   ■ Women

Source: American Trends Panel (wave 4). Survey conducted May 30-June 30, 2014. n=2,839.
PEW RESEARCH CENTER

Figure 3.3: Different types of harassment as experienced by men and women.[64]

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[63] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

[64] Duggan, Maeve. "Online Harassment." Pew Research Center: Internet, Science & Tech. October 22, 2014. Accessed April 16, 2017. http://www.pewinternet.org/2014/10/22/online-harassment/.

Identity Theft has become a major problem. This type of cybercrime consists of criminals accessing data about a person's bank account, social security number, credit and debit cards and more. With these sensitive information, criminals proceed to making payments in the victim's name. This may result in serious financial losses for the victim. According to the 2017 Identity Fraud Study provided by Javelin Strategy & Research, "$16 billion was stolen from 15.4 million U.S. consumers in 2016, compared with $15.3 billion and 13.1 million victims a year earlier."[65] In the United States, "The Consumer Sentinel Network maintained by the Federal Trade Commission (FTC), tracks consumer fraud and identity theft complaints that have been filed with federal, state and local law enforcement agencies and private organizations."[66] In 2015, The Consumer Sentinel Network received 3.1 million complaints. Of these, 16% were associated with identity theft. As can be seen in *figure 3.4*, identity theft complaints increased by more than 47% from 2014. These statistics prove that identity theft is a major problem that there is an ugent need to minimize its spread and impacts.

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[65] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.

[66] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.

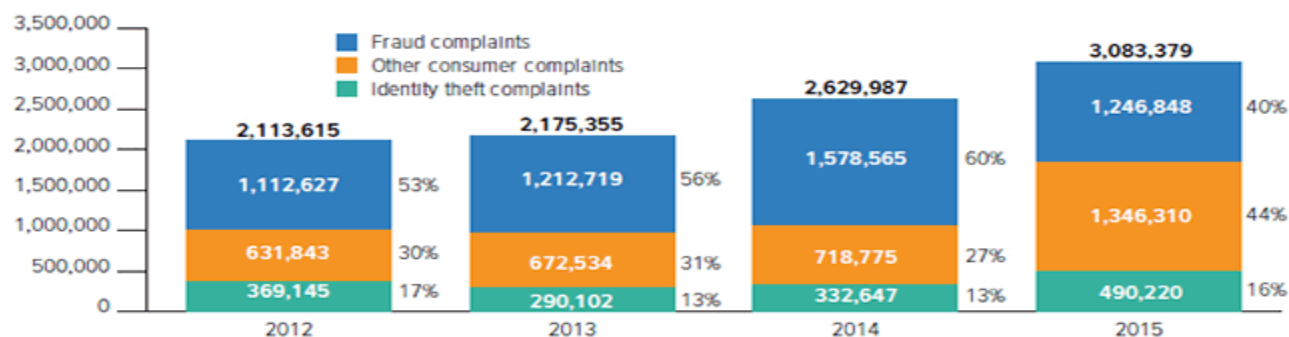## Identity Theft and Fraud Complaints, 2012-2015 (1)

Figure 3.4: (1) Percentages are based on the total number of Consumer Sentinel Network complaints by calendar year. These figures exclude "Do Not Call" registry complaints.
Source: Federal Trade Commission, Consumer Sentinel Network.[67]

How Victims' Information Is Misused, 2015 (1)

Type of identity theft fraud	Percent
Government documents or benefits fraud	49.2%
Credit card fraud	15.8
Phone or utilities fraud	9.9
Bank fraud (2)	5.9
Attempted identity theft	3.7
Loan fraud	3.5
Employment-related fraud	3.3
Other identity theft	19.2

Figure 3.5: (1) Percentages are based on the total number of complaints in the Federal Trade Commission's Consumer Sentinel Network (490,220 in 2015). Percentages total to more than 100 because some victims reported experiencing more than one type of identity theft.
(2) Includes fraud involving checking, savings, and other deposit accounts and electronic fund transfers.
Source: Federal Trade Commission, Consumer Sentinel Network.[68]

[67] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.
[68] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.

Identity Theft by State, 2015

State	Complaints per 100,000 population (1)	Number of complaints	Rank (2)	State	Complaints per 100,000 population (1)	Number of complaints	Rank (2)
Alabama	102.3	4,973	30	Montana	87.2	901	43
Alaska	94.3	696	40	Nebraska	100.5	1,905	34
Arizona	133.8	9,136	14	Nevada	125	3,613	19
Arkansas	97.7	2,911	37	New Hampshire	142	1,890	9
California	141.3	55,305	10	New Jersey	125.8	11,266	17
Colorado	123.2	6,724	21	New Mexico	101.1	2,109	33
Connecticut	225	8,078	2	New York	122	24,157	23
Delaware	124.9	1,181	20	North Carolina	106	10,646	29
Florida	217.4	44,063	3	North Dakota	76	575	48
Georgia	149.1	15,230	7	Ohio	134.4	15,611	12
Hawaii	62.6	896	50	Oklahoma	120	4,695	24
Idaho	101.3	1,676	32	Oregon	126.1	5,081	15
Illinois	158.7	20,414	5	Pennsylvania	116.2	14,877	25
Indiana	93.9	6,217	41	Rhode Island	141.2	1,491	11
Iowa	89.7	2,803	42	South Carolina	102.3	5,010	30
Kansas	112.7	3,282	27	South Dakota	63.1	542	49
Kentucky	80.9	3,581	46	Tennessee	107.9	7,121	28
Louisiana	94.4	4,410	39	Texas	144.3	39,630	8
Maine	113.9	1,514	26	Utah	85.7	2,567	44
Maryland	183.2	11,006	4	Vermont	83.9	525	45
Massachusetts	125.5	8,530	18	Virginia	123.2	10,329	21
Michigan	158.1	15,684	6	Washington	126.1	9,043	15
Minnesota	97.8	5,368	36	West Virginia	79.9	1,474	47
Mississippi	98.8	2,955	35	Wisconsin	134.4	7,756	12
Missouri	364.3	22,164	1	Wyoming	96.6	566	38

Figure 3.6: (1) Population figures are based on the 2015 U.S. Census population estimates.
(2) Ranked by complaints per 100,000 population. The District of Columbia had 228.0 complaints per 100,000 population and 1,533 victims. States with the same ratio of complaints per 100,000 population receive the same rank.
Source: Federal Trade Commission, Consumer Sentinel Network.[69]

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[69] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.

One of the ways cybercriminals use to steal important information related to people's finances is through cyberattacks and business data breaches. Since businesses increasingly rely on software to keep track of most of their customers' private information, cybercriminals can access these by hacking businesses' data system. *Figure 3.7* illustrates the number of data breaches and records exposed from 2007 to 2016, *figure 3.8* shows the number of cybercrime complaints from 2011 to 2015 and *figure3.9* displays the top the states by percent of total U.S. cybercrime victims in 2015. According to the Insurance Information Institute:

Cyberattacks and breaches have grown in frequency, and losses are on the rise. Breaches hit a new record in 2016, soaring to 1,093, up from 780 on 2015, but the number of records exposed fell to about 37 million from 169 million in 2015. The majority of the data breaches in 2016 affected the business sector, with 494 breaches or 45.2 percent of the total number of breaches. Medical/healthcare organizations were affected by 377 breaches (34.5 percent of total breaches) while the education sector sustained 98 breaches (9.0 percent of all breaches) and government/military breaches totaled 72 (6.6 percent), according to the Identity Theft Resource Center. According to the Identity Theft Resource Center there have been 392 breaches in 2017 so far (as of March 28) with 7.4 million records exposed. These figures do not include the many attacks that go unreported. In addition, many attacks go undetected.

In 2014 McAfee and the Center for Strategic and International Studies (CSIS) estimated annual global losses from cybercrime fall between $375 billion and $575 billion. The costs of cybercrime are growing. An annual study of U.S. companies by the Ponemon Institute cites estimated average costs at $15 million in 2015, up 21 percent from $12.7 million in 2014. These costs ranged among the 58 organizations surveyed from a low of

$1.9 million to a high of $65 million each year per company. Cyber insurance evolved as a product in the United States in the mid- to late-1990s as insurers have had to expand coverage for a risk that is rapidly shifting in scope and nature. More than 60 carriers offer stand-alone policies in a market encompassing $2.75 billion in gross written premiums in 2015. By mid-2016 gross premiums written was estimated at $3.25 billion.[70]
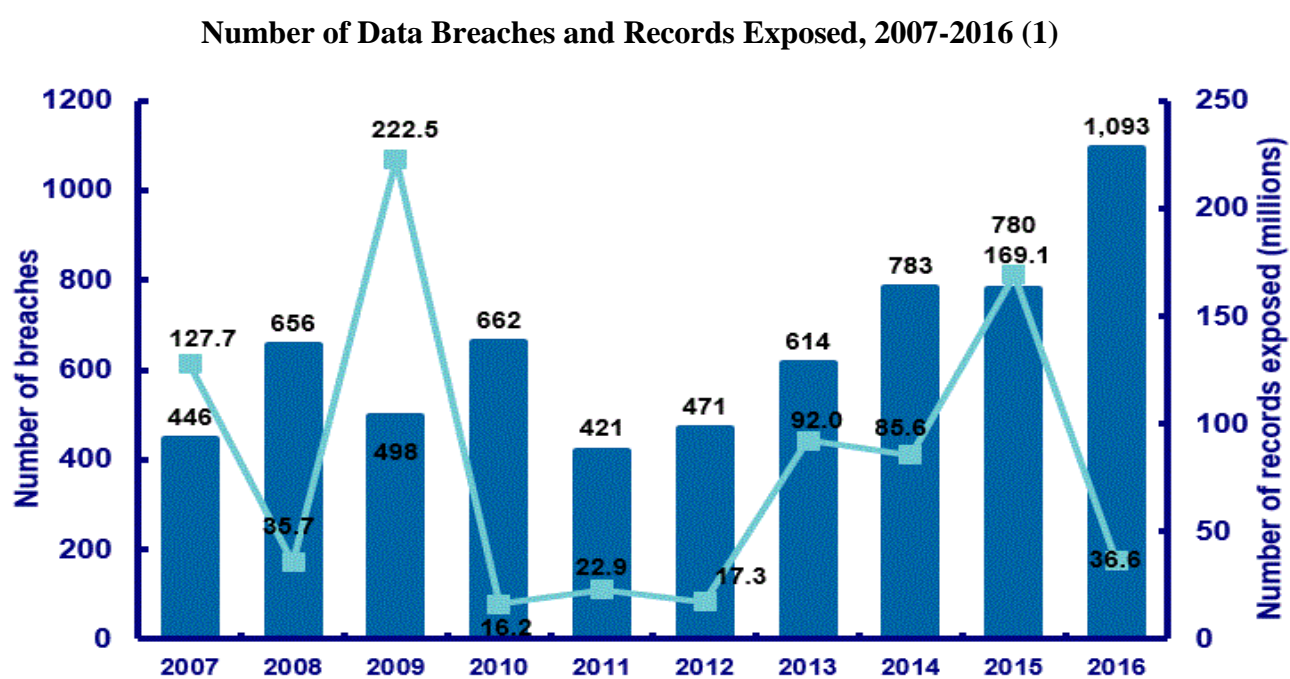
Number of Data Breaches and Records Exposed, 2007-2016 (1)

Figure 3.7: (1) As of January 18, 2017.
Source: Identity Theft Resource Center.[71]

[70] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.
[71] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.
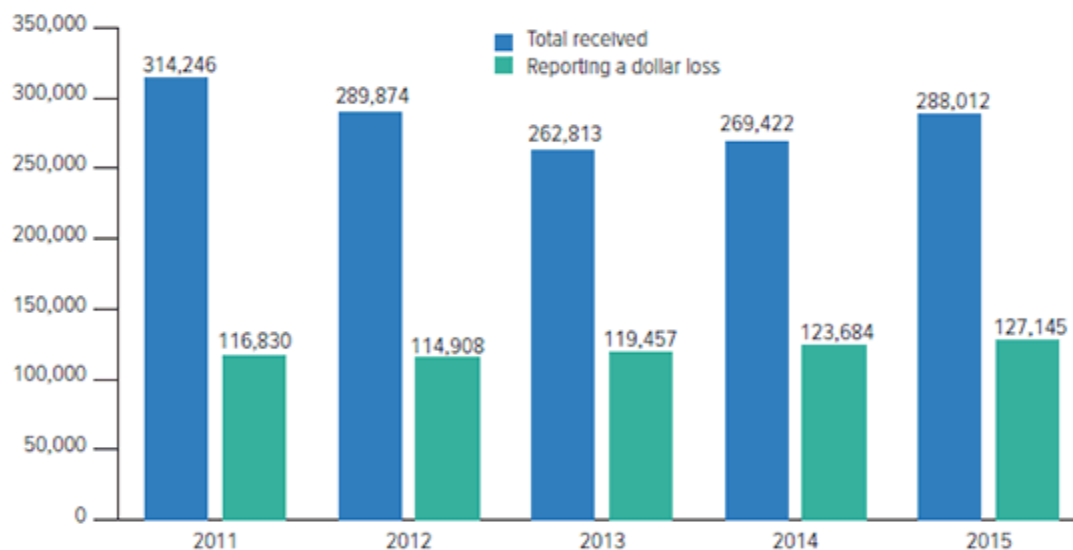
Cybercrime Complaints, 2011-2015 (1)

Figure 3.8: (1) Based on complaints submitted to the Internet Crime Complaint Center.
Source : Internet Crime Complaint Center.[72]

Top 10 States by Percent of Total U.S. Cybercrime Victims, 2015 (1)

Rank	State	Percent
1	California	14.53%
2	Florida	8.47
3	Texas	7.67
4	New York	6.30
5	Illinois	3.51
6	Pennsylvania	3.31
7	Virginia	3.14
8	New Jersey	3.01
9	Washington	2.72
10	Ohio	2.69

Figure 3.9: (1) Based on the total number of complaints submitted to the Internet Crime Complaint
Center via its website from each state and the District of Columbia where the complainant provided state
information. Source: Internet Crime Complaint Center.[73]

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[72] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.
[73] "Identity Theft And Cybercrime." III. Accessed April 16, 2017. http://www.iii.org/fact-statistic/identity-theft-and-cybercrime.

The Fight Against Cybercrimes: The Federal Bureau of Investigation

It is very difficult to fight cybercrimes. The main reason for this is that cybercriminals use technology and tools that keep changing at a fast rate. Law enforcement agents have a hard time stopping cybercriminals because they have access to current technology. Although the Federal Bureau of Investigation (FBI) devotes time and resources to fighting cybercrimes (for example through highly trained cyber squads and partnership with other federal agencies like the Department of Homeland Security)[74], it is still a cumbersome task to find and imprison cybercriminals. On the FBI's website, it is said that FBI agents rely on new technology to fight against cybercrime. This should serve as an incentive to invest more into new technologies to help law enforcement agents win against crime, because these investments would be truly useful. There is a growing need for commercial institutions and government organizations to better use existing tools and find new methods to make progress in the battle against cybercrime.

Nonetheless, it is important to stress that law enforcement agents must use new technologies available to them with caution. The fact that technology grows so fast means that new laws would also be needed. Yet, laws cannot always respond to the changing dynamics of society quickly enough. However, existing laws must be enforced. Therefore, law enforcement agents must make sure that when they use technology, they do not obstruct others' civil liberties. For example, police officers should obtain warrants before attaching a GPS to a suspect's vehicle because not doing so could result in the violation of the rights laid down in the fourth amendment.[75] If technology is used correctly, it will definitively do more good than harm.

[74] "Cyber Crime." FBI. March 22, 2017. Accessed April 16, 2017. https://www.fbi.gov/investigate/cyber.
[75] "How Police Use GPS for Personal and Vehicle Tracking." BrickHouse Security. July 18, 2014. Accessed April 28, 2017. http://www.brickhousesecurity.com/category/gps tracking/gps tracking and law enforcement.do.

Conclusion

Technology has significantly improved quality of life over the past fifty years. The benefits of technology can be seen in almost every sector of society. The sector of law enforcement is not an exception to that phenomenon. In fact, over the years, technology has facilitated the work of law enforcement agents. However, the growth of technology has also brought various challenges. One of the problems that came along with technology growth is cybercrime. Unfortunately, cybercriminals and other criminals often have access to better technology than the police.[76] Yet, as crime fighters, police and other agents of law enforcement need to have access to the same, if not better technology and tools as compared to criminals. Nevertheless, this is not to say that nothing has been done to provide the police with up-to-date technology. The National Institute of Justice (NIJ) is the designated federal source of research and development in law enforcement technology.

NIJ's main role is to create and evaluate new technologies. It was created in 1969. In the late 1970s, the institute introduced the soft body armor. By 1998, the soft body armor introduced by the institute was credited with saving the lives of more than 2,000 police officers.[77] Today, most of the NIJ's current research are directed towards: "Aviation Technology, Biometrics, Body Armor, Body-worn Cameras, Communications Technologies, Crime Mapping (Mapping and Analysis for Public Safety), Detection and Surveillance Technologies Less-Lethal Technologies (Technology & Tools) and Technology Assistance."[78] Still, the fact that some crimes keep

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[76] POLICE TECHNOLOGY - History of Technology. Accessed April 16, 2017. http://www.police-technology.net/id59.html.

[77] POLICE TECHNOLOGY - History of Technology. Accessed April 16, 2017. http://www.police-technology.net/id59.html.

[78] "Law Enforcement Equipment and Technology." National Institute of Justice. Accessed April 16, 2017. https://www.nij.gov/topics/law-enforcement/technology/Pages/welcome.aspx.

growing and that some criminals can get their hands on new technology before police officers

shows that there is still room for improvement. Police officers must be better trained and

equipped to be more effective. Better funding for police technology can be a solution to help

mitigate the effects of the science and technology gap between law enforcement agents and

criminals.

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    Fsites%2Fstevenkotler%2F2013%2F12%2F19%2F5-medical-technologies-

    revolutionizing-

    healthcare%2F&refURL=https%3A%2F%2Fwww.google.com%2F&referrer=https%3A

    %2F%2Fwww.google.com%2F.

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