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Technology and the American Criminal Justice System

By

Taylor Elizabeth Hunt

Advisor: Brian Pullen

An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of Science in Business Administration in Supply Chain Management and Information Systems.

**Sam M. Walton College of Business
University of Arkansas
Fayetteville, Arkansas**

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Abstract

The American prison population has grown to over 2.3 million citizens incarcerated (“United States of Incarceration,” 2016) and there are more than 900,000 police officers in the nation (“Law Enforcement Facts,” n.d.). These over 3 million people use technology every day in either their work or incarcerated lives. As the effectiveness of the criminal justice system is being questioned, now is the time to perform an assessment of the technology used and make technological recommendations to lower crime, incarceration, and recidivism rates simultaneously. To obtain that technology assessment, a student research study was conducted and consisted of research and interviews from multiple branches of the criminal justice system.

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Introduction

The criminal justice system typically measures success in the form of lower crime and higher incarceration rates. However, the United States has nearly 1% of its citizens locked up, creating an \$8.24 billion industry (“United States of Incarceration,” 2016). While this percentage may seem low, it adds up to about 2.3 million citizens incarcerated, which is a 500% increase since 1985 (Dimon, 2015). Additionally, the United States ranks first in incarceration (“Ranking,” 2018) and in crime rates (Murray, n.d.), neither of which should be considered a success. As Josh and Hank Green so gracefully put it, “today’s prisoners are tomorrow’s neighbors,” so we should be more focused on the goals of correcting prisoners’ behaviors and deterring others from committing crimes (Green and Green, 2014). These efforts can be measured through recidivism, or re-offending rates, which I believe should be the primary success indicator for the criminal justice system.

Using existing data surrounding criminal activity, I can pinpoint the “hotspots” of crimes on the University of Arkansas campus and in the Northwest Arkansas area. This data was chosen from these specific locations due to their familiarity and availability. Based on these hotspots, I interviewed different members of the police force and prison staff to understand what technology might be useful in lowering crime rates. Based on these suggestions offered, I studied the effectiveness of different types of technology and made recommendations about short-term and long-term technology implementations that would work towards the overall goal of lowering crime rates. As Darrel West says:

Unless we find alternatives to physical imprisonment, the social and economic costs of jails will continue to sky-rocket. Technology solutions can reduce costs, keep society safe, and ease the re-entry of nonviolent offenders (West, 2016).

Background

History of the American Criminal Justice System

The definition of a criminal justice system, according to the Oxford Dictionary, is “the system of law enforcement that is directly involved in apprehending, prosecuting, defending, sentencing, and punishing those who are suspected or convicted of criminal offenses” (“Definition of Criminal Justice System”, 2010). Prisons and police departments are among the first two things that come to mind for most Americans when they hear the word “criminal.” Therefore, I am going to focus on the prison and police systems in the United States in order to maximize the effectiveness of my research.

The inspiration for the first prisons came from a Biblical theological belief that was expressed in phrases such as “an eye for an eye or a tooth for a tooth” (James, 2017). Prisons were popularized around 1776 as a form of punishment in America. It is believed that the idea for American prisons partially came from England’s prison system, which was established during the 1500s. The other inspiration is said to have come from those same Biblical phrases which later spurred the American belief that prisons assisted citizens in deciphering between right and wrong, therefore improving the morality of society as a whole (James, 2017). Prior to 1776, the English practiced banishing their prisoners to America. As a result, some of the first colonial buildings in America were jails built to protect the new American citizens from the banished citizens. The 19th century population boom brought a massive increase in prison use. A greater population increased crime, leading to more prisoners. As a result, prison quality suffered and Americans were forced to improve conditions (Al-Khatib, 2015). Around the 1830s, there was a surplus of prisons built with these new conditions in mind to accommodate the surge of prisoners created by the population boom.

Also in the 1830s, the English came up with the idea to make prisoners upkeep the very prisons where they were incarcerated, and in wealthier areas, manufacturing goods such as socks and clothing became standard. The work was viewed to serve two purposes: offset the housing costs of prisoners and rehabilitate prisoners through hard labor. At the same time, slaves were becoming emancipated and moved North. The influx of citizens to northern towns again increased the incarceration count while funding remained constant, therefore lowering the conditions that prisoners lived in. The terrible conditions caused “mortality rates as high as 40 percent” for some prisons (Al-Khatib, 2015). Around the 1900’s, the government recognized the fact that there needed to be separate prison facilities for women and youth. The establishment of these facilities sparked an increase in the quality of conditions experienced by prisoners in all types of prisons. Later, in the 1970’s, many Americans held the belief that prisons would become extinct in their lifetime, which in-part led to Nixon’s War on Drugs in 1971. Years later, President Ronald Reagan attempted to counteract this fear again with his Anti-Drug Abuse Act in 1986 which established harsher conditions on crack cocaine and mandatory minimum sentences on drug crimes (Wright, 1986). Since Reagan’s presidency, no President has adequately addressed the prison reform that is demanded due to a general increase in both incarceration (Figure 1) and recidivism rates (Hull, 2014).

Police serve an important role in contemporary American society. As the widely accepted LAPD motto states, police are there “to protect and serve” (“The Origin of the LAPD Motto,” n.d.). However, as police were introduced along with prisons during colonial times, they were also privately funded. Because the number of police officers was not sufficient, volunteers formed a “night watch” in order to catch criminals and protect their towns (Waxman, 2017). When the inefficiencies of having both a private police force and volunteer watchers were revealed, the communities made a change. They decided to use “night watch” duty as a punishment and forced the new “policemen” to work patrols. At this point, the police system was de-aggregated and communities designed their own police forces, which further revealed the inefficiencies of the night watch system. Throughout the period before, during, and just after the Civil war, police officers were sometimes slave patrols in the South and other time keepers of public order in the North. Overall, police officers during this time lacked a clear mission. The first concrete legislation to set the police force’s mission was created by President Hoover in 1929 called the Wickersham Commission (Waxman, 2017). As this commission matured, so did the police force. In 2018, police officers are tasked with “maintaining order and keeping communities safe” (“What does a police officer do?,” 2016). Though the effectiveness and methods of the modern police force have been recently debated, it is clear that their background stems from a desire to serve their communities.

Incarceration Process (Figure 3)

Once a suspect has been arrested, he is taken into custody, typically by a police officer. At this point, the suspect is booked and transported to jail, which is a short-term facility for holding suspects/convicts, only if he is required to stay overnight (“Types of Prisons,” 2017). The suspect then attends their arraignment where they enter their plea and are either detained or released based on the plea and charges (“Chronology: The Arrest Process,” n.d.). At the arraignment, petty crimes, or incidents, are handled typically with a fine or alternative sentencing such as community service and/or defensive driving courses (“Classification of Crimes,” 2015). Then, the suspect attends a preliminary hearing where the judge typically sets the bail amount that is required to release the suspect from jail before trial (“How Courts Work,” n.d.). At this point, crimes are typically treated according to their classification: misdemeanor, felony-

misdemeanor, or felony. Misdemeanors are the least serious of the three with examples being shoplifting, DUIs, and vandalism (“Misdemeanor Crimes,” n.d.). The punishment for a misdemeanor is typically jail. As jails are short-term facilities operated by cities and counties, the sentences for misdemeanors are typically less than a year (“Classification of Crimes,” 2015). Felony-misdemeanors are crimes that can be prosecuted as either a felony or misdemeanor. The judge typically decides how to prosecute these crimes (“Classification of Crimes,” 2015). Finally, felonies are the most serious crimes of the three as they are “either supported by a heinous intent, like the intent to kill, or accompanied by an extremely serious result, such as loss of life, grievous injury, or destruction of property” (“Classification of Crimes,” 2015). Punishment for felonies includes “execution, prison time, a fine, or alternative sentencing such as probation, rehabilitation, and home confinement” (“Classification of Crimes,” 2015). Some examples of felonies are robbery, assault, homicide, and rape (“Felony Law,” n.d.).

For those convicted and sentenced to prison, they can be placed in a minimum, medium, or high security prison. Minimum security prisons typically house non-violent prisoners convicted of “white-collar” crimes such as fraud (“Types of Prisons,” 2017). Medium security prisons, the most common type, provide inmates with much less freedom than minimum security prisons (“Types of Prisons,” 2017). Maximum security prisons are reserved for “high risk individuals” and they provide inmates with the least amount of freedom and are extremely restricting (“Types of Prisons,” 2017).

Alternative sentencing includes methods such as house arrest, parole, probation, community service, psychiatric facilities, and juvenile detention. Psychiatric facilities are reserved for mentally ill inmates and juvenile detention is reserved for inmates under 18 years of age. The other alternative sentencing methods are distributed as punishment in lieu of incarceration and/or as a way of early release or post-release atonement.

Federal prisons are managed through a branch of the Department of Justice. Prisoners are sentenced to federal prisons if they commit a federal crime and are not eligible for parole (“Types of Prisons,” 2017). Therefore, federal prisons typically have longer sentence lengths. Conversely, state prisons typically house prisoners for shorter amounts of time because they offer the option of parole. There are more state prisons than federal prisons and they are operated by the state in which they are located. Violent criminals are usually housed in these state facilities (“Types of Prisons,” 2017).

Criminal Justice System Statistics

There are three key statistics used to measure the success of the criminal justice system: crime, incarceration, and recidivism rates. Crime rates are defined as “a count of crimes compiled to assess the effectiveness of a crime control policy, and the impact of the policy on the risk of crime victimization” (“Crime Rate Law and legal Definition,” n.d.). Next, incarceration rates are defined as “the number of inmates held in the custody of state or federal prisons or in local jails, per 100,000 U.S. residents” (“Terms & Definitions, n.d.”). Finally, recidivism rates are defined as “a person's relapse into criminal behavior...measured by criminal acts that resulted in rearrest, reconviction or return to prison with or without a new sentence during a three-year period following the prisoner's release” (“Recidivism,” n.d.).

Lower crime rates are usually presented as a sign of a properly functioning criminal justice system. As evidenced in Figures 1 and 2, incarceration and crime rates seem to be negatively correlated. Additionally, according to a study conducted between 2006 and 2014, “22 states saw an increase in their prison populations while also experiencing an average drop in crime of 20 percent” (Lantigua-Williams, 2016). Though low crime rates are definitely a

positive, they also suggest higher incarceration rates based on historical trends. One view is that high incarceration rates mean that more criminals are being caught and locked up, thus viewing high incarceration rates and prison populations as a positive. They can also be seen as a negative as they indicate a higher percentage of the population who have committed a crime and have been removed from society.

I believe recidivism rates matter the most, even compared to the traditional metrics of crime and incarceration rates. The reason I have chosen to focus on low recidivism rates stems from the problematic relationship between crime and incarceration rates. When one is high, the other has historically been low. However, the ideal correlation between crime and incarceration would be positive in that both crime and incarceration would be low at the same time. This is because low crime and incarceration rates would signal a success in both catching and rehabilitating criminals. Incarceration is just a delay of a crime occurrence if recidivism rates are high. And the higher recidivism is, the higher crime rates are because recidivism is included in the calculation of incarceration rates. Taking all of this into consideration, I suggest using recidivism rates to measure the success of prisons and the criminal justice system as a whole.

Unfortunately, the recidivism rate for the United States is over 75 percent in the first five years of an inmate's release ("Recidivism," n.d.). Additionally, the "United States has about 5% of the world's population yet it accounts for about 25% of the world's prisoners," as shown in Figure 1, and "despite a steady decline in the crime rate over the past two decades the United States incarcerates more of its citizens than any other country" (Deady, 2014). These shocking statistics suggest a problem that needs to be addressed. Recently, former President Barack Obama was on track to leave office with "a smaller federal prison population than when he took office – a distinction no president since Jimmy Carter has had" (Gramlich, 2017). Gramlich cited the reason for this decline in prison population to be that Obama "has overseen a Justice Department initiative that emphasizes lighter sentences for those convicted of lower-level crimes and used his executive clemency power more frequently than any other modern chief executive" (Gramlich, 2017).

Opposingly, President Richard Nixon implemented the War on Drugs in 1971 and in 1986, President Ronald Reagan implemented the Anti-Drug Abuse Act ("Anti-Drug Abuse Act of 1986," 1986). Both established harsher sentencing practices on drug crimes. Many argue that these policies sparked the negative correlation between crime and incarceration and the belief that to obliterate crime, criminals must spend time in prison (Curley, 2018). President Obama's approach was the complete opposite from most of Regan and Nixon's and subsequently produced different results: lower incarceration rates and relatively low crime rates in comparison. The lesson to be learned from the results of these different approaches is that crime and incarceration are not perfectly negatively correlated; they can, and sometimes are, positively correlated. Therefore, by starting at a major source of higher crime and incarceration rates, high recidivism rates, those recommending improvements to the criminal justice system can truly have a lasting impact.

Methodology

Based on my research and understanding of crime, incarceration, and recidivism rates, I have identified a two-pronged action plan for collecting and analyzing data for this study. First, I will use crime, incarceration, and recidivism data found online to understand the criminal justice system in the Northwest Arkansas (NWA) area before interviewing members of the system. This way, I will be prepared to ask questions about technologies surrounding the NWA "crime climate" as it is very different from the climate of big cities such as New York City or Chicago

where most of the technological research and implementation occurs. I will gather this data for the University of Arkansas and the Northwest Arkansas area.

Second, I will utilize the knowledge gathered from my research during interviews that I set up with key members of the criminal justice system. First, I will meet with Corporal Allen Porter, a crime prevention officer at the University of Arkansas Police Department. Second, I will meet with Corporal Dallas Brashears, a member of the Community Policing Division of the Fayetteville Police Department to get a broader scope of how the police use technology to impact an entire community through improved service. As both of these interviews are focused on the first part of the criminal justice system, identifying crime and catching criminals, I will focus my latter efforts on the punishment phase of the criminal justice system, a jail. Specifically, I will interview Richard, a member of the IT department at the Washington County Detention Center, a jail for the Northwest Arkansas area.

After completing both the research (quantitative data) and interviews (qualitative data) I will compile the data and begin to analyze the results. My first step of analysis will be to research technology used across the American criminal justice system and analyze the effectiveness of each type of technology. Second, I will analyze my interview notes and identify technology usage currently. From this analysis, I will identify multiple solution recommendations for technology implementation that will help lower crime, incarceration, and recidivism rates.

Quantitative Research

University of Arkansas

The first community that I researched crime statistics on was the University of Arkansas. Using the “Jeanne Clery Disclosure of Campus Security Policy Campus Crime Statistics Report And Annual Fire Safety” report for 2016, I looked at the patterns present, specifically for the most common crimes committed on campus (“2016 Jeanne Clery Disclosure”, 2017). The most common crimes committed were classified as “Arrests and Referrals for Disciplinary Action”, while hate crimes and criminal offenses were much less common. The clustering of crimes into the less offensive arrest/referrals section is likely due to the population these data represent: a college campus. College campuses are unique in that they have a younger average age, specifically for those living on campus, and the majority of students are there to better themselves, become more educated, and get a job. Studies have shown that crime rates on campus, likely due in part to the aforementioned factors, are lower than crime rates in surrounding areas, just as the case seems to be for the University of Arkansas and Fayetteville (Jones, 2016). Additionally, education and crime have been negatively correlated, so, around a place of education, such as a college campus, it could be expected to see lower hard crime rates (“Crime Rates Linked to Educational Attainment,” n.d.).

Furthermore, nationally, the five most common crimes on college campuses are disorderly conduct, underage drinking, simple possession of marijuana, drag racing, and Driving Under the Influence (DUI) (Gambone, n.d.). Based on the Clery report, the University of Arkansas has a similar set of most commonly reported/charged crimes. The “top five” crimes committed on campus are liquor, drug, motor vehicle theft, burglary, and domestic violence related. Disorderly conduct, underage drinking, and DUIs were grouped under the liquor law arrests, which was the highest category at 473 total arrests/referrals in 2016. Given that most categories of crime listed on the Clery report had 0 occurrences in 2016, 473 arrests on campus is high and points out an area where the UAPD can look to target for crime prevention efforts in the future.

Northwest Arkansas (Washington County)

In Washington County, excluding those reported by the UAPD, there were 3,206 (74 reported by the UAPD not included) total offenses in 2016 (2016 Offenses by Contributor). Of the 61,907 offenses reported in Arkansas in 2016, the other top offending counties were Pulaski (15,263 offenses), Faulkner (3,318 offenses), and Sebastian (3,186 offenses). As the third largest county in Arkansas, it is expected that Washington County ranks third in crime rates (“Arkansas Counties by Population,” n.d.).

Of the offenses reported, the most common in Washington County were Simple Assault, Intimidation, and Aggravated Assault. This trend remained consistent across the other counties with the majority of reported offenses being categorized as simple assault. Intuitively, this holds up as many simple assault charges are “paired” with another charge, such as robbery, liquor charges, or drug charges. Based on this information, the police forces in the Northwest Arkansas community, and across Arkansas, should focus on crime prevention for simple assault, intimidation, and aggravated assault first in order to see the biggest reduction in overall crime rates.

Technology in the American Criminal Justice System

Use of Technology

Technology has been a vehicle for growth across all industries globally and is being implemented to increase the efficiency and effectiveness of current practices, as well as innovate new practices. The criminal justice system has seen technology implementations aiming to lower crime rates through making it easier to catch and manage criminals. Technology “can safeguard the lives of both officers and [suspects/inmates] and improve efficiency and effectiveness” of criminal justice practices (“Corrections Technologies,” n.d.). In prisons, “technology can detect contraband, extract covert information, monitor behavior, and alert staff to personnel that are in trouble” (“Corrections Technologies,” n.d.). In the police force, technology is helping “police make the stuff of science fiction become science fact” (Roufa, 2018). The use of technology in the criminal justice system is not new. However, the rate at which technology is implemented and improved is increasing, as the entire system desperately attempts to improve its practices and results. The technologies that I found extra useful or unexpected from research and interviews are cameras, ankle bracelet monitors, information systems, fingerprinting, biometric scanning, training simulators, and ordering devices.

Cameras

The use of cameras in prisons started by photographing prisoners for “mug shots” that could be kept on record and used to identify an individual. Then, guards began to take photographs of prisoners in the yard to monitor their behavior (Back to Basics, 2011). Now, Closed-Circuit Television (CCTV) systems are used in most, if not all, modern prisons and jails. They are strategically placed around the prison or jail facility to show most of the activity and minimize blind spots (Rouse – “CCTV,” n.d.). Guards man the control room and scan the camera feeds to ensure the prison is operating smoothly and safely.

Though CCTV systems may seem invasive, studies have shown that “CCTV in prison...reduce[s] offending behaviour such as prisoner assaults” (Allard, Wortley, & Stewart, 2006). Though there has been no conclusion as to whether the CCTV systems increase feelings of safety, they have been used to corroborate officer or prisoner stories when necessary. The main argument against the CCTV systems is privacy, but supporters of the cameras argue that prisoners gave up their right to privacy by committing a crime.

Another type of camera used in the criminal justice system is the body and car cameras used by some police officers. Though the use of body cameras has recently gained popularity, many police officers still do not wear the cameras. The argument for using the body cameras is again that they help corroborate either the police officer or individual's story and provide concrete evidentiary support. Again, like the CCTV example, the argument against body cameras is privacy. Body cameras have received a lot of attention recently in cases such as the Michael Brown death where there was no body camera (Hendry, 2017), and in cases such as the Jordan Edwards shooting where there was body camera footage (Wiley, 2017). Some have sided with the officers, while others have begged for more body cameras to help identify cases of police brutality and shed light on others where the officer was truly acting in self-defense. In the end, most of the cases with body camera footage have been able to use the footage in court and help make a more evidence based ruling which, in the end benefits everyone. For this reason as well as to give families peace of mind, the use of body cameras is becoming increasingly more popular.

Additionally, a majority of police vehicles have cameras mounted to the dashboard to record traffic stops and other incidents. Each camera has a different set of features and functionalities, but many require the officer to press a button to begin recording. According to Corporal Allen Porter of the University of Arkansas Police Department (UAPD), human error is the biggest issue the police force deals with. These outdated cameras that heavily rely on humans to work introduce a higher likelihood of human error. Therefore, many police stations, including UAPD, are using their funding to purchase newer, more cutting edge cameras and technologies that require less human intervention. Specifically, the UAPD is transitioning to the use of car cameras that turn on when an officer turns his or her lights and sirens on and turns on the officer's body camera. Additionally, the new cameras are always listening and recording one minute, or another set value, of footage so that once the lights are turned on, the one minute prior is saved as a part of the reporting. Corporal Porter spoke about this feature with enthusiasm and passion for what it will help officers do, including capturing footage of traffic incidents as many of them occur before an officer switches on their lights as well as allowing an officer to capture more of an interaction, specifically for those that an officer may not realize are important.

Some drawbacks to cameras in police work are the battery life and storage capacity of the cameras. Though both are constantly improving, it is expensive to consistently update the hardware and updates may not provide enough battery life or storage improvements to keep up with officers on their busiest days. Additionally, as I hinted at already, camera equipment can be expensive and difficult to justify spending on relatively minor improvements compared to other funding candidates for new technology where technology hasn't been used before. For this reason, the implementation of the newer cameras has been delayed in many locations and is being utilized and popularized in cities such as Detroit, Los Angeles, and Chicago where the population and crime rates are higher.

Ankle Bracelet Monitors

Electronic ankle bracelet monitors are a technology used in the criminal justice system as an alternative to prison sentences. Non-violent offenders are typically the candidates for this monitoring system because of the freedom associated with it. The ankle bracelet tracks a criminal's location through either GPS or radio frequency technology and ensures that the offender does not violate the conditions of their house arrest (Hirby, n.d.).

The reason that ankle bracelets were introduced as prison alternatives was because of "prison overcrowding and inmate warehousing" as well as the cost of housing inmates (Hirby,

n.d.). In fact, “electronic monitoring reduces incarceration costs from \$70-80/day to \$4-9/day” (West, 2017).

The lower cost is one of the main benefits of the ankle bracelets. Additionally, the bracelets provide offenders with more freedom than a traditional prison sentence. As seen with the open “come and go” style prisons in Scandinavia, this freedom can greatly reduce recidivism rates (Larson, 2018). Additionally, it allows inmates to stay assimilated and involved in their communities. Some sentences even allow offenders to keep their job and even continue schooling. As Carol Peeples, re-entry coordinator for the Colorado Criminal Justice Reform Coalition in Denver, states, “a lot of people are hitting a very poor economy... and over half go back to jail in three years. The lack of employment plays a big part in this” (Tahmincioglu, 2010). Therefore, employment helps reduce recidivism rates, but ex-convicts find it more difficult to find a job after being imprisoned and removed from society for a length of time. So, the fact that some house arrest sentences allow offenders to keep their job would signal lower recidivism from house arrest offenders than imprisoned offenders.

One downside of wearing the bracelet is the negative connotation that offenders are associated with when members of the community see the ankle monitor. Though the bracelet can be hidden with pants, there are certain activities that those under house arrest might avoid, like swimming, due to the inability to hide their ankle bracelet during the activity. Additionally, because security is more flexible in nature than prison, there are also more risks of escape for these on house arrest. However, the risk is mitigated through the monitoring system triggering an alarm if the bracelet is removed as well as careful selection of offenders eligible for house arrest. Unfortunately, this triggering does not always work, and false alarms occur that “interfere with users’ ability to hold down a job” (Karsten and West, 2017). This is evidence that the ankle bracelet technology has not been updated as much as it could be and that if these kinks are worked out, the benefits of the bracelets would be greater than the downsides, prolonging their use in the criminal justice system.

Fingerprinting

The use of fingerprinting techniques in the criminal justice system has been popularized by fictional crime television shows such as CSI and NCIS. The FBI keeps a record of all fingerprints collected in a database that has over 100 million fingerprints stored in it (Integrated Automated Fingerprint Identification System, 2018). Most of the prints come from “criminals, suspected criminals, government employees, and military personnel” (Engber, 2005). Not every suspect who is arrested has their fingerprints taken, but criminals in prison and jail have their fingerprints on file with the FBI. Fingerprints are mainly used to match latent prints collected from a crime scene to an offender. The prints are stored in an automated fingerprint identification system (AFIS), which “is a computer system that stores fingerprint images in an organized, searchable data structure that is widely used by criminal justice agencies to maintain databases of the fingerprints of individuals who are arrested or incarcerated” (“Fingerprints: An Overview,” n.d.). This database helps match crime scene latent prints to those with their fingerprints on file. Because this is a standard practice used across the criminal justice system, catching recidivists via fingerprints is effective if fingerprints are left behind. But with nearly 7.5 billion people in the world, and only 100 million included in the database, it lacks the scope required to reach maximum effectiveness.

Fortunately, this is a growing area of forensic science. Advancements have been made in both the collecting and analysis of fingerprints, further improving the accuracy of the process. Some advancements on the collection side are the ability to collect prints from metal surfaces

and noninvasive procedures for identifying fingerprint locations at crime scenes (Montaldo, n.d.). On the analysis side, the AFIS system is a huge advancement that, along with other advancements such as the use of fluorescence, helps forensic scientists utilize the fingerprints that are collected (Montaldo, n.d.). Though the system is not perfect, it provides access to 100 million individuals that could have committed a crime, and with the growing popularity of fingerprinting, along with other areas of biometrics, it could become more of a tool to reduce the number of unsolved cases.

Biometric Scanning

Biometric Scanning, another way to identify individuals by features unique to them, is a technology used in most people's everyday life through their phones, laptops, tablets, and other pieces of technology. This technology is not new, and in fact eye scanners have been in the trial phase in select prisons since about 2010 ("Jails Hope Eye Scanners," 2010). However, few prisons have implemented this technology and it is still in the early stages of implementation at those who have started the process. The data collected from the eye scans is stored in the jail/prison information system on an inmate's file (Jail Management Software). It is touted that the eye scanners "can identify inmates in 20 seconds — just by looking into their eyes" and is used for "running background checks, scanning for outstanding warrants or missed paroles and ensuring that the correct inmates are released" (Pinho, 2018). The main case for these biometric scanning devices is that it is not uncommon for ex-convicts or escaped prisoners to change their identities so that their record is not linked to them post-prison. So, the biometric scanning devices that identify individuals based on characteristics that do not, or are extremely difficult, to change would help improve the validity of a person's background and reduce issues with fake identities. Though the technology has not been implemented in a majority of prisons, prisons are implementing better fingerprinting techniques, as mentioned above, which is a step in the right direction towards more reliable biometric scanning devices and techniques.

Training Simulation

When interviewing Corporal Brashears at the Fayetteville Police Department, he showed me a room that the Fayetteville police department uses for training to simulate field scenarios. Though the FPD is more technologically savvy in their field equipment than other police departments, a feat that Corporal Brashears pointed out, their training equipment was some of the more technologically advanced equipment that I saw during my tour of the station. Though I did not participate in the simulation exercise, Corporal Brashears walked me through the exercise and what technology is used. To train officers for weapon scenarios, an officer's supervisor sits in the back of a medium sized room and mans a computer that is connected to a large projector screen. When the simulation begins, the screen displays a computer simulated lifelike scenario of a confrontation with a suspect. The officer in training holds a lifelike computerized glock handgun and flashlight and interacts with the suspect as they have been trained to do. On the computer, the supervisor controls the scenario, clicking buttons to dictate what occurs on the screen. This way, the scenario is different every time and the supervisor can pick and choose what types of situations to train his or her officers on.

Though the technology used in the FPD training simulation is not the same as what other departments may use, the end goal is the same: provide better training to police officers to have better outcomes on the job and keep officers and the community safer. FPD uses this video game-esque scenario to simulate on the job situations and firmly believes that it helps train and prepare officers better than the alternative, less technologically advanced training methods other stations may use.

Ordering Devices

The last notable piece of technology that I found through my research and interviews is an ordering system used at the Washington County Detention Center. This system is a vended product that replaced the paper requests that inmates formerly used to make for doctors' appointments, phone calls, order commissary items, and any other requests that inmates may make from their cell. The system allows an inmate to make these requests via a kiosk located in each cell. These requests are submitted to the appropriate department to be fulfilled and are stored in a database that is hosted on the jail's server. Richard said that this is the jail's biggest piece of technology and is the most "high-tech" device that they use and that they will have for the foreseeable future.

Recommendations

Based on the information gathered from my interviews and research, there are gaps in available technologies and what the criminal justice system utilizes. I recognize that all of the recommendations I provide cannot, and will not, be implemented across every branch of the criminal justice system. My goal is to point out areas for improvement in the hope that one day, these recommendations can be implemented to help lower incarceration, recidivism, and crime rates. The technologies that I have identified for areas of improvement are sensors, computer programming, analytics, virtual reality, machine vision, and machine learning.

Sensors

Sensors are gaining popularity and are being implemented across a variety of industries to improve performance metrics. Sensors are "devices that are frequently used to detect and respond to electrical or optical signals. A sensor converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically" ("Sensors," n.d.). In layman's terms, sensors are used to monitor some activity as determined by the use of the sensor.

The abilities to track an object's location and measure human vital signs are two of the more basic capabilities that sensors have. However, the combination of these two functionalities is not being used widespread. Additionally, this combined functionality offers a unique opportunity for prisons and jails as the sensors could alert guards of injuries, fights, and locations at a certain time. The sensors could be woven into inmate clothing or worn as a wristband, depending on the type of sensor selected. Though radio-frequency identification, or RFID, tags that have been used in prisons to track inmates, I believe that sensors would be more effective in prisons due to the additional functionality that they have, that the RFID tags do not (Mann, 2016). RFID provides the same location tracking functionality that the sensors do, but it does not measure vital signs like sensors do. Therefore, the success seen with the usage of RFID technology in prisons, and more due to added functionality, could be expected from the implementation of sensors (Mann, 2016).

Poor prison conditions are one reason that prisoners fight rehabilitation efforts, and in most cases, prisons with poor conditions do not have these efforts at all ("Prison Conditions," n.d.). Sensors could help improve conditions by sensing when a fight is occurring, or when illegal, or unethical, actions are performed by both prisoners and guards. The results of the sensors could be reported to the guard who mans the camera screens to alert them of any unusual behavior and the location of the unusual behavior so that it can be promptly addressed. Additionally, the use of sensors could be paired with increased analytics efforts, mentioned below, to make use of the valuable data that sensors collect.

The main downsides to sensors are the privacy issue that they present and the expense of implementing sensors across all prisons. As mentioned when discussing CCTV usage, the argument for a prisoner's right to privacy is widely debated and because there will likely never be a concrete conclusion on the issue, the sensors shouldn't be rejected solely based off of the privacy concerns. However, with the current funding structure for prisons, the benefits of sensors would need to be converted to monetary values and compared against the monetary benefits of other technology to justify their use.

Computer Programming

Second, computer programming is becoming an increasingly sought after skill in the job market. Computer programming is "a way of giving computers instructions about what they should do next" via languages such as JAVA, Python, and C# (McCandless, 2018). Programmers can either learn the trade online or attend classes, such as the ones offered at universities, to learn coding skills. As programming is becoming more popular in the world, it is also starting to be offered as a learning opportunity for prisoners. For example, Sam Hearn, an inmate at the San Quentin State Prison, recounted his time spent in prison where he learned the air conditioning and refrigeration trade, sheet metal trade, and even various programming languages ("What Can People Learn in Prison?," 2016). Though all trades that he mentioned are useful and sought after, the first trades mentioned (air conditioning and sheet metal) have a higher chance of being automated (65% and 82% chances respectively) in the near future than programming (4% chance) ("Will Robots Take My Job?," 2018). Therefore, inmates that learn programming skills will be able to use them with greater longevity than the other trades mentioned.

Additionally, computer programming is a difficult task that requires lots of concentration and dedication to learning. Though there are different skill levels for programmers, it is difficult to draw a hard line between those levels and programmers are continuously improving. This sense of continuous improvement and the seemingly infinite ability to work on new tasks makes the job of a computer programmer meaningful, much more so than the air conditioning and refrigeration and sheet metal trades. Furthermore, employees with meaningful jobs are more productive, live longer, and enjoy their work much more than employees without meaningful jobs ("A Meaningful Job Linked to Higher Income and a Longer Life," n.d.). If an inmate would like the opportunity to work in a meaningful job, programming would be both a feasible and useful opportunity for someone behind bars as it can be learned entirely online from any location with a computer and Internet access.

Educational opportunities that provide a certificate upon completion, like a GED or cosmetology license, help to combat the negative signal that a prison sentence has on a potential employee's permanent record (Gaes, 2008). The certificate presents a positive signal to a potential employer that the ex-convict has the necessary skills and motivation to complete a job. Since one of the main reasons prisoners reoffend is the inability to locate steady employment upon reintroduction to society ("The Challenges of Prisoner Re-Entry Into Society," 2016), educational opportunities within prison should help lower recidivism rates. Additionally, a more educated society has been linked to lower crime rates ("Crime Rates Linked to Educational Attainment," n.d.), so increased educational opportunities would help decrease recidivism rates while also accomplishing the end goal of lowering crime rates.

Finally, once a programmer is skilled enough, she/he can begin consulting and designing systems for companies with lacking information systems capabilities. At this point, programmers can earn large sums of money as they get to the professional coding level, sums that are higher than what can be earned from traditional trade work. Additionally, inmates can begin earning

money as they are learning in prison and continue their careers outside of prison which would decrease the likelihood of the ex-prisoner reoffending. Taking all of this into consideration, I recommend that more prisons provide inmates with opportunities to learn a programming language either through offering classes, or better, more reliable access to computers and the Internet.

Analytics

Analytics is not a new tool, but it is just beginning to be understood and used to its full capacity. On a larger scale, the criminal justice system is starting to adopt analytics concepts and create predictive and prescriptive models to introduce fact based reasoning into an industry that has strayed from facts in recent years (May, 2014). Statistics are being used to fight crime by predicting where crime will occur, identifying trends to catch serial killers, and creating crime heat maps to spread crime awareness. Statistics are also being used in sentencing through models that suggest sentence lengths and suspect guilt. Though these models are helping to provide more consistent decisions, they also play into the biases that have determined many sentencing decisions in the past due to their use of historical data. I recommend that test counties and/or states should be used to create models that minimize bias and ensure the error of the models is minimized before implementation. Then, these models should be tweaked for and deployed at counties around the nation to ensure the consistency and accountability of the criminal justice system nationwide instead of segmented like it currently is.

Virtual Reality

A major cause of the high recidivism rates in the United States is the lack of effort put into successfully reintegrating prisoners. For many prisoners, especially prisoners with lengthy sentences, the world looks different when they leave than it was when they came in. Sometimes, if the prisoner has been out of society for long enough, this is enough to cause him to decide to become a recidivist so that he can return to his comfort zone: prison. An obvious first step to try to mitigate this would be to provide better reintegration processes for prisoners. One way to accomplish this is by training them on what the outside world will look like upon release. Because many prisons do not allow field trips into the community, this can be difficult to do in the constraints of the facility. However, with the advancements in Virtual Reality (VR) technology, VR could make testing out the outside world attainable from inside prison. Simulations could be created for everyday scenarios such as shopping, driving, interacting with others, etc. Similarly, this practice is currently done for those with agoraphobia and is called immersion therapy. The use of immersion therapy has been popularized by the TV show “Shameless”, but the results are recent and very real. With multiple sessions of therapy, all study participants saw improvement in their distress measurements of at least 50% (Berry, 2018). Replicating the success of the agoraphobia trial, VR could greatly reduce the distress of ex-convicts when they are released by better preparing them for release and ultimately lowering recidivism rates.

Along the same lines, VR can be used for training simulations for both police and prison guards. This use of VR is much more common for police than guards and is more commonly used for training police and guards than the reintegration purposes I outlined above. As I mentioned in the “Technology in the American Criminal Justice System” section, some police departments are already using technology to orchestrate more lifelike and effective training simulation tools. However, after my tour of the FPD training simulation room, I believe the effectiveness could be improved through the use of VR technology as the trainee would be fully immersed in the scenario. Just like the use case for better reintegration, training scenarios could

be built in areas and with crimes that are tailored to a police department's jurisdiction to better improve the training potential of the technology. For police departments that have not yet invested on training simulation gear, the VR tool would be justifiable as it would provide considerably better training due to the incredibly realistic scenarios.

Machine Vision and Learning

Machine (computer) vision is a technology that "allows a computer to see" (Rouse, Machine Vision). It has many applications, including inspection, pedestrian tracking, medical images, and autonomous vehicles, and I believe that inmate monitoring should be added to that list ("Applications of Machine Vision", n.d.). Combined with machine learning, which learns and draws insights from repeated scenarios, machine vision could be applied to prisons to identify potential dangerous situations, inmate locations, and contraband activities via strategically positioned cameras. Theoretically, the application of machine vision and learning would greatly decrease the manpower required to monitor prisons and free up that manpower to do more valuable things, such as making personal connections with inmates to increase their chance of success post-release.

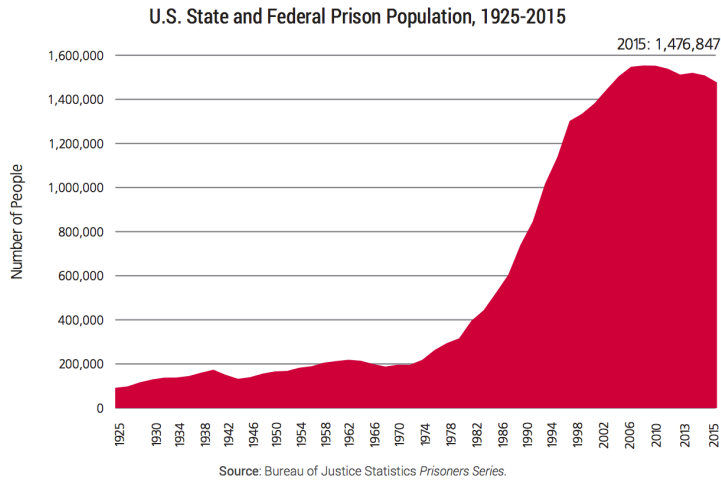
Conclusion

The American criminal justice system is due for a change. Though some branches of the system in certain areas of the country have kept up with modern technological advances, many have not and are still utilizing outdated technology (Erbenraut, 2017). Other industries, albeit mainly in the private-sector, have kept up with technology to an extent and have seen efficiency improvements in their work. Now, it is time for the criminal justice system to implement standardized technological practices to ensure that individuals in the system are treated consistently and fairly across the board. Only then can we begin to think about a major reduction in crime, incarceration, and recidivism rates. My recommendation is to benchmark each portion of the criminal justice system, i.e. police departments, jails, and prisons, against its peers to understand the technology gaps present for a specific facility. After this point of standardization, my recommendations for new technology can be evaluated and implemented as determined necessary based on the "newer," standardized environment across all facilities.

Appendix

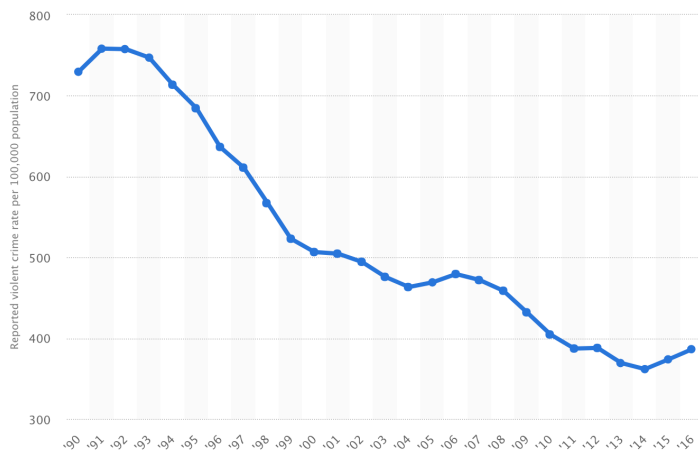
Figures

Figure 1. United States Prison Population



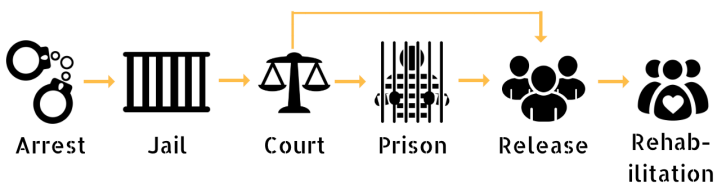
Source: <http://sentencingproject.org/wp-content/uploads/2016/01/Trends-in-US-Corrections.pdf>

Figure 2. Reported Violent Crime Rate in the U.S. 1990-2016



Source: <https://www.statista.com/statistics/191219/reported-violent-crime-rate-in-the-usa-since-1990/>

Figure 3. Map of the Incarceration Process



Source: Taylor Hunt

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