BUSINESS INSIGHTS

A COLLEGE OF BUSINESS RESEARCH JOURNAL

BUSINESS

INTEGRITY   QUALITY   LEADERSHIP

In This Issue

"This publication is designed to support and encourage excellence in undergraduate research and writing in all areas of business…"

NON-DISCRIMINATION POLICY

BUSINESS INSIGHTS

A COLLEGE OF BUSINESS RESEARCH JOURNAL

The College of Business at Athens State University is dedicated to providing students with the education and opportunities that will prepare them for professional positions in business, finance, or government by enhancing their skills in research, communication, technology, ethics, and critical thinking. The Athens State University College of Business Student Research Journal is now in its sixth edition and is larger than ever. This publication is designed to support and encourage excellence in undergraduate and graduate research and writing in all areas of business and to provide a vehicle for the dissemination of quality research studies by Athens State University students.

We are excited about this venue for student and faculty experience. By contributing research papers to the Journal to be considered for publication, students and faculty have the opportunity to gain experience and expand their professional resumes with peer-reviewed, scholarly publications. Each issue of the journal will be freely accessible on the College of Business website, making the articles available to students, researchers, employers, and others interested in the many topics our students pursue in their academic studies. We encourage Athens State University undergraduate and graduate students, and their faculty advisors to review and submit outstanding research papers to the Journal for publication.

With the sixth issue of the Research Journal, we are continuing to expand the exceptional work done by Athens State University College of Business students and faculty as they pursue their educational journey and begin or continue their professional careers. We would like to invite you to join us in this venture.

Sincerely,

Charles R. Roberts
Editor-in-Chief

Submission and Format Guidelines:

Submission guidelines

♦ Papers must be written by students (either individual or groups) enrolled at the institution.

♦ Graduating students may submit papers up to 30 days after graduation.

♦ Each paper must have a faculty sponsor, who may be the course instructor, lead for the course, or a faculty member from the College of Business List of Sponsors.

♦ Papers must be original.

♦ Papers cannot have been previously published, nor be currently under consideration or accepted for publication in print or electronic form.

♦ Multiple submissions by a single author are accepted.

♦ All types of research-based papers are eligible for consideration.

♦ It is recommended that student authors consult the College of Business Writing Rubric for writing guidelines. Students are also encouraged to consult the Athens State University Writing Center for advice on any questions regarding APA format, grammar, etc.

♦ All papers must be checked through Safe Assign (or an equivalent anti-plagiarism program), with this check verified by the faculty sponsor, before submission.

♦ Student authors retain copyright privileges.

♦ All research involving human subjects must have received approval from the Institutional Review Board prior to being conducted.

♦ The author is responsible for guaranteeing that no material in the paper infringes on existing copyrights.

♦ Each paper must be submitted by a faculty sponsor and must be accompanied by a completed Faculty Sponsor Form.

♦ Papers must be submitted by email to Dr. Charles R. Roberts (Charles.Roberts@athens.edu).

♦ Include contact information including name, phone number, email address and mailing address of each student author.

♦ Papers will be reviewed by three reviewers using a double-blind process.

♦ Papers will be evaluated based on strength of the thesis, clarity of concepts, demonstrated knowledge, and quality of empirical/documentary research, use of relevant visuals, grammar, and format.

♦ Students and faculty sponsors will be contacted when each paper is received and again after the review process is complete.

♦ The faculty sponsor will be identified on the published paper, separately from the student author(s) and any co-authors.

Format guidelines

♦ Papers are limited to no more than 25 pages, not counting the title page, abstract page, and list of references.

♦ Papers must be typed, using 12 pt Times Roman, and double-spaced, with 1" margins on all sides, using Microsoft Word.

♦ Papers must conform to APA format.

♦ Each paper must include an abstract (150-250 words).

♦ All pages must be numbered and have a running head (shortened form of title).

♦ The title page must include the paper title, full name of each author with email address, phone number, and mailing address, and name of the faculty sponsor with contact information.

♦ Names of the author(s) and faculty advisor should appear ONLY on the title page.

Technology's Impact on Work Environments

Charles N. Fowler
Management of Technology Major

ABSTRACT

Technology has fundamentally changed society and significantly impacted the workplace. For a business to be productive, entire offices have a need to communicate and collaborate. This paper explores the evolution of technology in the workplace and its impact on worker productivity, as well as the negative social impacts for individual employees who feel the pressure of constant connectivity and reachability, even while away from the office.

Introduction

Technology has fundamentally changed society. All aspects of life are different because technology has enabled humans to advance beyond our primitive beginnings. One environment that technology has significantly impacted is the workplace. Advances in technology have driven change in the way business operates and interacts with the public. Before the innovations of the mid-nineteenth century, all business was conducted face to face or by postal mail. The typewriter, electric telegraph, and telephone changed this interaction and opened a business to a wider customer base. The Digital Revolution has brought about the most significant changes in the workplace. Starting in the mid-twentieth century, introduction and advances in electronic circuitry has given birth to computers and electronics that have invaded all aspects of the workplace. This revolution created the Information Age: digital technology which allows electronically stored, transmitted, and accessible information to be accessed and used as a business commodity ("Information Age," 2017). Employees now have tools available to communicate instantly to wherever a digital network can reach. Productivity is helped and hindered by technology that has access to a plethora of information systems and services. Expansion of technology's role in business has created social issues with employees who feel it intrudes on their personal lives. As the newest generation of employees (those who grew up in the Information Age) enter the workforce, adoption of cutting-edge digital technology is considered normal and expected. Younger employees are more comfortable with digital technology and use it consistently throughout their daily lives (Oblinger & Oblinger, 2005). Traditionally, deployment of cutting-edge technologies was considered risky and unnecessary for business applications (Andriole, 2014). Management staff, who are responsible for steering a company's path, are likely to be comprised of an older generation who take a different stance to digital technology, which slows adoption (Lee & Coughlin, 2015). This has created a digital gap between workers as the generations attempt to find common ground as business teams. The workplace will continue to evolve as new technologies appear and those resistant to change leave the workplace. Even with resistance, technology continues to drive businesses to change in order to keep pace with competition and customers.

Communication and Collaboration

When businesses were local and the Pony Express was the fastest way across the country, communication and collaboration with co-workers was not too difficult. Everyone was usually located in the same office and worked the same hours. As technology expanded their reach, companies grew in the number of employees and offices in which these employees worked. For a business to be productive, individuals, teams, and entire offices have a need to communicate and collaborate. In the modern workplace, employees rely on a mixture of communication media. Voice systems consisting of the tried and true telephones in hardwired or cellular version, one of the original technologies used to connect employees across the geography, were the mainstay of business until the dawn of the Information Age. Email was the next disruptive technology to change the workplace. Born out of the government research initiative ARPANET, email allowed employees across geography and time zones to share information in various formats via the Internet (Partridge, 2008). With the success of email, researchers sought another way to share information via the Internet. The World Wide Web, known as "the web" in short, was created to share this information in an easily identifiable method ("World Wide Web Consortium," 2004). While email has remained the preferred method of business communication, most recent innovations have taken place on the web. Social media is the latest innovation that allows collaboration, not only amongst employees, but direct communication with customers, too (Kane, Alavi, Labianca, & Borgatti, 2014). These communication media make up the toolset an employee can use to collaborate with their co-workers. It is also the same communication media they can use to interact with customers and in their personal relationships.

Interconnecting offices has been enabled by expansion of the Internet. With offices interconnected, communi-

cation and collaboration tools were also connected and gave workers the ability to contact others regardless of their location. Technology has also begun to converge and form single points of interaction. Traditional office technology might consist of a landline telephone, desktop computer, and your standard office supplies. Further advancements in electronics has created mobile technologies, like the smart phone and tablet, that have merged the telephone and computer into a single portable device (Said & Adham, 2016). They have also converged other technologies like the camera, voice recorder, and physical items like a notepad and pen. Now employees are not tied to a fixed location; they can work anywhere mobile technology can be carried with almost the same capabilities as a fully furnished office. With the freedom to work anywhere, employees have chosen to work from home or telecommute in situations where it will benefit their needs (Hoang, Nickerson, Beckman, & Eng, 2008). While the office workspace still exists, employees now have choices on the method and time of their communication with co-workers and customers.

Productivity

Before the Digital Revolution, work tasks were almost an entirely manual affair. Office tasks that are simple today, like copying a document or calculating company financials, were performed by hand. With the advent of modern technology, employees are free to focus on more productive tasks. Increasing computational power and programming language advances have paved the way for automation to augment or replace humans in complex, but repetitive tasks (Kleis, Nault, & Dexter, 2014). The typewriter and the entire office pool of typists have been replaced by the word processor, printer, and copier. Accounting software has replaced the written financial ledger and financial report. Research and design utilizes simulation software to shorten the prototyping phase and create better products (Sommer & Moskowitz, 2016). Technology innovations are not limited to just the office space or the high-tech sections of business. Investments in automations across many industrial sectors are made to increase output and quality (Waldman, 2016). Service industries have benefitted from advances in communication and data access technologies (Gago & Rubalcaba, 2007). Many, if not all, new innovations are in some way affected or supported by technology (Kleis, Nault, & Dexter, 2014).

Automation of tasks is not the only way technology increases productivity. Optimization of current work processes and creating work flexibility will benefit productivity as well. By streamlining work processes, companies can increase their output utilizing the same resources. A primary method of work optimization is through software applications. Office productivity suites like Microsoft Office are a common example of software that increases individual's productivity. For company-wide optimization, Enterprise Resource Planning (ERP) applications are popular for their ability to consolidate data across the entire corporate structure for business decision purposes (Scurtu & Lupu, 2016). When data is siloed inside one department, other departments or teams could make decisions on incomplete information. By bringing data together into accessible systems, employees can make decisions with better accuracy. Another method of increasing productivity is through multitasking. Technology enables and encourages multitasking through convergence (Kayaalp, 2014). Talking on the cell phone while driving, reading emails while watching television, or surfing the web during a social event—people are accustomed to multitasking in their personal lives. Flexible working arrangements through remote connectivity with mobile devices like the smart phone and tablet give workers the option to take work outside of the office. For instances where employees have periods of downtime, they can take care of tasks that would otherwise wait until their return to traditional work methods (Said & Adham, 2016). As a stand-alone enhancement, any one of these technological advances is effective; but as a complete system is where these innovations make the most impact on business and the work environment.

Negative Social Aspects

While technology has improved the productivity and flexibility of the modern worker, it has also increased the pressure to perform in a fast-paced and dynamic work environment. This pressure has negative effects on employees in the form of physical and mental stress (Soylu & Campbell, 2012). Excessive stress has been proven to reduce job performance and is recognized by the World Health Organization as a health hazard (Soylu, 2007). Research has shown that email and other communication technologies have increased pressure on employees to keep plugged in and current or else they feel like they might fall behind (Colbert, Yee, & George, 2016). The constant connectivity of mobile devices has blurred the line between the workplace and personal life. Because work is occurring outside of the perceived office boundary, there are potentials to distract from rest, relaxation, and personal interaction which in turn creates conflict (Boswell & Olson-Buchanan, 2007). Continued conflict creates strain on the employee and can become a self-feeding cycle of stress that is difficult to break. Business must stay cognizant of intrusions into employees' off time and take steps to help employees avoid the stress-inducing situations technology creates.

Job satisfaction, which is how an employee feels his emotional needs are met by the job, is directly affected by emotional stress (Rathi & Rastogi, 2008). In periods of high pressure or stress, technology can be viewed as a distraction rather than a tool when an employee should be unplugged and resting (Soylu & Campbell, 2012). Especially in terms of mobile technology, the constant connectivity and reachability make some workers feel like they are required to stay informed or risk falling behind. This forces the employee into working during their personal time and making choices on what personal responsibilities must be delayed until later. It also allows the employee to rationalize performing personal business on company time. Depending on corporate policies or attitudes, this could be viewed unfavorably and as a cause to implement systems to monitor employees. Ethical companies will notify employees whenever monitoring systems are being put into place and discuss the information which may be captured. Combined with pressures to stay plugged in to work, the employee could begin to feel his privacy is being invaded, which will, in turn, increase stress and reduce job satisfaction (Ayyagari, Grover, & Purvis, 2011). In certain situations, this will give rise to Shadow IT: unauthorized technology utilized by employees to perform work outside of company IT policy and standards (M. Silic, D. Silic, & Oblakovic, 2016). Employees who feel encumbered by slower technology or company policy use unauthorized technology or methods to meet their work demands. Management can mitigate many of these technological issues by staying engaged with their direct reports. Just like a medical diagnosis, early detection of issues allows managers to recognize and react in ways that will benefit the employee and company. A high job satisfaction keeps job turnover low and morale high, which will positively affect a company's productiv-

ity and reputation.

Conclusion

Business moves at the speed of technology. Innovations in technology continue to change the workplace landscape. Traditional offices have transformed from a walled building to digital mobile workspaces where employees can work in the office next door or a coffee shop on the other side of the world. Technology adoption in the home has further impacted the workplace as employees' expectations change to match what is available in their personal lives. Businesses that have found ways to integrate current technologies into their work processes have found additional buy-in from the incoming generation of workers. The current generation of workers have not been left behind; they, too, have "grown up" with technology as the Information Age has made considerable changes to the workplace. Future technological innovations hold many unknown workplace and societal changes. Will further advances in automation make certain labor positions obsolete? Will neural network learning solve the biggest obstacles humans face in science and medicine? Looking to recent history and how far society has advanced in the previous forty years, we can expect the workplace to change once again with technology.

REFERENCES

Andriole, S. (2014). Ready technology. *Communications of the ACM, 57*(2), 40-42. doi:10.1145/2556941

Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly, 35*(4), 831-858.

Boswell, W.R., & Olson-Buchanan, J.B. (2007). The use of communication technologies after hours: The role of work attitudes and work-life conflict. *Journal of Management, 33*(4), 592-610. doi:10.1177/0149206307302552

Gago, D., & Rubalcaba, L. (2007). Innovation and ICT in service firms: Towards a multidimensional approach for impact assessment. *Journal of Evolutionary Economics, 17*(1), 25-44. doi:10.1007/s00191-006-0030-8

Hoang, A.T., Nickerson, R.C., Beckman, P., & Eng, J. (2008). Telecommuting and corporate culture: Implications for the mobile enterprise. *Information Knowledge Systems Management, 7*(1, 2), 77-97.

Information age. (2017). In *Merriam-Webster.com.* Retrieved from https://www.merriam-webster.com/dictionary/Information%20Age

Kane, G., Alavi, M., Labianca, G., & Borgatti, S. (2014). What's different about social media networks? A framework and research agenda. *MIS Quarterly, 38*(1), 275-304.

Kayaalp, A. (2014). The octopus approach in time management: Polychronicity and creativity. *Military Psychology, 26*(2), 67. doi:10.1037/mil0000032

Kleis, L., Nault, B.R., & Dexter, A.S. (2014). Producing synergy: Innovation, IT, and productivity. *Decision Sciences, 45*(5), 939-969. doi:10.1111/deci.12093

Lee, C., & Coughlin, J. (2015). Perspective: Older adults' adoption of technology: An integrated approach to identifying determinants and barriers. *Journal of Product Innovation Management, 32*(5), 747-759. doi:10.1111/jpim.12176

Oblinger, D., & Oblinger, J. (2005). Is it age or IT: First steps toward understanding the net generation. *Educating the Net Generation, 2*(1-2), 20.

Partridge, C. (2008). The technical development of Internet email. *IEEE Annals of the History of Computing, 30* (2). doi:10.1109/mahc.2008.32

Rathi, N., & Rastogi, R. (2008). Job satisfaction and psychological well-being. *ICFAI Journal of Organizational Behavior, 7*(3), 47-57.

Said, M.F., & Adham, K.A. (2016). Is a mobile phone a disruptive innovation in the workplace? *Gadjah Mada International Journal of Business, 18*(2), 131-151. doi:10.22146/gamaijb.12571

Scurtu, L., & Lupu, V. (2016). Enterprise resource planning-ERP for business and knowledge management. *USV Annals of Economics & Public Administration, 16*(1).

Silic, M., Silic, D., & Oblakovic, G. (2016). Influence of Shadow IT on innovation in organizations. *Complex Systems Informatics and Modeling Quarterly,* (8), 68-80. doi:10.7250/csimq.2016-8.06

Sommer, A.F., & Moskowitz, S. (2016). Leveraging virtual experimentation and simulation in R&D: Best practices and pitfalls developing technology for virtual experimentation and simulation offers both opportunities and challenges for industrial R&D. *Research-Technology Management, 59*(6), 12-17.

Soylu, A. (2007). Foreigners and workplace stress. *Journal of Individual Employment Rights, 12*(4), 313-327. doi:10.2190/ie.12.4.d

Soylu, A., & Campbell, S.S. (2012). Physical and emotional stresses of technology on employees in the workplace. *Journal of Employment Counseling, 49*(3), 130-139. doi:10.1002/j.2161-1920.2012.00013.x

Tomlinson, R. (2009). The first network email. *Email Home.*

Waldman, C. (2016). The evolving contours of productivity performance and automation investment in U.S. manufacturing. *Business Economics, 51*(4), 213-238. doi:10.1057/s11369-016-0013-1

World Wide Web Consortium. (2015, December 15). Architecture of the World Wide Web, Volume One. Retrieved from https://www.w3.org/TR/webarch/

Modern Concerns of Information Security in Business

Joshua Denmark
Information Assurance Major

ABSTRACT

Cyber attacks cost companies across the globe an estimated $400 billion a year. In addition to monetary losses, companies suffer physical damages to information systems, as well as loss in customer trust. This paper explores some of the factors that may lead to these attacks and some safeguards that can be utilized to minimize the danger to a company's information security.

Introduction

As of February 2017, 44% of American companies have suffered some type of data breach from malware, phishing or human activity. This is an astonishing number when we consider that, worldwide, only 20% of businesses have experienced the same type of breaches. Cyber-attacks cost companies across the globe an estimated $400 billion a year with the average U.S. firm suffering a $15 million yearly loss. Monetary loss is not the only effect of these crimes. Physical damage to information systems, proprietary information leaks, and threat of physical security breaches can result from cyber-attacks. Lack of training, complacency and negligence in following IT rules has led to the level of attacks we experience daily. As technology advances, controlling these losses will be at the forefront of business plans. Staying in front of these threats is the only way to achieve real security from these faceless attackers and end the unnecessary waste they cause.

Effects of Cyber-attacks

Cyber-attacks have far reaching effects. Businesses must have long term plans in place in order to remain profitable in this ever changing economy. Proprietary information is any company's key resource to ensure their future success, and protecting this information is critical. When an attacker manages to breach a company's computer system, they are in control of the business's well-being. These breaches lead to loss of intellectual property such as blueprints, financial data and merger and acquisition information. Loss of this intellectual property can be a death blow to even the largest of businesses. Customers may take their business elsewhere, citing reduced confidence and fear of their own data being compromised. This lack of trust leads other customers to follow suit and deters new customers from coming.

For years, there have been questions about malware and viruses causing physical damage to computer and network systems. While it is not likely that your PC will burst into flames, the risk of permanent physical damage is entirely possible. In 1999, a virus known as Chernobyl was responsible for the destruction of any computer system it infected. The virus caused critical system information to be erased, rendering the computer useless unless the information was restored by a service center. The cost of repairing infected computers often exceeded their value, meaning a new computer must be purchased. Imagine a company's computer system being infected by such a virus today. It would mean certain doom to their business. While this is an extreme example, there are very real threats from network slow down due to spam or software failure. Many computer systems today are nearly immune to these types of threats. However, cyber-attackers advance as quickly as technology, so this type of damage remains possible.

Many companies rely solely on computers to run their business and store vast amounts of information. Loss of data and viral infections can cause loss of revenue, but these attacks also expose site security. Something as simple as a company phone directory could lead a hacker to find a way into the company's network. Building blueprints, camera locations and other security measures obtained through hacking make physical breaches a very real possibility. This threat can be more menacing than financial loss. Physical breaches can lead to loss of property and even loss of life. Companies that deal with large amounts of money, precious metals, pharmaceuticals, weapons or anything else of criminal value, are at the greatest risk. American companies must catch up to the rest of the world if they wish to remain successful; but how did we end up here in the first place? Do we blame ourselves, IT departments, or cyber-attackers?

Responsibility for Cyber-attacks

"There are a number of trends that lie behind these increases in threats to information security, which, when taken together, suggest that things will continue to get worse" (Calder, 2006). Mobile computing is rapidly growing. We hold in our hands awesome amounts of computing ability. Today's smartphones have greater computing power than the computers on Apollo 11. This extraordinary power comes at a high cost for those who do not wield it properly. People have become complacent, almost oblivious, to this fact. Unauthorized personal devices can easily be connected to a company's network and open them up to attacks from hackers. Even devices that are authorized to be connected to a business's network are open to attack. The most common of these attacks is called phishing. Phishing is the fraudulent practice of sending emails that seem to be from reputable companies to gain knowledge of personal information, passwords or financial information. Being able to identify these fraudulent emails is the first step in ensuring your company's information is secure.

A business's IT department is the first line of defense against cyber-attacks. While policies created by the IT department may seem to make one's job more difficult, they are in place for a reason. Internal policies are meant to educate an individual on how to identify spam email, how to create strong passwords and to keep employees up to date on the latest scams.

"A large number of security breaches involve internal employee negligence and insider breach," (Chen & Ramamurthy, 2015) and, as such, training and education should be taken seriously. Complacency can lead to huge problems for a business. How do we protect ourselves and our businesses from these attacks? What does the future hold for information security?

Information security in the past has been seen as "no big deal" and treated with little respect. IT departments were the people who install computers and printers and make everyone's lives difficult with their policies. They had been largely ignored. This culture of information security ignorance has led to our present security problem. We, as a country, have made it easy to be attacked and robbed by digital thieves. In fact, the more prosperous a nation, the more likely it is to be attacked by hackers. To be able to move forward, we must change our way of thinking about information security. We must realize the vast effects of breaches and be willing to be part of the solution. We have made it all too easy for a hacker to proliferate at businesses' expense.

Companies should review their employee's digital rights yearly. Each employee will have different levels of access. Something as simple as a thumb drive can take under a company. Disgruntled employees cause U.S. companies between $450 and $550 billion in losses every year. Immediate termination of network access to such employees could reduce this loss significantly and prevent them from walking out with the company's future in their pocket.

Be Proactive

Unfortunately, dealing with information breaches has become a common occurrence in today's business environment. Rather than be reactive to breaches, companies need to be proactive in protecting their assets. Many businesses require security structure that can change with the advances by attackers. Businesses have begun realizing the importance of information security and that it is quickly becoming a CEO-level problem. In order to protect themselves, businesses must
1) Identify the problems,
2) Have a well-defined target,
3) Implement the new system
4) Decide what is an acceptable amount of loss,
5) Develop a plan that aligns business and technology, and
6) Ensure continued engagement.
This will lead a company to decide how much protection they will require and develop a comprehensive and robust information security system.

Comprehensive information security programs have come to the forefront of information security. These programs include security policies, education/training/awareness programs, and monitoring. The goal of such programs is to ensure "employees become part of the solution, not part of the problem" (Chen & Ramamurthy, 2015). Establishing values and norms and increasing awareness will lead businesses out of the information security darkness and make employees culpable for their actions. Businesses must be able to predict future needs as well. Any security system implemented must be able to change with the business needs of the company and with new threats from cyber-attackers. A robust system will allow a company to grow unimpeded and without worry of security breaches.

Conclusion

There is no silver bullet for information security. Technology advances daily as do cyber-attackers. Losses from cyber-attacks are expected to reach $2 trillion as early as 2019. Many companies have begun to realize the widespread effects and are fighting back. To be successful, companies must analyze their risk, implement changes and continue to grow and change with the environment of technology. "It's understandable for fretful companies to hunt for technology silver bullets to protect themselves from digital bad guys. But companies' fear of hackers doesn't erase the insecurity for the cybersecurity business" (Ovide, 2017).

REFERENCES

Calder, A. (2006). A business guide to information security: Threats and compliance. Retrieved from http://searchsecurity.techtarget.com/feature/ A-Business-Guide-to-Information-Security-Threats-and-Compliance

Chen, Y., & Ramamurthy, K. (Spring 2015). Impacts of comprehensive information security programs on information security culture. *The Journal of Computer Information,* 11-19.

Frenkel, K.A. (February 2017). N. American businesses suffered the most breaches. *CIO Insight,* 1.

Kolodzinski, O. (July 2002). Aligning information security imperatives with business needs (News & Views). *The CPA Journal,* 20, Business Collection.

The importance of information security for businesses. (2010, January 15). Retrieved from http://augustafreepress.com/importance-information-security-businesses/

Unemployment and Millennials

Melanie Curtis
Liberal Studies Major with a Minor in Human Resources Management

ABSTRACT

Unemployment is an important economic issue, especially for the American sector of the population known as Millennials. Three main types of unemployment—structural, frictional, and cyclical—have affected this large group. This paper explores these effects and what millennials are doing to combat them.

Introduction

Unemployment is an important economic issue for the American public. Millennials have a high rate of unemployment compared to other generations. The population of millennials has surpassed baby boomers as the largest generation to date. Millennials include anyone born after 1980, 18 to 34 years of age (Fry, 2016). According to a study by PEW, 63 percent of young adults from ages 18-31 had jobs in 2012, down from 70 percent of the same age group in 2007. Why do millennials face such hardships with finding employment or staying employed? Most of these young adults graduated high school during the Great Recession of 2007 to 2009. Growing up during those hard economic times has made it difficult for young adults to find employment due to many factors. Outcomes of unemployment for millennials include high student loan debt, declining formations of households, low homeownership, and more (Carter, 2014).

Three Main Types of Unemployment

There are three main types of unemployment: structural, frictional, and cyclical. Structural unemployment involves not having the right skills for available jobs. This type of unemployment can change depending upon geographical locations or changes in the economy. The second type of unemployment is frictional unemployment. Frictional unemployment is continuously present and is due to multiple factors, including temporary transitions or lack of necessary skills for a job. A person without the right skills may not apply for a certain job, or an employer might not be able to fill an open position. The third main type of unemployment is cyclical. This type of unemployment is greatly affected by the economy. If the economy is booming, there are low levels of unemployment. If there is a recession, unemployment is higher because there are more jobless people than there are jobs available (Econport, 2016; McConnell, 2017).

Millennials and Unemployment

All three of the main types of unemployment can be experienced by millennials. For example, most millennials entered the job force during the Great Recession. Cyclical unemployment was happening during this time for millennials due to there not being enough jobs for the number of people in the job market. Frictional unemployment can occur when a college graduate quits his current job, for example at a fast food place or retail store, and pursues a job requiring the skills obtained from his college education. Typically, this type of unem-ployment does not last over a long period of time (Econport, 2006).

Due to the difficulty of finding jobs, many millennials are taking education seriously and pursuing higher education opportunities. Compared to other generations, millennials are the most educated in U.S. history, with over one third holding a bachelor's degree or higher. The student loan debt totals have risen significantly due to the cost of education and the increase of young adults attending college. The student loan debt in 2005 was $144 billion, and grew to over $322 billion in 2012. Also, the numbers of young people borrowing money for education increased during this time, from 10.8 million to 15 million. Unfortunately, due to the number of millennials unable to pay back student loans, the delinquent student loans have increased to 16 percent as of 2012. It is also important to recognize the positives of millennials attending college. Even though the student loan debt is rising, many young adults realize there are benefits to obtaining a higher education. Millennials with a bachelor's degree or higher earn, on average, $17,000 more than their counterparts without a college degree. Many millennials are staying hopeful and feel that their education is currently "worth it" or it will be in the long run (Carter, 2014, p. 8-9).

Millennials As Homeowners

Previous generations in America were married and/or homeowners at a younger age compared to millennials. Many young adults are still living at home, and as of 2012, 36 percent of young adults were living with their parents. The formation of households has also been greatly affected by the Great Recession and unemployment. In 2012, Current Population Data surveys found that "people ages 18 to 24 composed the group with the largest shortfall in expected household formation between 2007 and 2011" (Berridge, 2014, p. 1). The second largest group was comprised of people ages 25 to 34. Both groups accounted for approximately 1.9 million out of 2.9 million people not forming new households.

In 2013, millennials ages 16 to 24 had an unemployment rate of 15.5 percent; but as of 2014, that rate improved slightly to 14.2 percent. Because of these high rates of unemployment, many young adults are unable to buy homes or rent apartments; therefore, many are still living at home or in dorm facilities (Berridge, 2014). Some young adults that are head of the household are either unmarried or are minorities, and statistics show these types of households have a higher chance of living in poverty (Fry, 2017). In 2004, around 44 percent of those

aged 18 to 34 owned a home, compared to 37 percent in 2011 (Carter, 2014).

Help for Millennials

There are programs available that provide career assistance for young adults seeking employment or higher employment. In 2014, the McKinsey Social Initiative developed a non-profit organization called Generation that helps train young adults from ages 18 to 29. Their training program helps millennials find careers in higher paying jobs like healthcare, information technology, mechanics, and more (Dishman, 2017). Generation not only provides assistance to workers in the United States, but also to young adults worldwide. Within four to twelve weeks, the Generation program will help young adults develop skills through a dedicated program that is similar to working a full-time job. After the program is completed, Generation will stay in touch with their trainees to monitor their progress with their careers (Generation, 2017).

The Department of Labor's Employment and Training Administration department also provides various assistance programs to young adults struggling with unemployment. These assistance programs include Job Corps, Youth Discretionary Grants, Youth Formula-Funded Grant Programs, and Apprenticeship. The Department of Labor website states that "Job Corps is the nation's largest and most comprehensive residential education and job training program for at-risk youth, ages 16 through 24" (DOL, 2017). The Youth Grant programs also provide assistance to at-risk and disadvantaged youths. The Apprenticeship program provides on-the-job training and assistance with learning skills for certain occupations (DOL, 2017).

Conclusion

Even though millennials are dealing with high unemployment in the current economy, many citizens are staying positive. Eight out of ten people between ages 18 and 29 say they are optimistic about their standard of living (Ferri-Reed, 2013). One might say that millennials are open-minded and feel that the economy will only improve over time. According to PEW, the millennial population will reach approximately 81.1 million by 2036 (Fry, 2016). Even though millennials have added to the student loan debt, they are the most educated generation to date. As time continues, hopefully both the economy and the job market will improve to allow more of these educated individuals to pursue careers in their desired fields. Being a young adult during the Great Recession has taught many Americans to "see the bigger picture, depend on each other, and seek to make the world a better place" (Ferri-Reed, 2013, p. 23).

REFERENCES

Berridge, S. (2014, September). Millennials after the great recession. *Monthly Labor Review,* 1. Retrieved from https://www.bls.gov/opub/mlr/2014/beyond-bls/pdf/millennials-after-the-great-recession.pdf

Carter, M. (2014, January-April). The economic plight of millennials. *EconSouth,* 6-10. Retrieved from https://www.frbatlanta.org/

Dishman, L. (2017, January 13). Can this program help solve millennials' unemployment crisis? *FastCompany.* Retrieved from https://www.fastcompany.com/3067136/can-this-program-solve-millennials-underemployment-crisis

Ferri-Reed, J. (2013). Millennials—generation "screwed" or generation "shrewd?" *The Journal for Quality and Participation, 36*(1), 22-23.

Fry, R. (2017, September 6). 5 facts about millennial households. *Pew Research Center.* Retrieved from http://www.pewresearch.org/fact-tank/2017/09/06/5-facts-about-millennial-households/

Fry, R. (2016, April 25). Millennials overtake baby boomers as America's largest generation. *Pew Research Center.* Retrieved from http://www.pewresearch.org/fact-tank/2016/04/25/millennials-overtake-baby-boomers/

Generation. (2017). Retrieved from https://www.generation.org

McConnell, C., Brue, S., & Macpherson, D. (2017). *Contemporary labor economics* (11th ed.). New York, NY: McGraw-Hill Education.

Types of unemployment. (2006). *EconPort.* Retrieved from http://www.econport.org

Youth programs. (2017). *United States Department of Labor.* Retrieved from https://www.dol.gov/general/topic/training/youth

The *Titanic* Disaster—Poor Risk Management

Logan Sulfridge
Management of Technology Major
Dr. J. Wayne McCain
Professor

ABSTRACT

The sinking of the Titanic *was one of the most horrible nautical disasters of all time with over 1,500 people killed in the tragedy. Although the disaster was horrific, it led to a serious investigation of procedures and decision-making. The* Titanic *story provides some lesson learned which may improve our performance in the risk management arena, including the benefits of a formal risk analysis.*

The Disaster

The sinking of the *Titanic* was one of the most horrible nautical disasters of all time, even though more than 100 years have passed since the catastrophe. One of the details about the disaster that makes it substantial was the number of lives that were lost; over 1,500 people were killed in this tragedy. The story of the *Titanic* continues to captivate us to this day, as depicted by the 1997 movie: *Titanic.* The movie had one of the biggest budgets of any movie to that date and its accomplishment invigorated interest in the story. That level of interest can be gauged by the amount of information available on the Internet. The *Titanic* story provides some lessons learned which may improve our performance in the risk management arena.

A Brief History

"On April 10, 1912, the RMS *Titanic,* one of the largest and most luxurious ocean liners ever built, departed Southampton, England, on its maiden voyage across the Atlantic Ocean, New York bound. The *Titanic* was designed by the Irish shipbuilder William Pirrie, built in Belfast, and was thought to be the world's fastest ship. It spanned 883 feet from stern to bow, and its hull was divided into 16 compartments that were presumed to be watertight. Because four of these compartments could be flooded without causing a critical loss of buoyancy, the *Titanic* was considered unsinkable. While leaving port, the ship came within a couple of feet of the steamer *New York* but passed safely by, causing a general sigh of relief from the passengers amassed on the *Titanic's* decks. On its first journey across the highly competitive Atlantic ferry route, the ship carried some 2,200 passengers and crew" (*Titanic* Sinks). It was 882 feet and 9 inches long. The widest point of the *Titanic* was 92 feet and 6 inches wide. The *Titanic* weighed in at a massive 46,328 tons (see Table 1). Unfortunately, there were not many survivors of the *Titanic.* A low 31.6% of passengers and crew survived this catastrophe; whereas 53.4% could have survived, given the number of spaces available on the *Titanic* lifeboats.

Titanic had 20 lifeboats for its 2,200 passengers and crew. Even though this was more than what was mandatory by the out-of-date Board of Trade laws, the lifeboats only had space for about half of the ship's passengers. The Board of Trade laws (re: lifeboats) had not been updated for ships the size of *Titanic;* so although the vessel followed the number of lifeboats regulation of the time, these measures were not enough to ac- commodate the number of passengers onboard—safety had been sacrificed for esthetics. In addition, many of the lifeboats were not filled due to the passengers' reluctance to board them. As a result, more than 1,500 people died in the disastrous accident.

When *Titanic* collided with the iceberg at 11:41 p.m. on April 14, it experienced a brittle fracture which caused holes to form in the ship's walls and water to flood. The brittle fracture was induced by three factors: the freezing water, the *Titanic's* high speed, and the high amounts of sulfur present in the ship's hull material. A piece of the steel hull was found and analyzed by scientists. Because of the sample's jagged edges, they concluded that the hull shattered on impact, instead of bending and deforming like quality, ductile steel would do to prevent holes forming. Another material flaw in the *Titanic* was the rivets that connected the plates of hull steel. The high impact collision with the iceberg scraped the rivets off the side of the hull, opening up large holes in the ship for water to flood. The rivets should have been stronger, but because of freezing temperatures, they were very brittle. These material flaws in the *Titanic* were major factors in its sinking. The *Titanic* had sixteen watertight compartments in its hull. When they began to flood, the crew sealed them off to prevent further flooding. However, the compartments were only horizontally watertight; so when the ship began to tilt, water flowed over the tops of the compartments into adjacent compartments, flooding even more of the ship. Had the *Titanic* not had watertight compartments at all, the ship may have actually sunk less rapidly. Because the water was contained only in forward sections of the boat, it began to tilt. However, had the water been allowed to spread out along the entire ship's bottom, the *Titanic* would have remained more horizontal and sunk much slower, allowing more time for rescuers to come. The design-flawed watertight compartments of the *Titanic* were without doubt a contributing factor to its sinking. However, the overriding factors were numerous human management/operational failures, e.g. ignoring iceberg warnings, traveling at high speed in a known ice zone, lack of outlook binoculars, ill crew and passenger safety training, etc. Attention to these risk management details would likely have prevented a collision in the first place!

Post-Facto Risk Analysis

Afterwards, maritime regulations were changed to require: a lifeboat seat for everyone aboard a ship, regular lifeboat drills to ensure everyone aboard knows what is expected of them,

## Table 1—*Titanic* Factsheet

Specifications of the *Titanic*

- Length: 882 feet 9 inches
- Cost of building the *Titanic:* $7,500,000 (1912 Dollars)
- Maximum Occupancy: 3,547
- Number of lifeboats equipped to carry: 64
- Number of lifeboats actually carried: 20
- **Number of iceberg warnings received: 6**
- Temperature of the sea water: -2 degrees Celsius
- Number of lifeboat spaces that went unused: 472

Ref: (titanicfacts.net)

and that the crew be able to fill the lifeboats and launch them efficiently. Regulations were also changed to prioritize distress calls and later require an alarm system be installed that would automatically be triggered by such calls. The *Titanic* began sending out distress calls (CQD's and SOS's) as soon as Captain Smith realized she was sinking, but almost no ships responded and those that did (e.g. the RMS *Carpathia*) were 4 or more hours away. Most operators had gone to bed because of the late hour. Maritime authorities established ice patrols to gather information about the ice in the North Atlantic. Up to that point, shipping relied on visual observation and warnings from other ships to advise them of ice in their area. These ice patrols spotted icebergs, plotted their drift, and advised all shipping of ice conditions. The catastrophic result for *Titanic* was because money and profits had been given higher priority than human life and risk analysis. Unfortunately, this was not an unusual mindset in the early 1900s, as competition became intense and shipping companies battled for passengers. However, the scrutiny that the *Titanic* disaster incurred brought about serious investigation of procedures and decision-making. **That analysis changed the ship building industry forever and catapulted risk analysis/management upwards toward more prominence.** Figure 1 shows an outline of a typical modern Risk Management Program that, if followed, would likely have mitigated the *Titanic's* risks and saved hundreds of lives. As observed in latter-day disasters such as the NASA Space Shuttle crashes and the loss of the World Trade Center, mankind often forgets once-learned lessons—an emphasis of the MG 415 Risk Management class. Figure 2 shows the Athens State University Amateur Radio Club contact confirmation (QSL) card and the *Titanic's* relationship to risk management planning. For the *Titanic,* as in many other instances, human behavior is often the weakest link in a system.

REFERENCES

Carpathia comes to *Titanics's* rescue. (n.d.). Retrieved December 4, 2017 from: http://www.premierexhibitions.com/exhibitions/3/3/titanic-artifact-exhibition/blog/carpathia-comes-titanics-rescue

Fowler, D. (n.d.). How big was the *Titanic*? Retrieved November 30, 2017, from http://www.titanicfacts.net/how-big-was-the-titanic.html

History.com Staff. (2009). *Titanic.* Retrieved November 30, 2017, from http://www.history.com/topics/titanic

McCain, J. W. Technical risk management class notes—MG 415 (Fall 2017). Athens State University, College of Business, Management of Technology Department.

Patrishkoff, D. (2015, October 05). What really sank the *Titanic*? Retrieved November 30, 2017, from http://insurancethoughtleadership.com/really-sank-titanic/

Q. (2012, May 11). How could the sinking of the *Titanic* have been prevented? Retrieved November 30, 2017, from https://www.huffingpost.com/quora/how-could-the-sinking-of_b_1510275.html

Quality observations: Preventing the *Titanic* disaster 100 years later. (n.d.). Retrieved November 30, 2017, from https://www.qualitymag.com/blogs/14-quality-blog/post/88657-quality-observations-preventing-the-titanic-disaster-100-years-later

Titanic sinks. (n.d.). Retrieved November 30, 2017, from http://www.history.com/this-day-in-history/titanic-sinks
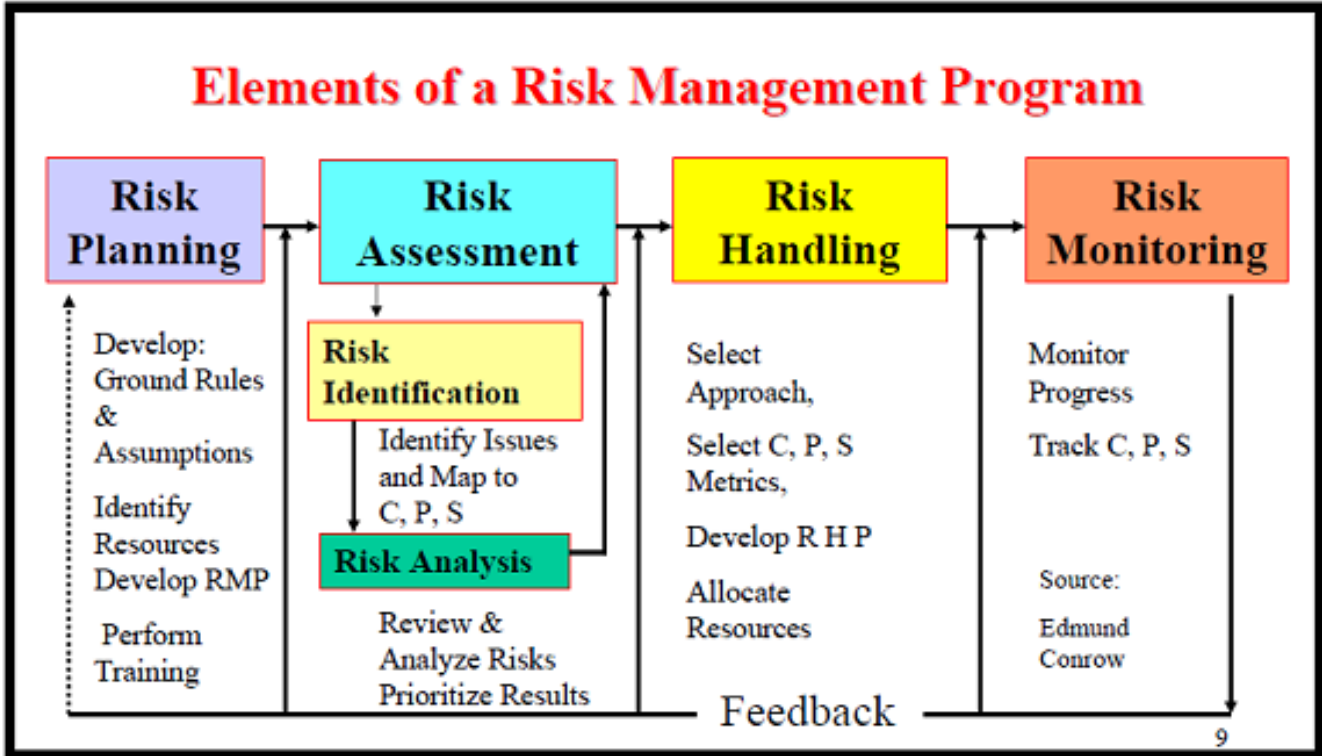
Figure 1—Modern-Day Typical Risk Management Program Outline
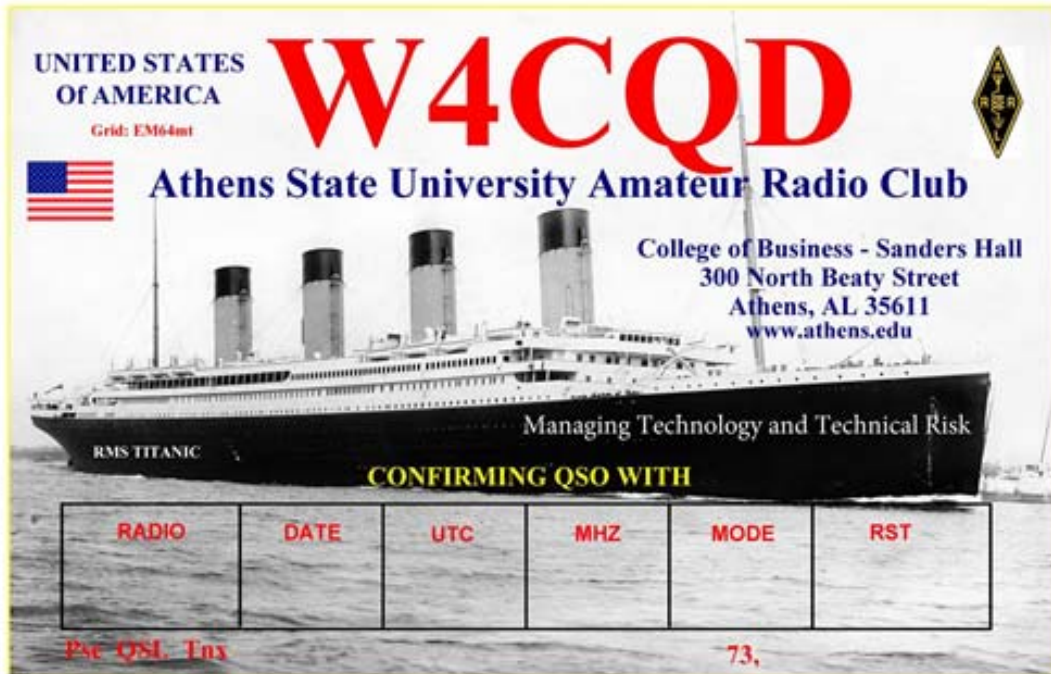

Figure 2—Athens State's ARC 'QSL' Card Depicting the *Titanic*

The Forensic Accounting Process

Katherine Hall Williams
Accounting Major with a Minor in Forensic Accounting

ABSTRACT

This paper discusses many aspects of forensic accounting. It begins by briefly exploring the history of forensic accounting. It traces a line from the origins of forensic accounting in the early American West to the current state of the field in modern day finances. It then discusses forensic accounting cases of note that encompass many areas of forensic accounting. These cases include Al Capone, Sir Paul McCartney, and the terrorist attacks of September 11, 2001. Next, the paper explores the five stages of the forensic accounting process: initiation, planning, execution, prosecution, and reflection. Each stage is discussed in detail, and the importance of each stage is explored. The role of the forensic accountant is examined thoroughly. In today's networked economy, the results of forensic accounting investigations have the potential to impact not only companies but individuals and both direct and indirect parties.

Introduction

Forensic accounting is defined in *Forensic Accounting* by Hopwood, Leiner and Young as follows:

> The application of investigative and analytical skills for the purpose of resolving financial issues in a manner that meets standards required by courts of law. Forensic accountants apply special skills in accounting, auditing, finance, quantitative methods, certain areas of the law, research and investigative skills to collect, analyze and evaluate evidential matter and to interpret and communicate finding (as cited in Silverstone, Sheetz, Pedneault, & Rudewicz, 2012).

Forensic accounting is of ever growing importance in our technologically advanced world. Even though it may seem that people's lives are not touched by forensic accounting, these specialized professionals are working day and night, behind the scenes, to keep the public safe. It was forensic accounting that uncovered the massive frauds at Enron. It was forensic accounting that followed the money trail after the terrorist attacks of September 11, 2001 (Warshavsky, 2012). This paper will discuss the forensic accounting process in detail. It will begin with a brief history of the evolution of the forensic accounting profession. It will then review a few noteworthy cases of mainstream forensic accounting. Lastly, it will analyze the many steps in the forensic accounting process and the implications that these investigations have on individuals, businesses and industry standards.

A Brief History of the Evolution of Forensic Accounting

Accounting has been a necessary vocation for centuries; however, forensic accounting is a relatively new branch of the accounting profession. The building blocks of forensic accounting can be traced back to auditing and the prevention of fraud at the turn of the 20th century (Smith, 2015). When large businesses were expanding into North America and the American West, it was important for them to keep their merchandise safe, not only from bandits and other outside forces, but from internal threats as well (Smith, 2015). At this point in history, there was no such thing as forensic accountants, so these specialized accountants were referred to as "auditors." It was the accountant's job to keep a close eye on the merchandise and accounts of a company and make sure there were no frauds, internal or external, being committed (Smith, 2015).

As businesses grew larger and more complex, it was thought that accountants could no longer keep up with the constant demand for fraud detection. At this point, the focus shifted to management and their ability to prevent fraud (Smith, 2015). In the 1950s, the term "forensic accounting" was mentioned in the magazine *New York Certified Public Accountant*; however, it referred to forensic accountants as being strictly used for presenting evidence in court and for expert testimony (Smith, 2015). In the 1970s, forensic accounting was thrust into the spotlight with huge fraud cases involving massive companies such as Equity Funding and National Student Marketing (Smith, 2015). Forensic accountants played a large role in exposing the many fraudulent activities in which these market giants were involved.

This brings us to the current age of forensic accounting. In our current time, the accounting practices of companies are under closer examination than they have ever been before (Hochberg, 2006). Although a huge part of the forensic accounting profession is litigation, the demand for forensic accountants to appreciate the technology behind fraud is growing (Smith, 2015). Today's forensic accountant must be able to use and understand a myriad of technologies. These professionals must know how to preserve evidence in a way that does not deteriorate that evidence. Forensic accountants must also present this evidence to a layman audience in a way the audience can understand (Smith, 2015). Although the title and specifics of the job have changed over the years, the basic function of a forensic accountant is the same—protect the assets of a party.

"Famous" Cases of Forensic Accounting

Although many people may think they are not aware of any forensic accounting cases, they actually have a general knowledge of many such cases. Forensic accounting has become more and more practiced as society has become more advanced. Here we will examine a few cases that were important to the development of the forensic accounting profession. It is with these cases that we see the importance of foren-

sic accounting, not only in the cases of crime and terrorism, but also in the cases of everyday life, such as divorce proceedings.

The first example of a forensic accounting case goes back almost 100 years. It is in the time of bootleggers and rumrunners that the case took center stage. This case involved a well known gangster named Al Capone (Ryan, 2003). Although Mr. Capone had committed many atrocities and was a notorious criminal, the law could not make any charges "stick." Finally, in 1931, after two years of work, the IRS had enough evidence against Capone to send him to jail. By using forensic accounting methods, such as tracking Capone's spending and purchases of hundreds of thousands of dollars of goods without declaring any income, the IRS was able to charge Mr. Capone with 22 counts of tax evasion and finally send him to prison (Ryan, 2003).

The next subject is one that touches every American and people all around the world: the terrorist attacks on September 11, 2001. These vicious and cowardly acts could possibly have been thwarted with some basic forensic accounting. There was much documentation of the financial activity of the terrorists responsible for the attacks on the U.S. leading up to September 11 (Beckett, Mollenkamp, & Phillips, 2001). One of these activities was a series of wires sent from the United Arab Emirates to the suspected stateside ringleader of the terrorist attacks, Mohamed Atta (Beckett, Mollenkamp, & Phillips, 2001). One of these transactions was even reported to federal authorities, but no action was taken (Beckett, Mollenkamp, & Phillips, 2001). If there had been a more thorough procedure for recognizing and processing these transactions, there is a chance that September 11 would have been just another day and not one looked back on with sorrow and regret.

Last, but certainly not least, is a more everyday application of forensic accounting involving the very famous divorce of Sir Paul McCartney and Heather Mills (Levine, 2008). When the pair determined to end their marriage, Ms. Mills decided she was not happy with the divorce settlement. She hired a bevy of forensic accountants to prove that Sir Paul was worth a lot more than he was claiming to be. Ms. Mills claimed that her ex-husband was hiding assets so that she would not have privilege to them in their divorce (Levine, 2008). The job of these forensic accountants was to hunt down Sir McCartney's alleged "hidden" assets by following the money trail (Levine, 2008). This is a growing application of forensic accounting— acting as a money bloodhound when marriages dissolve.

Stages in the Forensic Accounting Process

According to Silverstone, Sheetz, Pedneault, & Rudewicz (2012), there are five stages in the forensic accounting process: initiation, planning, execution, prosecution, and reflection. All stages are equally important in the forensic accounting process. Without careful preparation and implementation of each stage, the forensic case would fail to be taken seriously and could possibly be thrown out. We will discuss each of these stages further.

Initiation

There are two ways that a forensic accounting case can be initiated. They are reactive and proactive (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). A reactive investigation will be originated by someone who is not an investigator. Examples of these non-investigators are disgruntled employees, jilted spouses, or management (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). A proactive investigation will be originated by someone who is an investigator. An example of a proactive investigation is when an investigator is working on a case involving Company A and discovers something that points to Company B being involved with Company A in some sort of malfeasance (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012).

Both reactive and proactive investigations begin in the same way, with a report of some fraudulent activity. A forensic accountant will need to be wary of a reactive investigation more so than a proactive investigation because of the possibility of falsehoods. There have been instances where an unhappy employee or spouse has falsely accused another of wrongdoing when they are simply acting out of spite or hurt (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). Luckily, with the amount of technology involved in the day to day operations of most businesses, a forensic accountant can tell quickly which reactive accusations are legitimate. However, because these operations are so technologically advanced, in some cases, it can hurt a forensic accountant's investigation (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). The accused might find it easier to cover their tracks with technological traffic; or, on the reverse side of this coin, the technology may be too generalized, and pinning down a specific suspect might be hard to accomplish (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). There are many things a forensic accountant must consider before confidently continuing to the next step in the process, primary of which is addressing whether or not a crime was even committed.

Planning

Once it has been determined that a crime has happened, the forensic accountant moves on to the planning stage of the forensic accounting process. During the planning stage, the forensic accountant must set goals and requirements for themselves and the investigation. This is a very important stage of the forensic accounting process. It is in the planning that a forensic accountant lays out their "roadmap" for the entire investigation (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). Without this stage to consider all the possible outcomes of the investigation, a forensic accountant would be lost. It is important for the forensic accountant to know which direction he is going in a case (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012). Without a thorough and well directed planning stage, interviews could be neglected, evidence could be missed, and cases could be lost.

Execution

The execution stage of the forensic accounting process is a very busy one. This is the stage where all the forensic accountant's careful planning is put into action. Interviews are conducted, reports are written, and evidence is collected and organized (Warshavsky, 2013). It is usually at this stage that the forensic accountant begins to work with an attorney. This attorney can help direct the forensic accountant to which information will be most helpful in presenting the case. The forensic accountant can also help the attorney in determining which evidence is legitimate and most pertinent (Warshavsky, 2013). It is through this partnership that the next stage of the forensic accounting process is undertaken.

Prosecution

The forensic accountant can wear many hats when it comes to the prosecution stage of the forensic accounting process. There are five basic roles a forensic accountant can play when participating in a case. According to Choi (2003), these five roles are a testifying expert, a consultant, a trier of fact, a special master, and a court-appointed neutral party. A testifying expert is someone who has a substantial amount of education and experience in his or her field and whose professional opinion is considered when deciding a case (Choi, 2003). When a forensic accountant is acting as a consultant, he is an advisor. It is unlikely that he will be called upon to testify in this role. When acting as a trier of fact, a special master, or a court appointed neutral party, the forensic accountant is representing neither side of the case. He is strictly there for the use of the court. It is the forensic accountant's job, in this instance, to answer any questions the court may have or to provide neutral evidence as an expert (Choi, 2003).

Reflection

The reflection stage of the forensic accounting process is arguably the most important. Although this stage may not help a forensic accountant with their case, it can help others in the field immensely. This is the stage where the forensic accountant looks back at the case and decides what he or she could have done differently. Maybe the forensic accountant is unhappy with time wasted in a certain endeavor or perhaps pleased with a revelation uncovered in an unlikely source. It is a significant part of the forensic accounting process that allows others to gain from the experiences of the forensic accountants assigned to each case (Silverstone, Sheetz, Pedneault, & Rudewicz, 2012).

Conclusions

In conclusion, the forensic accounting process is a long and complicated one. It can be confusing, and the evidence can be hard to grasp. It is the job of the forensic accountant, not only to uncover the crimes committed, but to help others understand these crimes. The forensic accounting process has been growing and changing for over 100 years, and it is important to note how these changes have affected not only companies and industry practices, but also individuals.

With technology becoming more and more integrated into our everyday lives, it is imperative to understand the severe ramifications of fraudulent activities by large corporations. Perhaps we are not directly affected by these activities. Maybe it is not our employer who is under investigation, but there are underflows in our economy that make even the most mundane occurrence send shockwaves through our lives. A company is put under investigation and their stock prices fall (Hochberg, 2006). This impacts retirement savings. A fraud scandal puts a large company out of business which makes its competitor's prices go up. These are all real-world instances in which the forensic accounting process has touched multiple lives. In this intertwined economy, no one is immune from the results of a thorough forensic accounting investigation.

REFERENCES

Beckett, P., Mollenkamp, C., & Phillips, M. (2001, October 10). Withdrawal pains: In the financial fight against terrorism, leads are hard won—small sums and few triggers hamper banks' ability to flag a money trail—why clues went unheeded. *Wall Street Journal.* Retrieved from https://0-search-proquest-com.libcat.athens.edu/docview/398880133?accountid=8411

Choi, F.S. (2003). *International finance and accounting handbook.* Hoboken, NJ: Wiley.

Hochberg, N.A. (2006). When accounting practices go under the microscope. *Financial Executive, 22*(1), 53-55.

Levine, S. (2008). *Asset hiding lessons from Paul McCartney's divorce.* Retrieved from https://www.thestreet.com/story/12818962/1/asset-hiding-lessons-from-paul-mccartneys-divorce.html

Ryan Jr., B. (2003). Al Capone trial: 1931. *Great American Trials,* 357-360. Canton, MI: Visible Ink Press.

Silverstone, H., Sheetz, M., Pedneault, S., & Rudewicz, F. (2012). *Forensic accounting and fraud investigation for non-experts.* (3rd ed.). Hoboken, NJ: John Wiley & Sons, Inc.

Smith, G.S. (2015). The past, present, and future of forensic accounting. *CPA Journal, 85*(3), 16-21.

Warshavsky, M.S. (2013). The role of forensic accountants in litigation cases. *CPA Journal, 83*(6), 58-61.

Dr. Carl Jung and the Genesis of Alcoholics Anonymous

R. Bryan Kennedy
Professor of Management and Psychology
Susan D. Herring
Adjunct Instructor

ABSTRACT

After many months of preparation, the Society of Alcoholics Anonymous (AA) was officially founded on June 10, 1935. Several of the founding principles of AA were drawn from a conversation between Dr. Carl Jung and one of his patients, a conversation which the patient shared with Bill Wilson ("Bill W."), one of the co-founders of AA. Wilson described the impact of this conversation in a January 23, 1961, letter to Jung, who previously had not been aware of his role. Jung replied without delay, just a few months before his death in June of the same year. This manuscript attempts to unlock, interpret and share the messages that Jung appeared so anxious to convey at the end of his life.

The Society of Alcoholics Anonymous (AA) was officially founded in a meeting on June 10, 1935, after many months of preparation. The founding was unheralded and unnoticed by the public. Only two people attended the first meeting, Bill W. and Dr. Bob (last names are not used in AA), both of whom were viewed as unreliable, hopeless drunks by their sober friends, family members, and colleagues. After years of denial, attempting to cover their addiction and their lack of respect for the truth, both men had come to view themselves in the same light as their friends and had become aware that the "sands of time" for their lives were running out. In actuality, this view, which had been so difficult and painful to accept, was necessary if their budding recovery was to continue.

In 1931, Roland H. became a patient of Dr. Carl Jung, seeking a cure for his addiction to alcohol. Roland was a brilliant investment analyst who had become wealthy in the stock market on several occasions, but addiction to alcohol had ruined his financial standing and was destroying his health. When he came to Jung, he felt he had exhausted all other means of recovery. He remained under Jung's care for perhaps a year. Unfortunately, and to his deep dismay, he relapsed soon after completing his treatment. Despite this failure he remained certain that Jung was his last hope and returned to his care. Jung told him that further medical or psychiatric treatment would be hopeless in finding a cure. This candid statement was to become the foundation on which Alcoholics Anonymous would be built.

Coming from a professional he trusted and admired without reservation, the impact of Jung's statement on Roland H. was profound. He asked if there was any other hope, and Jung told him there might be, if he could experience a genuine spiritual or religious conversion that might re-motivate him when nothing else could. However, Jung caution him, "while such experiences had sometimes brought recovery to alcoholics, they were, nevertheless, comparatively rare." Jung advised him to find an environment with a religious atmosphere and hope for the best.

At that time the Oxford Group, and evangelical movement, was active in Europe and had established a branch in New York.

This group had experienced some success in treating alcoholics. It emphasized the principles of self-survey, confession, restitution, and service to others and stressed meditation and prayer. Roland H. joined the Oxford Group in New York and found a conversion experience that released him, at least for a time, from his compulsion to drink.

On January 23, 1961, Bill W., one of the co-founders of AA, wrote a letter to Dr. Jung in which he said, "Though you have surely heard of us [AA], I doubt if you are aware that a certain conversation you once had with one of your patients, a Mr. Roland H., back in the early 1930s did play a critical role in the founding of our fellowship. Though Roland H. has long since passed away, the recollections of his remarkable experience while under treatment by you has definitely become part of AA history." Roland had shared his experience with Jung with the founders of AA and his account of Jung's treatment led directly to the formulation of steps 1 and 2 in the 12-step program. Bill W. thanked Jung sincerely for his contributions to the development of AA.

At the time he received Bill W.'s letter, Dr. Jung was a widower in his 80s, in poor health, and was entering the last few weeks of his life. He had ceased counseling patients months before, but many powerful and wealthy people still tried to schedule a meeting with him. Jung was deeply involved in ensuring that his past writings were collected in proper order in a complete manuscript, while also pushing to finish current works in progress. The letter from Bill W. was unexpected, but its message was welcome news, as evidenced by Jung's quick and enthusiastic reply.

While Jung was not personally acquainted with Bill W., he was cognizant of the many accomplishments of AA and its role in helping tens of thousands of alcoholics restore their lives and remain sober. He also realized that by helping alcoholic heads of families, AA expanded its impact to the multitudes of family members who received help; this impact cannot be accurately estimated.

In his prompt reply, Jung expressed himself in a manner he had not previously used in public statements or in his writings.

He also revealed portions of his previously concealed belief in and concept of God, as well as his knowledge and awareness of an evil power in the universe that he reluctantly identified as the Devil.

These concepts were related in depth in Bill W.'s letter to Jung. In his response, Jung agreed that Roland's report of his treatment approach had been accurate. Jung confessed that he had not been able to communicate everything about the treatment to Roland because at that time he had to be careful about what he said. Early in his career, Dr. Jung had suffered withering attacks for many reasons, including his friendship with Freud, statements he had made about the existence of both a personal and a collective unconsciousness, and a variety of other ideas which other professionals in the relatively new profession of psychology did not accept and perhaps did not fully understand. In fact, his experience up to that time indicated that he had been misunderstood in almost every possible way.

In addressing the failure of his treatment efforts, Jung stated he had relied on his past efforts and experiences in treating men like Roland. Their craving for alcohol, he wrote, "was the equivalent, on a low level, of the spiritual thirst of our being for wholeness, expressed in medieval language [as a] union with God." Jung asked, "How could one formulate and attempt to communicate such an insight [to a patient or others] in a language that is not misunderstood in our days?" Jung believed that the only way to achieve such an insight is to experience it personally, and it can only happen when the individual follows a path that leads to higher understanding. This might occur through an act of grace, through personal and honest contact with friends, or through "education of the mind beyond the confines of mere rationalism." Jung wrote that he strongly believed that the evil in this world can lead the ordinary person to perdition. Only by real religious insight or through the aid of a close human community can a person be protected and enabled to resist the power of evil.

Jung had found that using religious terms and symbols often led to misunderstanding and to reject of his ideas, and found it necessary to avoid them whenever possible. Jung stated that this was why he did not give a sufficient explanation to Roland H. However, he felt that Bill W. possessed an understanding of alcoholism that rose above the typical platitudes. He added: "You see, 'alcohol' in Latin is *spiritus*, and you use the same word for the highest religious experience as well as for the most depraving poison. The helpful formula therefore is *spiritus contra spiritum*."

At the bottom of his letter, following his signature, Jung added the following scripture: "As the hart panteth after the water brooks, so panteth my soul after thee, O God." (Psalm 42,1)

In this very short letter Jung presented an immense amount of information concerning the psychodynamics of addiction, the way addiction forms and, in some instances, the way it can be arrested or contained. Although it cannot be cured, as demonstrated by the continuing misfortune of Roland H., such containment enables an addict to continue functioning as long as he follows the AA program. The insertion of the scripture also reveals how actively Jung sought answers and knowledge from all types of sources, a lesson he practiced and taught the many hundreds of analysts who had come to Zurich to train as Jungian analysts. In Psalm 42,1 Jung appears to be utilizing the Bible to illustrate the message that the human need for union with God is powerful, but often unrecognized and unrealized. This misunderstood yearning sometimes leads unprotected individuals to seek the poison of addiction in lieu of a union with God, which is the true goal of their subconscious mind.

Teaching Notes

General Discussion of the Case Elements

This case study provides supplementary material for textbooks and lectures on addiction, addiction treatments, and Alcoholics Anonymous, and relates information and documentation concerning the influence of Dr. Carl G. Jung, including the fact that psychology is sometimes ineffective in the treatment of addictions. The failure of Dr. Jung's psychology, coupled with his candid admission of his failure to cure addiction, continues to warn and console family, friends, clergy, health care professionals, and others facing the extreme difficulty of confronting and overcoming any true addiction. AA, when coupled with appropriate counseling strategies, continues to offer the most effective approach with a favorable success rate that hovers around 50% (significantly higher than rates reported by other groups).

The case study is appropriate for both college and university undergraduate and graduate classes in the areas of management, industrial psychology, human resource management, labor-management relations, organizational behavior, religion, health management, and similar fields. The utilization of case studies can be very effective in encouraging younger, less experienced students to speak out and share their thoughts. This is especially true of the more introverted students. The training would also be valuable for management and union officials in the discharge of their everyday duties. It is especially appropriate for officials who are charged with the interpretation and applications of the terms of the CBA when attempting to settle workplace disputes, especially since addiction issues are frequently a major source of problems in the workplace. The case study could also be utilized to supplement and enrich employee and management training programs in large and small organizations and ministerial associations.

Discussion questions

1. What is the importance of Roland H.'s relapse in understanding addiction and the progress toward recovery?
2. Does it not seem a poor and unfortunate choice of words, or an insulting attack on the co-founders of AA, to describe both as "unreliable, hopeless drunks?"
3. What is meant by the statement: "It is necessary for alcoholics to accept their personal limitations in order for healing and wholeness to begin?"
4. What does Dr. Jung really mean when he talks about composite efforts and experience in treating men like Roland? Was the statement an attempt to downgrade Roland by lumping him with other men Jung had treated who were caught in an addiction?
5. Dr. Jung was very straightforward in telling Roland H. that he was unable to help him further toward recovery and that psychiatry and medicine had no cure for addiction. In your opinion or experience, is honesty like Dr. Jung's a benefit or detriment in a professional work environment? If you were facing a failure at work, would you be as honest as Dr. Jung was?

Some suggested/possible answers to the questions

1. Research has shown that the majority of those suffering from addiction will go through several rounds of treatment. Only by accepting their addiction and finding the right treatment program can an individual achieve and maintain a stable recovery. The history of Roland H.'s path through addiction demonstrates this fact and illustrates that even the best intentions cannot solve the problem permanently. Sadly, HR professionals need to realize this and be ready to direct those seeking help to a variety of programs, so each individual can find the most effective approach.

2. Up to the point and place where Bill W. had his conversion experience, which is described in *Not-God,* this was a true and accurate description for him. It was also an accurate and true description of Dr. Bob right up to the establishment of AA. Hopefully this honest and true description of both founders can be an encouraging light for other alcoholics who wish to follow the co-founders into sobriety.

3. For most alcoholics and other addicts, it is only when the individual admits and accepts their past and present weakness and recognizes the fact that they are not capable of achieving sobriety on their own that they can move onto healing and wholeness. Usually, success in recovery requires this admission, followed by either a real religious experience or the support of a close, caring human community, or (for best results) both. This is a case in which true strength is found in weakness.

4. Jung's account of his relationship with Roland appeared to be on a very positive and high level. Jung remembered Roland and stated that he had often wondered what his fate had been. As mentioned in the previous question, unless addicts like Roland H. recognize their failures and admit that it requires a power beyond that of the individual to join the fight against addiction, there is very little chance of success in the battle. Jung was simply explaining that many men who had an addiction had come to him in the past and had the same issue that Roland had: "Their craving for alcohol was equivalent, on a low level, of the spiritual thirst of our being for wholeness, expressed in medieval language, the union with God." In addition to the spiritual, a supportive and sharing community also has been shown to be necessary to an addict's recovery. To quote Bill W.: "I still need others, but now I need them because I have something to give. Precisely because I accept my alcoholism, my weakness, my limitation I have found that I have something to give— something to give from that very limitation" (Kurtz, 1991).

5. The answer to this question will depend upon the individual's opinion and personal experience, but many people would be unwilling, ashamed, or afraid to admit the inability or failure to complete a task successfully. However, honesty in reporting results is necessary for advances to be made in most professional and academic fields, as well as being vital for workplace safety, product development, effective personnel actions, and other management decisions.

REFERENCES

Jung, C.G. (1973-1983). *The collected works of C.G. Jung,* H. Reed, M.S.M. Fordham, & G. Adler, eds. Princeton, NJ: Princeton University Press.

Kurtz, E. (1991). Not-God: A history of Alcoholics Anonymous. Center City, MN: Hazelden Educational Services.

Being a Global Supply Chain Leader

Melissa Kaiser
Global Logistics and Supply Chain Management Major
Cynthia R. Lovelace
Assistant Professor of Logistics

ABSTRACT

The supply chain leaders of today are required to have much more supply chain knowledge than the supply chain leaders of yesterday. With the increase in external sourcing, supply chain leaders must be able to wear many hats. They must be factory workers, CEOs, relationship managers, and planners, all while integrating their firm into the growing global supply chain environment. This research discusses the qualities and attributes of supply chain leaders and the responsibilities that are expected of them. In addition, this research addresses how applying those qualities and attributes results in a successful supply chain leader who is able to successfully address risk within the global supply chain.

Introduction

In an article titled "The New Supply Chain Agenda: A Synopsis and Directions for Future Research," five pillars of excellence are identified that form the foundation of the new supply chain agenda. The five pillars are: talent, technology, internal collaboration, external collaboration, and managing supply chain change. The pillars emulate the need for supply chain strategy to address an organization's ability to manage the pillars. The research conducted in the article showed that many companies maintain a traditional view of the supply chain, assuming the supply chain consists only of trucks, manufacturing lines, and warehouses, when in reality the supply chain is responsible for 60%-70% of a company's operating costs (Stank, Dittmann, & Autry, 2011).

Although all five pillars of excellence are important in the way supply chain managers lead their organizations to achieve performance improvements, this current research is concentrated on the talent pillar. Selecting the right talent to oversee the supply chain is pivotal in leading the modern supply chain. Organizations need supply chain leaders who have a cross-functional understanding as well as a global understanding of the supply chain environment. These leaders need to be able to lead diverse employee groups in complex multi-cultural environments (Stan, et al., 2011). The modern supply chain operates on a global level. Many large and small manufacturing firms do business with other countries in some form or fashion. Some businesses sell items to other countries, while other businesses buy items from other countries to use in their manufacturing process. A supply chain leader in a global environment must be able to navigate cultural customs or laws, arrange meetings in different time zones, and communicate effectively with all necessary parties (Stank, et al., 2011). A supply chain leader must be able to deal with customers on a global level and be able to forge strong interpersonal relationships around the world. This research addresses and discusses the attributes of supply chain leaders and identifies challenges that they face while navigating through the national and international supply chain.

Supply Chain Leadership Attributes

"We need to identify and recruit the best possible talent available. Opening a new market or facility isn't a matter of funding, it's a people issue. If you don't find the right people with the right skills and experiences, it isn't going to be successful" - Management Recruiter, Global Logistics Services Provider (SCM Talent Development: The Acquire Process, 7).

Peter L. O'Brien is the regional head of the Distribution and Supply Chain Practice in Asia/Pacific at Russell Reynolds Associates. He focuses on supply chain-related assignments across all sectors. In an article titled "Supply Chain Leaders of the Future," O'Brien identifies the primary attributes of a supply chain leader.

- **Attribute 1 -** "The ability to understand all aspects of an end to end supply chain" (O'Brien, 2015, p. 1).
    - This process is defined as having an understanding from the initial source of raw material through product manufacturing and all of the activities included in taking the product through to its final purpose (O'Brien, 2015).

- **Attribute 2 -** "Experience across all major aspects of the end-to-end supply chain" (O'Brien, 2015, p. 2).
    - Understanding all major aspects entails appreciating the value and role of every part of the supply chain. A leader must spend time amongst all divisions of the manufacturer in order to fully understand the significance of each part. A broad level of experience makes the leader better qualified to identify potential risks and, therefore, be able to address issues as they arise effectively (O'Brien, 2015).

- **Attribute 3 -** "Ability to foresee market changes, to adapt quickly to new business models, and to understand where value is being created and re-created" (O'Brien, 2015, p. 2).

- A supply chain leader must be able to look many years into the future in order to ensure that the organization is leading the changes in the supply chain environment. Leaders must be able to lead at the speed of change in order to stay ahead of the game (O'Brien, 2015).

- **Attribute 4 -** "Continually question and assess markets and opportunities" (O'Brien, 2015, p. 2).
  - Asking questions helps to provoke a different kind of thinking and assess opportunities based on personal experiences. At the end of the day it is necessary for supply chain leaders to create opportunities for their organizations and ensure that their organizations continue to evolve (O'Brien, 2015).

O'Brien asserts:

> The future supply chain leaders need to understand they operate in a virtual world, with an appetite for speed and continual change. They need to intimately understand and ideally experience all aspects of end-to-end supply chain management and do so across multiple boundaries. They need to continually travel and be citizens of the world...we need to ensure that our supply chain leaders are as innovative and dynamic as the region in which they may well be residing (O'Brien, 2015).

A true supply chain leader is able to implement innovative ideas to keep their organization poised high above the rest. An example of supply chain leaders who have used their experience to be innovative and keep their respective companies on top in terms of "supply chain excellence" is researched in an article for Supplychain247. For the article research, the authors asked executives at four of the best performing global supply chains in 2015 about their plans to remain at the top of their game. The supply chain leaders who were questioned for the research were CEOs at Unilever, P&G, Cisco, and Intel. The question asked was, "What does it take to remain a supply chain leader?" Their responses were as follows:

Cisco: The Transformation Supply Chain

The CEO at Cisco's highest priorities were "The Internet of Things, the Cloud, and Big Data." The goal was to "enable the supply chain to support a new business model" (Trebilcock, 2015). Cisco was forced to revamp their business model in order to keep up with demand for big data networks and cloud mobility. They had to think about strategies that could help deliver the next generation of productivity. In order to do this, Cisco implemented the mobile supply chain which included the use of RFID, barcode scanning, and sensors on the manufacturing floor. By doing this, they were able to link systems and processes that could automatically change production flows and reroute purchase orders instantly. Cisco also implemented a mobile supply chain. "Free the people" became their strategy for putting applications within a cloud server in order to have visibility of inventory within the supply chain. This allowed for teams to use their smart phones to take "real time action" (Trebilcock, 2015). The last thing that Cisco implemented was an analytic supply chain. By increasing sensing devices and nodes, they were better able to capture what they called "big data." The goal of this was to stop reacting to the

issues after the fact and begin taking proactive steps before a problem occurred (Trebilcock, 2015).

P&G: Customer Centricity and the Responsive Supply Chain

The CEO at P&G developed a business model which continually assessed which supply chain solutions provided the most value to customers and consumers, with the fastest response time. The goal was to provide a customer-centric service that was measured by how the customers were reshaping the way they engaged the market. P&G had ongoing initiatives to highlight how important restructuring is to the supply chain. In North America, they prioritized responsiveness. They developed a distribution goal of being within one day's transit to 80% of their customers. In order to do that, they built six distribution centers in strategic locations throughout the United States. To support those distribution centers, they reconfigured their manufacturing base with the idea of responsiveness in mind. Instead of having a "demand driven replenishment model," they developed a model based on information that they received from the retail supply base (Trebilcock, 2015).

Intel: Managing a Supply Chain that Enables Moore's Law

The CEO of Intel's goal was to stay several generations ahead of competitors in the semiconductor industry in order to keep their supply chain ahead of the curve. The secret to their success is what they call "Moore's Law." Moore's Law was named after Intel co-founder, Gordon Moore, who stated that "over time, the number of transistors in a dense integrated circuit doubles approximately every two years." To ensure Moore's Law, Intel set three priorities for the upcoming years. The first priority was ethical sourcing. Intel prioritized staying free of conflict minerals in microprocessors. They also worked to improve the health and safety of their workers by ensuring the availability of protective equipment such as safety glasses and ear protection. The second priority was being a partner of choice. They did this by aligning their business strategy with their business values and making the issues that customers face, P&G's issues as well. The third priority was demand shipping. Demand shipping entailed managing billions of dollars in capacity while working closely with customers to shape demand for new products (Trebilcock, 2015).

Unilever: Building a Brighter Future with Supply Chain Management

The goal of Unilever's CEO was to deliver viable and profitable growth. They tried to look beyond their financial results into the world around them in order to assess how to reduce their environmental footprint to improve the lives of the small farmers and communities in which they operate. They established "Unilever's heralded Sustainable Living Plan" which was imposed to help build a brighter future. The goal was to deliver zero waste to the landfill and have 50 percent of the raw agricultural materials sustainably sourced. Unilever installed a control tower in Europe that was built around an end-to-end transportation system. This system managed logistics flow by implementing secondary distribution that was managed from the control tower. Unilever in-sourced services in order to reduce their carbon footprint as well as costs. Lastly, Unilever centralized their networks. Distribution hubs were established with the idea that all finished goods and services would be shipped through the hubs and the shipments would be consoli-

dated between customers, factories, and suppliers by decreasing the number of deliveries while decreasing their carbon footprint (Trebilcock, 2015).

Qualities of Supply Chain Talent

Supply chain leaders are not only CEOs of companies. Supply chain leaders work in all aspects of the supply chain from transportation, warehousing, inventory management, production planning, etc. A supply chain leader in any function should be immersed in the end-to-end supply chain process even though he or she does not control it. Supply chain leaders bring value to their companies by educating their co-workers as well as the executive staff about the supply chain processes and what a critical role that plays in increased profit. In addition to Peter O'Brien's recommended attributes, Dr. Paul Dittmann, the Director of Corporate Partnerships at the University of Tennessee, lists the five most important qualities for top supply chain talent: systems thinking, inspiring and influencing leadership, technical savvy, superior business skills, and global orientation (Dittmann, 2012).

System Thinking

System thinking leaders are leaders who embrace the idea of cross-functional and cross-company complexity. The system thinking leader sees the supply chain as a whole system as opposed to looking at the individual links in the chain. They must be able to assimilate the relationships and interdependencies across procurement, logistics, manufacturing, and marketing/sales. In addition to this, the supply chain leader must be able to understand the complexity of interactions with customers and suppliers outside of the firms (Dittmann, 2012).

Inspiring and Influencing Leadership

A supply chain leader must be able to form interpersonal relationships that build credibility for them within the organization. They must be able to build teams and manage people while communicating effectively to company stakeholders. Being a leader puts them in the position of having to influence co-workers within the firm to work together to create a successful supply chain. A supply chain leader becomes skillful at building personal relationships with a firm's heads of marketing and sales, human resources, and finance in order to get the whole picture (Dittmann, 2012).

Technical Savvy

Although a supply chain leader does not need to be a subject matter expert in IT systems, he or she must keep a close relationship with the firm's Chief Information Officer and have technically savvy employees on hand. Understanding the implementation challenges in the complexity of the supply chain software is crucial (Dittmann, 2012).

Superior Business Skills

Being able to speak the language of all divisions of the supply chain is critical. A supply chain leader needs to be able to discuss topics such as fleet truck efficiencies and demand forecasting with the firm's executives while also being able to discuss cash flow with the finance office and delivery schedules with suppliers. Often, problems are issues least understood by the executive board and the supply chain leader must

be able to communicate the issues effectively in the language of all parties (Dittmann, 2012).

Global Orientation

Since global supply chains and global sourcing are continually increasing, it is important that a supply chain leader be "globally capable." There are few companies that do not at least source globally, sell globally, or have competitors who do so; therefore, it is essential for supply chain leaders to be able to manage an enterprise that expands across continents and has the ability to deal with customers and suppliers around the globe (Dittmann, 2012).

Supply Chain Leaders in the Global Market

Globalization has offered exceptional opportunities in the development of supply chains. Globalization offers companies the opportunity to increase revenue while decreasing costs. According to *Supply Chain Focused Manufacturing Planning and Control,* the global outsourcing process has surpassed the six trillion dollar mark. In a study by Booze Allen Hamilton, it was determined that global outsourcing will continue to increase by 10% every year (Benton, 2014, p. 254).

The choice of a supply chain leader to take his or her business into the global marketplace is not a decision to be taken lightly. In order to make the decision, it must be determined that the potential cost reduction is significantly lower than the firm's direct operating costs, and that it will improve quality, change company focus, help the firm acquire external capabilities, refocus cycle time, obtain cash infusion, and reduce risk (Benton, 2014, p. 260). In an external sourcing environment, the supply chain leader must be able to effectively manage the supplier/vendor relationship. In this kind of environment, relationship-building and coordinating is more extensive than with domestic suppliers. According to an outsourcing study conducted by Deloitte, "62 percent of the respondents cited requiring more management time than expected. It also suggested that managing the supply relationship costs at least 3 percent and sometimes more than 10 percent of the annual contract value" (Benton, 2014, p. 261). Additional money for managing the relationship can also be accumulated by way of travel, IT infrastructure and management, and supplier development programs (Benton, 2014, p. 261).

Supply Chain Leaders and External Sourcing Risk

Today's global supply chains are subject to more risk than domestic supply chains. Underestimating the risk involved with the global supply chain and not having sufficient risk mitigation strategies in place can be detrimental to a firm. A good supply chain leader understands how to create a successful network design that will help mitigate the supply chain risk. There are three major factors that must be considered by the supply chain leader when it comes to external sourcing risk. Those factors are: increasing supply chain complexity, decreasing access to information, and greater need for high quality faster (Savitz, 2012).

- **Increasing complexity -** Since manufacturing processes have become more complex, supply chain leaders must be able to manage numerous product lines with many assembled parts that have come from numerous different suppliers. In addition, they must be able to deter-

mine when and where products are needed in order to meet the global demand (Savitz, 2012).

- **Decreasing access to information -** If improper communication and collaborative systems are not in place, the lack of data leads to increased risk. Supply chain leaders must find a way to effectively manage numerous suppliers across the supply chain by implementing technology that will increase visibility into the supply chain (Savitz, 2012).
- **Greater need for higher quality faster -** A supply chain leader must have the knowledge to determine how their low cost bidder has the capabilities that they claim as well as the ability to deliver on time (Savitz, 2012).

Along with the aforementioned risks, there are other important risks associated with outsourcing some or all of a firm's activities. One of the greatest risks is cost. A supply chain leader must take into consideration the costs that can be incurred when making the decision to switch from internal sourcing to external sourcing. This cost can include "...supplier search, evaluation and contracting, the transfer of physical assets, domestic and international travel, and training the new source to ensure smooth transition and seamless integration" (Benton, 2014, p. 262). Dunn and Bradstreet found that 20%-25% of all outsourcing relationships fail within 2 years and almost half of all outsourcing relationships fail within five years of implementation. If the relationship fails, it is likely that the firm will incur significant cost with "re-internalizing" the outsourced activity.

Although a supply chain leader can do his or her best to mitigate risks, mitigating risks can still come at a price. "For example, increasing inventory mitigates the risk of delays, but increases the risk of obsolescence. Acquiring multiple suppliers mitigates the risk of disruption, but increases cost because each supplier may have difficulty achieving economies of scale" (Chopra, 2016, p. 147). It is important for the supply chain leader to find a way to develop a balance between the amount of mitigated risk and the increase in costs. A global supply chain strategy should be focused on lower costs and efficiency (Chopra, 2016, p. 147).

Another risk that must be considered by supply chain leaders concerns government and political risk. The supply chain leader must have a clear understanding of complying with "governmental laws, regulations, and local business customs. There can be a significant amount of cost associated incurred with legal expenses, lobbying efforts, travel, taxation, tariffs, local content obligations, quota systems, and so on" (Benton, 2014, p. 263). Identifying the underlying international location parameters usually requires personnel "on the ground" who have a complete understanding of the evolving environment. Some of the larger firms who have successfully implemented an external sourcing model have complete departments of personnel who are dedicated to assessing and managing the governmental and political factors around the world (Benton, 2016).

Supply Chain Leaders As Relationship Managers

Along with being able to assess the aforementioned risks, the supply chain leader must also be able to bridge the gap of cultural differences between the firm and the provider by being a relationship manager. Since cultural differences can have a negative impact on being able to control coordination functions, it is important for the supply chain leader to recognize

how individuals can be affected by organizational culture, professional culture, and religious culture (Benton, 275). It is the supply chain leader's responsibility to use their knowledge and understanding of the new culture to develop and maintain long-term relationships that have strong commitments from both parties. Part of this relationship involves successfully building trust between parties by being able to share and protect proprietary information. Being able to share information allows for effective planning and execution. It also includes sharing demand forecasts, detailed cost information, new product plans, and strategic changes (Benton, 2014, p. 272).

Part of managing the relationship also includes being able to work collaboratively. "Equitable distribution of pain and gain will ultimately lead to enhanced partnership performance" (Benton, 2014, p. 273). Implementing an effective procedure for communication can help alleviate any issues that may arise; however, it is the role of the supply chain leader to encourage and ensure that both parties are able to work through difficult situations in a constructive and productive way. "Collaborative communication was characterized as being formal, providing opportunities for feedback, and indirect influence (evaluation, certification, recognition, training, etc.)" (Benton, 2014, p. 273).

Conclusion

In conclusion, not all people are capable of being supply chain leaders. A supply chain leader must exhibit the qualities and attributes contained in this research while having the ability to wear many hats at one time. Being a supply chain leader is more than knowing how to run a firm and earn a profit. It includes in-sourcing and out-sourcing activities, effectively mitigating risks in decision making, and encouraging all parties within the supply chain to communicate effectively. As new technologies are embraced and supply chains continue to increase in complexity, even more may be expected of those leadership roles within supply chains.

Selecting the right talent to oversee the supply chain is pivotal in leading the modern supply chain. Supply chain leaders come in all forms. They can be company CEOs, team leads, factory workers, and managers. They must be able to lead teams, but also be able to learn and evaluate the supply chain. They must always be on top of and ahead of the supply chain game. Organizations need supply chain leaders who have a cross-functional understanding as well as a global understanding of the supply chain environment in order to successfully operate or manage a firm within and outside of the United States.

REFERENCES

Benton, W.C. (2014). *Supply chain focused manufacturing, planning, and control.* Stamford, CT: Cengage Learning.

Chopra, S., & Meindl, P. (2016). *Supply chain management: Strategy, planning, and operation* (6th ed.). Boston: Pearson.

Dittmann, P. (2012, March 15). Skills and competencies that supply chain professionals will need. Retrieved Feb-

ruary 19, 2016, from http://www.scmr.com/article/ skills_and_competencies_that_supply_chain_professi onals_will_need/

Gibson, B., Williams, Z., Goffnet, S., & Cook, R. (n.d.). SCM talent development: The acquire process. Retrieved March 03, 2016, from https://cscmp.org/sites/default/ files/user_uploads/resources/downloads/ talentacquireintro.pdf

O'Brien, P. (n.d.). Supply chain leaders of the future | Thought leadership | Russell Reynolds Associates. Retrieved February 19, 2016, from http:// www.russellreynolds.com/insights/thought-leadership/ supply-chain-leaders-of-the-future

Savitz, E. (2012, October 4). Managing the risks of a global- ized supply chain. Retrieved February 19, 2016, from http://www.forbes.com/sites/ciocentral/2012/10/04/ managing-the-risks-of-a-globalized-supply-chain/ #73b396f81d03

Stank, T.P., Dittmann, J.P., & Autry, C.W. (2011). The new supply chain agenda: A synopsis and directions for future research. *International Journal of Physical Dis- tribution & Logistics Management, 41*(10), 940-955.

Trebilcock, B. (2015, January 2). What does it take to remain a supply chain leader? Retrieved February 19, 2016, from http://www.supplychain247.com/article/ what_ does_it_take_to_remain_a_supply_chain_leader

Hyperloop Transportation: An Emerging Technology Analysis

Thomas B. Hanners
Management of Technology Major with a Minor in Logistics and Supply Chain Management

ABSTRACT

The Hyperloop system is a new potential mode of transportation that is not only gaining popularity, but is slowly becoming a reality. Several companies, as well as investors, have contributed a significant amount of work hours, energy, and money into the Hyperloop system within a very short time. The concept for this form of transportation is not new, but the technology to allow it to become a real form of transportation is. The Hyperloop system is gaining media attention and Elon Musk is helping lead those efforts. This research explores where the Hyperloop system currently stands, where it is going, and who is contributing to the effort. Furthermore, the Hyperloop's largest setbacks are discussed. Marketing strategies, as well as investment efforts, are evaluated. The Hyperloop system is still in the very early stages of development, but has the potential to revolutionize where and how we work and how products are shipped.

Hyperloop Transportation

Have you ever been stuck in a massive traffic jam and wondered if there will ever come a day the issue could possibly be resolved? With current infrastructures becoming older and less efficient due to population increases over the years, traffic will only continue to worsen. Elon Musk has taken an old concept and applied new technology to suggest a possible new method of transportation. This technology could potentially alter not only the way individuals commute, but also the way we live. The Hyperloop system is still currently in the developmental stages, but Musk is helping lead an aggressive path to have the first system introduced within the next decade. This paper will assess the Hyperloop system technology and discuss the business market and strategies.

Hyperloop Assessment

The Hyperloop system is an emerging technology in today's time that has the potential to reshape how the world transports people and products. An illustration of the system is shown in Figure 1. This technology will incorporate electric propulsion through a low-pressure tube which will glide at airline speeds for long distances due to ultra-low aerodynamic drag and a magnetic levitation system (Hyperloop One, 2017). The system will be fully autonomous, travel at speeds of 700 plus miles an hour, and have no at-grade crossing such as other modes of transportation or wildlife (Hyperloop One, 2017). This emerging technology has the potential to reshape how people commute to work, and in general. There will obviously be a significant amount of trial and error as well as testing performed before the Hyperloop system is available to the public for use.

Costs

The prices promised for Hyperloop travel appear to be reasonable, especially if it becomes a convenient form of transportation. From the early estimates, it seems as if it will cost roughly eight cents a mile. In comparison, traveling by air costs around twenty-eight cents per mile. The largest potential for error for companies right now is estimating how much this new
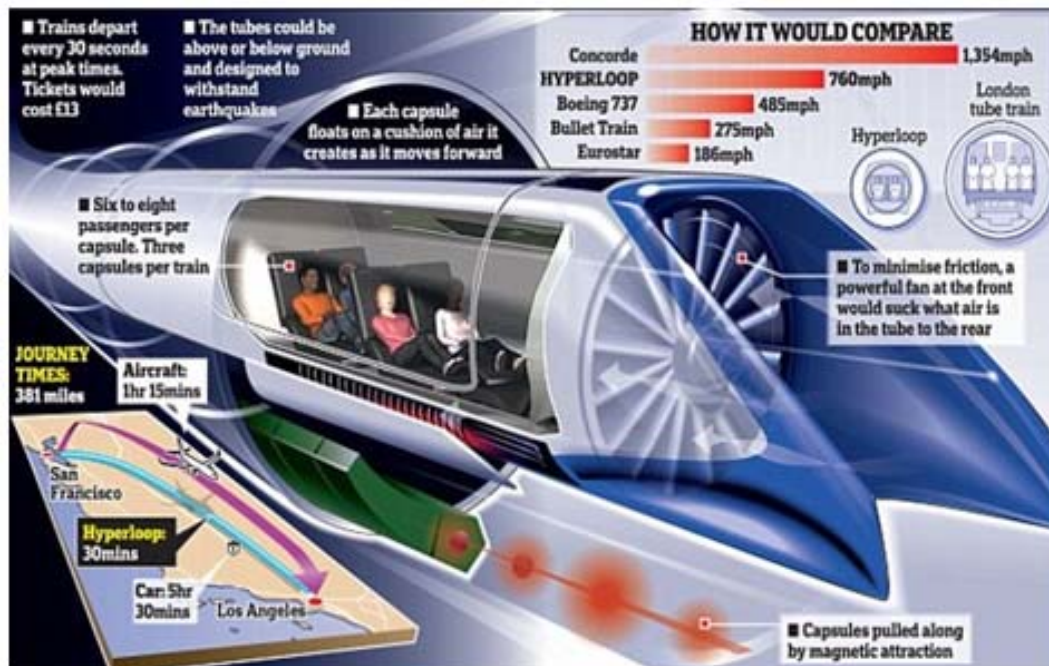

FIGURE 1—Overview of the Hyperloop System. This figure is from Victoria Woollaston (2015).

form of transportation will cost once it is established. With it still being in the beginning stages, companies are unaware of how much regulations will impact their overall costs. This may cause several companies that initially showed a lot of interest to become very reluctant to fully commit (Day & Shoemaker, 2000). The environmental as well as regulatory factors involved in the installation of a brand new form of transportation will be lengthy and expensive for the companies that initially develop real Hyperloop systems. This will cause a lot of the starter companies not to fully commit, but to hope that they are involved in the startup enough to remain as viable stakeholders and investors. A few other factors they must consider which can possibly hinder implementation and execution are: terrorism, expansion due to climate, weather, and the possibility of capsule failure (Follett, 2016).

Scope of the Hyperloop System

The scope of the Hyperloop structure will be evaluated by focusing on the target market, the target customer, and the potential boundaries they may need to expand. One of the goals of the Hyperloop system is to allow as many individuals as possible to travel at a much more affordable rate compared to current methods. They have plans to introduce this system by 2021 into three different locations and Hyperloop One has over 100 countries submitting applications (Hyperloop One, 2017). They also want to travel over long distances in short time frames compared to the current methods available. Another goal of the Hyperloop system is to attract companies in the logistics market by making the Hyperloop system available for shipping goods.

Currently, this technology is a latent need, because this form of transportation will be a completely new experience for the public. It will be accessible either through a subway system, at or near the interstate, or through a taxi service that will transport an individual to the closest station. Hyperloop's goal is to make their service as convenient as possible to the public which will allow people a new choice in rapid transportation to other areas with competitive pricing. This new form of transportation is aimed at giving commuters the option of working in cities that are hundreds of miles away from their homes. It will also provide customers an option to visit relatives out of state in a single day, or to make romantic arrangements for the evening at a favorite restaurant which is 400 miles away. The Hyperloop is currently a latent need for the commercial industry, as well, but will quickly become noticed if the service is as efficient as promised. They plan on shipping cargo for customers at over 700 miles an hour, but at very competitive rates compared to other modes of transportation (Jenkins, 2017). Companies such as Amazon and Walmart will be focused on the Hyperloop system's progression due to the opportunity to make same-day delivery an affordable and achievable option.

The engineering firms that are currently working on the Hyperloop system are promising that it will be a lot cheaper to build this form of transportation in comparison to the bullet train system currently in the works. A lot of critics have already expressed concerns that a new transportation system will cost a lot more than the Hyperloop teams are estimating. This is one area in which engineers, investors, and designers will have to expand their boundaries to keep from creating an "I told you so" situation. Although the critics are continuously pounding away at the cost impact of this system, the engineering firms as well as organizations involved in the development of the Hyperloop system are sticking with their current "affordable" estimates.

Technology Search

Since the Hyperloop system is a completely new technology, a majority of the technology information is currently evaluated from technical and trade literature. There is also a small portion that is currently affiliated with the government, but their role will continue to grow as regulations and permanent infrastructure is developed and installed for public use. Currently, some of the technology's information is obtainable through public licensors of technology as well. Companies such as Hyperloop One and Hyperloop Transportation Technologies are in a huge race to become the first company to successfully incorporate a functional model somewhere in the world. Since they both want to be the first, they must get substantial financial backing from investors that believe in their product and technology. For this to occur, they must make as much information as they possibly can public, not only to gain interest from investors, but also to educate the public who will be the ones purchasing the tickets for this new form of transportation.

They have laid out plans to effectively install a Hyperloop system by the year 2020, and have a lot of investors currently pouring money into their systems. They have promoted their models by holding public events that display their status as well as the rapid advancements they are making to perfect their models. For example, Hyperloop One recently released video footage of their latest successful run on the test track located in Nevada. Their top speed was 192 miles an hour during the test of the current XP-1 model they are using at the facility (Etherington, 2017).

Hyperloop Evaluation Process

The market risks associated with the Hyperloop system will be extremely high, initially, due to the technology and transportation system being so new. However, this has not detoured investors from pouring millions of dollars into the companies associated with the new technology. Hyperloop One just recently received another $85 million to bring the total to $245 million (Bhuiyan, 2017). Hyperloop Transportation Technologies has recently signed a deal with India to provide a route between the cities of Amaravati, and Vijayawada. It will be primarily funded by private sources, but the amount or the sources' names have not been revealed (Etherington, 2017).

The technology risks associated with this new technology are very high. This concept is not a new one, first being presented in 1910 as the vactrain concept; but technology and tooling have finally caught up with the idea (Lavrinc, 2013). Elon Musk has created a new company called The Boring Company that should help with one of the major obstacles lying in the way of reaching their seemingly impossible 2021 deadline. They plan on developing a new style of boring technology that could be up to ten times as fast as any current models and will build retaining walls as it tunnels through the earth (Bomey, 2017). This is another huge feat they will have to accomplish to reach their current goals. Even though it seems as if a Hyperloop system will be implemented in some country soon, the actual time it will take to finish is unknown. Another big technological risk involved with this concept is the safety concerns some scientists and engineers have with the system. Terrorism, earthquakes, and maintaining vacuum are three of the biggest concerns that critics have with this technology. Many critics claim that a system like this would be a prime target for terrorists who could easily shoot holes in the vacuum tube, ultimately causing mass casualties due to pods crashing into one another, or due to the instant pressure changes which

would destroy anything in its path (Follett, 2016).

The organizational risks associated with the Hyperloop technology are another daunting challenge for anyone associated with this dream. Companies have already started suing one another making claims that invested money is not being handled correctly. Death threats, demotions, resignations, and firings have all occurred due to this fallout. This has some investors obviously shaken and wondering if their money will be spent wisely (Davies, 2016). Even though they have already had their hiccups, there are plenty of organizations waiting in line to fill another group's spot. For instance, Hyperloop One's website states:

> You don't have to be a huge entity to enter and win—but huge entities are entering and planning to win. A diverse array of the world's biggest companies, governments and agencies have already registered. They include: Intel, AECOM, Gensler, Siemens, Google, Systra, Eventbrite, Korea National University of Transportation, NASA, State Bank of India, Connekt, State of Alaska, State of Colorado, Development Bank of South Africa, KPMG, Institute of Space Technology Pakistan, Ryder Architecture (Ubpin, 2017, para. 3).

This situation alone could potentially create risk. The time it could take to decide on with which companies to partner and move forward could potentially take a lot longer than anticipated for various reasons. Experience, money, depth, and even influence are only a few examples of how certain companies could be chosen to help with moving this technology forward.

Finally, for the Hyperloop system to be a success, numerous regulations will have to be put into place by several different agencies and departments. The list is so complex and diverse that it is difficult to explain; but some of the larger government agencies that will have to get on board and help in ironing out the technical difficulties associated with the transportation are: NSF, DOT, DOE, Homeland Security, EPA, and the GSA/land grants. Ironing out all the regulations could take years, unless the government comes up with a pardon like they did with the Space X program which would leave most of the details up to the private industry (Berger, 2017).

Hyperloop Commitment Postures

With the Hyperloop rapidly evolving, there are two key commitment postures that can be evaluated which can explain how the system has gotten to where it currently is. Elon Musk is not the owner of Hyperloop One, Hyperloop Transportation Technologies, or any other Hyperloop company, but he has put himself in a strategic position to learn. Elon Musk was the individual who brought this idea and technology to the forefront, and has helped any company involved with the Hyperloop by raising money to help fund their project. As mentioned earlier, he has created the Boring Company which will dig all the tunnels for the Hyperloop systems. Elon Musk has strategically positioned himself to not only be the liaison between the companies, but he has also created a situation where he can learn through other companies' tests, triumphs, and failures. This 'believe and lead' commitment posture has also been very strongly utilized during the early days of the Hyperloop evolution. This strategy is used by entrepreneurs with a gut feeling, "that even in the absence of signals of technological emergence or with only the weakest signal, a firm truly believes in the technology and leads the technical field and the market application" (Day & Schoemaker, 2000, p. 95). This causes an organization, a company leader, or an entrepreneur to "go out on a limb" *per se,* but with the potential of a successful outcome. Elon Musk has been fully committed to the technology and its development. Hyperloop One and HTT, which are currently the two leading companies in the upcoming industry, are also fully committed and it shows through the fierce competition, rapid technological advancements, and money raised from investors.

Current Hyperloop Governmental Role

Currently, this technology is still in the very early stages, so government agencies have not begun to get really involved with the process. Elon Musk made a statement via Twitter that they had received "verbal government approval" to begin developing the first route from New York to Washington, D.C. A verbal agreement may not be legally binding; but it is a start, nonetheless. Another big setback is that there will be many more agencies involved with getting the system put in place. Right of ways, land agreements, and regulations will vary from state to state which will require substantial paperwork and planning (Marshall, 2017). The government will eventually play a very beneficial role with the Hyperloop system by accepting the proposal, developing the regulations, and providing subsidiaries to help with the infrastructure expenses.

The local, state, and nationwide government structures could also become very harmful to the Hyperloop systems future. If one of the government agencies from any of the states or cities decides that the Hyperloop system is not for them, then it could potentially shut down the entire route. They would probably just attempt to find an alternate route, but there may not be another one that is practical or available due to natural barriers such as mountains, water, or government protected land. This could potentially stall plans for years until a resolution could be established to resume the route. This is a major fear of critics as well as the actual individuals, investors, and organizations behind the development of the Hyperloop, but fear is inevitably part of innovation.

If the Hyperloop system is implemented, there is a possibility that the government could become greedy and attempt to tax the form of transportation an excessive amount. This could cause the ticket sales to become significantly higher than planned which could potentially detour new and existing customers. The regulations that government agencies deem to be necessary for the safe operation of Hyperloop's systems could become overbearing for the young companies as well. Regulations and guidelines could cause a company to raise transportation prices due to consumer demand being low in the beginning and government expectations being high monetarily.

Customer Awareness

Target customers will become aware of the Hyperloop system once the first Hyperloop service has been placed online. This innovation will be so revolutionary, it will gain the attention of everyone in America and a lot of individuals around the world. The mainstream media, online affiliates, and other internet sources will voluntarily broadcast the Hyperloop system due to its popularity as well as potential to change transportation as we know it. For customers to fully understand the benefits of the Hyperloop service, promotional presentations for the public

will need to continue being used. Explaining to the public how this form of transportation will help alter how we will be able to travel long distances in a short time for a minimal cost, and how other items will be implemented, will be a key factor in selling the service. Safety concerns will need to be addressed and explained through transparency and promotional videos which display the overall success rate of the system versus risks and potential mistakes. Frequent updates as well as visual updates and even possible offers to tour a test site could possibly ease customers' concerns with the new technology's unknown risk factor.

Elon Musk has already been explaining to the public how he envisions this service will be incorporated with Tesla brand cars. One of the big merits that Musk has been attempting to sell is that the Hyperloop system will be able to transport you and your car anywhere you want to go (Hawkins, 2017). Eventually, customers will be able to enter a destination on their smart devices and a Tesla vehicle will pick them up from their location. It will then transport them to the closest Hyperloop station where the car will load itself into a Hyperloop pod. Once the passenger has arrived at his or her destination, the car will unload and finish driving the individual to his final location. This service could eventually allow individuals to work at a job that is multiple states away from his residence which is the biggest merit of all. These are just a few reasons why the Hyperloop system will become extremely popular if it does live up to its hype.

Hyperloop Market Management

Existing Barriers

There are multiple barriers currently in the way for the Hyperloop system that must be overcome before the system will be successful. This concept is very promising and one that has caught the attention of many investors, public figures, and even world leaders. The first barrier is getting the technology up to speed with the concept. For instance, the top speed any Hyperloop system has currently reached is 220 miles per hour (Muoio, 2017). That is a far stretch from the proposed 700 miles per hour it is supposed to maintain once in full production.

Another barrier that this technology is up against is proving it is safe enough for public transportation. As mentioned earlier, terrorist threats alone are a very big concern due to the overall design of the system. If a terrorist organization hits an airplane, or any other current mode of transportation, it typically affects the single source struck. If the Hyperloop system is attacked, it would potentially create the risk of catastrophic failure which would result in major casualties due to every pod in the system being at risk. This has individuals concerned with the overall integrity of the system. Even though there are a lot of individuals and organizations funding this new technology, there are just as many critics preaching Murphy's Law.

Market Strategy

To try and plan for the uncertainties that this technology will bring, several risk analyses as well as scenarios will need to be developed and evaluated. In the next section, two separate scenarios will be drawn up to consider the future of the Hyperloop system. Hypothetical assumptions will be made to create analyses to review which will help provide solutions to potential issues with slow or rapid growth. Table 1 provides a summary of the scenarios.

A Look into the Future. Year 2027 Scenario A.

In Scenario A, the Hyperloop system has exceeded the expectations of all the critics and has become a very popular form of transportation. Once the system was tested on a full-scale model to ensure the top speed was at a desirable rate and the overall safety met the minimum requirements, investors started pouring in money. This also caused a chain reaction within the mainstream and independent media which caused the public to become more aware of the upcoming technology. Once the public started inquiring about the system and voicing interest in it to come to their city, bidding wars began. Out of this rapid progression, two main business models rose to the top. The first was geared toward the public and the ability to work anywhere the Hyperloop system could transfer you. The second model was geared toward manufacturing organizations and the ability to expedite bulk products for the same price as standard shipping on other forms of transportation. Currently, they are working on the ability of cars driving into docking stations and loading themselves into a pod so one can travel with the car and have a no-hassle experience. This new technology is slowly but steadily becoming the top form of transportation in the world.

A Look into the Future. Year 2027 Scenario B.

In Scenario B, the Hyperloop is making progress, but it is taking a lot more time than Elon Musk and his teams anticipated. The Hyperloop is currently only available in larger cities in the United States as well as various points in the world such as Dubai. The technology has advanced and the Hyperloop system has met all its goals, but it took a few more years than anticipated. This caused customers and investors alike to worry about the future of the system. This also caused a lot of the system's critics to gain influential vantage points with concerns regarding the overall safety of the Hyperloop due to the delays. Currently, the only group that is using the service is millennials. Older individuals have been spooked by the delays and the critics' safety concerns. It does appear as if the market for the Hyperloop system is alive, but it will be on life support for a long time. Once the routes that are currently in place have successfully proven themselves, public interest as well as media coverage should become more positive. Table 1 provides a comparison of Scenarios A and B.

Investing for the Future

To support the Hyperloop system, venture capital funds will be established to let investors make suggestions and feel as if they are part of this new form of transportation. Angel investors will also be utilized during this phase to try and ensure there is a steady flow of fresh ideas (Day & Schoemaker, 2000). This approach will also be utilized for funding to help with not only establishing the Hyperloop system, but also to take an all hands on deck approach to help with expediting the new form of transportation. Technically, the Hyperloop system will be a "believe and lead" scenario from start to finish due to this form of transportation being new (Day & Schoemaker, 2000). Companies and individuals that are affiliated with the startup of the Hyperloop system must convince both big investors and angel investors to believe this new form of transportation will forever change the way people travel. The individuals that attempt to wait and see what will happen, potentially, could miss out on a big pay day if this form of transportation is

successful (Day & Schoemaker, 2000). The government will be fully receptive to the new form of transportation and will entice companies and investors alike by offering big tax incentives as well as awarding rights to the startup companies in relation to federal land passages and rights of way. Therefore, it is important for companies and investors to contribute early or miss their chance.

Rethinking the Organization

The Hyperloop system best aligns with the front-back organization due to the customers being placed in the front when considering the various factors involved with the system. "The front-back system is organized around customers in the front, with all company functions placed at the back to serve the front. The purpose is to provide customers with fast, responsive and customized solutions" (Day & Schoemaker, 2000, p. 388). By using the front-back system, customers can express their concerns, needs, and the things they like the most about the Hyperloop system freely and expect a prompt response. This will allow the design and engineering teams affiliated with

the Hyperloop systems to collect data from customers and address their needs by making changes or adding additional items they might request. As the Hyperloop system continues to grow and the design groups as well as investors continue to receive feedback from customers and other sources, the system will continue to gain popularity. As the overall use of the Hyperloop system continues to grow, manufacturers, designers, and engineering firms can start focusing on new routes and upcoming sites that will continue to propel the new form of transportation. The public sector will continue to benefit from the increase through lower prices and more affordable options due to overall revenue and from the business sector continuing to incorporate shipping into the system.

Conclusion

The Hyperloop system is still in the very early stages of development, but can essentially make a huge impact on the way the world operates. The end result of this new form of transportation could allow people to work in another state, not just another city, and still arrive home before dinner. Organiza-

Table 1—Hyperloop Future Potential Scenarios

Scenario Themes	Scenario A	Scenario B
Consumer Markets	The Hyperloop system has branched out to two main markets. Customers have the ability to work in other states, and manufacturing companies can ship goods overnight without excessive costs.	Only millennials are currently utilizing the technology due to the Hyperloop's slow start.
Technology	Hyperloop system exceeded expectations of critics and has become widely accepted. This form of transportation is rapidly growing and is expected to become the primary form of transportation for the public.	Hyperloop system has had a very slow start which spooked investors and caused critics to persuade the public. The form of transportation is growing, but at a very slow rate. It is currently only available in limited forms in a few larger cities.
Industry Leaders	Hyperloop system is now available to the public in many cities and various stops are available for travel options. Shipping costs have begun to decrease due to the uptick in companies using the Hyperloop system for their shipping needs.	The limited cities that are currently using the Hyperloop systems are seeing an increase in usage, but it is currently limited compared to traditional forms. Shipping is still very costly as well as limited due to the minimal choices of routes and most of the industry's energy is focused on persuading the public and their critics.
Business Models	New business models are fueled by media coverage and public interest. Currently the system is chosen one third of the time by consumers when traveling. Eventually, the form of transportation will evolve into consumers using the form two thirds of the time as trust and media coverage continue to grow.	Currently there is limited availability at higher rates due to the very slow start. Investors are not contributing on a scale that was forecasted, so new routes have been delayed. Current focus still remains on gaining trust from the public and eliminating critical reviews which are hampering growth.

tions that realize the power of the Hyperloop system when it comes to same-day delivery may reshape their industry by utilizing this method of transportation once it is available. This new form of transportation could help bring about the newest form of an industrial revolution through very fast travel times at extremely affordable costs. Currently, it is still up in the air as to whether this new form of travel will be successful, due to all of the hurdles it has to climb—technology advancements, investors believing in the technology, regulations, and government acceptance—just to name a few. This form of transportation may not be in the spotlight at the current moment, but as soon as the first route breaks ground, it could potentially forever change the way people live.

REFERENCES

Berger, E. (2017). SpaceX goes there—seeks government funds for deep space. Retrieved from https://arstechnica.com/science/2017/07/spacex-urges-lawmakers-to-commercialize-deep-space-exploration/

Bhuiyan, J. (2017). Hyperloop One raised an $85 million round at a valuation that tops $700 million. Retrieved from https://www.recode.net/2017/9/21/16344268/hyperloop-one-raised-85-million-tunnel-700-million-valuation

Bomey, N. (2017). How Elon Musk launched The Boring Company to revolutionize tunnel digging. Retrieved from https://www.cnbc.com/2017/08/03/elon-musk-launched-the-boring-company-to-revolutionize-tunnel-digging.html

Davies, A. (2016). This Hyperloop lawsuit is insane. Retrieved from https://www.wired.com/2016/07/hyperloop-lawsuit-brogan-bambrogan-shervin-pishevar/

Day, G.S., & Schoemaker, P. (2000). Wharton on managing emerging technologies. Hoboken, NJ: John Wiley & Sons.

Etherington, D. (2017). HTT signs agreement to develop a Hyperloop in India. Retrieved from https://techcrunch.com/2017/09/06/htt-signs-agreement-to-develop-a-hyperloop-in-india/

Etherington, D. (2017). Hyperloop One's full-scale pod reaches 192 mph in new Nevada track test. Retrieved from https://techcrunch.com/2017/08/02/hyperloop-ones-full-scale-pod-reaches-192-mph-in-new-nevada-track-test/

Follett, A. (2016). Scientist lays out 5 huge problems with Elon Musk's Hyperloop. Retrieved from http://dailycaller.com/2016/07/26/scientist-lays-out-5-huge-problems-with-elon-musks-hyperloop-video/

Hawkins, A.J. (2017). Hyperloop One wants to help your self-driving car go the speed of sound. Retrieved from https://www.theverge.com/2017/1/23/14314986/hyperloop-one-self-driving-car-global-challenge-nevada-test

Hyperloop One. (2016). Retrieved from https://hyperloop-one.com/fact-sheet-and-faq

Jenkins, A. (2017). Hyperloop One is a step closer to reinventing transportation as we know it. Retrieved from http://fortune.com/2017/07/13/hyperloop-one-test-nevada/

Lavrinc, D. (2013). Elon Musk thinks he can get you from NY to LA in 45 minutes. Retrieved from http://www.cnn.com/2013/08/12/tech/innovation/elon-musk-tube-hyperloop/index.html

Marshall, A. (2017). Oh, Elon. Building infrastructure for the Hyperloop doesn't work like that. Retrieved from https://www.wired.com/story/infrastructure-hyperloop-nope/

Muoio, D. (2017). Tesla's Hyperloop pod just set a speed record of 220 mph. Retrieved from http://www.businessinsider.com/tesla-hyperloop-pod-speed-record-2017-8

Ubpin, B. (2017). Nine things to know about the Hyperloop One global challenge. Retrieved from https://hyperloop-one.com/blog/nine-things-to-know-hyperloop-one-global-challenge

Global Manufacturing: Affected by Capitalistic Trade Agreements

Zachariah W. Lowery
Global Logistics and Supply Chain Management Major
Cynthia R. Lovelace, Ph.D.
Assistant Professor of Logistics

ABSTRACT

This paper will discuss government intervention policies as well as particular economic approaches related to various economic and trade partnerships. An examination of the effects of these policies on the performance of global supply chains will provide insights into whether other policy solutions, which may help the U.S. remain relevant and competitive in a global manufacturing environment, should be pursued. From the North American Free-Trade Agreement (NAFTA) negotiated in 1988, to the current Trans-Pacific Partnership (TPP), the U.S. has participated in foreign trade deals negotiated through executive oversight action afforded by the Trade Promotion Authority (TPA). In recent years, it could be argued that U.S. presidents have used their fast-track authority to negotiate trade deals which resulted in adversarial effects regarding the interest of the general masses. At present, the global economic stage has shifted from the Western world toward countries like China, South Korea, Malaysia, India, and other Pacific Rim nations. As global manufacturing shifts to these countries, U.S. citizens should reconsider the method with which the U.S. enters trade agreements with foreign nations. The full economic impact of the new Trans-Pacific Partnership trade agreement should be carefully considered so that no oversight is made. A bi-partisan approach to this trade agreement should include research into the shifting economics of global manufacturing, since they are affected by this trade agreement.

Introduction

Asian countries are liberalizing economically and this could be a sign that their governing authorities are shifting toward more open discussions. The effects of this liberalization are changing the landscape of global economies. Market transformations will only intensify as these governments begin listening to policy suggestions from special interest and capitalists alike. All of this is coming at a time in history when the world is indeed flattening in terms of trade agreements and other logistical barriers. Large countries like China have now taken the position of adopting capitalism as an economic model, and the global markets are responding in a significant way. These responses are resulting in even further liberalization as shown by the increase in Pacific Rim countries engaged in negotiating with Western countries. One example that has likely brought China and other players to the negotiation table is that provided by European and Japanese manufacturing corporations. These European and Japanese manufacturers are being attracted to the U.S. because of its skilled labor, solid energy infrastructure, proper rule of law, and vast consumer base. These calculated benefits are paying dividends for these foreign countries and companies. However, those foreign companies and economies are not the only ones benefiting. The U.S. has also benefited immensely from trade with many of these countries. Is it possible that these same U.S. benefits can be realized in increasing measure as we negotiate new deals with other Asian and Indian countries? Not so fast. A similar outcome may not be so likely, as noted by Noah Smith of Stony Brook University (2016).

> In particular, the U.S. benefits enormously from trade with rich countries like Japan and Europe, which have wage levels comparable to the U.S.'s. These countries don't put U.S. workers out of jobs; instead, trading with them simply creates work for Americans and allows the U.S. to buy a wider variety of products (Smith, p. 1).

While historical data has proven success rates for free trade with those wealthier countries like Germany and Japan, Chinese trade agreements and negotiation benefits may not do the same. The range of benefits may not be so great, according to Smith (2016):

> China is probably a special case because of its undervalued exchange rate, heavy government promotion of exports, very low income and enormous size. It presents U.S. workers with a challenge unlike any they faced from Japan, Europe, or even Southeast Asia (Smith, p. 1).

Therefore, the U.S. level of free trade with China and other Pacific Rim countries should be a calculated decision based on many anticipatory discussions. The full disclosure of effects regarding the American people should also be determined and conveyed freely. As previously mentioned, these countries are now open to trade negotiations that at one time were not an option. It would be foolish to ignore negotiations with these powerhouse global economic players. After all, it is believed that by 2025, China and India will be poised to dominate the global market with their purchasing power. This is evidenced by the realization that 80 percent of Wal-Mart's 5,000 suppliers are from China (Steingart, 2008, p. 145). However, it would be equally foolish to rush into a deal without knowing the full ramifications of every detail. Intellectually wise trade agreements must be reached by the U.S. if it intends to remain relevant and competitive in a global manufacturing environment.

Capitalism: A Closer Look

Perhaps a look into capitalism itself will provide some insight as to what to expect as the markets globalize. After all, capitalism is the driving force behind the globalization of manufacturing and free trade. From the perspective of capitalists, more trade options will only open the door for more liberalization of economic partnerships. At the same time, Capitalists, by definition, will always invest capital where return on investment is

highest. Democratic processes and social achievements are hardly at the forefront of the Capitalists' vision. This is not to say Capitalists are at fault for social problems. Conversely, it is to state that the very nature of the Capitalist is simply but unequivocally to create more capital. In fact, it is this very capital that makes all of this globalization of manufacturing and our benefit of consumption even possible. Therefore, as Steingart suggests in his book *The War for Wealth* (2008), Capitalists have no choice but to take full advantage of a vast supply of low-wage workers. He also notes that the jobs will follow the capitalists as they invest around the world. "They leave the West and pop up elsewhere. They surface in an Indian software company, or we encounter them in a Hungarian toy factory or a Chinese engine assembly plant" (Steingart, 2008, p. 5). While the location and method of process may change, the result is exactly the same every time. Capitalism will have generated more wealth for itself by the end of the globalization process. This is a deeply rooted fact of the capitalistic framework, and America is not immune to its constant shifting investment methods. Just look back at the history of the industrial revolution that exploded in the Western world (Steingart, 2008).

> Thirty-five percent of the American workforce worked in industry in the 1950s. By the 1960s, that number had dropped to 32 percent, and in the 1980s it slid below 20 percent. Today less than 15 percent of American workers are employed in industry, a 50 percent decline within a single generation (Steingart, 2008, p. 146).

The industry revolution may be better viewed as a blip on the radar rather than a revolution in terms of the current globalization trends. Furthermore, it could be that the very framework of capitalism and the ideology associated with a responsibility for social welfare can never economically coincide in a democracy. The American welfare state could be one reason behind the push of capitalism to return to its roots. As noted by Steingart (2008), "American made goods come with a built-in markup for a welfare state. With the help of a global labor and financial market, capitalism has regained its former brutality" (Steingart, 2008, p. 153). If so, what effects will this have on the future of globalization? Is the American ideal for social justice the driving factor behind the leaking of capital to offshore markets; or is capitalism just following the basic principles that it has since the beginning? This debate is one that will likely not be fully decided until history plays out. It will be one that is read about by the historians of tomorrow as they look back on Western theology and how American civilization changed the rest of the world.

Big Government's Role in Economics

As previously mentioned, the roles of government in economic policies have major effects on the outcomes of market progression. Trade deals, in particular, have the potential to direct an economic outcome one way or another. The effects expected by each agreement are not always apparent and may turn out differently in real practice. For this reason, it is important for effective research models to play a key role in all trade negotia-tions. The current model that has been used by the U.S. to negotiate with foreign countries for over 30 years is called the Trade Promotion Authority (TPA). Often referred to as fast-track authority, the TPA is the result of a need for swift action regarding a very complex process. Fast-track authority gives the executive branch of the U.S. government the ability to fully negotiate foreign trade agreements without any involvement from congressional leadership until a final vote is administered without the possibility of amendment (Trade, 2016, p. 1). For this reason, the fast-track authority recently has been regarded as a controversial topic. A new approach to how these agreements are reached is a hotly debated topic. In order to reach a solution, it is important that the proper amount of time is spent researching various outcomes. The outcomes of all past trade agreements should be researched and monitored for further understanding. By looking into past trade deals, research correlating directly with government size and trade deal outcomes would be of interest. The result of trade openness and government size has successfully been related. By looking at capital to labor ratios, specific outcomes may be predicted. As noted by Ariwatari (2015),

> If the trade partner is more labor abundant than the home country, the start of trade lowers the wage-rental ratio and increases the income inequality in the home country. Therefore, the government size that is determined by voting increases. In contrast, if the trade partner is more capital abundant than the home country, the start of trade raises the wage-rental ratio and lowers the income inequality in the home country. Therefore, government size as determined by voting decreases (Ariwatari, 2015, p. 27).

As noted, when trade agreements between two governments have been reached, the likely outcome will directly affect the size of the government in the future, as well as the labor wages of the people within each country. Ariwatari (2015) describes a theoretical model that can provide understanding into the likely results of such negotiations.

> This model is the first attempt to present both positive and negative relationships between trade openness and government size in the political economy framework. Further empirical research based on the results of the model would clarify the relationship between trade openness and government size (Arawatari, 2015, p. 27).

Furthermore, the relationship between trade openness and government size can have a direct effect on the stabilization of markets to slow capital flight. There have been times in history where government intervention regarding market turmoil has proven effective to maintain capital flight. One example is the collapse of Lehman Brothers in September 2008. Although a direct correlation would appear to exist between institutions, it appears that the role of government has a greater effect on the behavior of portfolio investors. This is outlined further by Pepinski's findings (2014).

These findings are revealing. There is no evidence that countries with better institutions—those with more (or less) democratic, more (or less) constrained or more accountable political systems—experienced lower net capital flight after Lehman. My results show that governance, rather than institutions, affects portfolio investors' behavior during the Global Economic Crisis (Pepinski, 2014, p. 26).

There are certainly times when government intervention has a positive result on market turmoil. So, do those results translate from the proven slowing of capital flight during turmoil to the slowing of capital flight during globalization progression through trade negotiation? This question may not be as easily determined in a multi-capitalistic and global environment. For this reason, the fast-track authority (TPA) may not be a solution to maintaining competitiveness in a globalizing manufacture market after all. More research into the shifting economics of global manufacturing and how governmental policies maintain control will certainly help bring the picture into focus (Sirken, Zinser, & Rose, 2014). At this point, it is helpful to consider some of the other possible alternatives to the TPA and fast-track authority in the best interest of the American working class.

Exploring Alternative Negotiation Methods

Based on the effects of capitalism on the globalization of supply chain economies, it is important to address the issue of American competitiveness in a global manufacturing environment. The following four recommendations are proposed to address this issue and keep America competitive. First it is important to address the core issue of the current policy in place. Fast-track authority is designed to give the executive branch of the U.S. government the ability to negotiate free trade agreements with no restrictions. While this may be a flexible method that allows our government to react rapidly to a complex situation, it may leave the best interests of the American public in limbo. One possible solution is to replace the executive branch bargaining team with a team of delegates that are elected as trade negotiators solution. These trade negotiators should be highly educated in the area of foreign trade. Secondly, a policy commission made up of Congressional members should be given the responsibility to examine ongoing trade architecture and provide recommendations for practical use (Swire, 2016). Thirdly, smarter anti-dumping duties based on effective methods from historical research should be the responsibility of the trade negotiators. The anti-dumping duties should only remain effective if the intended goal is made open and clear. There have been instances where tariffs and duties have been implemented that contradicted their intended purpose. It is imperative that smarter anti-dumping practices are put in place. For example, as Shen says (2014) in regard to Chinese imports in the last decade, "As a result, if the decrease in imports from China is completely offset by the increase in imports of non-named countries, the single petition policy cannot help the U.S. substitute imports with domestic production" (Shen, 2014, p. 37). Therefore, it is important to maintain control of such duties in a more intelligent manner. Also noted by Shen (2014),

A definitive anti-dumping duty from a multiple petition creates a larger destructive effect on U.S. imports from China. The Chinese government and compa-

nies should be made aware of this effect and develop effective strategies to respond to this challenge, including the establishment of a national AD precaution information centre and the possible international collaboration with other targeted countries (Shen, 2014, p. 37).

Lastly, fast-track authority as currently given to the executive branch should remain an option only in the case of global economic turmoil. As previously discussed, executive actions from big governments have been effective in calming certain types of economic turmoil in the past (Pepinski, 2014). In the case of fast-track authority, it should only be given by a democratic vote aided by Congress, to prove that the U.S. is indeed in a crisis situation necessitating the limited granting of power.

Conclusion

In conclusion, economic and trade partnerships, as decided by the government, have major long term effects on working-class citizens. The responsibility to negotiate open free trade agreements is not one that should be taken lightly by the American people. Due to the complex nature of such agreements, it is common for many deals to pass into law through what is known as fast-track authority. Fast-track authority should be utilized only in the case of global market turmoil. Because of the nature of capital framework, a constantly shifting landscape can be expected in the future as these investments seek additional capital gains. Along with the shifting of these markets, the way future trade agreements are negotiated must shift as well. The globalization of the manufacturing sector has exploded in places like China, thus creating the need for smarter trade deals moving forward. If America wants to remain on the main stage of economic power, a new trade agreement must be reached in Asia, India, and Pacific Rim countries. The Trans-Pacific Partnership is so important for the future of America that a fast-track method of negotiation and approval is not in the best interest of the American working class. The line of reasoning presented here highlights the need for additional research in the area of how the shifting economics of global manufacturing are affected by each and every trade agreement.

REFERENCES

Arawatari, R. (2015). Political economy of trade openness and government size. *Economics & Politics, 27*(1), 28-52. doi:10.1111/ecpo.12049

Pepinsky, T.B. (2014). The politics of capital flight in the global economic crisis. *Economics & Politics, 26*(3), 431-456. doi:10.1111/ecpo.12042

Shen, G., & Fu, X. (2014). The trade effects of U.S. anti-dumping actions against China: Post WTO entry. *World Economy, 37*(1), 86-105. doi:10.1111/twec.12125

Sirkin, H.L., Zinser, M., & Rose, J. (2014, August 19). The shifting economics of global manufacturing. Retrieved April 24, 2016 from https://www.bcgperspectives.com/content/articles/lean_manufacturing_globalization_shifting_economics_global_manufacturing/

Smith, N. (2016). Hey, Bernie Sanders, trade isn't all bad. Retrieved March 10, 2016, from http://www.bloombergview.com/articles/ 2016-03-06/sanders-fails-to-recognize-that-some-trade-is-good

Steingart, G. (2008). *The war for wealth: The true story of globalization, or why the flat world is broken.* New York: McGraw-Hill.

Swire, M. (2016, March 22). Tax-News.com. Retrieved March 23, 2016, from http://www.tax-news.com/news/Policy_Commission_ To_Advise_On_AsiaPacific_Trade_Treaty_70767.htm1#sthash.xBgLuQzA.dpuf

Trade Promotion Authority | United States Trade Representative. (n.d.) Retrieved March 12, 2016, from https://ustr.gov/trade-topics/trade-promotion-authority#

Implementing an IOT System

David Currier
Global Logistics and Supply Chain Management Major
Cynthia R. Lovelace, Ph.D.
Assistant Professor of Logistics

ABSTRACT

Businesses are relying on data streams for their informed decisions. IoT (Internet of Things) systems are helping move large amounts of data between companies to help make the production of items faster and cheaper. It is becoming necessary to share data that is stored and viewed within a company so that the entire supply chain can make the process easier and more profitable. This research is designed to help understand the importance of implementing an IoT system and to show certain limitations that will be encountered. The changing landscape is not asking the question of why a company should implement an IoT system, but when. This paper will clarify that the time to do so is now.

What Is an IoT System?

A supply-chain is a complex tapestry of companies and parts that fit together for the purpose of getting the consumer what they want. This complexity can lead to miscommunication and misunderstanding if the information gathered between the points of the chain is not shared for the benefit of the whole chain. Today's systems are more advanced and capable than those of a decade ago. If the businesses that appeared ten years ago were successful with the limited systems they had then, what would stop a business or a supply-chain from being even more successful now? Companies are becoming dependent on those systems as they have proven their usefulness and are looking into implementing them even further down the supply-chain. These systems that bring the full knowledge of what is happening all along the supply-chain are called Internet of Things systems (IoT systems). These systems combine hardware and software to share the information amongst the other companies that are involved in the supply-chain. As an article in Biztech puts it, "IoT is a network of devices which communicates among itself using IP connectivity without human interference. This ecosystem includes intelligent systems, network equipment, connectivity services and data integration" (Biztech, 2014, p. 1). Implementing these systems is imperative, as they send the vital information of the chain and the important processes of a company to the rest of the companies involved in the chain. The IoT system is quickly becoming a requisite in the world of business because, without it, companies cannot be successful.

Importance to Customers

The importance of these systems starts with the end of the supply-chain and it falls into the category of customer satisfaction. The importance of having IoT systems is to ensure the efficient and rapid reception of a product by the consumer. As was pointed out in conjunction with drones and deliveries, Adam Robinson wrote that IoT systems can, "ensure the proper packages are delivered on time and the connected items can automatically generate notifications to customers and suppliers, and the entire process can grow more accurate" (Robinson, 2016). Interestingly enough, "IoT as it stands today is predominantly consumer led, and the sectors that can envisage value are those such as healthcare, retail, manufacturing and construction. These are industries that are looking to revolutionize their customer interaction experience—they are considering how the IoT can enhance the services they provide to their customers" (Tay, 2016). Along the chain, there are certain points that the product must meet to continue along its path to the consumer. The IoT system is a repository of information that is seen by all those involved in the production and transportation process. The system is designed to locate a certain product that the customer wants, start the production of said product, or to replenish the product for the next customer. This is done by the system's ability to communicate with each company that is involved. When the whole of the chain is interested in providing the customer with immediate satisfaction, the end result is a satisfied customer.

Importance to Supply-Chain

With the satisfaction of customers, the system and the processes associated with the production of an item are said to be functional. This is said to be a success in the world of business. The IoT systems are designed to take the successes of customer satisfaction and to disperse this knowledge in the form of information pertinent to each company's involvement in the chain. With this information, the IoT system will be able to give numerical data that can be studied to find faster and even more efficient and effective ways to carry on their duties within the supply-chain. The systems process these changes to efficiency and are able to give projections and show trends with all of the information gathered. With these types of tools at the company's disposal, managers are able to make informed decisions on what to carry for the customers as well as what to produce. The end goal of a company is to make money and be profitable. The IoT systems that are available are helpful as the focus of the supply-chain is the movement of the product from one end to the other. This makes transportation the driving factor for IoT implementation. With an IoT system, companies will now be able to see what is going on and be able to make in-transit changes so that delays can be avoided. In-transit visibility gives the other partnered companies assurance that materials are on their way.

Importance to Sales

Implementing an IoT system does not only affect the sales aspect of the chain. It affects how the companies within the supply-chain operate. This inflow of data from the system can help the players within the chain make valuable inter-business goals and contracts. Making lucrative contracts between companies helps to insure an income stream for the companies involved and helps them to develop new ideas that would be mutually beneficial. Having multiple companies from within the supply-chain look at chain-wide problems will help when they are all working toward a solution as more feedback is helpful. "IoT can help organizations utilize their business infrastructure and assets in innovative ways to offer new services and deliver additional revenue. Moreover, deriving meaningful information from the huge volumes of data that IoT produces can improve decision-making and enable proactive, predictive insights" (Reddy, 2014).

Numbers Efficiency

IoT systems can be used in a variety of ways to help improve a multitude of areas within the supply-chain. The first way that the supply-chain can be affected is in the area of number efficacy. These systems are made to store massive amounts of data from beginning to end in the supply-chain. The numbers that are stored are those that the company feels are important to its success and progress. This data will range from inventory and sales to technical specifics as the product is being made. These data bundles are drivers in the decisions of the company as they show the management and leadership of the company just how the product is coming to be within their organization. Numbers will also come from the end of the supply-chain in the form of sales, inventory levels, orders made and orders to be filled. The numbers can be viewed in great detail so that trends can be spotted.

Process Efficiency

With the influx of data, a company can view what is beneficial or damaging so that better executive decisions can be made. As the base word for executive is "execute," these decisions will affect the processes of the company in many different ways. Companies have multiple ways of looking at problems, but might have the same idea of how to handle them. IoT systems provide data that "not only helps to substantiate or debunk conventional wisdom, but also prompts others to create similar data" (Affelt, 2016). If sales are bad at the end of the chain, then cost saving decisions could be made within the line in the form of searching for cheaper materials, layoffs, and efficient monitoring of the automated systems. If a robotic arm can have its work points narrowed from twelve movements per part to ten, for example, then this would be considered.

The processes can also be influenced in positive ways such as green initiatives, more involvement in the Research and Development side, better materials, and even higher safety measures. Dave Meyer, a senior consultant at Environmental and Occupational Risk Management Inc., stated "another potential benefit of the IoT lies in linking equipment sensors to incident response systems, enabling companies to avoid releasing excess pollutants into the air or disposing of too much wastewater" (Kontzer, 2016). The biggest savings for the company would be the waste that is present within the company's processes. Having the IoT system locate the waste that is happening in the company can help the management make easy decisions to fine tune the production cycle and process of their product.

Communication Efficiency

The next way that the IoT systems help a company is with communication. The IoT system is designed to be used by all the companies within the supply-chain to collaborate more closely so that the chain as a whole is much more productive and profitable. "A question seldom investigated by small and mid-sized manufacturers is: What is the cost of the required communications? The paperwork and communication data is a big deal because large customers are bureaucratic and demand enormous documentation. The cost to sell and support these type customers require sizable indirect investments in staff and systems, and the supplier company must absorb the costs" (Collins, 2008). These systems are helpful in communicating problems or hold ups in the chain as well as successes that are happening.

One of the best communicators involved in IoT is GPS monitoring. This allows the supply chain to know where parts and materials are or where they are headed. "With IoT logistics, tracking and tracing goods becomes faster, more accurate, predictive and secure; while analytics from a connected fleet can predict future asset failure and schedule maintenance checks automatically" (Wollenhaupt, 2016). When communication is happening, the whole work flow is smoother and easier to manage than one that is fraught with constant breakdowns in communication and product manufacturing.

Implementation

As the IoT system is made specifically to bring to light all knowledge available from a company for the entire supply-chain, implementation of this system is of utmost importance as it will influence and affect the entire chain. The first portion of implementation is the understanding of what is to be implemented and why. Training is vital as the system is only as efficient as those running it and maintaining it. Implementation starts with planning and then spreads to the purchase of all hardware and software needed. As a company upgrades its systems, all involved in the supply-chain are also notified so that they can compensate for the information changes that are to come. Collaborating companies will have access to each other's information as well as to new bits of informative data and trends. With the collaboration of companies, a review of what is to be implemented will be a necessity. The companies will have to meet to ascertain the spectrum of new data bits that will be shared as well as negotiate the extent of the data to be shared. The entirety of the supply-chain should be involved in some way with the input of all companies to determine what shared data can be beneficial. Also, the security of the system should be discussed to guarantee protection for all companies. After these decisions have been made, testing is needed so that compatibility of the different systems is ensured so that the agreed data can be shared. Once discussed, tested and implemented, the due diligence of each part of the supply chain is then required.

Affecting Customers

The increased efficiency to the supply-chain will affect the consumer first and foremost. The supply-chain will become more effective in sending and ensuring that the product that was ordered is received by the consumer. The consumer will be

able to see changes in the speed of deliveries, the variety in what can be ordered, as well as see the chain at work through product monitoring during delivery. Consumers have a sense of ease when they know where their product is in the available network. This type of knowledge can also affect the consumer in a negative way if the supply chain is experiencing some problems with their deliveries. If the consumer is impatient in waiting as they locate and track their order, then negative ratings will ensue. This negative side also will be affected if the chain does not do due diligence in keeping specialty items readily available for the consumer without having to wait. As Mike McMurray, SVP of Marketing and Business Operations at Pointe Inside said, "You need to make sure that you are delivering the right message to consumers and are nurturing relationships. It's all about context. And if you have the right data, you can provide that context" (RTP, 2016).

Affecting Partners

With the focus being on customer satisfaction, the companies will then turn attention to their partners. The combined effort of the whole chain is what causes triumphs to happen instead of failures. Collaboration between the organizations will cause that information to be shared, and with the new information, new ideas and concepts can be imagined. "Boston and Los Angeles, for instance, forged data-sharing partnerships with traffic app Waze to better understand their roadways and to offer citizens new services from the city and company alike" (Wood, 2015). The partnerships within the chain will be forged into strong links that will work well with one another and will be able to depend on the other companies to work with them even in difficult situations. Partnerships will cause that new information to be shared, therefore new ideas can be implemented between partners. The learning from one another due to this data interchange can aid supply-chains to become versatile and fluid in making needed changes.

Affecting the Company

The only way to describe how the IoT system affects the company is the way Fritz put it: "In order to keep up with the rapid progression toward supply chain precision by business-to-consumer giants like Amazon and Zappos, mid-market companies need to shake off the dust from last decade's recession, and re-evaluate their technology capabilities and shortcomings. Advances in supply-chain tools and solution delivery now make the decision to upgrade far more affordable and far less disruptive than ever before" (Fritz, 2014). The previous statement rings clear as the ability to either implement new or to upgrade existing IoT systems has become more available. The companies that are able to implement and to maintain these systems are seeing conventional ideas and abilities become more of an afterthought as new information is leading the way for change. The company that is flexible and versatile will have the competitive advantage in the world market. With the ability to see numbers on a daily basis, and to gather pertinent information concerning sales, the company will be able to maximize profits and to maneuver its way into greater market shares within the industry. In conjunction with how IoT will affect the company, Raj Badarinath said, "Revenue will not come from the hardware, but instead from services on top." He goes on to state that the problem with this service-centric environment is that smaller businesses will struggle to find the best strategy to charge customers for value in a transparent and secure manner (Fallon, 2014). With these types of changes, the company will be affected by its pricing to the consumer

and how it will deal with these increases in its sales. The company will also be affected in how it runs its organization as these changes are made.

Who Would Supply the System

The great thing about IoT systems is that technology has come a long way from where it started. With that distance, affordability has also crept into the picture. The first part of knowing who would provide the system is to first compare who is in the market. With the growth of internet and computing based companies, the pool to choose from has also increased. The larger providers are from a list of well-known companies. These names include Amazon, Google, Microsoft, AT&T, and Allerin. As in Amazon's case, they are even providing IoT to their competition. Amazon knows that the shift to have an IoT is imminent, and if these companies are going to get it, then Amazon might as well be the one to supply and get the profits from it. This gives them a leg up on competition. The AWS (Amazon Web Service) is the leading provider of IoT and is not slowing down. As of 2013, "Amazon Web Services accounted for 37% of the $9 billion infrastructure as a service (IaaS), according to analysts from equity research firm Evercore. The IaaS market is growing by 45%, but Amazon has a growth rate of 60%" (D'onfro, 2014). This growth rate for the market has continued. Choosing between providers is not a difficult decision anymore as there are multiple providers now. These companies are looking into what would be more inviting with value-added services so that they might be able to earn more users and clients of their system.

What Are the Limitations

The competition is getting numerous enough that each company has to give reasons and incentives to be picked as providers. As technology is not perfect, there are current limitations with IoT systems. These limitations are not only from the computers that the companies work with, but also the people that use them and work on them. System limitations by way of the hardware and software are caused by the computers that companies use, as they are not capable of holding such vast amounts of data or are not able to process the data. It could also be caused by the software not being compatible with the other systems of partner companies within the chain. "The practical realization of IoT requires the development of a number of new versions of platforms and technologies including device and process identification and tracking, sensing and actuation, communication, computational sensing, semantic knowledge processing, coordinated and distributed control and behavioral, traffic, and user modeling. The realization of IoT subsystems will be subjected to numerous constraints that include cost, power, energy, and lifetime. However, there is a wide consensus that the most challenging of requirements will be security" (Xu, Wendt, & Potkonjak, 2014). Another limitation is the data that is shared. Companies have their trade secrets. This information is classified to the company and is not open to the entire chain. Each company will have its own idea of what needs to be classified and this will vary from company to company. With certain data, other companies may have a better picture of what can and needs to be changed or done. If a company is not willing to share that "grey area" data, then it could cause the entire supply-chain to be less effective, or worse, be detrimental to the chain. The efficiency of the supply-chain is based on how trusting the chains' companies are in sharing their data.

Conclusion

The idea of an all-inclusive system that will help the product move quicker and more efficiently is materialized in the IoT system. Companies of all sizes are implementing these systems so that they can keep up with the rapidly changing technology. These systems are important because they keep the customer informed and satisfied as to the speed of their purchase. They help the entire supply-chain by keeping the information between partners flowing, and help the companies' ability to be versatile in the changing business world and make more efficient changes, if needed. Given these points, it is clear that IoT systems are important because they make the company more profitable. As there are many companies that are offering IoT services, the ability to implement these systems is easier than ever. These systems receive and process high volumes of data used in the manufacturing and transportation of goods and can be used to make efficient changes to perfect these processes. As there are limitations on these systems due to provided data and employee imperfections, companies will have to make the upkeep of the system and the training of the employees involved with the system a high priority. The biggest concern for the companies is the security of the data that is stored and shared. Having all employees exert due diligence will lessen the probability of data breaches and keep the entire chain at ease. Implementing the IoT system will involve the company in the data streams of the current technological era and will help usher in the ability to keep pace with what is to come.

REFERENCES

Affelt, A. (2016). The rise of the IoT and the impact on content. *Econtent, 39*(4), 26.

Biztech. (2014). Indian government plans to offer incentives to IoT startups. Retrieved from: http://www.firstpost.com/business/govern- ment-plans-offer -incentives-iot-startups-2195658.html

Collins, M. (2008). Supply chain partnerships or supply chain management? Retrieved from: http://www.manufacturing.net/article/2008/06/supply-chain-partnerships-or-supply-chain-management

D'Onfro, J. (June 6, 2014). Here's a reminder just how massive Amazon's web services business is. Retrieved from: http://www.businessinsider.com/amazon-web-services-market-share-2014-6

Fallon, N. (2014). Internet of things: How businesses can prepare and adapt. *Business News Daily.* Retrieved from: http://www.businessnewsdaily.com/6844-internet-of-things-businesses.html

Fritz, D. (2014). Three technology upgrades that your supply chain should implement. Retrieved from: http://www.sdcexec.com/articles.11572627/the-cloud-information-storage-and-distribution-channel-may-soon-control-workflow-for-nearly-half-of-the-worlds-supply-chains

Kontzer, T. (2016). IoT's supply chain benefits becoming clearer. Retrieved from: http://searchmanufacturingerp.techtarget.com/feature/IoTs-supply-chain-benefits-becoming-clearer

Reddy, A. (2014). Reaping the benefits of the Internet of Things. *Cognizant Reports.* Retrieved from: https://www.cognizant.com/InsightsWhitepapers/Reaping-the-Benefits-of-the-Internet-of-Things.pdf

Robinson, A. (2016). Logistics technologies: 4 benefits of RFID, AIDC, and IoT-based technologies to shippers. Retrieved from: http://cerasis.com/2016/04/13/logistics-technologies/

RTP (Retail Touch Points). (2016). Improving customer experiences and business processes with IoT. Retrieved from: http://www.retailtouchpoints.com/features/special-reports/improving-customer-experiences-and-business-processes-with-iot

Tay, J. (2016). Embracing IoT and building the right partnerships. Retrieved from: http://www.enterpriseinnovation.net/article/embracing-iot-and-building-right-partnerships-1213066965

Wollenhaupt, G. (2015). IoT logistics are transforming the trucking industry. Retrieved from: https://insights.samsung.com/2015/12/17/iot-logistics-are-transforming-the-trucking-industry/

Wood, C. (2015). How smart and connected partnerships are improving your life. Retrieved from: http://www.govtech.com/fs/How-Smart-and-Connected-Partnerships-are-Improving-Your-life.html

Internal Social Networks and Collaboration

Garrett W. Ennis
Global Logistics and Supply Chain Management Major
Cynthia R. Lovelace, Ph.D.
Assistant Professor of Logistics

ABSTRACT

This paper will attempt to answer one simple question: How can internal social networks allow individuals, groups, and functional units to collaborate? Internal social networks provide an important way for individuals, teams, and leaders to collaborate. Technology has come a long way in the last 20 years, and collaboration is vital for any firm in order to further their brand and expand market share. While there are some issues of misuse with this type of technology in the workplace, there is no denying that internal social networks are vital to organizational success. This paper will discuss and analyze different views on this subject as a way to allow managers to decide if allowing internal social networks would be a good fit within the organization.

Introduction

Over the last 15 years, social networks have become a huge part of society. From Facebook to Instagram to LinkedIn, social networks have become a part of the daily routine. They allow people to discuss ideas, collaborate on projects, or just interact in ways that were unheard of just ten years ago. Meanwhile, within organizations where communication is vital for product growth and expansion, similar types of internal social networks are becoming a part of the daily work routine. Park, Lee, Zhou, and Kim (2011) state, "Intense competition in the service industry has led service firms to develop an increasing stream of new service products with shorter life cycles" (p. 61). Research has shown that as business environments change, the more closely integrated operations and marketing functions need to be (Park et al., 2001). Collaboration is now vital to the success of any firm. This paper will seek to answer the question: how can internal social networks allow individuals, groups, and functional units to collaborate? The paper will first look at internal collaboration and recent studies into this arena and then look at internal social networks as serving as a vital function in growth, performance and competitiveness.

Internal Collaboration

Internal collaboration is not a new concept, as it has been around for generations through internal meetings with staff. However, with the advent of new technology, a firm can collaborate across functional areas more easily, thus increasing performance across the firm. Johnson and Filippini (2009) stated, "Specifically, American firms are more likely to use internal integration practices and this translates into better performance" (p. 15). There are numerous implications for managers related to internal collaboration. Johnson and Filippini (2009) also state:

> "If your main goal is to develop new products, focusing on internal collaborations may be more effective and safer. Internal collaboration between design, marketing, and production has been shown to have a greater positive effect on product success due to increased innovation capabilities. Marketing helps

bring in ideas that match the market while interacting with design, which has the requisite technical skills for the development. Integrating the production department into that process allows for realizing the ideas of marketing and design" (p. 16).

This is key. Allowing all departments to work in a synergistic manner will, without a doubt, increase performance across the firm. Finally, Johnson and Filippini (2009) state, "The ultimate goal of any integration practice is the creation of knowledge and capabilities that help your firm produce more creative product idea" (p. 17). By allowing all staff to collaborate, the firm can generate ideas quicker, improve the performance, and gain a more competitive place in the market.

Why is this type of collaboration so important? Laseter, Kandybin, and Houston (2002) note that operations departments focus on reducing costs through efficiencies in the service supply chain system, while marketing emphasizes higher revenue, more service product variety, and meeting customer needs from well stocked inventory pools. Research has shown that if effective integration exists, operational performance is improved (Laseter et al., 2002). Shapiro (1977) noted that there are two functions that are necessary for interdependency and coordination and cooperation in manufacturing and marketing. Hausman, Montgomery, and Roth (2002) state "Harmony influences both marketing and manufacturing morale with a stronger competitive position leading to higher profit performance" (p. 252). Research has also shown that effective decision making is directly correlated to linkages found between marketing and manufacturing (O'Leary-Kelly & Flores, 2002). One other thing that cannot go without mentioning is the importance of communication. Communication means sharing information. Research has shown that communication can provide mutual benefits to all within the firm as well as reduce any misunderstandings and uncertainty (Dwyer, Schurr, & Oh, 1987).

As previously mentioned, communication is vital, and when mixed with collaboration, the organization can reap unlimited benefits. Kahn (1996) states "Collaborative elements of integration can actually have a greater impact on performance than physical activities and cross-functional training" (p. 242).

If the firm can communicate across the separate functions, greater performance can be realized. Research has also shown that greater organizational competitiveness and higher productivity can be gained through collaboration (Tjosvold, 1988). Finally, there are numerous benefits to a firm using collaboration as a key aspect of their business model. Some of these benefits could include greater satisfaction from customers, less conflict, and boosts in business performance (Ken & Piercy, 2007; Menon, Bharadqaj, & Howell, 1996).

Internal Collaboration and Information Technology (IT)

While internal collaboration is nothing new in the field of business and manufacturing, information technology (IT) of today is proving to be a game changer within organizations. Firms are now able to communicate globally in a second. Information can be shared simultaneously through email, instant messaging, and video-teleconferencing. Firms can actually be worldwide now, and speak with each other as if they are neighbors. Rapid developments in technology have transformed our society from a producing culture focused on manufacturing to one that focuses on information exchange (Kurzwell, 2005; Zittrain, 2008). As Lee, Olson, and Trimi (2012) state,\:

> "With the internet, many new business models have overcome the limitations of time, space, and distance thus minimizing the locational advantage. Financing is no longer the major barrier when innovative business ideas and opportunities are present. Also, many knowledge workers, consultants, and outsourcing firms are widely available for providing human resource support. Many new innovations that have been hailed as engines of competitive advantage, such as total quality management (TQM), Business Process Reengineering, Six Sigma, Lean Approach, enterprise resource planning (ERP), Just-in-Time Systems, on demand computing, etc. have also become commodities. Many organizations can easily implement these systems and in fact most large firms have either tried or have them in place. Thus, the life span of competitive advantage based on these systems is indeed very short" (p. 821).

These are points that cannot be discounted. With instant access to all sections within a firm, across the globe, businesses can now collaborate and innovate in a shorter time frame. By using technology that is in place, or even upgrading systems, organizations can indeed become more competitive in a shorter amount of time.

Managers and decision makers really need to clearly identify the main goal behind collaboration. Lee et al. (2012) state, "The main idea behind building a collaborative organization is to develop a value chain with world class competencies. The "we" proposition is much broader and powerful than just "I" and "you." In addition to collaboration among organizations, many different forms of collaborative work exist such as open-source collaborative community, social networks for collaboration, Web 2.0 technology supported collaborations, etc. The main characteristic of collaboration for co-creation is a shared purpose, be it making profit, participation experience, recognition without financial rewards, or just for fun. Collaboration is especially effective for value creation through new products/ services/ventures, process innovation, and new business mod-

els. Collaborative organizations are "simultaneously innovative and efficient, agile, and scalable" (Adler, Heckscher, & Prusak, 2011). They are focusing on knowledge production through both internal and external collaboration (Lee et al., 2012). Finally, as Lee et al. (2012) state, "A platform of innovation for convergence of expertise/ideas, collaboration among participating organizations, and co-creation of the shared value with customer should be at the core of co-innovation."

In today's environment, there is no denying that technology will continue to prove vital for organizational success. Thus, a successful firm could model its business strategy around IT capability, collaboration, and performance. Sanders and Premus (2005) state, "IT has been viewed as an enabler of internal and external collaboration, which is the foundation of supply chain management. Firm collaboration and information sharing, in turn, are expected to improve firm performance and that findings will show that firm IT capability directly impacts internal and external collaboration as well as firm performance." Functions that have been particularly impacted, at least from a theoretical perspective, are supply chain management (SCM) and logistics. Supply chain management, founded on collaboration between supply chain partners, is intended to bring performance benefits to the organization (Golicic, Foggin, & Mentzer, 2003; Narasimhan & Jayaram, 1998; Stank, Keller, & Daughterly, 2001). According to Sanders and Premus (2005), this type of collaboration is only made possible through the sharing of large amounts of information along the supply chain, including operations, logistics, and strategic planning. Information sharing provides firms with forward visibility, improving production planning, inventory management, and distribution, and can be viewed as the backbone of the supply chain business structure (Grover & Malhotra, 1999; Kent & Mentzer, 2003). IT capability has been positively linked to firm performance (Bharadwaj, 2000; Kearns & Lederer, 2003) and shown to have potential of providing a significant competitive advantage to firms (Earl, 1993; Ives & Jarvenpaa, 1991; Kathruia, Anandarajan, & Igbaria, 1999). The importance of IT in SCM is further documented through the extended enterprise model, developed by Bowersox and Daugherty (1995), Bowersox, Closs, and Stank (1999), and modified by Edwards, Peters, and Sharman (2001). The model identifies key attributes of firms moving toward world-class logistics, with an integrated IT system identified as a key component of this framework. The highest level firms within this framework are those that operate seamlessly across boundaries due to IT capability that enables information to flow freely in real time.

According to Sanders and Premus (2005), internal organizational collaboration requires cross-functional planning, coordination, and sharing of integrated databases. Sanders and Premus (2005) proposed a conceptual model on the relationship between firm IT capability, internal and external collaboration, and firm performance. Their model shows IT capability as a factor influencing the organization's internal and external collaboration, two distinct collaboration constructs. Internal collaboration is a construct defined as an affective, mutually shared process where two or more departments work together, have mutual understanding, have a common vision, share resources, and achieve collective goals (Schrage, 1990).

External collaboration is defined similarly to internal collaboration, with the exception that the focus of collaboration is between two or more firms, rather than departments (Sanders & Premus, 2005). The Sanders and Premus model showed how

IT capability directly influenced both internal and external collaboration along with firm performance. Information technology is a separate construct that promotes both internal and external collaborative relationships and that collaboration is a result of human interactions which can only be supported by IT, but not replaced. This is an important point for managers as they consider funding for various IT initiatives. Also, Sanders and Premus (2005) state, "The significant impact of internal collaboration on performance suggests that companies should invest in strategies that promote cooperation and integration across the functions of the organization, and since IT is shown to promote internal collaboration, companies should consider investing in these types of information technologies" (p. 3). This leads to the next part of this paper, where internal social networks are shown to prove vital to an organization and allow individuals, groups, and functional units to collaborate.

Internal Social Networks

Internal social networks are becoming more prevalent in business today. Leaders and decision makers within firms across the globe are turning to this new business style as a way to collaborate across functional areas and to gain competitive advantages through the sharing of information. These firms also use internal networks as a way to gain knowledge. Knowledge, in particular, is often considered among the most important resources to be accessed via group social-network structures, and is thereby proven to improve team performance (Wong, 2008). This is one vital aspect of internal social networks. It allows organizations to communicate in ways that were not even imagined just 30 years ago. These types of networks can actually be called instrumental networks. Instrumental networks are patterns of work-related interaction, and involve relationships between organizational members that form due to the carrying out of formal work tasks (Lincoln & Miller, 1979). While this form of thinking has been around for quite some time, it is still relevant in today's business environment. Sometimes, however, these can be expressive networks. Expressive networks "involve the exchange of friendship and social support" (Ibarra, 1993, p. 57). They are reflected in close relationships and aim at satisfying social motives (Formbrun, 1982). Both types may comprise several sub-types with different network contents. For example, instrumental ties involve not only interaction related to the carrying out of formal tasks, but also authority relations, advice seeking, and influence (Barly, 1990). These types of social networks in an organization will lead to an increased knowledge base across the firm. With regard to instrumental networks, the more extensive the exchange of information and ideas, the more individual knowledge is shared, and the degree of shared knowledge is also likely to increase (Henttonen, Janhonen, & Johanson, 2013). When members are connected through instrumental advice relationships, the opportunities to access each other's knowledge are likely to increase, and the direct interaction should also enhance knowledge sharing (Wong, 2008; Nahapiet & Ghoshal, 1998). According to Henttonen et al. (2013), instrumental relationships typically provide information and ideas; thus one might expect internal relationships to affect knowledge resources in groups and, thereby, also to improve performance. As discussed, if team members are interconnected through instrumental relationships, they are better able to share their knowledge and to increase task knowledge in the work team (Henttonen et al., 2013). Interpersonal relationships function as conduits for the flow and exchange of information, and are valuable in that they ensure consideration of different points of view through open communication about task-related differences of opinion (Bunderson & Sutcliff, 2002; Campion et al., 1993).

Autry and Griffis (2002) state, "Internal social networks can also impact structural and relational linkages on firm execution and innovation" (p. 160). The knowledge-based view of the firm is well established in the business strategy literature. This perspective proposes that information represents a critical firm resource, and firms that best acquire, distribute, and use information—that is, those that leverage knowledge assets for unique competitive positioning—enjoy long-term performance (Grant, 1996). This can be a great advantage for an organization, as internal social networks can greatly add to this sharing of knowledge. The dilemma management faces today is how can internal social networks help functional units to collaborate? By acquiring, using, and sharing the information it has across functional units, the firm can gain an edge. Some would also argue that density, or connections, within a firm can also lead to performance advantages. Burt (1992) proposed that social capital originates from the absence of ties among those with whom a focal actor is connected and the presence of structural holes causes information imbalances to emerge within a network. However, contrasted with Burt's structural holes' thesis is the dense network theory presented by Coleman (1988, 1990), which argues that dense networks, where all (or most all) possible contacts know and frequently interact with one another, generate social capital. Coleman's structural density argument, summarized, is that the efficiency resulting from communications and process economies yields execution-related performance (Autry & Griffis, 2008). While this may be academic in nature, it does prove a valid point in that internal social networks allow for the exchange of information and can yield better performance within the firm. Defee and Stank (2005) highlight the importance of density in their discussion of the relationship between supply chain structure and integration. Their core argument is the densely constructed supply chain—with high levels of technology integration, communication, and data standardization among all members—better executes their supply chain strategies and thus enjoy performance advantages. If the firm has better technology in place, and can communicate across all the functional areas, then the decision makers will understand that internal social networks can and will help the organization thrive at a higher level.

Can social network-based organization models actually improve knowledge management in supply chains? Knowledge is one of the most decisive factors capable of offering competitive advantages for supply chain partners (Crone & Roper, 2001). Firms must collaborate on numerous issues, and it is essential to base this collaboration on mutual trust, openness, shared risks, and shared rewards to yield competitive advantages that result in better performance (Hogarth-Scott, 1999). Mahorta et al. (2001) maintain that supply chain partners engage in interlinked processes that enable rich information sharing and building information technology infrastructures to process the information obtained from partners, a scenario that enables the creation of new knowledge. In order to create new knowledge, supply chain partners engage in interlinked processes that enable rich information sharing and building information technology infrastructures that allow them to process the information obtained from partners (Seggie et al., 2006). While the aforementioned is external in nature, companies in a supply chain can then use knowledge of social networks to identify internal collaboration opportunities and to obtain management improvements such as working together easier with the rest of the supply chain members, generating confidence between the companies in the supply chain and collaborative learning, among others (Carter et al., 2007). Knowledge management is possible with a series of met conditions (Capo-Vicedo, Mula, & Capo, 2011) and these conditions come in two large groups: conditions relating to the industrial sector and conditions relating to each supply chain. As mentioned above, a series of met requisites are necessary to achieve positive interaction among the different enterprises in order to generate knowledge creation and an interchange process (Capo et al.,

2011). This process of meeting requisites demands a degree of similarity among the management systems, culture, language, objective, etc., which is not always the case (Capo et al., 2011). If a firm can grasp this process, then all of the above mentioned conditions can be combined into a single unit where supply chain enterprises must establish relationships to create a dynamic network that eliminates learning barriers to allow knowledge to flow freely throughout the network (Capo et al., 2011). If the firm has the capacity to acquire and absorb knowledge, that will be key to competitive advantages within the organization. This is another huge aspect of internal social networking in that, while it allows individuals and groups to collaborate, it can also lead to competitive advantages for the organization as a whole.

Scholars have suggested that participation in social networks can be influential in providing actors, or employees, with access to timely information and referrals to other actors in the network (Burt, 1992), and this ability to be a part of a social network has often been cited as a source of competitive advantage for people and organizations alike (Van Laere & Heene, 2003). How can these internal social networks actually achieve this? Uzzi (1997) stated that "embedded ties accommodate actors, or employees, with problem-solving mechanisms that enable them to coordinate interactions and work out problems" (p. 37). Research has shown that problems can be resolved flexibly through negotiation and adjustment. Joint problem solving arrangements are mechanisms of voice (Uzzi, 1997). So, as Van Laere and Henne (2003) state, "Being a good partner in embedded relationships has become a key corporate asset. We can call it a company's collaborative advantage. And as we move further into an economy where collaboration is increasingly central to organizational effectiveness, we must pay attention to the sets of relationships that organizations rely on" (p. 250). The aforementioned statement shows the importance of internal social networks. It posits that internal social network collaboration is key to a firm's performance and competitive advantage and that, over time, this will continue to grow in importance.

Business 2.0 and Sales and Operations Planning

What is the role of internal social networks and the sales and operations planning process mingle in business 2.0? Social media today is prevalent in all parts of the world, and apps such as Facebook, Instagram, Twitter (to name a few) are the leaders in this highly popular industry. These various tools are popular worldwide because they are conduits of interaction (Plank & Hooker, 2014). Can these tools actually enhance the supply chain functions? The answer is yes.

Supply chains consist of many moving parts, all of which help the flow of products and services to the end customer (Mentzer et al., 2001). A vital part of any supply chain is the sales and operations planning (S&OP) function. Boyer (2009) states that "S&OP is top management's handle on business which requires balancing demand and supply on a regular and formal basis" (p. 6). In a sense, the S&OP team is the cog that keeps everything running smoothly. Another way of describing S&OP is that it is the process of taking many different business plans and turning them into one overall plan for the entire organization (Thome et al., 2012). Any successful S&OP process should follow the same characteristics: cross-functional and integrated planning, unified plans, set time frames of three to 18 months, linked strategies within the firm, and added value to coincide with greater performance (Thome et al., 2012).

Another way of stating this is that the S&OP process is a unifying process that is vital to all functions within an organization as it creates a unified plan of attack (Plank & Hooker, 2014). This unified plan of attack encapsulates every single function within the firm and unites them within a singular business plan (Basnet, 2013). Research has shown that an organization can obtain true benefits from external integration if they first understand the critical nature of internal integration (McCormick & Lockamy, 2005). By having better communication and through sharing information, organizations are effectively creating a better supply chain overall (Plank & Hooker, 2014).

Considering all the points previously discussed, it can easily be seen how internal social networks fit right in with the S&OP process. Business is now in the middle of the Web 2.0 era, and organizations are now realizing the importance of tools such as Facebook, LinkedIn, and Twitter. This allows firms to create their own social networks internally to drive collaboration. Kosk (2013) states, "That can truly drive collaborative efforts of firms." A great example of an online community that has huge collaborative impacts is SAP. Their online community has over 3 million members, thus showing the importance of internal social networks (Kiron, 2012). Finally, if a firm can effectively integrate technology and pull together the different functional units through this technology, the entire organization can greatly benefit through the sharing of information in real time (Plank & Hooker, 2014). It truly is easy to see how important and vital to organizational success internal social networks can be. They allow for greater collaborative efforts, allow for greater knowledge creation, and also allow for greater performance as a whole. How can some of these tools help an organization? These tools, if used correctly, will continue to shape business models for many years to come.

Research has shown that the companies of today are truly beginning to understand the importance of the various social networking tools which allow for greater collaboration and communication across the firm (Burrus, 2010). There are several tools available that can be applicable in today's business environment. Burrus (2010) states, "Facebook and Twitter can allow large organizations to connect all of their employees, or members, and can dramatically increase their internal networking and collaboration as well as to allow them to problem-solve in a quicker fashion" (p. 52). Business leaders and professors alike agree that Wikipedia is not an accurate source of information. However, research has shown that many organizations could benefit from this type of technology. Organizations with manufacturing ties, retailers, or even suppliers, could create and use something like Wikipedia internally as a way to share information and drive the collaborative efforts (Burrus, 2010). YouTube could also be a valuable social networking tool. Another way that organizations could capture and use this type of technology would be to create and use videos to educate and train the workforce as well as to inform the public about their products (Burrus, 2010). Another popular social network site is Dig. This type of social network allows people to share what is most important to them, which could greatly enhance any organization (Burrus, 2010). Visual communications can also be a valuable tool in the social network arena. Research has shown that organizations across the globe have found that visual communication is a powerful tool in connecting with their entire supply chain (Burrus, 2010). Finally, Burrus (2010) states, "Repurposing the use of personal social networking technology as a set of business tools, companies can increase collaboration, problem solving, and improve communication transparency, all of which are critical

to adopting continuous value innovation focused on the customer" (p. 53). Through the use of these networks, organizations could see significant growth firm wide.

Conclusion

Internal collaboration has been a common theme in business for many years. However, internal social networks within a firm are just now starting to ramp up. The times have changed indeed, and businesses must change as well. There is no denying the fact that internal social networks help the collaborative effort across a firm, and that this can lead to greater performance, a greater competitive advantage, as well as opportunities for knowledge growth. Should firms use this technology? Yes. Should decision makers adjust business models to incorporate this type of technology? Yes. Internal social networks add value to firms, and the business leaders of today should indeed begin to embrace this technology to grow and sustain going forward.

REFERENCES

Adler, P., Heckscher, C., & Prusak, L. (2011). Building a collaborative enterprise. *Harvard Business Review, 29*(7), 94-101.

Autry, C.W., & Griffis, S.E. (2008). Supply chain capital: The impact of structural and relational linkages on firm execution and innovation. *Journal of Business Logistics, 29*(1), 157-IX.

Barley, S.R. (1990). The alignment of technology and structure through roles and networks. *Administrative Sciences Quarterly, 35*(1), 61-103.

Basnet, C. (2013). The measurement of internal supply chain integration. *Management Research Review, 36*(2), 153-172.

Bharadwaj, A.S. (2002). A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quarterly, 24*(1), 169-196.

Bowersox, D.J., Close, D.J., & Stank, T.P. (1999). *21st century logistics: Making supply chain integration a reality.* Oak Brooks, IL: The Council of Logistics Management.

Bowersox, D.J., & Daugherty, P.J. (1995). Logistics paradigms: The impact of information technology. *Journal of Business Logistics, 16*(1), 65-80.

Boyer, J.E. (Spring 2009). Ten proven steps to successful S&OP. *The Journal of Business Forecasting,* 4-10.

Bunderson, J.S., & Sutcliffe, K.M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: Process and performance effects. *Academy of Management Journal, 45*(5), 875-880.

Burrus, D. (2010). Social networks in the workplace: The risk and opportunity of business 2.0. *Strategy & Leadership, 38*(4), 50-53.

Burt, R.S. (1992). *Structural holes: The social structure of competition.* Boston, MA: Harvard University Press.

Campion, M.A., Medsker, G.J., & Higss, A.C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. *Personal Psychology, 46*(4), 823-850.

Capo´-Vicedo, J., Mula, J., & Capo´, J. (2011). A social network-based organizational model for improving knowledge management in supply chains. *Supply Chain Management, 16*(4), 284-293.

Carter, C.R., Ellram, L.M., & Tate, W. (2007). The use of social network analysis in logistics research. *Journal of Business Logistics, 28*(1), 137-168.

Coleman, J.S. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94* (supplemental issue), 95-120.

Crone, M., & Roper, S. (2001). Local learning from multinational plants: Knowledge transfers in the supply chain. *Regional Studies, 35*(6), 535-548.

Defee, C.C., & Stank, T.P. (2005). Applying the structure-strategy-performance paradigm to the supply chain environment. *The International Journal of Logistics Management, 16*(1), 28-50.

Dwyer, F.R., Schurr, P.H., & Oh, S. (1987). Developing buyer-seller relationships. *Journal of Marketing, 51*(2), 11-27.

Earl, M.J. (1993). Experiences in strategic information systems planning: Editor's comments. *MIS Quarterly, 17*(2), 5.

Edwards, P., Peters, M., & Sharman, G. (2001). The effectiveness of information systems in supporting the extended supply chain. *Journal of Business Logistics, 22*(1), 1-27.

Formbrun, C. (1982). Strategies for network research in organizations. *Academy of Management Review, 7*(2), 115-130.

Golicic, S.L., Foggin, J.H., & Mentzer, J.T. (2003). Relationship magnitude and its role in interorganizational relationship structure. *Journal of Business Logistics, 24*(1), 57-76.

Grant, R.M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*(Special Issue), 109-122.

Grover, V., & Malhorta, M. (1999). A framework for examining the interface between operations and information systems: Implications for research in the new millennium. *Decision Sciences, 30*(4), 901-920.

Hausman, W., Montgomery, D., & Roth, A. (2002). Why should marketing and manufacturing work together? Some exploratory empirical results. *Journal of Operations Management, 20,* 241-257.

Henttonen, K., Janhonen, M., & Johanson, J. (2013). Internal social networks in work teams: Structure, knowledge sharing and performance. *International Journal of Manpower, 34*(6), 616-634.

Hogarth-Scott, S. (1999). Retailer-Supplier partnerships: Hostages to fortune or the way forward in the millennium. *British Food Journal, 101*(9), 668-682.

Ibarra, H. (1993a). Personal networks of women and minorities in management: A conceptual framework. *Academy of Management Review, 18*(1), 56-87.

Ives, B., & Jarvenpaa, S.L. (1991). Applications of global information technology: Key issues for management. *MIS Quarterly, 1*(2), 33-49.

Johnson, W.H.A., & Filippini, R. (2009). Internal vs. external collaboration: What works. *Research Technology Management, 52*(3), 15-17.

Kahn, K.B. (1996). Interdepartmental integration: A definition with implications for product development performance. *Journal of Product Innovation Management, 13,* 137-151.

Kathuria, R., Anandarajan, M., & Igbaria, M. (1999). Linking IT applications with manufacturing strategy: An intelligent decision support system approach. *Decision Sciences, 30*(4), 959-992.

Kearns, G.S., & Lederer, A.L. (2003). A resource-based view of strategic IT alignment: How knowledge sharing creates competitive advantage. *Decision Sciences, 34*(1), 1-29.

Kent, J.L., & Mentzer, J.T. (2003). The effect of investment in interorganizational information technology in a retail supply chain. *Journal of Business Logistics, 24*(2), 155-176.

Kiron, D. (2012). SAP: Using social media for building, selling, and supporting. *MIT Sloan Management Review, 54* (1), No. 1, 1-8.

Kosk, N. (2013). Social media drives B2B collaborative efforts in the supply chain. *Supply and Demand Chain Executive.* Retrieved at http://0-bi.galegroup.com. athens.iii.com/essentials/article/GALE/ A290993298/4eec8e4d6f58e062675 (June 24, 2013).

Kristien, V.L., & Heene, A. (2003). Social networks as a source of competitive advantage for the firm. *Journal of Workplace Learning, 15*(6), 248-258.

Kurzwell, R. (2005). *The singularity is near: Where humans transcend biology.* New York, NY: Penguin Books.

Laseter, T., Kandybin, A., & Houston, P. (2002). Marketing and operations: Can this marriage be saved? *Strategy + Business, 26,* 22-27.

Lee, S.M., Olson, D.L., & Trimi, S. (2012). Co-innovation: Convergenomics, collaboration, and co-creation for organizational values. *Management Decision, 50*(5), 817-831.

Lincoln, J.R., & Miller, J. (1979). Work and friendship ties in organizations: A comparative analysis of relational networks. *Administrative Science Quarterly, 24*(1), 181-199.

Malhorta, A., Gosain, S., & El Sawy, O.A. (2001). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *MIS Quarterly, 29*(1), 145-187.

McCormack, K., & Lockamy, A. (2005). The impact of horizontal mechanisms within sales and operation planning processes on supply chain integration and performance: A statistical study. *Proceedings of the Global Conference on Business & Economics,* Oxford, UK, available at www.Krkresearch.org/ Contact_us/ McCormackandLockamy4th Globalconferencepaper_Finalversion.pdf (accessed June 13, 2013).

Menon, A., Bharadwaj, S.G., & Howell, R. (1996). The quality and effectiveness of marketing strategy: Effects of functional and dysfunctional conflict in intraorganisational relationship. *Journal of the Academy of Marketing Science, 4,* 299-313.

Mentzer, J.T., Dewitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D., & Zacheria, Z.G. (2001). What is supply chain management? In Mentzer, J.T. (Ed.), *Supply Chain Management,* Thousand Oaks, CA: Sage Publishing.

Meunier, K.L., & Piercy, N.F. (2007). Exploring collaboration between sales and marketing. *European Journal of Marketing, 41*(7), 939-955.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review, 23*(2), 242-266.

Narasimhan, R. & Jayaram, J. (1998). Casual linkages in supply chain management: An exploratory study of North American manufacturing firms. *Decision Sciences, 29*(3), 579-606.

O'Leary-Kelly, S.W., & Flores, B.E. (2002). The integration of manufacturing and marketing/sales decisions: Impact on organizational performance. *Journal of Operations Management, 20,* 221-240.

Park, T., Lee, M., Zhou, M., & Kim, C. (2011). The impact of internal communication and collaboration between operations and marketing on new service development. *Journal of Services Research, 11*(1), 61-75.

Plank, R.E., & Hooker, R. (2014). Sales and operations planning. *Journal of Research in Interactive Marketing, 8* (1), 18-36.

Sanders, N.R., & Premus, R. (2005). Modeling the relationship between firm IT capability, collaboration, and performance. *Journal of Business Logistics, 26*(1), 1-23.

Schrage, M. (1990). *Shared minds: The new technologies of collaboration,* New York: Random House.

Seggie, S.H., Kim, D., & Cavusgil, S.T. (2006). Do supply chain IT alignment and supply chain interfirm system integration impact upon brand equity and firm performance? *Journal of Business Research, 59*(8), 887-895.

Shapiro, B.P. (1997). Can marketing and manufacturing coexist? *Harvard Business Review,* (September-October), 104-114.

Simatupang, T.M., Wright, A.C., & Sridharan, R. (2004). Applying the theory of constraints to supply chain collaboration. *Supply Chain Management, 9*(1), 57-70.

Stank, T.P., Keller, S.B., & Daugherty, P.J. (2001). Supply chain collaboration and logistical service performance. *Journal of Business Logistics, 22*(1), 29-47.

Thome, A.M.T., Scavard, L.F., Fernandez, N.S., Scavarda, A.J. (2012). Sales and operations planning: A research synthesis. *International Journal of Production Economics, 138,* 1-13.

Tjosvold, D. (1988). Cooperative and competitive interdependence. *Group and Organizations Studies, 13*(3), 274-289.

Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly, 42*(1), 35-67.

Van Laere, K., & Heene, A. (2003). Social networks as a source of competitive advantage for the firm. *Journal of Workplace Learning, 15*(6), 248-258.

Wong, S.S. (2008). Task knowledge overlap and knowledge variety: The role of advice network structures and impact of group effectiveness. *Journal of Organizational Behavior, 29*(5), 591-614.

Zittrain, J. (2008). *The future of the internet: And how to stop it.* New Haven, CT: Yale University Press.

Can Collaboration Be the Key to Competitive Advantage for the U.S. Auto Industry?

Chris Moss
Global Logistics and Supply Chain Management Major
Cynthia R. Lovelace, Ph.D.
Assistant Professor of Logistics

ABSTRACT

The dynamics of the American auto industry has changed dramatically over the last four decades. The global automotive market is fiercely competitive today. All auto manufacturers use complex supply chains, both foreign and domestic. Collaboration with suppliers is essential for the automotive industry; foreign and domestic automakers collectively use collaboration with suppliers and have for many years. This study explores the differences in collaboration among foreign and domestic auto suppliers. This research will focus predominately on the American and Japanese auto industries. Data collection methods will be used to gather both quantitative and qualitative data. Additionally, peer-reviewed books, publications, journals, and various electronic databases will be considered. Supply chain management has become the key driver of competitive advantage for auto manufacturers. Close relationships with tier one, two, and three suppliers is essential to effective supply chain management. Some collaboration efforts create more value than others. Can collaboration be the key to competitive advantage to the U.S. auto industry?

Introduction

Supply chain collaboration has been used by the auto industry for many years. Some manufacturers practice an arms-length strategy to their relationship with their suppliers while others use a more close approach. Andrews (2014) defines collaboration as "taking part in joint planning, process redesign, as well as sharing some level of risk and reward" (level 3). The benefits of supply chain collaboration include low inventory costs, shorter lead times, improved customer service, and closer monitoring of customer demand and supplier performance. In these scenarios, supply chains work toward maximizing profitability. Supply chain coordination is necessary to the success of this strategy. In order for this strategy to be effective, a hands-on approach is a necessity. Close and frequent contact with all tier suppliers allows effective planning and utilization of resources. Foreign automakers, especially in Japan, have implemented close relations with suppliers for many years.

American Tier Suppliers

At one time, supplier relations were an arms-length relationship. The U.S. auto industry's main concern with suppliers was price. Quality was also important, but the bottom line always revolved around price. The relationships with tier suppliers were distant and the supply chain objective was to receive the components as cheaply as possible and in a timely manner. The majority of suppliers today are international suppliers. U.S. auto manufacturers have tried to evolve their supply chain collaboration to a more hands-on approach but challenges still exist. Susan Helper (1991) states that "all the talk about increased cooperation in the auto industry could mean merely that suppliers have acquiesced in the short term to automaker demands for not just low prices, but high quality and just-in-time delivery, too; no real foundation for a mutually beneficial relationship has been established. Such a situation would bode ill for the long-term competitiveness of the U.S. industry, since suppliers

are unlikely to continue to make significant investments on such terms" (p. 19). The U.S. auto industry at this time was arriving at a crossroads. Helper goes further in her thoughts by stating, "If U.S. automakers wish to continue to compete in the global industry, which is now characterized by technology and quality based competition, they will need to establish truly voice-based relationships between suppliers and customers, in which both sides make commitments and share information" (1991, p. 24). U.S. automakers made attempts to rectify the collaboration dilemma with suppliers.

Supplier Relationships

The U.S. auto industry, composed primarily of the Big Three (Ford, GM, and Chrysler), is tremendously large and uses suppliers to produce thousands of components and various parts for automobiles. An enormous and complex supply chain is required to supply assembly plants with the correct parts at the correct time for assembly. The relationships with suppliers are more than merely transactional in nature. Collaboration with suppliers is necessary to complete processes for the auto assemblers. In a discussion about how to become global leaders in the auto industry, Caiazza and Nueno (2014) noted that collaboration between suppliers and manufacturers is vital to generate the innovation necessary for the cost reductions required in developing markets (p. 119). It is suggested that collaboration will reduce costs associated with the auto industry. This is a strategy of working closely with suppliers. It is obvious that manufacturer/supplier collaboration is being recognized as an effective tool for the supply chain system. Helper and Mudambi (1998) noted that the understanding and management of buyer/supplier relations is growing in strategic importance. Supplier relations are being recognized as important in developing sustainable competitive advantage (Intro). Close collaboration is a very small ingredient in the complex supply chains of the domestic auto industry. Yet, it is a very critical aspect of the competitive advantage of the U.S. auto industry. The auto industry has evolved more to the advantage of the supplier. In 2015, auto suppliers' contribution climbed to 82%. With such a high concentration in value add-

ed suppliers, it is imperative that competitive advantage could be attained by close relationships with suppliers. This increase allows significant supplier bargaining power. Auto manufacturers spend enormous amounts of capital resources with suppliers. There is little doubt as to why good supplier relationships are valuable. Colias (2004) noted that about 90% of GM's global spending spread across about 400 suppliers. In 2013, Ford Motor Co. spent about 70% of its purchasing budget among 104 suppliers. Chart A (Statista, 2018) illustrates the increase in supplier participation since the mid 1980s.

Domestic Collaboration Challenges

Many suggest that the U.S. auto industry is at a crossroads. Due to globalization, business practices that once gained competitive advantage are not as effective as they once were. The price of supplier parts and components for vehicles is no longer the only aspect to consider. The supply chain of the U.S. auto industry has evolved from its past state. The domestic auto industry is on the business stage with global competition. Alternative strategies of collaborative efforts are necessary to provide value and decrease costs. Viable challenges such as trust, research development, and globalization must be evaluated to help determine if closer relationships with suppliers can gain competitive advantage.

Trust

Collaborative efforts by U.S. auto manufacturers face tremendous challenges with supplier relationships. Trust is an issue among suppliers in their relations with auto manufacturers. Helper (1991) noted that buyer/supplier interface has remained the same. There is evidence that increased formal commitment between buyers and suppliers has not been accompanied by a corresponding increase in noncodified forms of cooperation between the parties. For instance, suppliers to the U.S. automobile industry have little expectation of being treated fairly by their customers; further, a large plurality believe that if a competitor appeared with comparable quality and a lower price, their customers would switch 'as soon as technically feasible,' rather than working with them to match or better the competitor (p. 19). Also manufacturers fear that intellectual property and new designs may be compromised and released to competitors by suppliers.

Research and Development

Domestic collaboration efforts do not consider the research and development benefits of having close relationships with their suppliers. Suppliers may hold the key to competitive advantage for the industry through product development. Xia and Tang (2011) noted that research and development requires close collaboration with suppliers (4.3). If the supplier has the technology and intellectual ability, taking advantage of product development with suppliers may provide competitive gains. Components such as machinery, technology, and engineering are necessities for suppliers entering into product development. Takeshi (2001) notes that involving suppliers in product development allows a firm to reduce its workload, to focus on the activities that take advantage of its areas of competence, and to capitalize on the supplier's competence and potential for scale economies.

Globalization

Most domestic manufacturers do not take advantage of the benefits of outsourcing product development. This is due to the fact that most domestic auto manufacturers depend on international outsourcing for components. Close collaboration in R&D is difficult to form due to geographical locations of the supplier and manufacturer. Additionally, long lead-time on parts inhibits any relationship with suppliers. Xia and Tang (2011) suggest that automakers should stay close to each other, stay close to their core suppliers (to control the supply chain), identify their own potential, and rely on collaboration
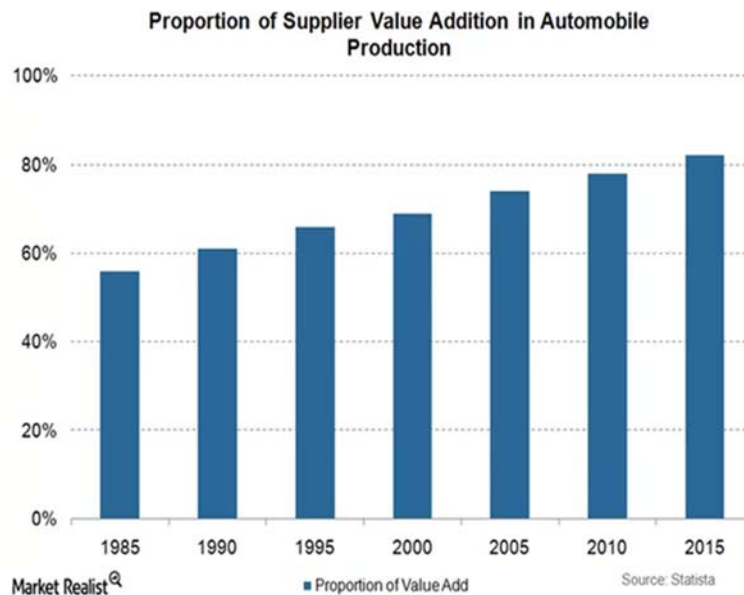

Chart A—Proportion of Supplier Value Addition in Automobile Production

instead of competition in order to survive and enhance future development (combine research power) (sec 6). Swiecki and Gerth (2008) spoke of closeness by noting that collaboration is potentially a powerful tool to address the technical and financial problems faced by the industry; but unless a more structured and optimized approach to collaboration is adopted, the automotive industry faces the threat of not being able to maximize its benefits (p. 5). The integration of material suppliers into the product development phase can provide substantial benefits.

Quantitative Data

For the last 15 years, the annual North American Automotive—Tier 1 Supplier Working Relations Index Study is conducted to study automakers' supplier relations and determine how these relations impact OEM profits (Perspectives, 2017). The OEM supplier ratings are directly related to their competitiveness and profitability. Much attention is given to these rankings from auto manufacturers all over the world. This data also reveals who is maximizing their supply chain collaboration efforts. For this paper, the results of the study from 2014 and 2015 were analyzed. PR Newswire reported this data. Chart B displays the finding of the 2014 study.

According to the chart, Toyota and Honda were rated consistently good to very good from year 2003-2008. Ford, GM, and Chrysler ranked consistently poor to very poor from 2003-2008. The big three continued to struggle in Tier 1 supplier relations collectively from years 2002-2014.

Supplier relations between General Motors and Toyota were also investigated. Chart C displays these findings. These graphs compare supplier relations between General Motors and Toyota. The red bars indicate supplier relations that are poor, while green bars represent supplier relations that are good. The research exhibits poor supplier relations from 2013-2015. The red bars for Toyota are showing a decline in poor supplier relations over this given period.

What is wrong with the big three? Henke (2015) believes that supplier relation programs are not focused on the foundational or relational activities that can make a difference in supplier relations. Another reason is that buyers and engineers responsible for implementing the necessary improvements are simply not capable of doing so, or more likely not sufficiently motivated to do so. Finally, when internal mandates come down to reduce cost, buyers are simply reverting back to their old adversarial ways of getting the reductions; because, to them, building collaborative supplier relations is of little importance. The results of the survey indicate why OEMs (original equipment manufacturers) with good supplier working relations gain a competitive advantage. There does not seem to be any interest in working closely with suppliers at this level. Henke (2015) emphasizes the significant difference in the way the American big three and the Japanese big three treat their suppliers. There are fundamentally different approaches to working with suppliers. The difference in treatment may well be a major factor in the consistently high quality and competitive gains by the Japanese (p. 3). Research suggests that tremendous financial benefits are attained by close collaboration. Henke (2015) states, "The Japanese OEMs clearly understand this and it's helping them gain competitive advantage and market share" (p. 5). Table 1 displays the criteria used for the study, as well as the ratings for both auto manufacturing groups evaluated in the study.
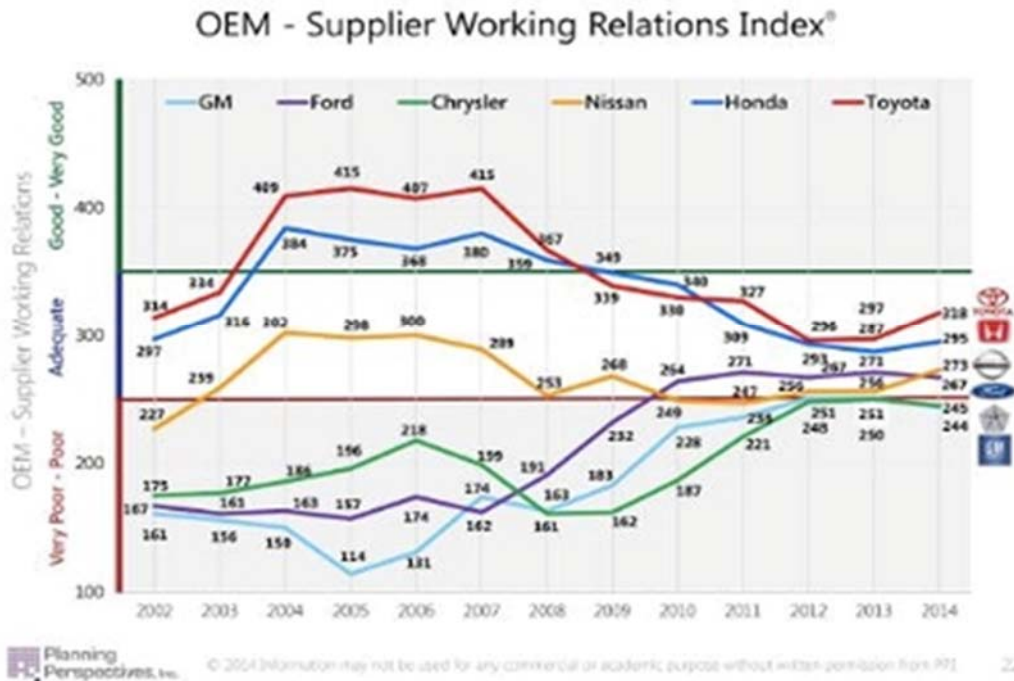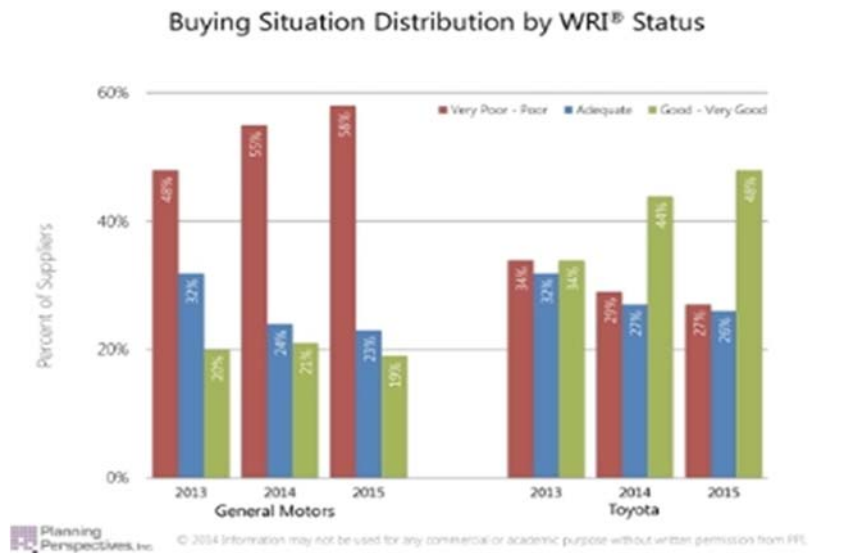

Chart B—2014 OEM - Supplier Working Relations Index

Buying Situation Distribution by WRI® Status

Chart C—Buying Situation Distribution by WRI Status

Study Metrics

The metrics used for the series of Working Relations Index studies (Perspectives, 2017) included trust, open and honest communication, timely information to suppliers, help to the supplier to reduce cost and increase quality, excessive and late engineering changes, early supplier involvement in product development, supplier means to recover costs on cancelled or delayed programs, and supplier ability to make an acceptable return over the long term on the OEM's business. For the year 2015, the results were: 1) Toyota, 2) Honda, 3) Ford, 4) Nissan, 5) FCA (Fiat Chrysler Automobiles) & 6) GM. This study measured satisfaction within the manufacturer/supplier relationship.

Cultural Relationship Contrasts

Supplier relationships among globally competitive auto manufacturers differ greatly due to culture. The U.S. and foreign auto industry are no exceptions. Liker and Choi (2004) comment that American companies created supply chains that superficially resembled those of their Japanese competitors, but they did not alter the fundamental nature of relationships with suppliers. It was not long into the partnering movement before manufacturers and suppliers were fighting bitterly over the implementation of best practices like continuous quality improvement and annual price reductions (para. 3). The U.S. auto industry has been required to overcome obstacles to implement a version of the Japanese model. A change in attitude and behavior with suppliers is necessary for U.S. manufacturers to improve competitive advantage. Gonzalez (2015) notes that U.S. auto companies of yesterday took a "What's in it for me?" approach to business relationships, where negotiations are viewed as a zero-sum game with a clear winner and loser (para. 5). It must be realized that the auto industry globally has evolved. Strategies with suppliers must be adjusted to compete with the likes of Toyota and Honda. Mudambi and Helper (1998) describe the importance of cooperative buyer and seller relationships and the importance of it to

sustain competitive advantage. Japanese auto manufacturers have attained competitive advantage by efficient relationships with suppliers. Japanese supplier relationships, unlike American supplier relationships, are long-term commitments. Kopp (2012) described auto supplier relationships in Japan as far more close and interdependent than the arm's length relationships that are considered ideal in many western countries. In Japan, a customer and a supplier may have been working together for decades, may exchange personnel, may have engaged in joint development projects and extensive information sharing, and may have cross share-holdings (para. 2). Cultural differences in close collaboration may be difficult to overcome. Liker (2004) believes that Toyota's continued success at implementing these tools (operational excellence) stem from a deeper business philosophy based on its understanding of people and human motivation. Its success is ultimately based on its ability to cultivate leadership, teams, and culture, to devise strategy, build supplier relationships, and to maintain a learning organization.

Competitive Advantage

Porter (1985) describes competitive advantage as organizational factors that enable a firm to outperform its competitors. All auto manufacturers desire competitive advantage. Close collaboration, although a very small portion of the supply chain structure, has a tremendous bearing on the success of the auto industry. Strategic partnerships promote organizational learning, facilitating the development of skills and competencies that help the firm to achieve a global competitive advantage (Vermeulen & Barkema, 2011). It seemed prophetic when Dyer (2000) stated that future competitive advantage will be created by teams of companies rather than by single firms. Competition between single firms is becoming less universal as networks of allied firms have begun to compete with each other. Competitive advantage is increasingly jointly created and shared by teams of other firms within a value chain.

Conclusion

The factual evidence determined that Japanese automakers, namely Toyota and Honda, possess exceptional relationships with their suppliers. They have surpassed U.S. automakers in the attempt to achieve effective supplier relations. Japanese auto manufacturers increase value with suppliers by open and frequent communications, strategic integration, the desire for long-term relationships, and sharing information and technology. These measures, in turn, create close partnerships and enhance the ability to gain competitive advantage. The Toyota Camry was the best selling car in the U.S. from the years of 2010-2015. The rankings for 2nd place during these years shuffled between the Honda Accord, Toyota Corolla, Nissan Altima, and Honda Civic. Close collaboration with suppliers is a significant aspect in the supply chain and, if done effectively, obtains competitive advantage. All is not lost for U.S. automakers though. Domestic auto manufacturers are changing supplier strategy to compete with the Japanese. About two and a half years ago, Ford unveiled its 2.0 version of The Aligned Business Framework, which was designed to work closer with their suppliers with technology and product development. In 2014, GM unveiled a new supplier collaboration strategy called The Strategic Supplier Engagement Program. This strategy involves more open communication and technology sharing. When competitive advantage is acquired, it's a process that must have sustainability factors. Currently, Japanese automakers are mastering those factors of sustainability.

REFERENCES

Andrews, J. (2014). The importance of supply chain collaboration. Retrieved from www.supplytechnologies.com/blog/the-importance-of-supply-chain-collaboration

Caiazza, R., & Nueno, P. (2014). Corporate strategies of automotive firms: How to become global leaders. *Competitive Review 24*(2). doi http://dx.doi.org/10.1108/CR-12-2012-0035

Colias, M. (2014). GM takes next step to strengthen relationship with suppliers. Retrieved from www.autonews.com

Dyer, J.H. (2000). *Collaborative advantage: Winning through their extended enterprise networks.* New York: Oxford University Press. Retrieved from http://0-search.ebscohost. com.athens.iii.com/ login.aspxdirect=true& db=nlebk&AN=151402&site=ehost-live&ebv-EB&ppid_vii

(Ed.). (2018). Automotive suppliers share of worldwide automobile manufacture 2015 | Statistic. Retrieved February 22, 2018, from https://www.statista.com/statistics/269619/automotive-suppliers-share-of-worldwide-automobile-manufacture-since-1985/

Gonzales, A. (2015, May 20). The high cost of poor supplier relationships. *Talking Logistics.* Retrieved from http://www.talkinglogistics.com

Helper, S. (1991). How much has really changed between U.S. automakers and their suppliers? *Sloan Management Review, 32*(4), 19.

Henke, J.W. (2015, May 31). Strained relationships with suppliers costing GM and Ford. Planning perspectives, p. 2. Retrieved from http://www.ppi1.com/site/wp-content/uploads/2009/05/2005-relations-study-press-release1.pdf.

Kopp, R. (2012, October 18). Preference for Japanese suppliers. *Japan Intercultural Consulting.* Retrieved from http://www.japanintercultural.com

Liker, J.T. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer.* Madison, WI: McGraw-Hill.

Liker, J., & Choi, T.Y. (2004). Building deeper relationships. *Harvard Business Review.* Retrieved from http://www.hbr.org

Table 1—Study Criteria and Group Evaluations

Criteria	U.S. Big Three	Japanese Big Three
Protect confidential info	Little regard for suppliers proprietary information or intellectual property	High regard
Open, honest communication	Indifference; incomplete and late information	High level, timely
Importance of cost, vs. quality and technology	By far, primary focus on cost	Always seek low cost, but balance it with quality improvements and technology
Supplier survival	Little regard	Concern for long term success and stability
Relationship orientation	Adversarial; focus is on cost and low OEM's short term gain	Strategically integrate suppliers into partnership-like relations

Mudambi, R., & Helper, S. (1998). The 'close but adversarial' model of supplier relations in the U.S. auto industry. *Strategic Management Journal, 19*(8), 775. Retrieved from http://search.proquest.com.athens.iii.com/docview/231206422?

Perspectives, I.P. (2017, May 15). 2017 N.A. automotive OEM study shows General Motors jumps to third place. Nissan falls to last, in supplier relations. Retrieved February 22, 2018, from https://222.prnewswire.com/new-release/2017-na-automotive-oem-study-shows-general-motors-jumps-to-third-place-nissan-falls-to-last-in-supplier-relations-300457268.html

PRNewswire. (2015, May 18). OEM-Supplier relations study shows strong gains for Toyota and Honda, with Ford, Nissan, FCA, and GM falling behind. *PRNewswire.* Retrieved from http://www.prnewswire.com

Swiecki, B., & Gerth, R.J. (2008). Collaboration in the automotive supply chain-Realizing the full potential of a powerful tool. p.5 retrieved from http://www.cargroup.org/assets/files/020609autosupchain.pdf

Takeishi, A. (2001). Bridging inter-and intra-firm boundaries: Management of supplier involvement in automobile product development. *Strategic Management Journal, 22*(5). Retrieved from http://search.proquest.com.athens.iii.com/docview/225020057?accountid=8411

Vermeulen, F. & Barkema, H. (2011). Learning through acquisitions. *Academy of Management Journals, 44*(3). Retrieved from http://search.proquest.com.athens.iii.com/docview/199791406?accountid=8411

Xia, Y., & Tang, T.L. (2011). Sustainability in supply chain management: Suggestions for the auto industry. *Management Decision, 49*(4), 495-512. Retrieved from https://doi.org/10.1108/00251741111126459

A Radio Astronomy CubeSat for STEM Education: STEM-SAT1

Dr. J. Wayne McCain
Professor of Management of Technology
Collin R. McCain
Calhoun Community College Student

ABSTRACT

A CubeSat is a miniaturized satellite originally designed for use in conjunction with university educational projects. Its use was to enable graduate students to be able to design, build, test, and operate in space a small spacecraft with capabilities similar to that of Sputnik. *This paper emphasizes and lists several CubeSat missions that have radio astronomy research objectives and proposes a list of potential mission objectives or scenarios.*

Background

CubeSats (see Figure 1) have been around for upwards of two decades now. The terminology refers to small, light-weight, and usually 'cube-shaped' secondary payload satellites that take advantage of today's electronics to accomplish useful scientific research in space at much reduced cost and complexity. CubeSats are miniaturized satellites originally designed for use in conjunction with university educational projects and are typically 10 cm x 10 cm x 10 cm (4 inches x 4 inches x 4 inches) and approximately 1.3 kg (3 lbs.). The CubeSat reference design was first proposed in 1999 by professors from California Polytechnic State University and Bob Twiggs of Stanford University [formerly Weber State (Utah)].

Figure 2—Students Play a Major Role in CubeSats

Their goal was to enable graduate students to be able to design, build, test, and operate in space a small spacecraft with capabilities similar to that of the very first spacecraft, *Sputnik.* The CubeSat, as initially proposed, did not set out to become a standard; rather, it became a standard over time.

The first batch of CubeSats was launched in June 2003 on a Russian Eurockot vehicle. One launch provider, ULA (United Launch Alliance, Decatur, AL), had successfully placed over 100 into orbit by year's end 2016. During March 2017, India launched 104 CubeSats from a single launch vehicle! Over 700 of these 'cubes' have been launched to date but with only a small number dedicated to radio-astronomy-related research. This paper emphasizes and lists several CubeSat missions (past-present-near future) that have radio astronomy research objectives. It also formulates a basic specification for a possible SARA (Society of Amateur Radio Astronomers)-initiated

Figure 1—4x4x4 Inch 1U CubeSat

CubeSat radio astronomy mission (STEM-SAT1) and proposes a list of potential mission objectives/scenarios/participants. Not only will team members and participants be served by such a mission, but SARA's student STEM (Science, Technology, Engineering, and Math) outreach objectives will also benefit greatly (See Figure 2). In addition, collaboration with other academic and industrial organizations (including the AMSAT, the Amateur Satellite Organization) will further enhance the resulting outcomes for a broad range of beneficiaries.

The 'Basic" size CubeSat is a 100x100x100 mm (4.0x4.0x4.0 inch) cube weighing in at no more than 1.3 kg (~3.0 pounds). The requirements entail the design to be completely 'autonomous,' meaning no electrical and only minimal physical interfaces with the launch vehicle. As CubeSats are piggyback to the primary payload(s) of any given mission, they have secondary priority and MUST NOT interfere or degrade the primary payload in any manner. Fairly extensive testing must be done in advance of acceptance for launch to assure that this is the case. There are many design iterations for the outward frame or support structure which includes 3-D printed versions (See Figure 3) along with conventionally-manufactured composite or metal components. Several companies even offer CubeSat 'kits' with all the supporting frames or shell AND supporting standard avionics components and various other options. These kits are not cheap; however, with prices starting in the low $20k range. Some commercial companies also offer launch opportunities for sale as well, suborbital and low-Earth orbit (LEO). Many participating organizations design and build much of their CubeSat hardware 'from scratch' but in conformance with the standard specifications developed by Cal Poly and Stanford. As long as critical external dimensions and electrical/electronic/power standards are met, these individual efforts present no major problems. Indeed, many of the STEM-related efforts are centered around the conceptualization, design, development, manufacture, and test of all the CubeSat kit hardware (and for that matter, software) to support a mission or series of missions. The one big advantage of using CubeSat kit hardware and components is the potential savings in design and development time should an experiment's launch schedule be a critical driver. Without expediting measures, an overall CubeSat mission can involve three to four years of efforts between conceptualization to eventual launch.

The anatomy of a typical CubeSat mission is shown in Figure 4. As mentioned earlier, since CubeSats are secondary, piggy-back payloads, their priority is relegated relative to the primary payload(s) on any given mission (the exception, of course, is one of the CubeSat dedicated missions usually flown on smaller orbital launchers or even smaller sub-orbital sounding rockets). CubeSat payloads are integrated into the mission's payload enclosure(s) usually being mounted on primary payload support frustums or payload 'adapters.' Several different CubeSat ejection systems have been developed (e.g. the Ca Poly/Stanford P-Pod) to release the small satellites once the main payloads have been deployed. As shown in Figure 4, some scenarios include mounting the CubeSats on the upper stage booster itself, rather than in the actual primary payload bay. Paramount is the requirement that the **CubeSats offer no risk to achieving the mission objectives of the primary payload(s).** This includes the small satellite ejection operations AND any potential interference from the CubeSats with the primary payloads after ejection (use of active station-keeping propulsion might risk contamination of primary
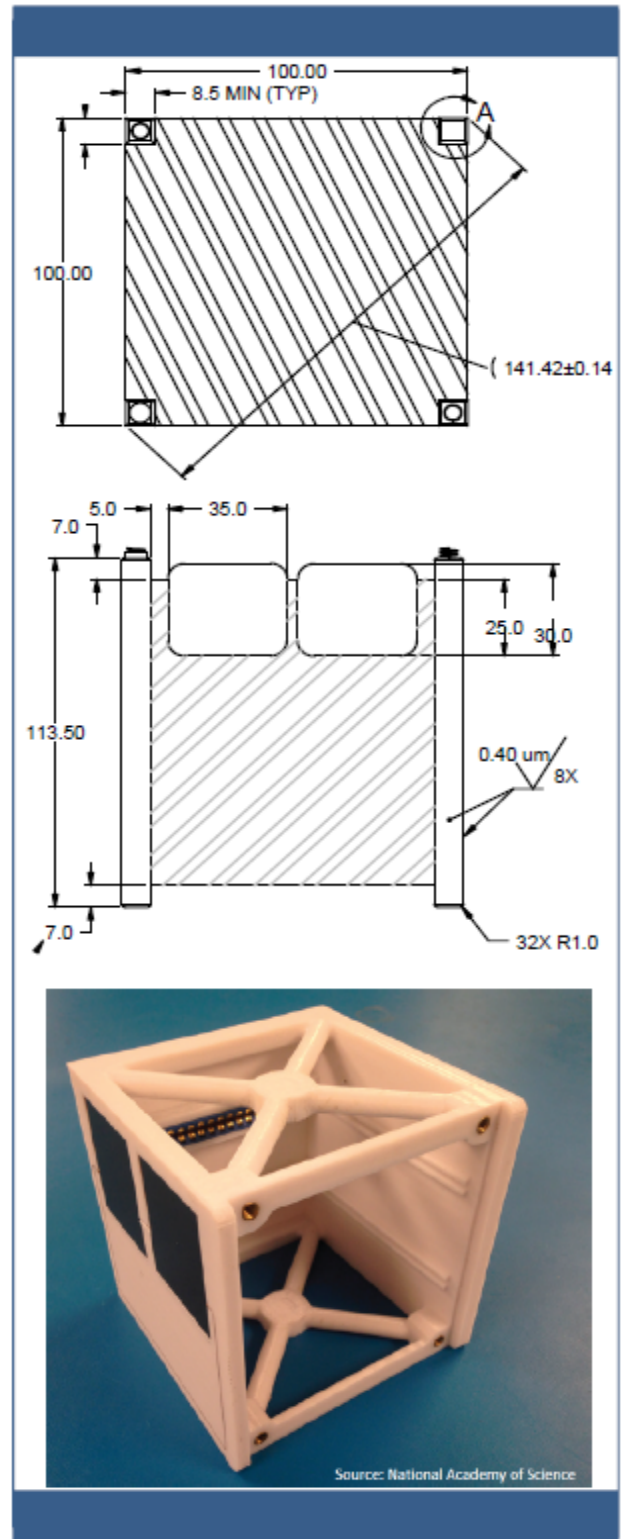

Figure 3—Basic CubeSat Dimensions & 3D Printed

payload optical systems OR, RF signals from the CubeSat might be able to interrupt or degrade the communications of commands and/or data to the primary payload). Barring any of these eventualities, the CubeSats and the primary payloads

are able to 'share' a launch opportunity in complete autonomy. CubeSat orbits are normally designed to be far from the planned orbits of primary payloads; therefore, no significant probability of a physical collision would exist. In addition, most CubeSat orbits decay rather rapidly and re-enter Earth's atmosphere without constituting a permanent addition to the already massive amount of space debris/junk in orbit.

United Launch Alliance (ULA) is taking CubeSat rideshare to the next level by launching a new, first-of-its-kind program in the commercial industry to allow universities and students to compete for the opportunity to be awarded a free CubeSat launch slot. On May 2, 2005, The Boeing Company and the Lockheed Martin Corporation announced their intention to form a joint venture called ULA, combining the production, engineering, test and launch operations associated with the U.S. government launches of Boeing Delta and Lockheed Martin Atlas rockets—providing world-class space launch services for the U.S. government at lower cost. ULA provides launch services using its Atlas and Delta renown vehicles. Built on a heritage of sequential enhancements to the Atlas I, II and III families, and developed in partnership with the U.S. Air Force Evolved Expendable Launch Vehicles (EELV) program, the Atlas V provides a single system that can accommodate medium-lift to heavy-lift missions for U.S. government and commercial launch customers. Delta rockets have been built and launched since 1960. Delta's origins go back to the Thor intermediate-range ballistic missile, which was developed in the mid-1950s for the U.S. Air Force. The Thor, a single-stage, liquid-fueled rocket, was modified to become the Delta launch vehicle, which later evolved into the Delta II. Delta IV was developed in partnership with the U.S. Air Force EELV program and is the most advanced family of Delta rockets. Delta IV blends advanced and proven technology to launch virtually any size medium-to-heavy class payload to space. ULA is

offering universities the chance to compete for at least six CubeSat launch slots on two Atlas V missions, with a goal to eventually add university CubeSat slots to nearly every Atlas and Vulcan Centaur launch. Since it began operations, ULA has been committed to STEM education initiatives. Innovative programs such as this are designed to help motivate, educate and develop our next generation of rocket scientists and space entrepreneurs, while making space more affordable and accessible for hundreds of rides in the coming years. The CubeSat launch program is available to all U.S. accredited colleges and universities. These colleges are encouraged to team with K-12 schools to further expand these opportunities throughout the science, technology, engineering and math (STEM) community.

NASA's CubeSat Launch initiative (CSLI) provides access to space for small satellites, CubeSats, developed by the NASA Centers and programs, educational institutions and non-profit organizations giving Cube-Sat developers access to a low-cost pathway to conduct research in the areas of science, exploration, technology development, education, or operations with some details shown in Figure 6. Through Educational Launch of Nanosatellites (ELaNa) Missions International Space Station deployment opportunities or ride-share launches to space via existing launch services of government payloads are provided, as well as dedicated CubeSat launches from the newly selected VCLS contracts for the CubeSats selected through CSLI. CubeSats are a class of research spacecraft called nanosatellites. The cube-shaped satellites are spacecraft size in units or U's, typically up to 12U. To participate in the CSLI program, CubeSat projects/investigations should be in alignment with NASA's Strategic Plan. The initiative is an integrated cross agency collaborative effort led by NASA's Human Exploration and Operations Mission Directorate to streamline and prioritize ride share and deployment opportunities of Cu-
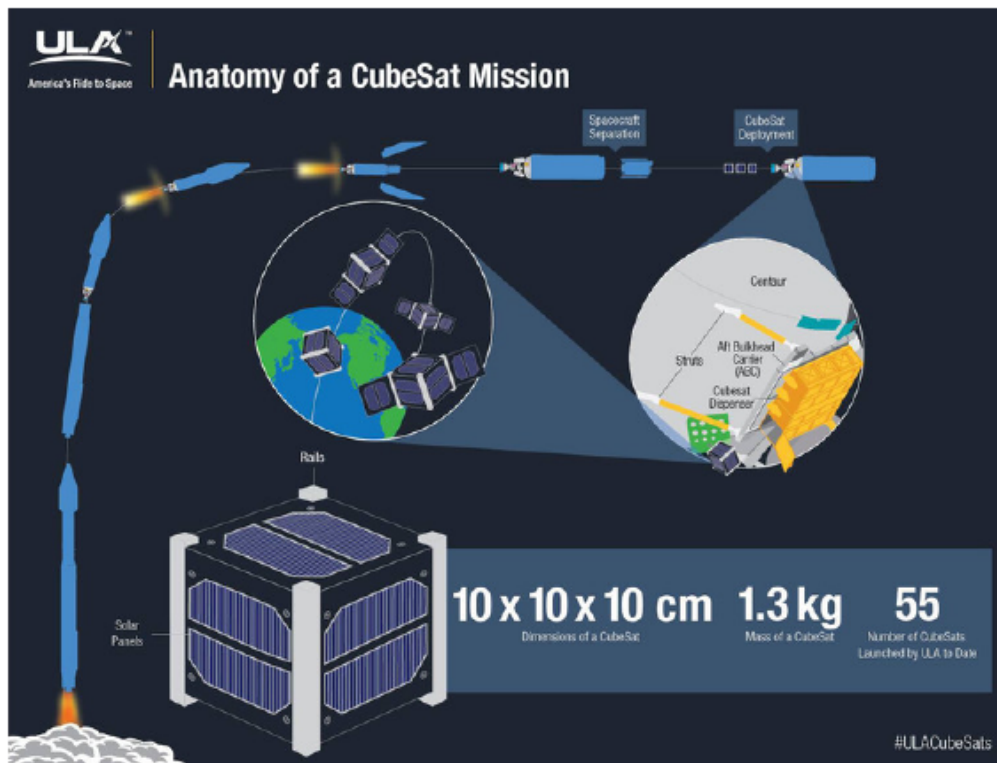

Figure 4—Anatomy of a CubeSat Mission Showing Deployment after Primary Payloads

beSats. CSLI opportunities are available to NASA centers, U.S. not-for-profit organizations, and accredited U.S. educational organizations. In the past, selected science investigation missions have studied Earth's atmosphere, near earth objects, space weather and biological sciences. Technology demonstration missions have included in-space propulsion, space power, radiation testing and solar sails. By providing a progression of educational opportunities including CSLI for students, teachers, and faculty, NASA assists the Nation in attracting and retaining students in STEM disciplines. This strengthens NASA's and the Nation's future workforce. Further, the CSLI promotes and develops innovative technology partnerships among NASA, U.S. industry, and other sectors.

Since its inception, 46 CubeSats have been flown on 12 ELaNa Missions with 52 manifested for flight. ELaNa missions have included: BisonSat, the first CubeSat built by a tribal college; TJ3Sat, the first CubeSat built by a high school; and STMSat-1, the first CubeSat built by an elementary school.

NASA has selected 152 CubeSat missions from 85 unique organizations representing 38 states and the District of Columbia: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

Of all CubeSat missions flown, Figure 7 illustrates numbers by mission types. Began initially as a heavily-biased towards education endeavor, the CubeSat has flourished into other areas to be currently dominated by 'commercial' category flights. In all fairness, many of the so-called commercial missions are actually technology development and demonstration missions mounted by both academic and industrial organizations with most centered on developing or further defining technologies to support future CubeSat AND full-sized satellite missions. Educational flights hold a second-place ranking in numbers, followed by military and civil government experiments (these latter numbers include some NASA space-development-oriented missions as well). One interesting note is that industry has found a great utility in launching small, CubeSat spacecraft and experiments that serve to improve and pave the way for increased variety and improved success of their multi-million dollar communications, earth resources, and military dedicated satellites. Sort of a 'David supporting Goliath' analogy. Nevertheless, it serves to indicate the growing importance of the smaller, shorter development time and lower cost attributes of the CubeSat template for research and development.

In terms of CubeSat mission science objectives, Figure 8 corroborates the previous statement declaring the dominance of commercial technology-oriented missions. These current data (and projections into the year 2018) show technology is followed by Solar and space physics a significantly-distant second, then Earth science and biological/physical sciences essentially tied for third place. Astronomy/astrophysics and planetary science experimentation using CubeSats is barely measurable on this chart, bringing up a distant 4th and 5th places respectively. There are, however, considerable advantages to moving astronomy research to outer space as exemplified by the still overwhelming amounts of useful data and discoveries coming from our Hubble space-based optical telescope, which

Figure 5—Launch Vehicles Used in Some CubeSat Deployments (Atlas top and Delta vehicle bottom)

is soon to be outdone by the newest mission slated, the James Webb (medium IR range) telescope.

Figure 6—ELaNa NASA-Sponsored Opportunities

From a radio astronomy perspective (over 50% of our accumulated knowledge of the Universe is derived from radio astronomy which has been in existence only about 100 of the thousands of years of existence of astronomy in the visible parts of the electromagnetic spectrum), there are unique opportunities for observation and discoveries that CANNOT be duplicated using Earth-based observing equipment at any frequency. New interesting astronomical science drivers for <u>very low frequency radio astronomy</u> have emerged, ranging from studies of the astronomical dark ages, the epoch of reionization, exoplanets, to ultra-high energy cosmic rays. Huge efforts are currently being made to establish low frequency Earth-bound instruments, since today's technology is able to support this. However, astronomical observations with Earth-bound radio telescopes at very low frequencies are hampered by the ionospheric plasma, which scatters impinging celestial radio waves. This effect is larger at lower frequencies. **Below about 5 MHz at night or about 10 MHz during daytime, the ionosphere is essentially opaque for radio waves.** That means that Earth-bound radio astronomy observation in those bands would be severely limited in sensitivity and spatial resolution, or **is entirely impossible.**

A radio telescope in space would not be hampered by the Earth's ionosphere, but prior to now such a telescope was technologically and financially not feasible. However, extrapolation of current technological advancements in signal processing and small CubeSat systems imply that distributed low frequency radio telescopes in space could be feasible. Some (Roby and others) have proposed an autonomous distributed sensor system in space to explore this new low-frequency band for radio astronomy. The array would have identical CubeSats, and ideally no central processing system. An advantage of such a system is that it is highly scalable and, due to the distributed nature, virtually insensitive to failure or non-availability of a fraction of its components. One such proposal is the novel concept of OLFAR, the orbiting low frequency antennas for radio astronomy in space. Figure 9 illustrates the phenomenon of opaqueness of the upper atmosphere starting below about 15 mhz. This means that investigations into the deep space sources for such signals cannot be undertaken from Earth. One example of where such investigations ARE feasible is the National Radio Astronomy Observatory's Jansky **'Very Large Array or VLA'** located near Socorro, New Mexico. The VLA, one of the world's premier astronomical radio observatories, consists of 27 radio antennas in a Y-shaped configuration on the Plains of San Agustin, fifty miles west of Socorro. Each antenna is 25 meters (82 feet) in diameter. But even the VLA (or Arecibo or the new China 500 meter dish) cannot receive ANY signals at the low frequencies. If it were possible to move the VLA to low Earth orbit, one would still be subject to the radio interference (RFI) produced by the millions of human initiated sources (ranging from automobiles to microwave ovens), weather phenomenon such as lightning, and the aurora which emits powerful signals in the low frequency spectrum as the result of Earth's atmosphere interacting with high-energy particles of the Solar wind. The very best arrangement would be to build a VLA like facility on the dark side of the Moon, but that is not likely to happen soon.

There are real possibilities using CubeSats which, although not shielded from Earth's interference, can still provide useful results. Figure 10 shows several of the small satellite missions that have addressed radio astronomy objectives, including the aforementioned OLFAR proposed Lunar-orbit mission.
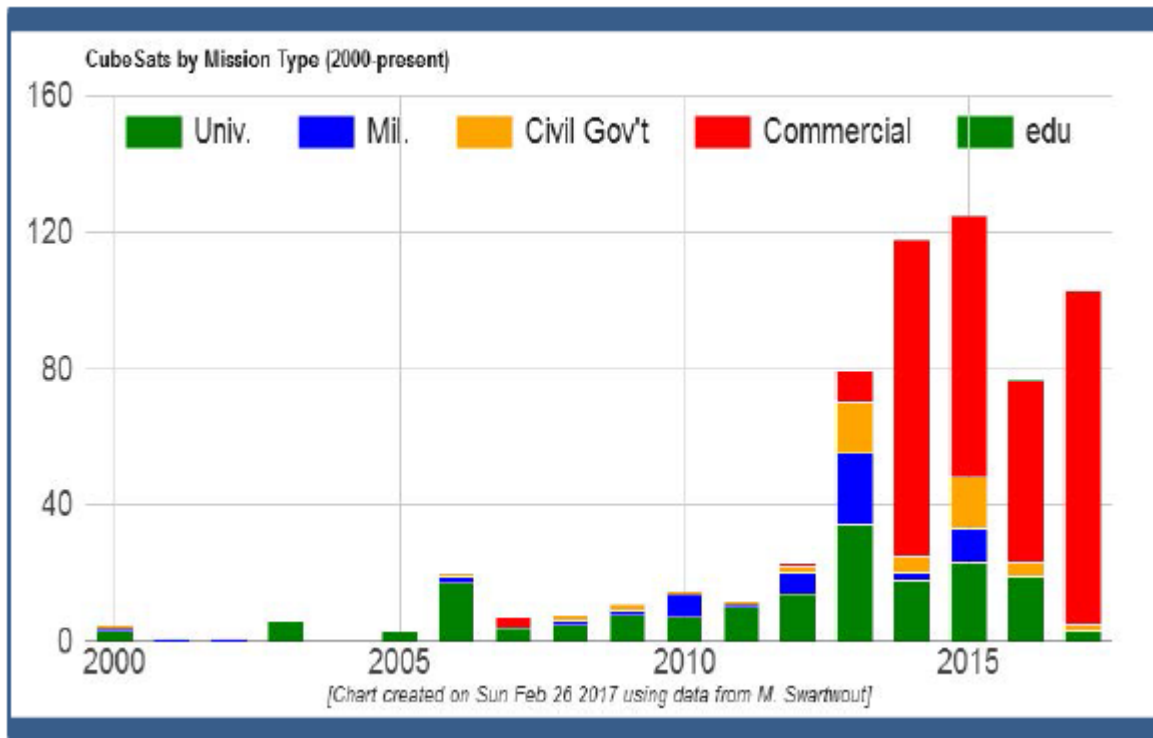
Figure 7—CubeSat Numbers by Mission Type from 2000 to Present Year [Swartwout]

Each of these use or propose to use some number of CubeSats in an array or satellite 'swarm' in much the same fashion as does the VLA, to receive and image signals in the very low frequency (VLF), low frequency (LF), and high frequency (HF) ranges. A "Low Frequency radio interferometer" has been proposed several times—here in the USA: SIRA project (MacDowall et al, GSFC), SOLARA/SARA project (Knapp et al, MIT); and in Europe, with the LOFAR team: OLFAR project (Bentum et al, NL) plus other emerging projects in NL, Sweden and France (DEX, SURO, DARIS, FOAM…). OLFAR's science objectives include «Dark Ages» (cosmology < 10MHz, redshift ~100, EoR [Epoch of Recombination]); Sun-Earth (space weather); and Planets (outer planets: Uranus…); In situ measurements (Thermal Noise). Many spacecraft (like Cassini, STEREO or JUNO, and these are the more recent ones) have embarked radio receivers dedicated to the study of the radio emissions of the Solar System, but these instruments have no angular resolution. Their wavelengths are ranging from several 10m to 100's of km. The next generation of space radio instrumentation is requiring a space based interferometer (primarily at the low frequencies as noted), that can be set up with a swarm of CubeSats. Dr. Frank Robey, on behalf of the MIT-EAPS-Lincoln-Haystack HFVS team, proposed such a system at the 2016 Small Satellite Conference. Using "Vector Sensor Inversion Processing," Dr. Robey and the team theorize that it is possible to achieve substantially useful, VLA-like imaging with a relatively small number (~18-24) of CubeSats making up a formation-flying array. Figure 10 reiterates the potential science results while Figure 12 further illustrates this general concept.

An obvious first step would seem to be the development and launch of a single radio astronomy CubeSat as a proof-of-concept technology demonstration. Such a project was proposed to the 2017 SARA Western Conference at Socorro in March 2017. Figure 13 summarizes the elements of the proposal to be undertaken under the auspices of a SARA Special Interest Group (SIG) but funded and managed as a totally separate, autonomous organization. As shown, the primary objective will be to demonstrate the basic VLF/LF/HF transponder concept wherein the low frequency signals are received while in LEO, then rebroadcast on a downlink frequency in the 146 MHz (2 meters) band using standard protocols in use by AMSAT on its other CubeSats of the FOX 1 variety. Vanderbilt University in Nashville currently has one such spacecraft flying with an experiment to study the effects of space-based radiation on semiconductors used in typical satellite avionics and control systems and has two other similar birds in the queue. Science objectives will be both planetary and Solar emissions, deep space cosmic radiation, EoR (Big Bang) emissions, and other high energy object emissions (e.g. active galactic nebula, AGNS). Secondary objectives will include standard downlinks of systems operating parameter data, (a UHF Calibration Beacon has been dropped) and the standard 70CM uplink-2M downlink Amateur Radio repeater. Preliminary estimates suggest that these objectives can be met within a 1U CubeSat configuration (4.0x4.0x4.0 inches) with very similar architecture as the proven Vanderbilt/AMSAT Fox 1A RadFxSat mission. The requested orbit will be 650 km (same as Vanderbilt) based upon winning a slot from the NASA ELaNa request for proposal due November of this year (2017). A meeting was held with Vanderbilt's Institute for Space and Defense Electronics (ISDE) in early March where its Director, Dr. Robert Reed, agreed in principle to collaborate with the STEM-SAT1 team with help from ABD Rebekah Austin, one of the Fox-1A Principal Investigators. A non-disclosure agreement (NDA) is in work with the ISDE as is a memorandum of understanding (MOU) with AMSAT (coordinated with Mr. Jerry Buston, AM-

SAT's Vice President of Engineering). It is anticipated that these basic framework documents will be put in place prior to the July 2018 SARA Eastern Conference in Green Bank, WV.

Figure 14 shows a notional functional block diagram of the STEM-SAT1 science experiment hardware and its interface with the AMSAT Standard hardware. The degree to which it is possible to utilize the existing FOX-1 standard protocols and hardware will inevitably drive the design. It is anticipated that the STEM-SAT1 experiment will be allotted 4 of the total 10 PWBs of the FOX hardware. Fox-1A (aka AO-85) carries a U/V FM repeater operating at up to 800 mw. Uplink was planned for 435.180, but reports indicate it may be closer to 435.172 due to unforeseen temperature differences. Repeater access requires the satellite to receive a 67.0 Hz PL tone for two seconds. If the satellite does not receive a signal carrying a 67.0 Hz PL tone, the repeater will turn off after one minute. When the repeater is not activated by a signal carrying the PL tone, a voice beacon is transmitted every two minutes. Downlink is 145.980 and includes Data Under Voice (DUV) FSK telemetry simultaneous with repeater operation. A high speed data downlink at 9600 bps is available for experiment and high resolution data. In addition to the amateur operations, there are a number of scientific experiments on board the spacecraft. Vanderbilt University is provided a Low Energy Proton radiation experiment, and Pennsylvania State University-Erie, a gyroscope experiment.

The opportunity to work with Vanderbilt and AMSAT will serve to 'jump start' the STEM-SAT1 project and, assuming that a slot can be won as a result of the NASA ELaNa down-select, it is feasible that the mission could be flown within 18-36 months, if not slightly earlier. Schedule will be highly dependent upon what 'spare' hardware from the AMSAT Fox-1 series may be available for use on the project, availability of the specific, flight-qualified NICAD power system batteries (of which there currently are zero spares), and the ability of the project to coordinate and raise the necessary additional funding required for purchase, assembly, and test of the remaining hardware for the science experiment *per se*.

The primary science objectives for the mission are also chosen with educational opportunities to promote and enhance STEM educational outreach. SARA currently supports several programs that depend solely upon Earth-based observations of HF spectrum signals in support of planetary science (Jupiter/Io Project JOVE) and Solar observations, both direct and indirect with the INSPIRE and SuperSID projects, respectively. Figure 15 addresses the planetary science interests mentioned, while Figure 16 addresses the Solar observations interests. **Radio JOVE** is a hands-on educational activity that brings the radio sounds of the Sun, Jupiter, the Milky Way Galaxy, and terrestrial radio noise to students, teachers, and the general public. Participants may build a simple radio telescope kit, make scientific observations, and interact with professional radio observatories in real-time over the Internet. The JOVE website (http://radiojove.gsfc.nasa.gov) includes science information, construction manuals, observing guides, and education resources for teachers and students. The **INSPIRE Project** objective is to bring the excitement of observing natural and manmade radio waves in the audio region to students. Underlying this objective is the conviction that science and technology are the underpinnings of our modern society, and that only with an understanding of science and technology can people make correct decisions in their lives: public, professional, and private. Stimulating students to learn
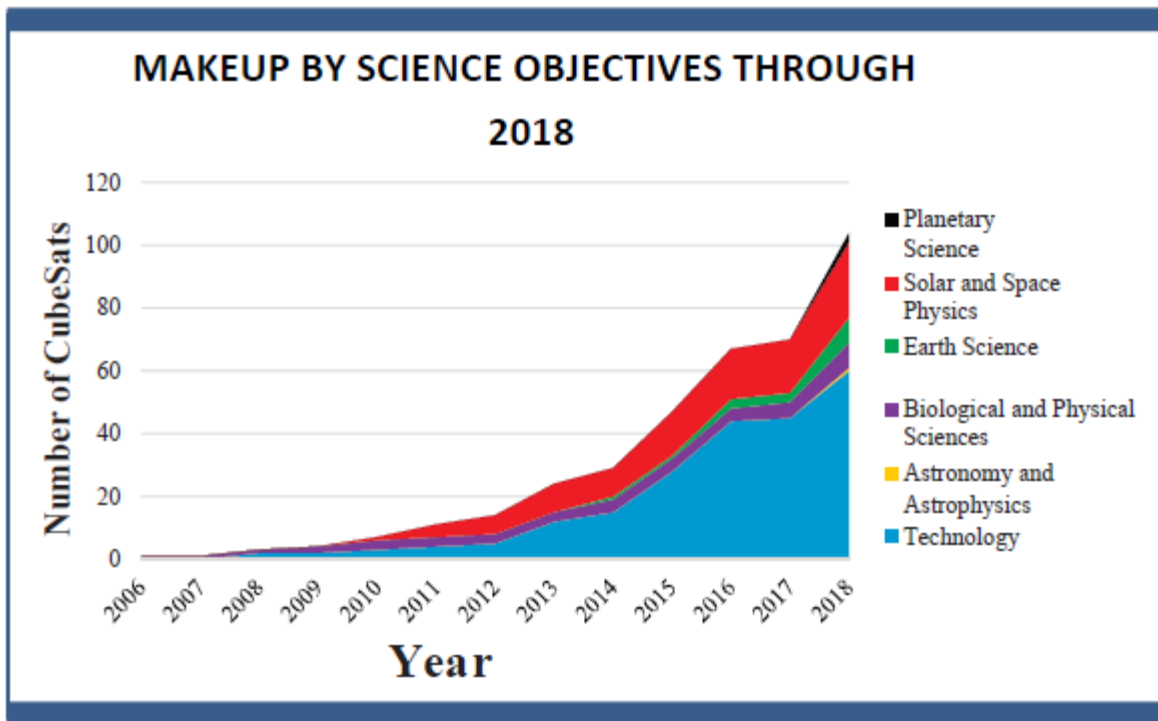

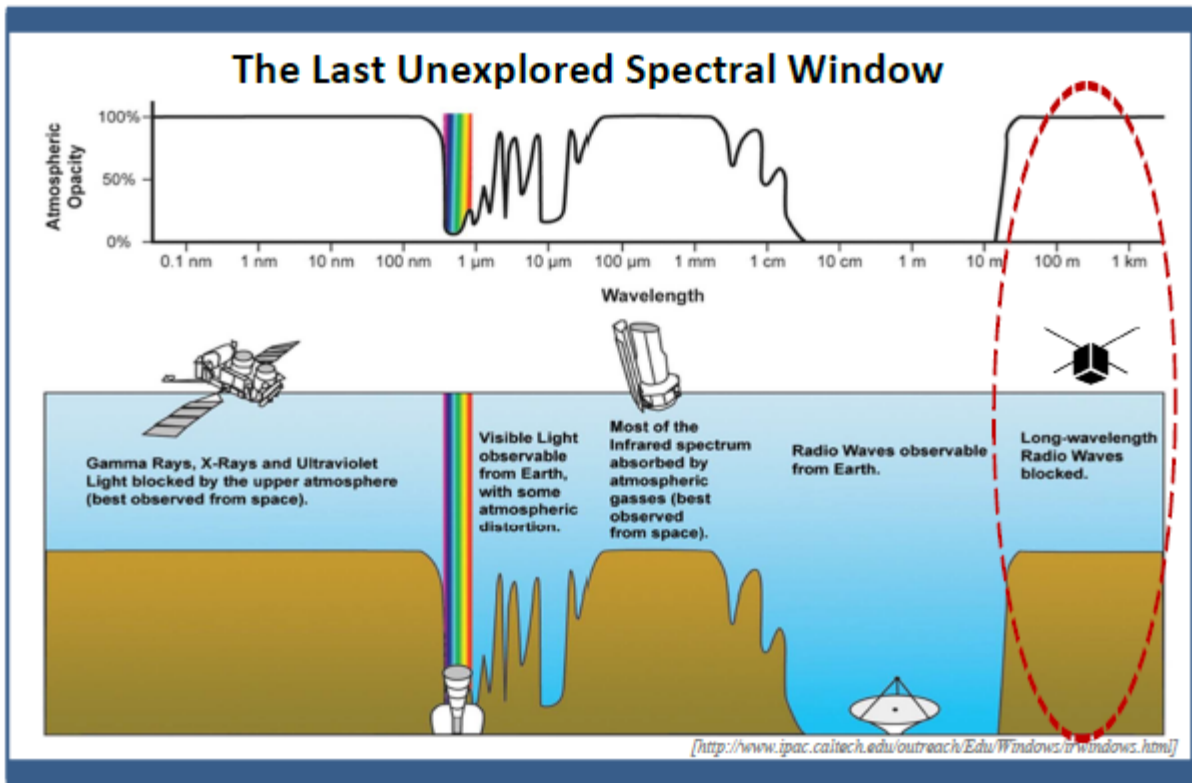**Figure 8—CubeSat Mission Makeup by Science Objectives through 2018 [Swartwout]**

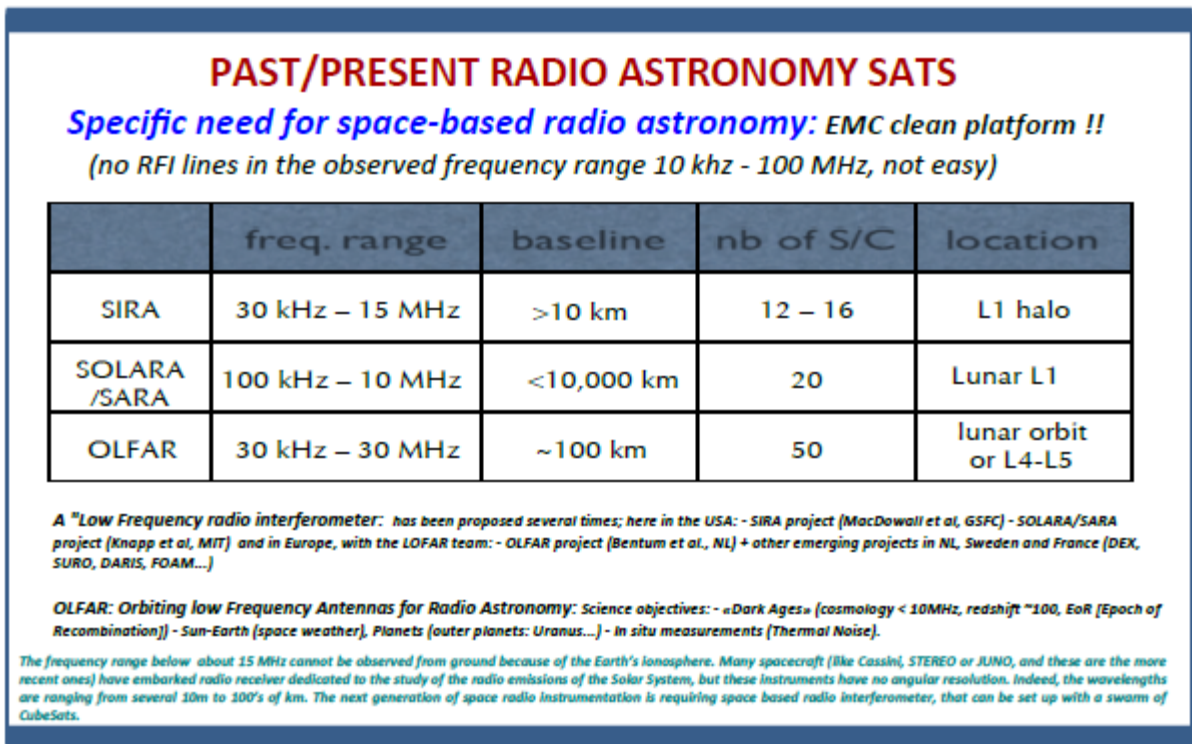**Figure 9—The Last Unexplored Spectrum Region Accessible Via CubeSat to Ground Relays**

Figure 10—Low Number of Current Radio Astronomy CubeSat Science Experiments

Science at Low Frequencies

- Low frequency observations probe
  - Non-thermal processes (plasma, magnetic fields)
  - High redshift (early universe)
- Key science cases:
  - Heliospheric radio emission (solar bursts, CMEs)
  - Planetary and exoplanetary radio emission
  - Galactic synchrotron emission and cosmic rays
  - High energy objects (supernovae, pulsars, black holes, AGN)
  - Cosmic dawn (Epoch of Reionization (EoR), first stars and galaxies)
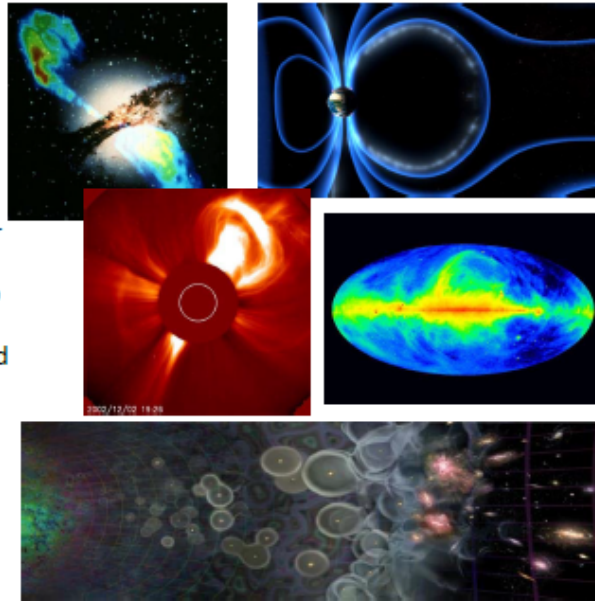
Figure 11—Scientific Interests Accessible Via CubeSat Relays
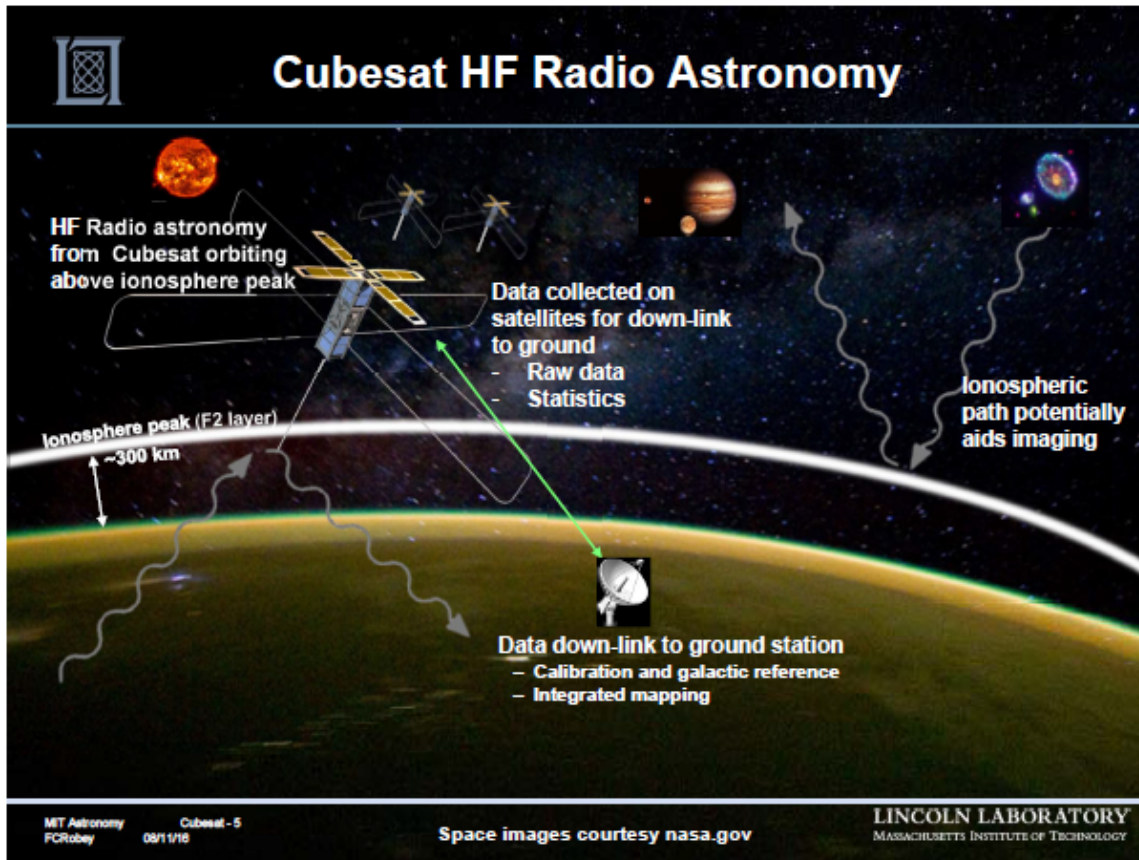
Figure 12—CubeSat Radio Astronomy at HF Frequencies Overcomes Ionospheric Blocking of Signals

Figure 13—Proposal for STEM-SAT1 CubeSat Project Objectives (updated from SARA Conferences)

and understand science and technology is key to them fulfilling their potential in the best interests of our society. INSPIRE also is an innovative, unique opportunity for students to actively gather data that might be used in a basic research project. In further support of Solar research, Stanford Solar Center and the SARA have teamed up to produce and distribute the **SuperSID** (Sudden Ionospheric Disturbance) monitor. This monitor utilizes a simple pre-amp to magnify the VLF radio signals which are then fed into a high definition computer sound card. This design allows the user to monitor and record multiple frequencies simultaneously. The unit uses a compact 1 meter loop antenna that can be used indoors or outside. This is an ideal project for the radio astronomer that has limited space. <u>STEM classes can correlate STEM-SAT1 spaceborne data with those from **JOVE, INSPIRE,** and **SuperSID** thus allowing considerable student involvement.</u>

To accomplish the STEM-SAT1 project, the STEM-SAT1 team will collaborate with a variety of organizations (See Figure 17), each having special skill sets and resources to bring to the project. Foremost in the organization will be the ASU AIAA students and SARA radio astronomers. In the order of two dozen engineers, scientists, and enthusiasts have expressed an interest or committed to help work the project. Skills of the SARA SIG will range from SDR design to ground station development, and deep space science. Other astronomy groups such as the Roane State College Tamke-Allan Observatory, University of North Alabama Astronomy Department, and the Von Braun Astronomical Society (VBAS) are expected to contribute significantly. Athens State University will manage, with consulting help from the Florida Institute of Technology's

Space Systems Program (Dr. Don Platt). The Alabama Academy of Science STEM Section will participate and help coordinate STEM educational activities. Of key technical importance is the collaboration with Vanderbilt University's ISDE and their CubeSat technical and management teams. AMSAT is expected to contribute essential expertise in the mission design and development areas and potentially provide assistance in assembling spacecraft hardware and use of some existing FOX-1 program spare assets. We are anticipating participation with the NRAO (particularly with their Project Management and Intern programs). An Athens, Alabama STEM school, SPARK Academy (Jennifer Kennedy) may participate in conjunction with JOVE, INSPIRE, and SuperSID data correlation. The Macon Art and Science Museum (Macon, Georgia) has also committed to participate via their science curator, Paul Fisher, an accomplished aerospace engineer and astronomer. All in all, the initial organizational structure offers substantial technical and educational expertise to help assure a high probability of STEM-SAT1 success!

Schedule wise, the first efforts to be completed include: finalization of agreements with Vanderbilt University and AMSAT; preliminary mission concept to include communication and data architecture; ground station design and tracking plans; approval from SARA Board of Directors to formally establish the CubeSat SIG; development of a project schedule, budget, and funding plan; and research into the details of and the development and submittal of the NASA CubeSat Initiative proposal expected to be due in November 2018. Other details will include the establishment of formal and informal lines of communications (e.g. all proprietary data must be strictly controlled

and have limited access) and coordination and briefings to all of the participating STEM institutions and groups. The STEM activity development and coordination is paramount to meeting the overall goals of the STEM-SAT1 team and will require close interface with the Alabama Academy of Science STEM Committee. It is possible that additional AAS activities (e.g., small grants based upon paper and/or poster competition) will be developed and incorporated into the annual AAS meetings that are held in March of each year.

Another important task is to develop formal channels of communication and data dissemination for the STEM-SAT1 project team. Another effective method involves developing a Facebook page, similar to that of the AAS STEM Section (credit to Mel Blake of UNA) and post announcements, status, and other news to this page. Team members will then be automatically notified whenever a post of any kind is added. This has proven to be effective given that all team members 'join' the page. Other means of media data communication will be explored such as Twitter, Instagram, and Photobucket. As shown in recent political campaigning, these social media resources can have huge impacts and will be worth exploiting to benefit communication of STEM-SAT1 information. To better organize and manage funding solicitations and expenditures, formation of a STEM-SAT1 Limited Liability Corporation (LLC) is anticipated.

Figure 18 presents a summary of the STEM-SAT1 proposal. It is unquestionable that such a project will afford the participating organizations a tremendous opportunity to expand amateur radio astronomy into the realm of orbital spaceflight and in-

crease educational STEM opportunities as well. The proposed science experiment (VLF/LF/HF reception of Solar/planetary/deep-space signals from above the active ionosphere and their retransmission to Earth) has yet to be demonstrated with CubeSat hardware/software so that aspect of a successful project will contribute significantly to the field of study. Its success can also add to the foundations for the MIT and other proposals for CubeSat array, space-based interferometers. Partnerships with AMSAT and collaboration with Vanderbilt's ISDE help substantially improve the probability of success AND should allow a shorter time lapse until the launch.

The most formidable tasks are to achieve means to finance the necessary expenses to include hardware, test, and any design development required and development of an achievable project schedule. Athens State's AIAA Student Branch, in conjunction with the STEM-SAT1 LLC, may choose to lead in these regards by developing a funding plan, risk management plan, and a project schedule as part of related coursework. Previous SARA projects [e.g., the Radio Astronomy Software-Defined Receiver (RASDR)] have been provided support in these areas by student projects from Athens State and Florida Tech. In addition, conference papers may be developed as a result of these research and development efforts. As noted in Figure 18, even with participation from AMSAT with potential use of spares, real costs could easily approach $100k, not a small sum for the project. One encouraging note is that the expected payoff should fully warrant the efforts devoted to accomplishing the STEM-SAT1 mission. Its success would most likely lead to more advanced, space-based opportunities for STEM education in the future!
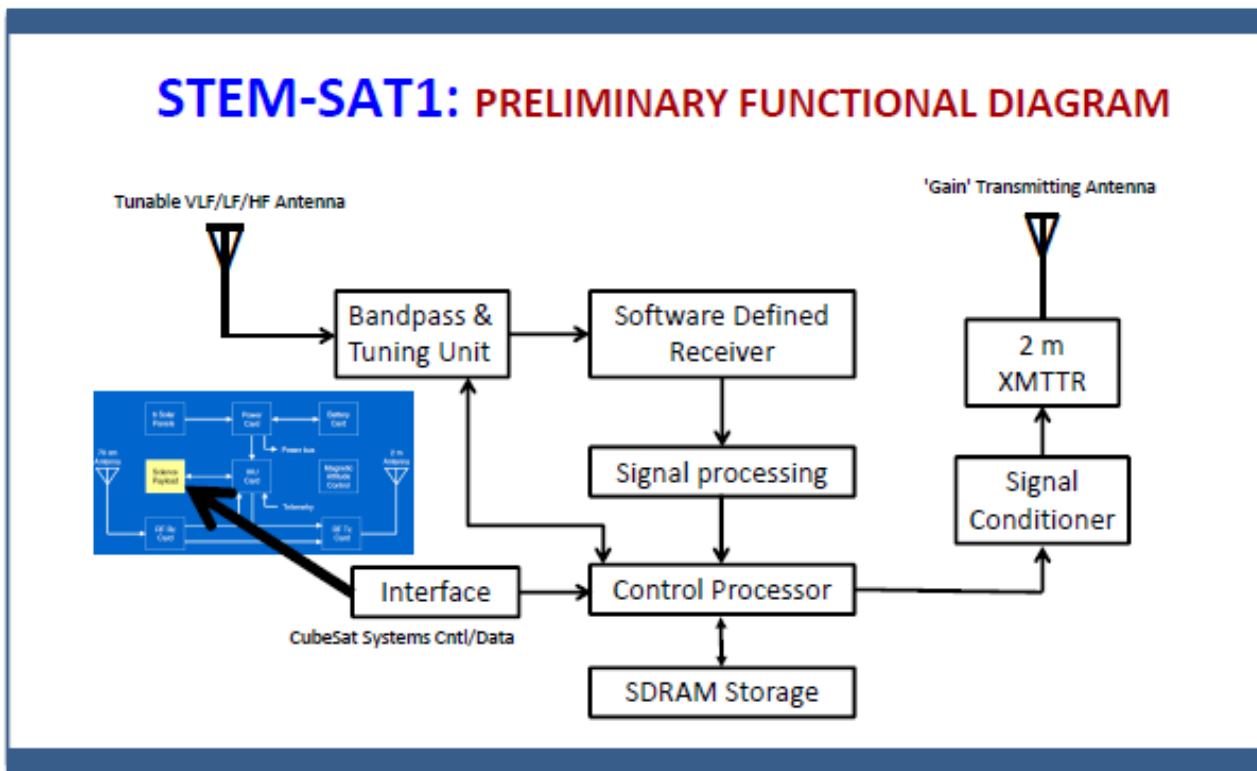

Figure 14—Preliminary STEM-SAT1 Science Experiment Block Diagram with AMSAT (FOX 1) Interface

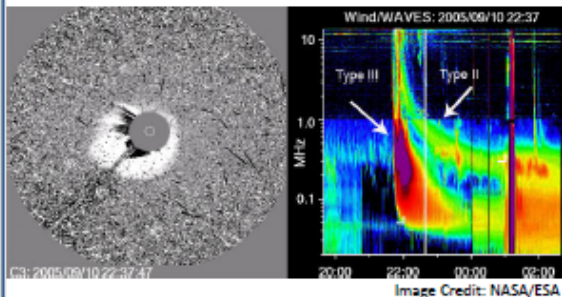**Figure 15—STEM-SAT1 Planetary Science-Giant Planet Magnetospheres**

Figure 16—STEM-SAT1 Data Could Be Directly Correlated with Existing Stanford SuperSID CME Data
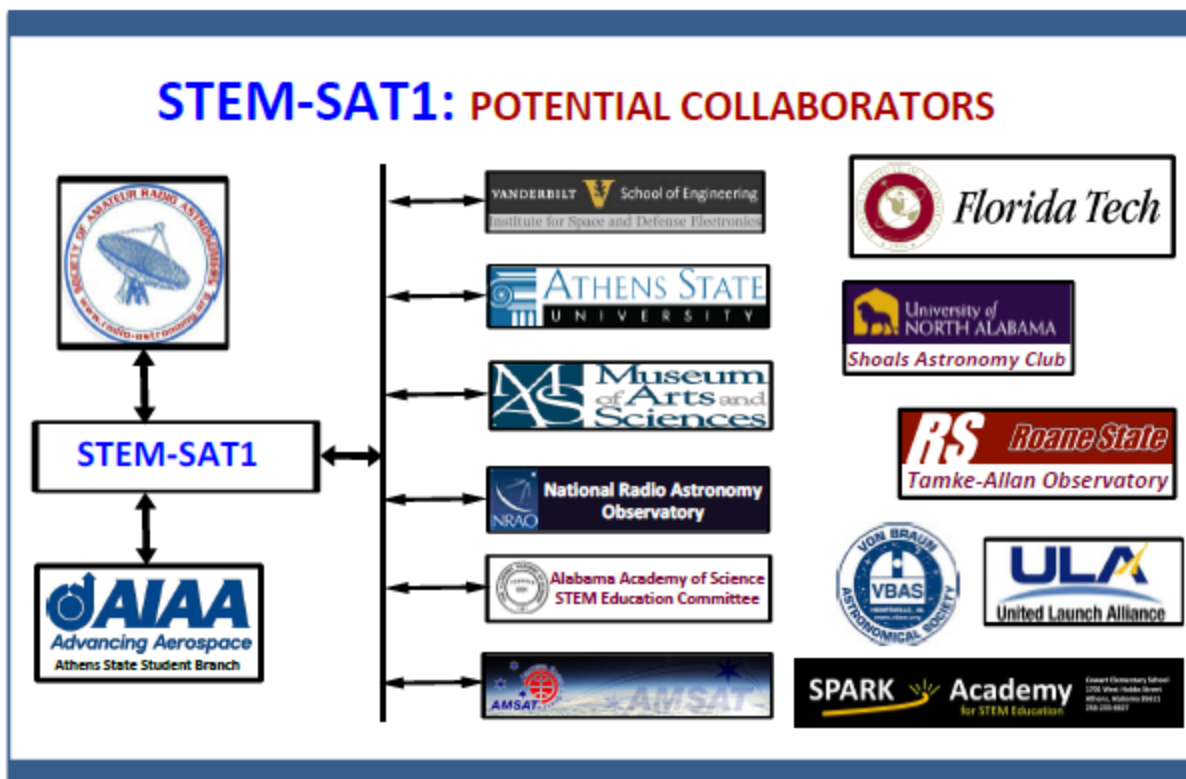
Figure 17—Proposed STEM-SAT1 Collaborators Include Academic, Public, and Industrial Partners

Figure 18—Overall Summary of STEM-SAT1 Concept and Proposal Development

REFERENCES

AMSAT. Getting started. The Amateur Radio Satellite Corporation. Available at http://www.amsat.org

Athens State University, College of Business. Online at: http/www.athens.edu/business

Fields, D., McCain, W., & Bigbee, T. (March 18, 2017). Radio astronomy and light-sail research with small satellites. SARA Western Conference, Socorro, NM.

Knapp, M., Babuscia, A., Jensen-Clem, R., Martel, F., & Seager, S. (November 2012). Solar observing low-frequency array for radio astronomy (SOLARA): Exploring the last frontier of the EM spectrum. MIT and JPL.

McCain, J.W., & McCain, C. (March 18, 2019). Radio astronomy cubesat anthology and STEM-SAT1 proposal. SARA Western Conference, Socorro, NM.

Morgan, D. (2011). Experiments with a software defined radio telescope. http://www.wirelessinnovation.org/page/Introduction_to_SDR

National Academies of Sciences, Engineering, and Medicine. (2016). *Achieving science with cubesats: Thinking inside the box.* Washington, DC: The National Academies Press.

NASA, CubeSat Launch Initiative. https://www.nasa.gov/content/about-cubesat-launch-initiative

Pumpkin, Inc. CubeSat Kits. Online at: http://www.cubesatkit.com/content/overview.html

Quillien, K.A. (June 2013). Astronomical antenna for a space-based low frequency radio telescope. 27th Annual AIAA/USU Conference on Small Satellites.

Robey, F. (2016). High frequency (HF) radio astronomy from a small satellite. MIT Lincoln Laboratory. 2016 SmallSat Conference.

Society of Amateur Radio Astronomers, SARA. Online at: http://radio-astronomy.org

Swartwout, M. CubeSat Database, Saint Louis University, [Online]. Available at: https://sites.google.com/a/slu.edu/swartwout/home/cubesat-database

ULA, CubeSat Program. http://www.ulalaunch.com/history.aspx

Voss, H.D. (2014). TSAT global star ELaNa-5 extreme low earth orbit (ELEO) satellite. 28th Annual AAIA/USU Conference on Small Satellites, June 2014.

A Call for Standing Firm: Employer Workplace Drug Testing Obstacles and Pervasive Legal Challenges

Kim LaFevor, DBA, SHRM-SCP, SPHR
Dean, College of Business
Tommy M. Eden III, Esq., JD
Partner at Constangy, Brooks, Smith & Prophete, LLP

ABSTRACT

The available pool of working age Americans is shrinking; organizations are experiencing increased employee absenteeism, lost productivity, company theft, rising health care costs, and significant spikes in workplace injuries and fatalities. Yet these are all related to the same too familiar common denominator: **American business has a drug problem**. *Eight million Americans use some type of illegal drugs, and 73% or an estimated 20 million of them are employed (Cholakis & Bruce, 2007). Other workers have been overprescribed and abused legally prescribed impairing effect opioids, in many cases for work-related injuries. It is a downward spiral and it has recently gained national attention on a very public stage. Do managers know how to recognize these emerging drug related issues in the workplace? Are organizational leaders aware of the legal challenges and have a plan for a viable path forward? Will the realized benefits outweigh the costs? An employer's response should be unwavering, calculated, firm and legally compliant.*

Recognizing Drug Related Issues

Substance abuse in the workplace is a multi-faceted and complex issue. On one hand, and in many cases, there are recognizable signs that an employee has a "drug problem" if one knows what to look for (Walsh, 2016). Such tell-tale chronic indicators include unexplained absences, mood swings, changes in attitude, difficulty relating to others, decrease in productivity, inability to concentrate, and work that continually falls short of meeting employer expectations. However, on the other hand, there are those drug abusers that are able to stay under the radar and hide their drug habit for months or even years.

Drug overdoses, largely from opioid painkillers, now replace car crashes as the leading cause of unintentional death in the United States. Sales of opioid painkillers have risen a staggering 300% in the past two decades, while deaths from overdoses have continued to rise (Meinert, 2016). Opioid painkillers, such a OxyCotin and Percocet, are some of the biggest culprits. This is an ever-emerging crisis that is getting worse. Viable solutions should seek to provide a safe drug free work environment and to deter drug abuse on the job rather than aim at catching or punishing workers.

The Hazelden report, which was derived from telephone interviews with over 1,000 human resource professionals, noted that substance abuse was one of the most serious issues facing employers. However, despite this concern, the interviews revealed that less than 25% of companies worked proactively towards the implementation of solutions. To add to the conundrum, 92% of human resources professionals noted that effective substance abuse treatment programs increased worker productivity and 67% found that such access reduced overall health care costs to employers ("Reports highlight challenges," 2007).

A Substance Abuse and Mental Health Services Administration (SAMHSA) study on worker substance abuse assessed work-

ers 18-64 years of age and found that 9.4 million current illicit drug users and 10.1 million heavy alcohol users (five or more drinks on the same occasion on at least 5 of the past 30 calendar days) were employed full time. The study also found that drug abusers were less likely to work with companies that had well instituted drug testing policies and programs (Report highlights challenges, 2007).

Worker instability can be associated with drug use and abuse. It is estimated that only 5.1% of non-drug users changed jobs 3 or more times in a one year period compared to 12.3% of drug users. While these challenges exist and affect an organization's bottom line, there are viable and pragmatic solutions. For example, 15 years ago, the transportation industry had a 13% illicit drug use incident rate until mandatory Department of Transportation (DOT) drug testing programs were put in place for safety sensitive positions in aviation, trucking, mass transit, and other transportation-related fields (Delogu, 2007; "Report highlights challenges," 2007).

Increase in Safety Incidence Rates & Fatalities

While the Center for Disease Control (CDC) has found that drug overdose deaths have risen for adults of all ages, both males and females, and with non-Hispanic whites and African-Americans, current research and related trends demonstrate drug abusers can be predicted to some degree by various factors and for those working for certain types of industries (Meinert, 2016). In these identified populations, there has been a steady increase in safety incidences and fatalities. These newly identified trends can be traced back to the late 1990s when opioid painkillers became widely available.

Painkillers most often abused are opioids. Opioids represent 25% of the total costs of all workers' compensation prescription drug costs today. The new American College of Occupational and Environmental Medicine guidelines do not recommend opioids for acute or chronic use for patients who perform safety sensitive jobs which include operating motor vehicles, other

modes of transportation, forklift driving, overhead crane operations, heavy equipment operation, sharps work (e.g. knives, box cutter, needles), work with injury risks (e.g. heights) and tasks involving high levels of cognitive function and judgement (Merchant et al, 2014). Some states have a higher prescription rate per person than others as seen in Figure 1. This drug class alone is considered responsible for the increase in overall mortality rates for middle-aged white Americans without a college degree, even as death rates for other age, racial, and ethnic groups have fallen since 1999 (Meinert, 2016).

Industry can also be a predictor of niches of illicit drug use. Food service workers (17.4%) and construction workers (15.1%) have shown the most significant prevalence of drug abuse. Researchers argue such trends are largely attributed to the general lack of robust drug testing programs in these industries which become a safe haven for drug abusers. The transportation industry struggled with the same level of usage rates until the implementation of the Department of Transportation (DOT) drug testing program in safety sensitive positions in mass transit and other transportation fields. The industry is now among one of the lowest ("Reports highlights challenges, " 2007).

A December 19, 2017 Bureau of Labor Statistics report noted that there was a 7% percent increase in fatal workplace injuries from 2015-2016 which rose from 4,836 to 5,190 and an increase of 12.4% since 2009 (Table 1). The majority of these deaths were related to transportation related incidents (Table 2). Fatalities have increased from trips, slips and falls in the workplace since 2011, which coincides with the 'marijuana greening of America' and 'national opiates epidemic.' Showing an equivocal trend, the fatal injury rate increased to 3.6 per 100,000 full time equivalent (FTE) workers from 3.4 in the prior year (2015), which reflects the highest rate it has been since 2010. At the same time, overdoses from non-medical use of drugs or alcohol while on the job increase by 32% (National Census of Fatal Occupational Injuries, 2017).

What Are Employers' Viable, Legal Path Forward?

It is maintained that employers assume some responsibility in preventing opioid abuse. Examining 15 court cases from 2009 to 2015, employers were found to be negligently libel for the death of employees who were treated for work-related injuries with prescribed opioids which resulted in worker addiction or death (Semkiu & Lambert, 2016). There is a path forward, but it takes a deliberate and concerted effort on the part of employers. Taking such a calculated direction necessitates the adoption of "Standing Firm: 7 Strategies to Maintain a Drug-Free Workplace." These include:

1. Knowing the safety sensitive and other work related risks associated with opioid use and other impairing substances
2. Becoming knowledgeable with the marijuana laws and applicable cases in various states
3. Ability to upgrade job descriptions to include critical essential function safety language applicable to opiates and marijuana to render employer requirements job related
4. Creating a culture of safety and targeting and embedding this message in supervisory training

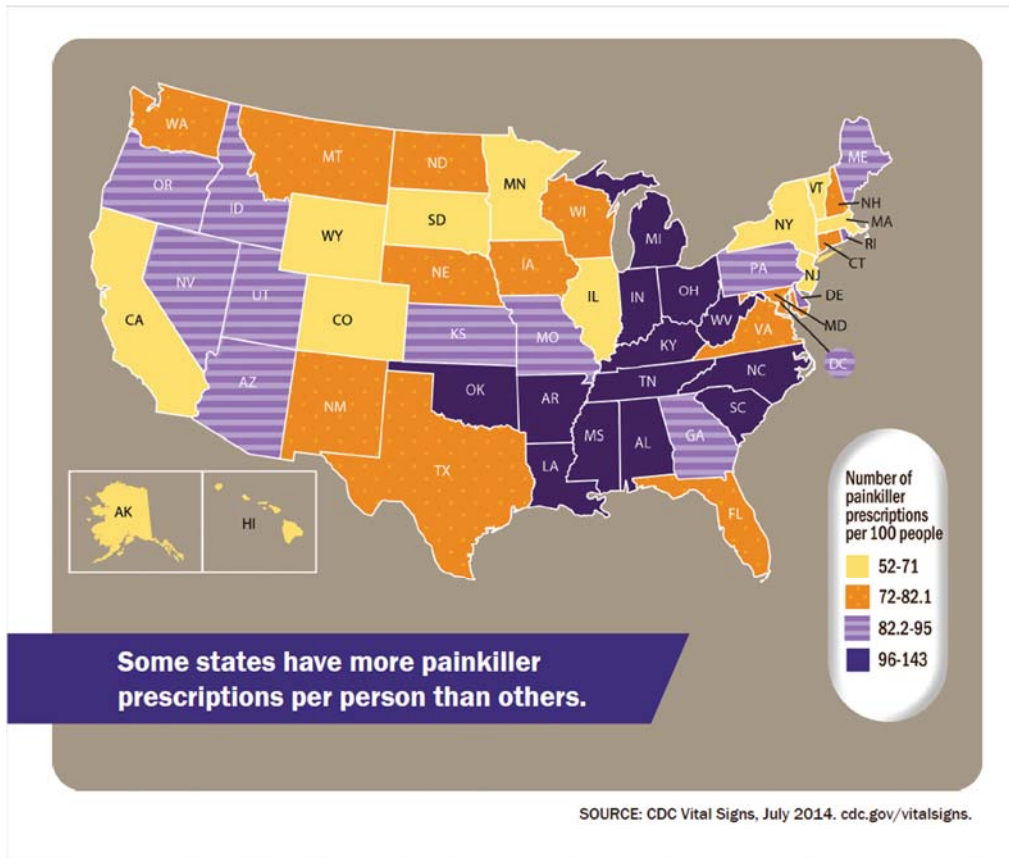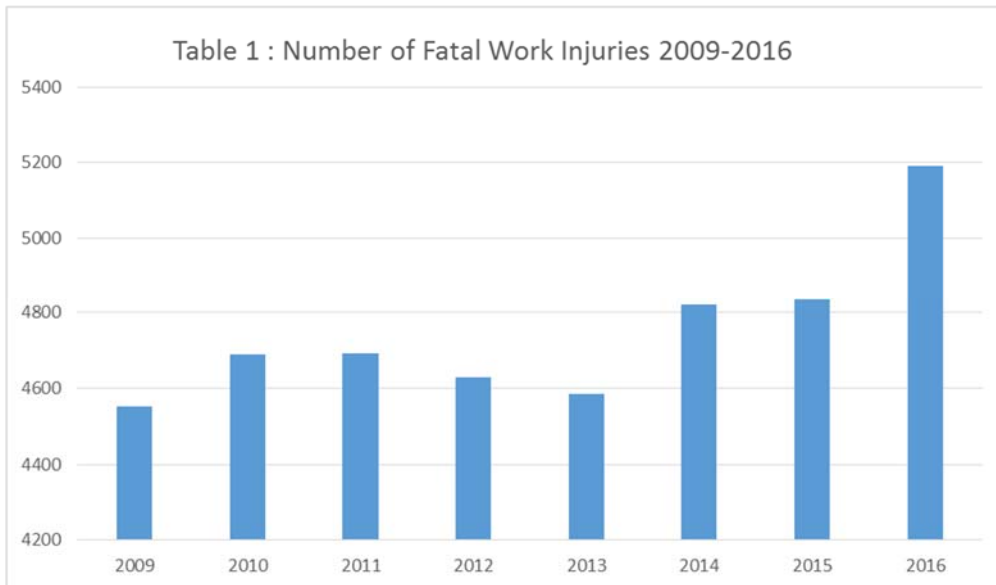Some states have more painkiller prescriptions per person than others.

Number of painkiller prescriptions per 100 people
- 52-71
- 72-82.1
- 82.2-95
- 96-143

SOURCE: CDC Vital Signs, July 2014. cdc.gov/vitalsigns.

Figure 1—Number of Painkiller Prescriptions per 100 people

Table 1 : Number of Fatal Work Injuries 2009-2016

A bar chart titled "Table 1 : Number of Fatal Work Injuries 2009-2016" with the y-axis ranging from 4200 to 5400. Bars by year: 2009 ≈ 4550, 2010 ≈ 4690, 2011 ≈ 4695, 2012 ≈ 4630, 2013 ≈ 4590, 2014 ≈ 4820, 2015 ≈ 4835, 2016 ≈ 5190.
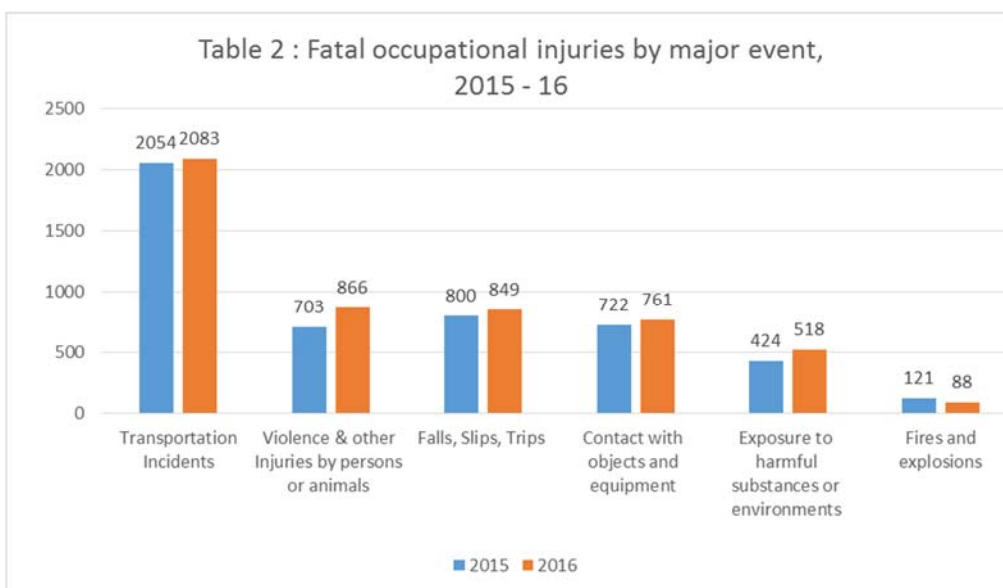
5. Acting with a sense of urgency on drug free workplace policy options when dealing with opiates and other impairing substances such as marijuana
6. Understanding the interplay between the American Disabilities Act (ADA), emerging state case law and Medical Marijuana anti-discrimination cardholder protections laws, and state, federal and DOT workplace drug testing obligations
7. Forming an overall legally compliant strategy to effectively stand firm when dealing with opiates and impairing substances in the workplace

Among many other signs, work-related impairing effects of opiates and marijuana related intoxication can cause somnolence, extreme fatigue, decreased ability to concentrate, dizziness and mental confusion, slowed reflexes, impaired coordination, inability to cope with sudden changes, non-caring uncommitted and unconcerned attitude, and inability to accurately judge distance.

Supervisors must be trained on the risks associated with workplace injuries. Therefore, creating a culture of safety and targeting and embedding this message in supervisory training is essential. According to OSHA, average claims for workplace injuries are 7 times higher when compared to worker's compensation claims. There are a host of indirect costs to include: 1) wages paid to injured workers for absences not covered by workers' compensation, 2) wage costs related to lost time through work stoppage as a result of the worker injury itself, 3) overtime costs necessitated by the injury, 4) administrative time appropriated by supervisors, safety personnel, and clerical workers as it relates to an injury, 5) training costs for a replacement worker, 6) lost productivity related to work rescheduling, new employee learning curves, and accommodation of

Table 2 : Fatal occupational injuries by major event, 2015 - 16

A grouped bar chart comparing 2015 (blue) and 2016 (orange):

Major event	2015	2016
Transportation Incidents	2054	2083
Violence & other Injuries by persons or animals	703	866
Falls, Slips, Trips	800	849
Contact with objects and equipment	722	761
Exposure to harmful substances or environments	424	518
Fires and explosions	121	88

injured employees, and 7) clean-up, repair, and replacement costs of damaged material, machinery, and property (Opioid Abuse, 2016). Why should an employer stand firm? *A safe workplace is a business necessity.*

To give employers an additional incentive to stand firm, OSHA has introduced new maximum fines that apply to all citations issued after January 2, 2018 up to $12,934 for serious and failure to abate violations and $129,336 for willful/repeated violations—including workplace fatalities (Eden, 2018) (Figure 2). Such measures encourage safety sensitive workplace policies and practices. Since August 1, 2017, the average initial penalty for all companies with a serious violation is $5,087 up from $3,285, while companies with more than 250 employees have seen their average penalties increase to $10,065 (Maximum Penalties, 2018). *Standing Firm: While OSHA fines should be an incentive, increased workplace fatalities is the true cost of opiate and marijuana use and abuse in the workplace.*

Employers should revisit job descriptions to ensure critical 'essential function' safety language is in place. Adding as an essential job function the "ability to work in a constant state of alertness and safe manner" to every safety-sensitive job description can serve to meet the safety culture. Additionally, in this way, "alertness" for a safety sensitive position becomes an ADA "business necessity." *Standing Firm: There is an OSHA mandated employer general duty to provide a safe work place from known hazards.*

Employers must act with a sense of urgency on drug free workplace policy options when dealing with opiates and marijuana. Specific policies that support a drug-free workplace include: 1) incorporating a pre-duty disclosure of impairing effect medications and substances, and 2) prohibiting the use of impairing effect prescription medication and substances by safety sensitive employees. An ideal substance abuse policy should outline a statement of the organization's policy as it relates to maintaining a safe and productive work environment through a drug-free workplace, describe employee responsibilities, define related penalties for non-compliance, and outline a

clear drug testing policy (See Figure 3 on page 78). *Standing Firm: A sound drug-free workplace policy applies to all employees equally without any discriminatory intent or implication.*

Prudent risk reduction in handling drug use in the workplace requires understanding the interplay between the American Disabilities Act (ADA), emerging state case law and statutes, and workplace drug testing obligations (Dunning, 2015; Stevens, 2017). This requires employers to utilize an interactive process. Employers can offer various types of reasonable accommodations to include: 1) leave of absence beyond FMLA, 2) work continuation agreement (based on an interactive discussion with the cardholder and follow up testing agreement), 3) modified work schedules, and 4) only take adverse employment action based on an individualized assessment by a trained medical doctor (MRO is best) (Delogu, 2007). While there are many states that have legalized recreational and medicinal use of marijuana, it is important to know and understand your own state medical marijuana cardholder protection laws (Eden, 2018). *Standing Firm: The onus is on the employer to know and be accountable to what the law requires.*

Return on Investment: Employer Solutions and Strategies

An employer's ability to comprehensively manage drug abuse in the workplace necessitates forming an overall legally compliant strategy to effectively stand firm when dealing with opiates and marijuana in the workplace. Putting this complex puzzle together necessitates the following actions:

1. Updating job descriptions to include "safety sensitive position" and the ability to work in a constant state of alertness and safe manner as an essential job function
2. Instituting a drug free workplace policy to bring it into compliance with state laws and to include as a "safety rule" a pre-duty impairing effects disclosure safety policy for safety sensitive employees

Figure 2 : New OSHA Penalties
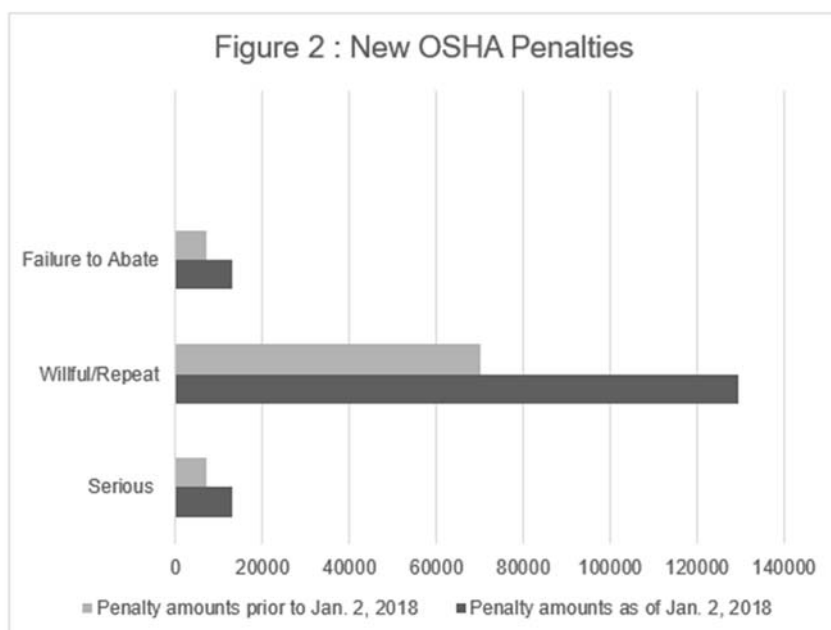
OSHA's new maximum fines apply to all citations issued after Jan. 2, 2018.

Since August 1, the average initial penalty for all companies for a serious violation is $5,087, up from $3,285. For companies with more than 250 employees, the average went to $10,065. See Bloomberg BNA Occupational Safety and Health Reporter, 3/9/17.

3. Treat all impairing effect medications equally to avoid a prescription/medication medical marijuana discrimination/ not compassionate claim
4. Engage in an interactive process in the 12 states with medical marijuana cardholder protection laws (more states coming)
5. Obtain a written fitness for duty opinion from an Occupational/MRO Physician before you take adverse employment action
6. Using resources, as needed, to guide this process (Eden, 2018)

The economic costs of workplace drug use in the U.S. are estimated to be more than $180 billion annually or $10,000 per drug abuser (Cholakis & Bruce, 2007). Prescription painkillers alone are held to be accountable for 25.5 billion of those costs (Meinert, 2016). The consequences of this drug epidemic for employers are alarming. These drug abusers are responsible for 30% increase in turnover rates, 32% in workplace theft, have staggering healthcare utilization rates of 300-400% higher than the average worker, and are associated with more than half of workplace injuries (Cholakis & Bruce, 2007). Castlight Health, a benefits platform, found that while non-drug users cost employers, on average, $8,600 a year in health care costs, opioid abusers cost over two times that amount. Oftentimes, employers remain unaware of these types of drug users. According to the National Safety Council, 57% of employers use drug tests, yet 40% of those do not screen for synthetic opioids which is among the most widely abused narcotics. In 2015, opioids killed about 33,000 Americans which has been fostered by the decriminalization and expanded use for medicinal purposes ("Opioid-abusers on payroll," 2017; Stevens, 2017). The bottom line—the cost of a drug testing program is virtually insignificant compared to the potential return on investment which can be as much as 100 times the actual expense. In essence, an effective drug testing program is not a liability, but rather a tool that can provide an organization more control (Cholakis & Bruce, 2007).

In a recent report from The Department of Health and Human Services, both short and long-term benefits of company customization of specific drug-testing programs tailored to fit specific needs. These particular benefits are listed below:

Short Term Benefits:

1. Cost savings and incentive programs offered by medical and health insurance carriers; property, casualty and liability insurance carriers; and workers' compensation carriers;
2. Lower chance that a current user/abuser will apply for a job or be hired
3. Ability to respond quickly when problems with alcohol or other drug abuse arise
4. Fewer accidents
5. Fewer disciplinary actions
6. Reduced losses due to absenteeism, theft and fraud

Long Term Benefits:

1. Improved employee morale and overall productivity
2. Lower costs due to losses and errors
3. Reduced costs of insurance claims
4. Greater employee awareness about alcohol and other drug abuse, as well as other health issues
5. Earlier identification and resolutions of problems that affect job performance

6. Decreased legal costs and costs of hiring and training new employees
7. Reduced medical and insurance costs
8. Reduced liability (Cholakis & Bruce, 2007)

These aforementioned benefits can be realized through well-educated workplaces, greater access to resources (including EAP programs for intervention), and managerial training (Reports highlight challenges, 2007). ***Standing Firm: is good for employees, business and the bottom line.***

REFERENCES

Cholakis, P.N., & Bruce, R. (2007). Drug testing in the workplace. *Professional Safety, 52*(7), 31-36.

Delogu, N.N. (2007). Essential elements of a drug-free workplace program. *Professional Safety, 52*(11), 48-51.

Dunning, M. (2015). Legal marijuana blurs the workplace drug policies: Employers challenged by conflicting laws. *Business Insurance, 49*(6).

Eden, T. (2018). Standing firm: Workplace solutions for marijuana and opiate use and abuse. *Special Report.* Constangy, Brooks, Smith Prophete, LLP.

Meinert, D. (2016). A hidden epidemic, *HR Magazine, 61*(2), 20-36.

Mitchell, K. (2016). Addiction in the workplace. *Business West, 32*(23), 15-49.

Merchant, J.A., Kelly, K., Burmeister, L.F., Lozier, M.J., Amendola, A., Lind, D.P., KcKeen, Arlinda, B.A., Slater, T., Hall, J.L., Rohlman, D.S., & Buikema, B.S. (2014). Employment status matters: A statewide survey of quality-of-life, prevention behaviors, and absenteeism and presenteeism. *56*(7) doi:10.1097/JOM.000000 0000000149.

National Census of Fatal Occupational Injuries in 2016. (2017). U.S. Department of Labor. *Bureau of Labor Statistics News Release, USDL-17-1667.*

Opioid-abusers on payroll create risks at workplace. (2017). *Indianapolis Business Journal, 38*(32).

Maximum penalties increase in 2018 for OSHA violations. (2018). OSHA Education Center. Retrieved from https://www.oshaeducation center.com/articles/2018-osha- fine- increases. aspx..

Reports highlight challenges of combating substance use in workplace. (2007). *Alcoholism & Drug Abuse Weekly, 19*(28), 1-3.

Semkiu, J., & Lambert, E. (2016). Opioid abuse. *Professional Safety, 61*(10), 57-59.

Stevens, C.B. (2017). Opioid crisis challenges employers. *Business NH Magazine, 34*(12), 14-15.

Walsh, D. (2017). Opioids in the workplace: A bitter pill for business. *Crain's Detroit Business, 33*(30).

Figure 3—Substance Abuse Policy Template

Purpose

The company has a vital interest in maintaining a safe, healthy and efficient workplace for the benefit of its employees, clients and the public. The use of performance impairing drugs can cause avoidable injuries to employees, damage to property and productivity losses.

Statement of Policy

To ensure a safe and productive work environment, employees are prohibited from:

A) Unlawfully manufacturing, distributing, dispensing, possessing or using controlled substances, or misusing or abusing prescribed or over-the-counter drugs.

B) Having present in their bodies detectable levels of illegal drugs during working hours.

C) Violating any federal or state law relating to drugs.

D) The exception to this policy is the authorized possession, use and transportation of drugs prescribed by a physician and used according to prescription instructions, unless such use would pose a safety risk to the employee, other employees or the public.

Employee Responsibilities

As a condition of employment, each employee must:

A) Abide by this substance abuse policy.

B) Notify the company of any criminal drugs statute conviction for a violation of federal or state law relating to drug use, possession or dealing no later than 5 days after such conviction.

C) Employees who are required to submit to reasonable suspicion or post-accident testing agree to accept, at the company's discretion, transportation to a location where the test will be conducted and to their residence.

Penalties

Any employee who violates this substance abuse policy shall be subject to discipline up to and including termination. Nothing in this policy changes the at-will employment relationship, and employees may be terminated at any time, with or without cause or notice.

Definitions

DRUG: Any substance that has known mind- or function-altering effects on a person, including psychoactive substances prohibited or controlled by federal or state controlled substance laws.

PRESCRIBED DRUGS: Any substance prescribed for use by the employee by a licensed medical practitioner.

SAMPLE: Means oral fluid, urine, hair or blood.

Drug Testing Policy

Preplacement Testing

1) Each applicant for a position in the company will be subject to the company's substance abuse policy.

2) All offers of employment to applicants will be contingent upon the applicant passing a drug test in accordance with the company's policy.

3) An applicant who refuses to submit to pre-employment testing when requested, or refuses to sign the company's substance abuse policy consent form, will not be employed by the company.

4) If an applicant's test is positive for any prohibited substance, the applicant will not be employed by the company.

Random/Periodic Testing

1) The company, at its discretion, may institute a program of random testing of current employees. This program may include testing of all personnel at a jobsite or a random selection program of individuals throughout the year.

2) If selected for a random test, the employee must go immediately to the collection area and submit a sample for drug testing.

3) Refusal to submit a sample or to properly complete documentation for a random test will be considered a refusal to test, which will require discipline up to and including termination.

Post-Accident Testing

1) Employees involved in a work-related injury, regardless of severity, that requires professional medical treatment will be subject to a drug test.

2) Employees involved in an accident or safety-related incident of any kind while in a company vehicle or while on company time or on company property, will be subject to a drug test.

3) The company may require an employee who contributed to an accident be tested if there is reasonable cause to believe that the accident may have resulted from the use of drugs.

Reasonable-Suspicion Testing

1) When the company has a reasonable belief that an employee may be under the influence of a substance a drug test may be conducted immediately.

2) Employees suspected of being unfit for duty will be escorted by a supervisor or designated company representative to the authorized testing location. The employee's cooperation with the escort and the collection procedures will be required.

3) Refusal to cooperate in the collection procedure or refusal to take the test will require discipline up to and including termination.

Confidentiality

Only those persons authorized to receive results from the laboratory will be allowed to discuss these results with the supervisor or the employee. Individuals within the company will be notified of the results on a limited need-to-know basis. No test results shall appear in a personnel folder. Information of this nature will be included in a medical file. Drug test results will be released to a decision maker in a lawsuit, grievance or other proceeding (such as for a workers' compensation or unemployment insurance claim) initiated by or on behalf of the donor.

Use of Prescription Drugs

In the event an employee is under the care of a physician and is taking prescribed medication that might impair the ability to perform a job safely, the employee must notify management in advance of starting work. It is management's discretion as to whether the employee may continue to perform the normal assigned duties or be designated non safety-sensitive duties (if available) until the employee provides a physician release to perform normal duties.

Source: www.asse.org JULY 2007 PROFESSIONAL SAFETY 35

Contributors

David Currier is an Athens State University alumnus who received his Bachelor's in International Business in the summer of 2015. Furthering his education and love for analyzing, he then enrolled in the first ever Logistics program at Athens State University and was part of the first graduate cohort ever offered in Global Logistics and Supply Chain Management, receiving his Master's in Fall 2017. He has been married for fourteen years and has three children. He is currently employed in his field as a Cycle Count and Receiving Manager for Hyco in Arab, Alabama.

Melanie Curtis is enrolled at Athens State University. She is planning to graduate in 2020 with a Bachelor's degree in Liberal Studies and a minor in Human Resource Management through the Adult Degree Program. Her paper was originally written from Dr. Wilkes' Labor Economics class in Fall 2017. Melanie currently works at a local credit union as a Virtual Service Representative.

Joshua Denmark works at BASF in Huntsville, Alabama as a lab technician. He is majoring in Criminal Justice and plans on graduating in 2020. After graduation, he plans to pursue a career in a criminal forensic lab.

Thomas M. Eden III is a partner in the law firm of Constangy, Brooks, Smith & Prophete, LLP whose primary focus is in the areas of Management Labor and Employment Law. Dr. Eden is a frequent speaker and trainer on Drug Testing Law and Preparation of Drug Free Workplace Policies. He received his Juris Doctor from the Cumberland School of Law at Samford University in Birmingham, Alabama, and a Bachelor of Arts from Auburn University.

Garrett Ennis is a recent graduate from Athens State University as part of the first class in the Global Logistics and Supply Chain Management program. He holds three degrees from Athens State to include a BBA in Human Resource Management, a BS in Management of Technology, and a Master of Science in Global Logistics and Supply Chain Management. He currently works for the Missile Defense Agency logistics program and has over 16 years' experience in the logistics field. He is a lifelong resident of Athens and has been married to his wife, Joanna, for 12 years. They have two children.

Charles N. Fowler is a student at Athens State University pursuing a Bachelor's of Science in Management of Technology. He plans to graduate in Spring 2018. Mr. Fowler resides in Decatur, Alabama.

Katherine Hall-Williams is a student at Athens State University. She is pursuing her Bachelor's in Accounting with a minor in Forensic Accounting. She is currently employed full time in the finance department of IXS Holdings, Inc. at corporate headquarters in Huntsville, AL. She plans to graduate from Athens State University in 2020 after which she will pursue her Master's in Accounting. She is an avid reader, loves music, the outdoors, traveling, and spending time with her husband, Jamie, and their three dogs.

Thomas Hanners is currently enrolled as a full-time student at Athens State University pursuing a bachelor's degree with a major in Management of Technology and a minor in Logistics and Supply Chain Management. He is an active member of the Delta Mu Delta business honor society. Prior to enrolling at Athens State University, Thomas earned an Associates of Applied Science degree in General Studies with a Certificate in Business from Calhoun Community College. Thomas has worked full time in the manufacturing industry for over a decade, including various roles in production, operations, logistics, procurement, and project management. In his free time, he enjoys spending time with his family outdoors at sporting events and the lake, as well as trail riding and camping. Thomas plans to utilize the knowledge and skills he has gained while at Athens State to advance his career.

Susan Herring is a former librarian and retired professor from Athens State University. She holds a Masters of Library Science from the University of Denver, a Master of Arts from the University of Alabama in Huntsville, and a PhD from the University of Alabama. Dr. Herring has served on the editorial board for the College of Business Student Research Journal since its inception in 2013 and collaborates with other professors on numerous research projects.

Melissa Kaiser is one of the 6 students in the first cohort of the Athens State University graduate program earning a master's degree in Global Logistics and Supply Chain Management (December 2017). She received her Bachelor's Degree in Acquisition and Contract Management from Athens State University in August 2013. Although she grew up in Colorado Springs, CO, she considers herself a native of Huntsville, AL. She is currently employed by the Boeing Company as a Supplier Management Business Specialist where she supports the Integrated Air and Missile Defense (IAMD) programs. In her spare time, she enjoys travelling with her (almost) husband and spending time with her family to include her 7 year old Great Dane.

Dr. Bryan Kennedy is a Professor of Human Resource Management at Athens State University. He holds a Doctor of Education in Human Development and Counseling from Vanderbilt University. He has held various other jobs, including high school teacher and coach; supervisor of a division in the area of Human Resource Management with the Department of Army in Huntsville, AL; and arbitrator in the areas of labor/management. He serves on numerous state and national panels and as a mediator and consultant for various organizations. In his spare time, Dr. Kennedy enjoys officiating at basketball games and spending time with his grandchildren.

Dr. Kim LaFevor serves as the Dean for the College of Business at Athens State University. She has taught collegiately for 27 years at both the undergraduate and graduate levels, specializing in human resource practices, labor relations and employment law. Currently, Dr. LaFevor serves on the Board of Directors for the Tennessee Employment Relations Research Association and the Alabama Society of Human Resource Management as the State Director for College Relations. She has

Contributors

been nationally recognized as an HR Fellow, Pearson "One" Professor, HRM Hall of Fame, National Woman of Achievement and has served as a SHRM National Foundation Scholarship Judge for multiple years. Prior to her academic career, Dr. LaFevor had a 21-year career with General Motors in HR/Labor Relations. A native of Detroit, Michigan, Dr. LaFevor has a Bachelor of Science Degree from Athens State University, a Master's of Science Degree in Human Resources Management from Troy University, and a Doctorate of Business Administration with dual majors in Management and Education from University of Sarasota. She holds HRCI's SPHR and the SHRM-SCP certifications.

Dr. Cynthia Lovelace serves as an Assistant Professor of Logistics within the College of Business at Athens State University, where she teaches both undergraduate and graduate courses in logistics. She has over 20 years teaching experience at both the undergraduate and graduate levels in business and engineering, as well as corporate training and consulting experience provided to a wide variety of industry groups through her consulting firm. Her research has focused on process capability analysis, and her current research efforts are focused on the application of these techniques to current supply chain metrics. She has served as a Certified Quality Engineer through ASQ, and is currently a member of APICS and the National Contract Management Association. She is the co-author of *Process Capability Indices in Theory and Practice* with Dr. Samuel Kotz.

Zachariah Lowery is a current resident in Cleveland, Alabama. He holds a Bachelor's of Science in Business Management and a Master's of Science in Global Logistics and Supply Chain Management from Athens State University in Athens, Alabama. He currently works in the automotive industry where he has 8 years' experience in procurement, supply chain, logistics, and materials management. He has been married for seven years to wife, Megan, and has two young daughters.

Collin Rogers McCain is currently attending Calhoun Community College. He is a member of Athens State's American Institute of Aeronautics and Astronautics (AIAA) Student Branch and the Society of Amateur Radio Astronomers (SARA). Collin is an entrepreneurial computer graphics designer and plans to pursue that profession as a long-term career. He has participated in research associated with the STEM-SAT1 proposal to develop and fly to low-Earth orbit a student-oriented Radio Astronomy CubeSAT (a small 4x4x4-inch, 3-pound satellite) in support of the Science, Technology, Engineering, and Math (STEM) nationwide initiative. He won second place in a recent student poster competition sponsored by the Alabama Academy of Science which featured the STEM-SAT1 project and recently helped staff a SARA booth at the USA STEM Expo and Festival held in Washington, DC, where as many as 350,000 people attended. Collin plans to pursue a degree in Management of Technology with a computer science minor at Athens State after completing an associate degree at Calhoun.

Dr. J. Wayne McCain (shown with daughter Amelia) has been a practicing engineering consultant/manager and a college educator since the inception of the Management of Technology degree at Athens State University's College of Business. Dr. McCain graduated from Auburn University with a Bachelor of Science in Aerospace Engineering and has MBA and PhD (in engineering)

degrees from the University of Alabama at Huntsville. In May 2016, he earned a Master of Space Systems degree from Florida Institute of Technology (FIT) in Melbourne, Florida where he concentrated on risk analyses of humans-to-Mars space missions along with Mars mission planning. He has engineered, developed, and managed Army, Air Force, and Strategic Defense related programs for Thiokol Propulsion and Martin Marietta (now Lockheed Martin) in Denver. Dr. McCain also developed automated test equipment for the NASA Space Shuttle while at United Space Boosters, Inc. He has served as Principal Investigator for several Small Business Innovative Research (SBIR) endeavors and was inventor on a recently-patented laser initiated ordnance system (LIOS) safe-arm device. He has received recognition from the Army AMRDEC at Redstone Arsenal for assistance in missile development and propulsion fault analysis. McCain served as a UAH Research Scientist at NASA MSFC while coordinating technology transfer and commercialization (T^2C) projects. Dr. McCain is currently taking post-doctoral coursework in Space Systems from FIT. He is an Associate Fellow in the AIAA (American Institute of Aeronautics and Astronautics) and is faculty advisor for the Athens State Branch. He is a member of IEEE (Institute of Electrical and Electronic Engineers), a certified PMP (Project Management Professional) in the PMI (Project Management Institute), and a Director within SARA (Society of Amateur Radio Astronomers) where he is participating in the JOVE and SuperSID Programs, both NASA co-sponsored Radio Astronomy STEM (Science, Technology, Engineering and Math) projects. Dr. McCain is Chair of the Alabama Academy of Science (AAS) STEM Section. He has pioneered a small rapid prototyping lab, a radio astronomy observatory, and an amateur radio station at Athens State. He is an avid pilot and scuba diver.

Chris Moss resides in a small community near Athens, Alabama and is employed at Athens State University in the Maintenance Department. He was awarded his Bachelor of Science in Management of Technology in May 2013. He completed his Masters of Science in Global Logistics and Supply Chain Management in December 2017. Other achievements include a State of Alabama Electrical Contractors Certification and a Master Plumbers and Gas Fitters Certification. Chris is married to Amanda, who is a fifth grade teacher at Blue Springs Elementary in Limestone County, Alabama. They have two children, Abby (8) and Lillian (11), who keep them extremely busy. In his spare time, Chris enjoys repairing and restoring vintage vehicles.

Dr. Charles R. Roberts is an Associate Professor of Management at Athens State University and the Anchor for Acquisition and Contract Management in the College of Business. He holds a BS in Business Management from Jacksonville State University, MBA in Business Administration from NOVA Southeastern University, and a PhD in Business Leadership from Capella. He has held various other jobs at numerous locations with the Department of Defense (U.S. Army). In his spare time, Dr. Roberts enjoys officiating at WADO RYU KARATE Tournaments and spending time with his family.

Logan Sulfridge is a senior at Athens State University. He will graduate with a Bachelor's in Management of Technology in May of 2018. Logan is currently employed by ASRC Federal, a contractor for the Missile Defense Agency, as an IT Specialist.

Business Insights

A College of Business Research Journal

Business Insights: A College of Business Research Journal is an annual publication of the College of Business at Athens State University. Athens State University's College of Business is nationally accredited by Accreditation Council for Business Schools and Programs (ACBSP).

The mission of the College of Business is to offer programs of study to students that will prepare them for positions in business, finance, or government; enhance the professional development of those already employed; and provide an academic framework for graduate study leading to professional positions. The purpose of the College of Business is to provide quality education for all students, teaching them to think critically, to use technology effectively, to be effective leaders, decision makers, and communicators; to maintain ethical standards, and to understand the global economy.