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BUSINESS INSIGHTS

A COLLEGE OF BUSINESS RESEARCH JOURNAL

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BUSINESS

INTEGRITY QUALITY LEADERSHIP

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BUSINESS INSIGHTS

A COLLEGE OF BUSINESS RESEARCH JOURNAL

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Sincerely,

Charles R. Roberts
Editor-in-Chief

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A General Manager's Ethical Dilemma: A Case Study

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ABSTRACT

This case study describes the dilemma faced by the General Manager of a three-section division in a large federal bureaucratic organization that has a powerful and aggressive Union presence. An investigator from the Criminal Investigation Division (CID) who is a close personal friend of the General Manager, has shared with the General Manager on an unofficial and confidential basis the very disturbing information that an employee called the corporate hot line with a tip alleging that one of his section supervisors approved four hours of annual leave for five employees approximately twelve months ago, but attendance records show that no leave was charged to any of the employees. Complicating this news is the fact that an arbitration hearing is pending to address the termination of the nephew of the local Union President for "failure to properly post three hours of annual leave." Added to this are several other potential ethics violations that might result in disciplinary action if they become known, leaving the General Manager with a serious dilemma.

THE CASE

As General Manager of a division within a large federal agency, you find yourself facing what could be a perfect storm of ethical issues. An arbitration hearing addressing the termination of the local Union president's nephew for failing to properly post three hours of annual leave is currently pending. A few days ago an investigator from the agency's Criminal Investigation Division (CID) confided unofficially that an employee called the agency's tip line with a report that one of his section supervisors approved four hours of annual leave for each of five employees about a year ago, but records show that no leave was changed to any of those employees.

Further complicating matters, a long-time friend, Kim Price, was hired into your division approximately two and a half years ago as B section chief. As General Manager and supervisor of this position, you were directly involved in the hiring decision. The fact that both you and Kim are graduates of the state university, where you were classmates and fraternity brothers, might be seen as a factor in Kim's selection for this position. You and Kim have remained close friends since your college days, jointly attending away football games, barhopping, consuming large amounts of alcohol and picking up members of the opposite sex. This information is not generally known in the office and community. This season your practices have changed somewhat, as both you and Kim have started dating two female employees and have regularly accompanied them to many of the away games. Both of the female friends work in the organization's Criminal Investigation Division, a part of the security department, and both of them assisted in gathering information for the termination action against the Union President's nephew. Kim is single but your situation is more complex, since you have a family and are active in many community activities. The activities include leading singing and actively serving as the Sunday school superintendent in a large conservative church that does not believe in drinking, partying, and dating outside of marriage.

Two weeks ago you and Kim attended the Virginia Tech game in Blacksburg, Virginia, along with some other friends from work. You are certain you saw the terminated nephew and the Chief Union shop steward drinking in a bar. You and your three friends exited the bar as quickly and unobtrusively as possible.

Your immediate supervisor, the Deputy of your division, has confided to you that the Chief of your organization is scheduled to retire in less than three months. The Deputy believes that he has the inside rail for the position and the only thing that could keep him from getting the position is some type of ethical or professional dilemma arising in his division.

Two weeks ago you attended an ethics refresher course. The course re-emphasized that it is a serious ethics violation for a supervisor or member of management to advocate, influence or in any way participate in a personnel process which results in the promotion or selection of a close personal friend or relative. Under the regulations, officials who fall into this category are required to withdraw from and no longer

participate in the process. The refresher course also made you realize that fraternizing with the female employees from the CID might be considered an ethics violation as well.

This afternoon, when you arrive back in the office after lunch, your secretary hands you a note from the Union President requesting that you phone him to schedule a time for a meeting with him concerning a personnel issue that he will identify at the meeting. You immediately start to worry about which of the potential problems might be the focus of this meeting.

DISCUSSION QUESTIONS

1. The General Manager does not work in either labor relations or human resource management. How would you advise him to respond to this unusual request to discuss a personnel issue?

2. Over two years have passed since the selection of Kim Price. Would the General Manager's involvement in his selection still be a possible issue, or would the statue of limitations regarding this selection have run out?

3. The General Manager's immediate supervisor has stated that he will seek a promotion to Chief soon. What do you think the supervisor would think about the Union President's request for a meeting?

4. Does the General Manager really have anything to be concerned about or does this situation fit in the "all in a day's work" category?

5. Is it believable that a CID investigator would share confidential and secret information with a friend, or does this strain the imagination? Discuss.

6. If the scenario is true and most of the facts came out, would it discourage employees from using the agency's tip line? Discuss.

TEACHING NOTES

General Discussion of the Case Elements

This case study provides supplementary material for textbooks and lectures on how management officials in both the public and private sectors can better manage and approach the difficult task of dealing with myriad ethical issues and disciplining employees. It focuses on the potential impact friendship may have on hiring practices and addresses the possibility that employees of organizational sections such as the CID may at times allow their loyalty to friends to encroach on their duties. At the same time, it also touches on fraternization, personal ethical standards, and proper reporting of work hours.

The case study is appropriate for both college and university undergraduate and graduate classes in the areas of management, industrial psychology, labor-management

relations, organizational behavior, etc. The training would also be valuable for management and union officials in the discharge of their everyday duties. It is appropriate for officials who are charged with the interpretation and applications of the terms of the CBA when attempting to settle workplace disputes. The case could also be utilized to supplement and enrich employee and management training programs in large and small organizations.

Some Suggested Possible Answers to Discussion Questions

1. If the General Manager did not have a number of skeletons in his closet he would not be concerned. In this particular situation he will most likely toss and turn at night thinking about the upcoming meeting. This type of request would probably indicate that the union official is making an initial effort to clarify the situation, before the union takes any official action. The official would request an opportunity to confer with the General Manager as a special favor. It can be assumed that the fat is already in the fire. The General Manager must respond. To avoid meeting with the union official is not acceptable, but the meeting can pose a number of potential problems. Perhaps the best solution would be for the General Manager to request that the meeting take place away from the work place over breakfast, lunch, or a soft drink. He should scout around and find a place where there is little chance that anyone will recognize him or the union official. The meeting should take place outside of work hours or during the weekend, and the General Manager should pretend that he will look forward to the two of them becoming better acquainted.

2. In this type of situation the statue of limitations will not run out until Price no longer works under the General Manager. It could continue to be a problem even if Price transfers to another division of the agency. If some question were to arise, any action taken would depend on both Price's reputation and that of the General Manager, and their perceived status as loyal, competent employees. It would also depend on how many people might be aware of the selection issue and on their attitudes toward Price and the General Manager.

3. Any meeting with a union official that comes to the attention of the supervisor will bring immediate and probing questions about the purpose of the meeting. The supervisor will undoubtedly be concerned that the reason for the meeting, and its potential results, might well have a negative impact on the supervisor's chances for advancement in the organization.

4. The General Manager has a lot to worry about, not only at work but also at home and in his church. It all depends on who finds out about the complicated situation he is in and how that information is received in the organization and the community. The level of understanding and sympathy he finds could make a significant difference in the outcome. If the information gets to someone who does not particularly care for the General Manager it could cause numerous problems, ranging from disciplinary action at work to serious conflicts within the community. Interpersonal problems could also arise at home that might ultimately result in separation or divorce.

5. This type of information often leaks out eventually. Occasionally someone will leak the information deliberately, usually because the issue is not handled effectively or ethically within the organization. Much of the time when confidential information is leaked or otherwise becomes known, a CID official can use the shield of secrecy to avoid any type of punishment. Individuals at the top of the organization often assist in covering up this type of situation to save their own reputations. Excuses usually are based on an attempt to save the head of the organization or the organization itself from embarrassment in an attempt to protect programs and funding requirements.

6. As long as the identity of the person who called the hot line is not revealed, other employees should not be reluctant to use the hot line. The fact that the problem itself has come to light and has been discussed should not be an issue, since that is often what the caller wants to see happen.

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Legal Ethics in Acquisitions and Contracting: Why Doing the Right Thing Matters
A CASE STUDY

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Abstract

This paper examines why doing the right thing matters in the Acquisitions and Contracting Management (ACM) process. Information from multiple resources and from different viewpoints and perspectives was examined, allowing for a broad analysis of the data. This paper establishes a baseline of assumptions and inferences needed to develop an expert perspective on the problems associated with ACM processes as a customer and as a contractor.

Introduction

This paper analyzes assumptions that can be made in the connections between the parties involved in the Legal Ethics of the ACM process. The links between customer relationships and the ACM process, and between the provider of the contract and the contractor, will be explored through research drawn from Internet sources and its analysis. Customer relations are a major part of doing business and the analysis of the information will provide a better understanding of the process and connections that are made in doing business.

Background of the Problem

Doing the "right thing" is not always an easy task nor is it always a clearly defined path to take. We struggle in our everyday lives with doing what is not only legally responsible but also morally responsible. The business world is no different. Practicing good ethics plays such an important role in the business world that it is no longer simply a moral issue but in many cases is a legal issue as well. We can thank companies such as Enron, Tyco, and even WorldCom for showing how a culture reflecting poor ethics can literally destroy a company and its stakeholders.

The government of the United States is no exception. In the 1990s, the United States government, in order to reduce wasteful spending and decrease a number of inefficiencies especially in the Department of Defense (DOD), began a push to make the government mimic the operations of a commercial business (Serbu, 2012). At the time the federal government was hemorrhaging money, especially the DOD. To make matters worse, just as much money was being wasted as was being spent, if not more. There had to be a better way for the DOD to procure goods and services for less money without having to compromise quality, just as in a commercial business where the focus is on maximizing bottom-line profits while minimizing costs.

In October of 1994, President Clinton signed the Federal Acquisition Streamlining Act (FASA) (Drelicharz, 1994). Not only did this bill revamp the entire acquisitions process and how the government purchased goods and services, but for the first time in the country's history, FASA also allowed the government to rely heavily on commercial sources to procure goods and services (Drelicharz, 1994). FASA helped to streamline the procurement process for the federal government, making it easier for commercial companies to compete for government contracts (Drelicharz, 1994). Government contracting began to take on a new meaning for the first time, leading to an increase in competition for contracts, but also leading to an increase in contracting problems.

Statement of the Problem

Prior to 1994, trying to get a government contract was extremely difficult. Potential contractors had to figuratively jump through hoops and cut through massive amounts of bureaucratic red tape to even be considered. By the time the actual contract was awarded, the bidders would have already spent large sums of money, causing many to drop out of consideration voluntarily. Essentially, there was little competition because many companies found it was too difficult and too expensive to try to secure a government contract (Drelicharz, 1994). Since there

was limited competition, the government was unable to ensure it was getting the best price or best quality for the product or service being acquired.

The passage of the 1994 FASA made contracting with the government more feasible for many commercial operations. It also became the stepping stone to further legislation that established regulations regarding how the government acquires goods and services and awards commercial contracts. For the first time in history, the federal government became a valuable customer to many private sector businesses. Because of this, there has been a significant increase in the number of companies competing for government contracts. The government must be fair and impartial in awarding these contracts to avoid appearing to favor one company over another, especially when supporting American owned and small businesses.

Since the passage of the 1994 FASA, many companies began to see just how valuable and profitable being awarded a government contract could be, leading to an increase in competition. Potential bidders will now try just about anything to get awarded a government contract. Bidders sometimes will resort to unethical tactics to secure a winning bid, which leads to a major problem: how do we protect the acquisition and contracting processes from unethical tactics? More importantly, we need to look at what happens when we have a breakdown in ethics throughout the acquisition process and examine the consequences that come with these types of violations.

Significance of the Problem

The most successful commercial companies are those that can secure new business or new customers. In a sense, the federal government is the jackpot of customers – especially the DOD. The DOD contracts out for things ranging from helicopter parts and munitions, to janitorial supplies, services and concessions. Such things can be too time consuming or too costly for the government to produce on its own, so it will cut cost and save time to contract with companies that have the experience, the means, and the manpower to complete these tasks more efficiently than the government could alone. Since the passing of the initial FASA, many companies are fighting for the right to provide these products or services to the government. These contracts often come with very attractive rewards in the form of compensation and bragging rights.

When everyone follows the rules, the best company wins the contract and provides the best price and best service or product to the government for that particular contract; everyone else is free to bid again when the next contract comes along. But when the rules are broken, problems arise. These problems can be small, such as broken promises that can lead to the contract being abruptly terminated. Or they can be slightly bigger, such as bidders claiming that the contract was awarded unfairly; this can cause a contract to be terminated or can lead to the Contracting Officer (CO) or the Contracting Officers Representative (COR) being terminated as well. In addition, major complications can arise, such as an unqualified bidder winning a contract and being unable to perform the duties in the contract, providing the government with a defective product. This could cause injury or lead to casualties that lead to lawsuits and negative publicity for the government.

Negative perceptions can go a long way in the business world. The government is no different. If our enemies perceive us to be weak, we are more prone to attack. If the American

people view the government as unfair and ineffective, this will reflect on the government's approval ratings. When the government's approval rating is low it indicates that the American people have little confidence in the government and reflects negatively in international dealings. Therefore, it is important that our government operates at the highest standards at every aspect including the acquisitions and contracting process.

Ethics as a Priority

Ethics should be a priority in the acquisition and contracting process for the DOD, but is it? With cases such as Boeing, L-3, and Halliburton there leaves much room for doubt. Are these cases outliers, or are they the norm? Unfortunately, further research indicates that these were not the only companies that have committed moderate to serious ethics violations in the government acquisitions and contracting process. We must ask if contractors are more focused on winning the bid than they are on making sure their actions are honorable and in the best interest of the government and the American people.

Summary

Most people would agree that these are uncertain times for businesses. As the economy fluctuates, businesses struggle to stay afloat. Some businesses will do just about anything to secure a loyal customer with large pockets. Who has bigger pockets than a government? The United States leads the world in military spending (Shah, 2013). In 2013, it was estimated that the United States spent over 39% of all the world's military spending, a number that was over $600 billion in 2012 alone (Shah, 2013). No other country comes close to spending as much on the military. China comes in second with a mere 9.5% (Shah, 2013). This makes the DOD a very attractive customer. Landing a DOD contract is like hitting the lottery to most businesses. Any time that much money is available, there will always be those who question the integrity of the process. Do they have good reason?

The FASA made the federal government, especially the DOD, a very attractive customer for most commercial businesses. The FAR defines and regulates the DOD's acquisition and contracting process. It also serves as a legal and ethical guide. Is the process flawed or does the flaw lie in the companies that pursue these often highly profitable DOD contracts? A survey indicated that 94% of those participating felt that the government acquisition and contracting process was fair. While the process may be fair, it can be concluded that the means by which some contractors secure a winning bid on a government contract is not.

References

Bierga, A. (2004). *Ex-Boeing CFO Pleads Guilty in Tanker Deal Scandal.* Retrieved February 10, 2015 from http://old.seattletimes.com/html/businesstechnology/2002091816_webboeing16.html

Branstetter, J. (2005). *The Darleen Druyun Debacle: Procurement, Power, and Corruption.* Retrieved April 20, 2015 from http://dtic.mil/dtic/tr/fulltext/u2/a437374.pdf

Buying Commercial in DoD: 15 years after acquisition reform. Retrieved February 3, 2015 from http://www.federalnewsradio.com/474/2872216/Buying-commerical-in-DoD-15-years-after-acquistion-reform

CCH Federal Acquisition Regulation. (2012). Chicago, IL: Wolters Kluwer.

Commercial Company. (2015). Retrieved April 5, 2015 from http://dictionary.cambridge.org/us/dictionary/business-english/commercial-company

Crime and punishment. (2000). Retrieved from http://www.crimeandpunishment.net/FL/chart.html

DOD Contract Management. (2015). Retrieved April 15, 2015 from http://www.gao.gov/highrisk/dod_contract_management/why_did_study (GAO, 2015).

Drelicharz, J.A. (1994). *Lowering Government's Cost of Doing Business.* Retrieved February 5, 2014 from http://www.dau.mil/pubscats/pubscats/PM/articles94/drelicha.pdf

Federal Contractor Misconduct Database. Retrieved April 19, 2015 from http://www.contractormisconduct.org/index.cfm/1,73,222,html?CaseID=48

Fitzgibbon, W. (2015). *Files Point to $183mn Halliburton Bribery Scandal in Nigeria.* Retrieved April 7, 2015 from http://indianexpress.com/article/world/world-others/files-point-to-182mn-halliburton-bribery-scandal-in-nigeria/

Former Defense Contractor on His Way to Prison for Trying to Sell Defective Machinegun Parts to Department of Defense. (2015). Retrieved April 24, 2015 from http://www.justice.gov/usao/miw/news/2015/2015_0211_HCahn.html

Giallourakis, B.C. (2008). *Contracting with Uncle Sam*. Annapolis, MD: Naval Institute Press.

Gormley, B. (2010). *Government contracting: Explaining the process in 5 steps.* Retrieved from https://www.sba.gov/blogs/government-contracting-explaining-process-5-steps

Growth of Corporate Power and Profiteering. (n.d.). Retrieved February 14, 2015 from http://costsofwar.org/article/growth-corporate-power-and-profiteering

Lipton, E. (2006). *Billions later, plan to remake the coast guard fleet stumbles.* Retrieved from http://www.nytimes.com/2006/12/09/us/09ship.html?pagewanted=all&_r=0

Shah, A. (2013). *World military spending.* Retrieved from http://www.globalissues.org/article/75/world-military-spending.

Wayne, L. (2005). *Former Executive at Boeing 4-month Prison Term*. Retrieved February 13, 2015 from http://www.nytimes.com/2005/02/19/business/19sears.html?_r=0

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Are 12-Step Programs Suitable for Treating Behavioral Addictions?

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Abstract

The use of 12-step programs based on the Alcoholic Anonymous program is common in many substance abuse treatment programs and has proven effective for many people. Recently, new types of addictions have been identified that do not involve drugs or other substances, such as gambling, shopping, viewing pornography, cutting, sex, use of computers, use of cell phones, playing video games, the Internet, etc. These are generally referred to as behavioral addictions, although only compulsive gambling is recognized in the DSM-5. Various forms of treatment are currently in use, primarily psychotherapy and psychopharmacology. The question to be considered here is whether 12-step programs can be effective treatments for non-substance-abuse addictions.

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Introduction

What do you picture when you think of an addict? The most common image is an alcoholic or a drug addict, but addiction is not restricted to substance abuse. We are hearing more and more frequently about other types of addiction – gambling, overeating, Internet porn, gaming, cell phone use, sex, shopping – and the heavy toll these can take on the individual and the family. These are generally referred to as "behavioral addictions." The fact is that almost anyone can be an addict. It's time to widen our view and realize that the problem is much more common than we want to think.

Characteristics of Addiction

The *Diagnostic and Statistical Manual of Mental Disorders* lists the following characteristics of addiction:

- The patient persists in engaging in the addictive behavior despite being aware of the potential or already-realized risks involved.
- The addictive behavior is compulsive and repetitive (with both substance and behavioral addictions).
- In cases of substance dependence, the patient displays an increasing tolerance for the drug and its effects, and will take higher doses to achieve the desired effect even though there may be serious risks involved in doing so. [In behavioral addictions, the person will need to engage in the behavior more frequently or at a higher risk level.]
- The patient experiences withdrawal symptoms if he or she attempts to discontinue use of the addictive substance. With behavioral addictions, the patient is unable to resist compulsions to continue the addictive behavior despite attempts to stop.

There are many similarities among the different types of addictions. According to Peter Martin (2005), "The areas of overlap among behavioral and drug addictions are more compelling than are the differences… various irresistible, repetitive, and harmful behaviors, such as out-of-control gambling, eating, sexuality, and internet use, not only resemble each other clinically but share neurobiological underpinnings with drug and alcohol dependence" (1). According to the National Institute of Health, the activity causes the release of dopamine, resulting in a feeling of euphoria, but over time the brain requires more dopamine to experience the same response. This means the person addicted to a certain behavior must either engage in the activity more often or take more risks to increase the dopamine level ("What is Behavioral Addiction," 2016).

As the behavior progresses, the person develops an inability to find pleasure in normal day-to-day activities and is able to respond only to stimulation related to the behavior. This leads to psychosocial complications such as social withdrawal, anxiety, and depression, resulting in enhanced vulnerability and greater reliance on the addictive behavior, and, eventually, to loss of control over the behavior (Martin).

Treatment

The treatment of any addiction must begin with the individual recognizing and admitting the problem. Denial is the most common issue preventing the treatment of addiction and must be overcome before treatment can begin. Recognizing and admitting the problem can be difficult with behavioral addictions because, unlike drug abuse, many of the behaviors are seen as normal and most are not illegal or socially unacceptable. The person must realize that he or she is experiencing an uncontrollable compulsion to engage in the activity more frequently than is usual or is doing it in inappropriate places or times. Often this becomes apparent when the person finds that the behavior is becoming less satisfying or pleasurable, but still cannot stop doing it. He or she also might try to hide the activity and lie about it to friends or family members.

Once the person admits the existence of the problem, treatment can begin. Many treatment programs take multiple approaches including education, individual therapy, behavioral therapy, and support groups ("Behavioral addiction treatment"). In some cases psychopharmacology is also used, primarily to relieve anxiety or depression. The main focus of treatment often is educational, teaching the addict how to live without the behavior; this is important to minimize the chance of relapses, which are very common. Individual therapy can be effective in helping the addict understand the underlying causes and triggers for the behavior, as well as learn how to recognize and deal with stressors that might cause a relapse. Behavioral therapy can teach specific techniques to overcome compulsive feelings and to make life-style changes to avoid temptation. Group therapy is often based on 12-step recovery programs modeled on Alcoholics Anonymous ("Behavioral addiction treatment"). Participation in such therapy programs allow people with similar additions to meet together in a supportive environment, realize they are not alone, overcome feelings of isolation and shame, and learn new coping skills (Hall, 2014; "What is Behavioral Addiction"). In addition, involvement in a formal 12-step program can offer addicts access to other assistance programs ("12-Step Programs for Addictions").

The 12-Step Model

The 12-step model can be successfully applied across the spectrum of chemical and behavioral addictions. The 12 steps developed by Alcoholics Anonymous are as follows:

1. We admitted we were powerless over alcohol - that our lives had become unmanageable.
2. Came to believe that a Power greater than ourselves could restore us to sanity.
3. Made a decision to turn our will and our lives over to the care of God as we understood Him.
4. Made a searching and fearless moral inventory of ourselves.
5. Admitted to God, to ourselves and to another human being the exact nature of our wrongs.
6. Were entirely ready to have God remove all these defects of character.
7. Humbly asked Him to remove our shortcomings.

8. Made a list of all persons we had harmed, and became willing to make amends to them all.
9. Made direct amends to such people wherever possible, except when to do so would injure them or others.
10. Continued to take personal inventory and when we were wrong promptly admitted it.
11. Sought through prayer and meditation to improve our conscious contact with God as we understood Him, praying only for knowledge of His will for us and the power to carry that out.
12. Having had a spiritual awakening as the result of these steps, we tried to carry this message to alcoholics and to practice these principles in all our affairs.

Twelve-step programs for other groups use these basic steps while making minor changes in wording to adapt the steps to addictions other than alcoholism. Typically, groups have changed the word “alcohol” in Step 1 and “alcoholics” in Step 12 to reflect the specific addiction.

Conclusion

There is little reliable information on the success of recovery programs for any type of addiction, but there is general agreement that success rates are not high for any program and agreement that the vast majority of addicts must cycle through treatment several times before overcoming their addiction. Twelve-step programs have detractors among health care professionals, primarily due to the fact that most success reports come from AA and other support groups rather than from independent and objective research. However, at the present time 12-step programs, used in conjunction with education, individual therapy, and behavioral therapy, represent the most successful approach to treatment. The most important factor in successful recovery remains the addict’s conscious action in admitting the addiction, accepting responsibility for recovery, realizing they are powerless to overcome it alone, and consistently following the 12-step approach.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. (5th ed.). Washington, DC: APA.

Behavioral addiction treatment. (2016). Retrieved 1/17/2016 from Addiction Treatment.com website: http://www.addiction-treatment.com/research/behavioral-addiction-treatment/

Hall, P. (2014). Sex addiction – an extraordinarily contentious problem. *Sexual and Relationship Therapy*, *29* (1): 68-75. doi 10.1080/14681994.2013.861898

Martin, P. R., & Petry, N. M. (2005). Are non-substance-related addictions really addictions? : Affirmative viewpoint. *American Journal on Addiction*, *14*:1-7, doi 10.1080/10550490590899808

12-step programs for addictions. (2016). Retrieved 1/12/2016 from 12-Step.com website: http://www.12step.com/articles/sober-living/12-step-programs-addictions

What is behavioral addiction? (2015). *Behavioral addiction*. Retrieved 1/17/2016 from Recovery4Addiction website: http://www.treatment4addiction.com/addiction/behavioral/

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Knowledge of Personality Types Can Enhance Instructional Programs

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Abstract

This paper presents information concerning the possible effects of personality preferences on teaching and learning styles. Special permission was granted in writing by the Center for Applications of Psychological Type (CAPT), Gainesville, FL for extensive summaries of type information from *People, Types and Tiger Stripes* by G. D. Lawrence. No original research was conducted by the authors of this paper.

Introduction

Research by Dr. Carl G. Jung, a Swiss psychiatrist, confirmed that individuals have mental or psychological preferences for performing certain tasks, just as they have physical preferences such as preferred hand or an eye that is dominant. Many of the mental processes are not conscious but nonetheless dictate many of our choices in life, i.e. preferred communication patterns, study habits, teaching styles, what we consider the ideal vacation, stressors, etc. Jung utilized this knowledge in dealing with patients and people he came in contact with. Jung wrote and lectured extensively on this theory of personality preferences, but only limited research was available to insure practical application of the theoretical principles. Two of Jung's female students (although the students and teacher had not met in person) conducted research in the early 1940's on how to measure personality preferences and invited Dr. Jung to participate in the research. Dr. Jung declined to become involved in the research because of other projects that consumed his time, his age, and the geographical distance between himself and the researchers. Dr. Jung recognized the potential of their proposed research to help bring his theory of personality type into more practical application and encouraged the mother/daughter pair to go forward with their research. Subsequently, as a result of their research and development, the Myers-Briggs Type Indicator® (MBTI®) emerged as a personality instrument having numerous applications, including (but not limited to) teaching and learning preferences, preferred communication, and negotiation styles.

Using the MBTI® to Enhance Teaching and Learning

The MBTI®, developed by Myers and Briggs, identifies and measures within four basic dimensions (energizing, attending, deciding, living) eight mental or psychological preferences for performing certain tasks, outlined by Hirsh and Kummerow (1989, pp. 5-6):

There are two ways a person can be energized. *Extroversion* is the preference that relates to drawing energy from outside oneself in the external world or peers and activities. *Introversion* is the preference that relates to drawing energy from one's inner world of ideas, emotions, and impressions.

The two preferences for attending are Sensing and Intuition. *Sensing* relates to the preference for paying attention to information that is perceived directly through the five senses and for focusing on what actually exists. *Intuition* refers to the preference for paying attention to information that is taken in through a "sixth sense" and for noticing what might or could be, rather than what actually exists.

The deciding preferences are Thinking and Feeling. *Thinking* is the preference that relates to organizing and structuring information to decide in a logical and objective way. *Feeling* is related to the preference for organizing and structuring information to decide in a personal, value-oriented way.

Judgment and Perception are the two preferences that relate to how one likes to live one's life. *Judgment* is the preference that relates to living a planned and organized life. *Perception* refers to the preference for living in a more spontaneous and flexible way. (pp. 5-6)

The MBTI® is based on the idea that people have preferences, and there are two opposing behavioral dichotomies for each of the four preferences. Even though people use all eight, only one from each of the four basic preferences is generally favored. The combination of these four preferences results in a psychological type (e.g. Introverted-Intuitive-Thinking-Judging).

Information gleaned from the MBTI® can be used by teachers at all levels to more effectively engage individual students' learning styles. Lawrence (1993) explains that the term "learning styles" is used variously and loosely in educational literature. McClanaghan (2000) agrees that the term has several definitions, but describes it succinctly as "an individual's characteristic means of perceiving and processing information" (p. 479). Lawrence gives a broader definition which covers four aspects of psychological makeup (p. 39).

A. Cognitive style in the sense of preferred or habitual patterns of mental functioning: information processing, formation of ideas, and judgments.
B. Patterns of attitudes and interests that influence what a person will attend to in a potential learning situation.
C. A disposition to seek out learning environments compatible with one's cognitive style, attitudes and interests, and to avoid environments that are not congenial.
D. Similarly, a disposition to use certain learning tools, to use them successfully, and to avoid other tools.

Knowledge of personality type can help identify some of the normal differences in learning styles, and will provide instructors (in both educational institutions and industrial/organizational settings) a rational structure for designing activities that will help to encourage learning. Myers (1998, p. 37) states that individuals demonstrate different ways in which they learn best, starting from their earliest years:

- Some children prefer to get careful, complete instructions before they begin a new game or task.
- Some like to observe others playing with a toy before they try it themselves.
- Some like to plunge in right away and learn as they go along.
- Some prefer to learn while interacting with others.
- Some prefer to focus by themselves.
- Some like to know all the rules and follow them.
- Some like to create their own rules and change them frequently.

McClanaghan (2000) points out that helping students understand their learning styles can lead them to become more engaged in the learning process, can enhance underdeveloped aspects of their styles, and can assist them in taking charge of their own success as learners. By enabling students to "learn how to learn," instructors can nurture

students' ability to become lifelong learners, capable of learning and working in the diverse settings of the 21st century.

Lawrence (1993, pp. 43-46) provides the following summaries of the learning preferences and their effect on learning as well as the way the trainer or teacher can evaluate the learner.

Learning Styles Based on Preferences*

EXTRAVERSION (E)	INTROVERSION (I)
Cognitive style: The extraversion preference is associated with a cognitive style that favors: • Learning by talking and physically engaging the environment, • Letting attention flow outward toward objective events, • Talking to help thoughts to form and become clear, • Learning through interactions, verbal and non-verbal. **Study style:** The extraversion preference is associated with a study style that favors: • Acting first, reflecting after, • Plunging into new material, • Starting interactions needed to stimulate reflection and concentration, • Having a strong, interesting, external-extraverted reason for studying, • Avoiding distractions that will cut into their concentration, • Studying with a friend, studying to prepare to teach someone. **Instruction that fits E's:** The extraverting types do their best work with: • Opportunities to "think out loud"; for example one-to-one with the teacher, classroom discussions, working with another student, action projects involving people, • Learning activities that have an effect outside the learning, such as visible results from a project, • Teachers who manage classroom	**Cognitive style:** The introversion preference is association with a cognitive style that favors: • Quiet reflection, • Keeping one's thoughts inside until they are polished, • Letting attention flow inward, • Being engrossed in inner events: ideas, impressions, concepts, • Learning in private, individual ways. **Study style:** The introversion preference is associated with a study style that favors: • Reflecting first, acting after (if necessary), • Looking for new data to fit into the internal dialogue that is always going on, • Working privately—perhaps checking one's work with someone who is trusted, • Reading as the main way of studying, • Listening to others talk about the topic being studied, and privately processing what they take in, • Extraverting just when they choose to. **Instruction that fits I's:** I's like learning situations that let them: • Work internally with their own thoughts: listening, observing, lab work, reading, writing, • Process their experiences at their own pace,

dialogue so that extraverts have ways to clarify their ideas before they add them to class discussion, • Assignments that let them see what other people are doing and what they regard as important.	• Present the results of their work in forms that let them keep their privacy, • Have ample time to polish their work before needing to present it, • Have time to reflect before answering the teacher's questions, • Tie their studies to their own personal interests, their internal agenda.

SENSING (S)	**INTUITION (N)**
Cognitive style: The sensing preference is associated with a cognitive style that favors: • Memorizing facts, • Observing specifics, • Processing data step by step, • Starting with the concrete, then moving to the abstract, • Being careful and thorough, • Aiming toward soundness of understanding, • Staying connected to practical realities around them, • Being attentive to what is in the present moment. **Study style:** The sensing preference is associated with a study style that favors: • A sequential, step-by-step approach to new material, • Beginning with familiar, solid facts, • Moving gradually toward abstract concepts and principles, • Approaching abstract principles and concepts by distilling them out of their own personal, concrete experience. **Instruction that fits S's:** S's do the best with instruction that allows them to hear and touch as well as see (or only read about) what they are learning. They like: • Hands-on labs, • Relevant films and other	**Cognitive style:** The intuition preference is associated with a cognitive style that prefers: • Being caught up in inspiration, • Moving quickly in seeing associations and meanings, • Reading between the lines, relying on insight more than careful observation, • Relying on verbal fluency more than on memory of facts, • Focusing on general concepts more than details and practical matters. **Study style:** Intuitives typically adopt a study style that includes: • Following inspirations, • Jumping into new materials to pursue an intriguing concept, • Finding their own way through new materials, hopping from concept to concept, • Attending to details only after the big picture is clear, • Exploring new skills rather than honing present ones, • Reading. **Instruction that fits N's:** The intuitive types do their best work with: • Learning assignments that put them on their own initiative, individually or with a group, • Real choices in the ways they work

audiovisual presentation, • Materials that can be handled, • Computer-assisted instruction, • First-hand experience that gives practice in the skills and concepts to be learned, • Teachers who provide concrete learning experiences in any learning sequence, before using the textbook, • Teachers who show them exactly what is expected of them, • Teachers who do not move "too quickly" through material, touching just the high spots or jumping from thought to thought, • Assignments that do not expect them to generate possibilities not based on solid facts, • Skills and facts they can use in their present lives. Being naturally observant of detail in the here and now, they tend to overlook the big picture, general meanings, and implications for the future. They believe the adult world has specific skills and facts they should be taught, and they are disappointed in any teacher who expects them to discover them for themselves.	out their assignments, • Opportunities to find their own ways to solve problems, • Opportunities to be inventive and original, • Opportunities for self-instruction, individually or with a group, • A system of individual contracts between teacher and students. Intuitive types like beginnings a lot more than endings, because beginnings are fired with the fascination of new possibilities. When they have study assignments they can be enthusiastic about, they are much more likely to carry them to the finish line. In high school and beyond, they generally like experiences rich with complexities, which may include stimulating lectures. After a concept or skill is understood to their satisfaction, they may find continued practice boring, shift over to new inspirations, and never achieve complete mastery. They get frustrated with the teacher who paces instruction "too slowly."

THINKING (T)	**FEELING (F)**
Cognitive style: The thinking preference is associated with a cognitive style that favors: • Making impersonal judgments, aiming toward objective truth, • Keeping mental life ordered by logical principles, • Analyzing experiences to find logical principles underlying them, • Staying free from emotional concerns while making decisions,	**Cognitive style:** The feeling preference is associated with a cognitive style that favors: • Making value judgments concerning human motives and personal values, • Attending to relationships, • Personalizing issues and causes they care about, • Staying tuned to the quality of the subjective tone of relationships and

• Naturally critiquing things, aiming toward clarity and precision. **Study style:** Thinking types typically adopt a study style that includes: • Having objective material to study, • Compartmentalizing emotional issues to get clear thinking on the task at hand, • Analyzing problems to bring logical order out of confusion, • Wanting to get a sense of mastery over the material being studied. **Instruction that fits T's:** The thinking types do their best work with: • Teachers who are logically organized, • Subjects and materials that flow logically and respond to logic, • Feedback that shows them their specific, objective achievements.	seeking harmony in relationships, • Attending to the quality of their own emotional life, • Naturally appreciating people and their accomplishments. **Study style:** Feeling types typically adopt a study style that includes: • Learning through personal relationships rather than impersonal individualized activities, • Learning by helping and responding to other peoples; needs, • Studying with a friend, • Wanting to choose topics to study that they care deeply about. **Instruction that fits F's:** The feeling types do their best work with: • Teachers who value a personal rapport with students, • Assignments that have a goal of helping people, • Feedback that shows warm appreciation for the student and his or her effort, and gives corrective suggestions in that context, • Personalized assignments.

JUDGMENT (J)	PERCEPTION (P)
Cognitive style: The judging preference is associated with a cognitive style that favors: • Having a clear structure in a learning situation from the beginning, • Aiming toward completions and getting closure, • Having life organized into an orderly plan. **Study style:** Judging types typically adopt a study style that includes: • Planned and scheduled work, drawing energy from the steady, orderly process of doing their work, • Wanting to know exactly what they	**Cognitive style:** The perceiving preference is associated with a cognitive style that favors: • Open exploration without a pre-planned structure, • Staying open to new experiences, • Managing emerging problems with emerging structures, • The stimulation of something new and different. **Study style:** Perceiving types typically adopt a study style that includes: • Spontaneously following their curiosity, • Studying when the surges of impulsive energy come to them,

are accountable for and by what standards they will be judged, • Treating assignments as serious business, and persisting in doing them. **Instruction that fits J's:** The judging types do their best work with: • Pre-planned structure, and a teacher who carefully provides it, • Predictability and consistency, • Formalized instruction that moves in orderly sequences, • Prescribed tasks, • Milestones, completion points, with little ceremonies to honor successful completions.	• Studying to discover something new to them, • Finding novel ways to do routine assignments so as to spark enough interest to do the assignments. **Instruction that fits P's:** The perceiving types do their best work when: • They can pursue problems in their own way, • They have genuine choices in assignments, as with a system of individual contracts in which the student can negotiate some of the activities, • Assignments make sense to them, • Their work feels like play.

*From *People, Types, and Tiger Stripes*, 1993, by Gordon D. Lawrence. Used with permission. Center for Applications of Psychological Type, Gainesville, FL • www.capt.org.

Discussion

As MacLellen (2011) explains, "Understanding student personality types can help teachers plan instruction and activities that best suit the personality tendencies of their students. Personality types are related to patterns of thought and behavior, and they provide insight into how students form and maintain relationships with one another and with teachers" (p. 38).

Lawrence (1997, pp. 28-29) offers the following tips for using type:

- **Adjusting to a teacher.** There are 16 different personality types, and the chances are good that most teachers encountered will have types different from ours. The variety and fresh viewpoints may be an advantage, if one possesses the knowledge to experience type differences constructively.
- **Study style.** The most important advice is to work from the strengths of our type. Extraverts may want to find a study partner to talk issues over with, and remove distractions when studying alone. Studying alone will most likely help introverted students, but they should do a trial run with a partner prior to making an oral presentation. (pp. 28-29)

Kise (2001, p. 4) concluded the following from a one-year-long study in a 375-student middle school with 25 teachers:

- Type allowed teachers to adapt lesson plans to appeal to all personality preferences. Adjustments were often small.
- Teachers learned to deal better with other faculty and staff, based on understanding type differences.

- Teachers began coaching individual students in ways appropriate to the students' types. Students, feeling more respected and understood, were more receptive.
- Teachers interpreted and handled discipline problems in terms of type, particularly extraversion and introversion.
- Parent-student-teacher conferences went more smoothly when teachers could use their knowledge of a student's type to show respect and valuing of the student.
- Type made study skills teachers less dogmatic about what techniques are "right."
- Teachers working with at-risk students could often link learning difficulties in preferences and take steps to meet the students' type needs.

However, a thorough understanding of the instructors' learning styles is necessary before the most effective techniques for improving classroom instruction can be determined. Instructors must examine their own assumptions and beliefs, and understand the societal beliefs on which the school operates, before classroom practices can be changed. This process requires extensive time, analysis, and commitment. Utilizing the MBTI in conjunction with empirical evidence can help improve instruction. For example, a study by Schroeder (1993) showed that over 75% of college faculty favored the intuitive learning pattern, but approximately 60% of entering college freshmen preferred the sensing mode. Henson and Chambers (2003) demonstrated that extraversion is related to classroom efficacy but negatively related to people management skills. Kise found (2005) that it can be extremely difficult for teachers to overcome their own type preferences when trying to change classroom practices.

Myers (1998, p. 42) suggests that we remember the following aspects related to type:

- Type describes 16 dynamic energy systems, rather than defining static boxes.
- There is no right or wrong type, and there are no better or worse combinations of types in work or relationships. Each type and each individual bring special gifts.
- The purpose of learning about type is to help you understand yourself better and to enhance your relationships with others.
- Each person is unique.
- Everyone uses each of the preferences to some degree.
- You are the final judge of your best-fit type.
- Type does not explain everything.
- You may use type to understand and forgive yourself, but not as an excuse for doing or not doing anything. Type should not keep you from considering any career, activity, or relationship.
- Become aware of your type biases (we all have them!) to avoid negative stereotyping. (p. 42)

Summary

Information concerning the influence of personality on learning and teaching styles is important for industrial/organizational training programs just as it is in the educational classroom. Researchers in personality type are convinced that people are born with a certain personality type and that our personality type does not change throughout our lifetime. Much of the research concerning type and learning has been conducted with

and focuses on educational institutions but is also applicable in instructional/learning situations in other organizations. Information concerning personality type will enable teachers/instructors and other individuals to consciously choose the appropriate type for approaching and dealing with different situations in their personal or work life.

> *For as in one body we have many members, and all the members do not have the same function, so we, though many, are one body. Having gifts that differ according to the grace given us, let us use them. (Romans 12:4-6, Revised Standard Version)*

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References

Henson, R. K., & Chambers, S. M. (2003). Personality type as a predictor of teaching efficacy and classroom control in emergency certification teachers. *Education 124*(2): 261-268.

Hirsch, S.K., & Kummerow, J. (1989). *Life types*. New York: Warner Books.

Kise, J. (2001). Type in schools: More than just learning styles. *Typeworks*, June, issue 41, 304.

Kise, J. (2005). Coaching teachers for change: Using the concepts of psychological type to reframe teacher resistance. *Journal of Psychological Type, 65*(6), 47-58.

Lawrence, G. (1997). *Looking at type and learning styles.* Gainesville, FL: Center for Applications of Psychological Type, Inc,

Lawrence, G. (1993). *People, types, and tiger stripes*. Gainesville, FL: Center for Applications of Psychological Type, Inc.

MacLellan, C. R. (2011). Understanding your band, orchestra, and choir students. *Music Educators Journal*, *97*(4), 37. doi:10.1177/0027432111405532

McClanaghan, M. E. (2000). A strategy for helping students learn how to learn. *Education, 120*(3), 479-486.

Myers, I.B. (1998). *Introduction to type*. Palo Alto, CA: Consulting Psychologists Press, Inc.

Schroeder, C. C. (1993). New students--new learning styles. *Change*, *25*(5), 21

Management in Additive Manufacturing/3D Printing

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Abstract

Additive manufacturing is the process of joining materials in layers to form a 3D object without the use of molds or tooling. The technology has the potential of transforming industries in the development and innovation shift of the entire business model. This paper explores the current trends and growth of the process in industry, as well as the future potential for its use.

Introduction

Additive manufacturing is the process of joining materials in layers to form a 3D object. The model may be formed into any shape and produced from an electronic data source such as a CAD software file. The greatest advantage in additive manufacturing is to produce composite (or certain metal) parts without the use of molds or tooling. This allows manufacturers to develop serviceable models at a low cost, without the need to engineer production lines for producing test prototypes and quick modifications. In streamlining the production lines, eliminating cumbersome mold manufacturing improves bottlenecks, speeding process times in other production areas. This long-lived emerging technology brings design and innovation to the front by giving creative freedom in the developing process. Engineers are now able to try a variety of design concepts consecutively, minimizing costs of prototyping. The traditional manufacturing and production systems are now restructured into a compressed environmental footprint of material waste. Additive manufacturing is a transition in supporting the green industrial initiative. The technology has the potential to transform industries in the development and innovation shift of the entire business model. The use of additive manufacturing with 3D printing could reduce energy by 50% and material costs by up to 90% in comparison to traditional manufacturing process. The ability to quickly produce small quantities of complex parts on demand is the future of manufacturing. The advancement of sophisticated IT capabilities will transition amongst the mold manufacturers. The production time of complex parts is significantly reduced as demand increases enables continuous improvement of production. This move from a traditional manufacturing process of using molds to additive manufacturing/3D printing and all digital technology makes production predictable of real-time delivery dates. Additive manufacturing improves the bottom line by reducing the time needed to produce parts.

Reality Additive Manufacturing

Additive manufacturing/3D printing is an industrial revolution and is changing the aspect of product improvement in a digital age. The costs needed in manufacturing tools used in the traditional methods of product development have reduced significantly and are less dependent on the economies of scale. The recognized data requirements for workflow is streamlining information throughput during product realization in additive manufacturing. Past manufacturing depended on producing mechanisms through mold tools, adding costs of fixed assets, where additive manufacturing replaced mold, casting or machining in a disruptive technology reduced the added costs. The value chain of additive manufacturing added more than just the elimination of tools and molds, it added freedom to build complex geometric designs (How 3D Printing is Disrupting Mainstream Manufacturing Processes, 2007-2015).

The use of 3D printing in additive manufacturing is changing the roles of the industry, but there is doubt that it will replace the traditional process completely. The expense of some parts will remain cheaper when work is done manually, as well as control of the quality of parts produced. Knowing when to change traditional design, manufacturing process to the emerging technology of 3D printing can be challenging, but has opened avenues of opportunity for complex designs. Additive manufacturing has changed market in terms of cost per part, when complexity and customizability has no cost. Producing customized parts in a short time frame gave quicker response time in meeting customer needs. Parts produced through 3D printing various materials are cheaper with the benefits of a lighter and sturdier part than traditional manufacturing. For low volume production of sustainable products, additive manufacturing has benefited and increased flexibility for innovative design freedom.

Trends

The concept of 3D printing/additive manufacturing is not new to the industrial process and has been in operation for over twenty years now. The organizations that require a higher quality product are able to secure a premium priced machine that will fabricate fine-grained metal and polymer parts, and more simplistic machines produce plastic objects for prototyping. The additive manufacturing industry annual growth rate in a twenty-four year history is over 26.4% and expected to expand in double-digit growth by 2019. The trends of 3D printing technology is evolving into other business sectors such as medical, automotive, and electronics, giving way to market development of new additive materials. This growth rate is also including the new startup companies and at home hobbyist. Since the use of 3D printers in the industry, a more affordable version has come to market that attract the lower end businesses, self-employed engineers, and schools for training. This has created an open-source-based commercialization of 3D printing for startup businesses just entering the market or adding a niche to the existing business (de Jong & de Bruijn, 2012).

Adoption

Although 3D printing has been in the industry for many years, it is still technology not widespread in the business world. The adoption of 3D printing technology/additive manufacturing is in the preliminary stages of one-quarter of businesses surveyed out of 500 companies. This manufacturing process creates an impact on the supply chain for early adopters in virtually any

part production industry in accelerating development, through management departmentalizing tasks in allowing designers full reign of software to take concepts from inception to manufacturing and understanding the value of rapid prototyping in quickly getting products to market. During the inception phase of additive manufacturing, teams of traditional manufacturing practices will learn new skills and understand how new technology will affect their current position. (Aurthor, 2015) Training employees allows them to be involved with the inception of the new technology, relieving them of routine tasks. The employees from the bottom up have more insight of how this new technology will influence their production standards and give more ideas into accepting their new role of innovation. Management as a motivational tool in adopting technology uses the behavior aspect of job design that empowers employees (Wagner, Dainty, Hague, Tuck, & Ong, 2008).

Growth

The growth of 3D printing in the market has resulted in segments of specialties for this technology. The rapid growth of 3D printing/additive manufacturing will soon replace the traditional ways of mass production, which previously defined the industrial revolution. This growing technology will have much influence on the industry as a whole and will show a substantial part in manufacturing for decades. The turbulence of the market in additive manufacturing is caused by the speed of scientific advances and dissimilar changing niche markets. These technologies not only benefit large corporations, they also allow small businesses and communities to produce and customize anything conceivable to sell or offer services locally (Emerson, 2011). The gradual change of additive manufacturing in the market from mainly industrial use to home 3D printing will look very different in contrast. The value chain of 3D printing/additive manufacturing creates a centralized manufacturing facility, diminishing the need for toolmakers. Producing tools in additive manufacturing creates little waste with short changeover times and reduces overhead in labor creating value added. The new business model of additive manufacturing is a shorter value chain, has superior lead times, and lowers costs over the traditional supply chain that went through several added steps in manufacturing with 30-80% more in waste. The proficiency in responding to unforeseen deviations in the market is one of the foremost business objectives in assessing a strategy for new technology.

Streamlining Additive Manufacturing

There are factors that drive the 3D printing concept in manufacturing and that is the ability to get the job done more rapidly, inexpensively, and with improved quality. More materials have been developed, and additive manufacturing capability continues to improve the tools made to order on demand. The production of tools, traditionally, can be expensive and time-consuming which limits quantity of tools released into production, creating bottlenecks. In an additive manufacturing facility, the redesigned tool is produced with less waiting time and more efficiency than traditional methods of producing tools. Management is able to streamline the production floor by utilizing 3D printing of multiple up-to-date tools at the same time within a few hours.

Breaking the Mold

The use of 3D printing is for quick response time in customer demand and eliminating the need for extra work force creating set up tools for molds. There are some parts that still require casting of molds and, therefore, still a need for cumbersome and expensive mold set-ups for certain

metals that have not yet been created for additive manufacturing use. Foundries have developed a solution in an effort to eliminate the creation process of the expensive molds for casting and incorporated additive manufacturing in actually making molds for casting of metals. The orthodox construction of various tools are highly meticulous, labor-intensive, and costly for the production of sand core molds. Through CAD data and 3D printing, the old manufacturing process of creating burdensome molds convention was cut down from several weeks to a matter of hours (Complex Core? No Problem, 2013). The significance of using 3D printing in constructing molds has a tremendous impact on reducing production costs, eliminating waste materials, and creating tools on demand. Additive manufacturing has the potential to change the landscape and economies of manufacturing.

Outsourcing

Firms who are uncertain and late movers in emerging technology turn to outsourcing to professionals and forming partnerships. Companies that lack the knowledge and resources outsource production to facilities with additive manufacturing capabilities without taking the risk of investing into the technology; outsourcing delegates, a company's business to a third party vendor for lower cost labor, innovation of services and quality of product knowledge. Many companies use outsourcing to save expenditures and afford a safeguard investment fund in a manner to profit the company. The firm will define the purpose of need for outsourcing and research for vendors that fit the expected outcome or return of services. For an effective joint venture, the servicing partner and the receiver of the service must understand all processes involved of additive manufacturing. As materials of 3D printing improve, so will the demand for the technology (Hartford, 2015). Smaller businesses may invest in low-end 3D printers for production of basic prototypes, but outsource for manufacturing needs.

Conclusion

The future of 3D printing/additive manufacturing is based on influences and strategic planning of technologies within the industry. The wide spread use of 3D printing technology has moved from manufacturing to almost all aspects of the medical sector, aerospace, automotive, and electronics. As new materials are added to the additive manufacturing process, so are the markets it serves and capabilities of products produced. The technological situation for each sector is developed in unison with the movement of the global environment of overall knowledge scenarios. Companies prefer to form alliances with other firms who have 3D printing capabilities in outsourcing their needs without the need for investing into the technology. The emerging technology of 3D printing/additive manufacturing demonstrates the thought process to physical models in prototyping and trigger new design ideas.

References

Aurthor, G. (2015, March 02). *3D Printing Is Transforming the Supply Chain*. Retrieved from CIO INSIGHT: http://www.cioinsight.com/it-management/innovation/3d-printing-is-transforming-the-supplychain.html

Complex Core? No Problem. (2013, May 16). Retrieved from Foundry Management & Technology: http://foundrymag.com/moldscores/complex-core-no-problem?page=2

de Jong, J. P., & de Bruijn, E. (2012, December 18). *Innovation Lessons From 3-D Printing*. Retrieved from MIT Sloan Management Review: http://sloanreview.mit.edu/article/innovation-lessons-from-3d-printing/

Emerson, G. (2011, September 14). *How 3D Printing Will Change the World*. Retrieved from The Street: http://www.thestreet.com/story/11277789/1/how-3-d-printing-changes-everything.html

Hartford, J. (2015, March 26). *3-D Printing Partnerships*. Retrieved from MDDI Medical Device and Diagnostic Industry: http://www.mddionline.com/blog/devicetalk/3-d-printing-partnerships-0326-15

How 3D Printing is Distrupting Mainstream Manufacturing Processes. (2007-2015). Retrieved from Interior Design & Architecture Magazine: http://freshome.com/2012/11/06/how-3d-printing-isdisrupting-mainstream-manufacturing-processes/

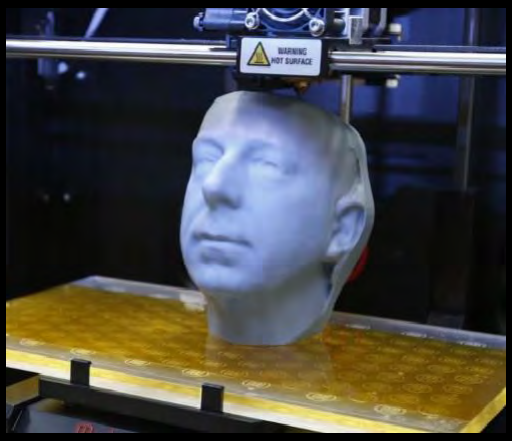
Wagner, H., Dainty, A., Hague, R., Tuck, C., & Ong, M. H. (2008). The effects of new technology adoption on employee skills in the prosthetics profession. *International Journal Of Production Research*, 46(22), 6461-6478. doi:10.1080/00207540701432623.

Appendix - PowerPoint Slides

Management
3D Printing/Additive Manufacturing

Introduction

3D printing or Additive Manufacturing is a progression of creating 3 dimensional solid objects from a digital CAD file. An object is generated by laying down consecutive layers of additive material in a cross section of thinly sliced horizontal layers until the entire project is created.



Reality Additive Manufacturing

The reality of additive manufacturing/3D printing, it is becoming the third industrial revolution and changing the aspect of product improvement in a digital age. Knowing the trends of technology in the market and will they be early adopters or late movers as this technology significantly grows

- Trends – 3D printing has developed into other market sectors such as medical, automotive, and electronics in addition to the traditional industrial printing needs.
- Adoption- The early adopters of AM technology accelerate the supply chain in the manufacturing process. This technology is also in the preliminary stages of ¼ of 500 companies surveyed and are considered as late adopters.
- Growth- 3D printing growth in the market results from adoption of AM technology in other business sectors creating turbulence over traditional methods of manufacturing parts in those areas.

Streamlining Additive Manufacturing

Breaking the Mold

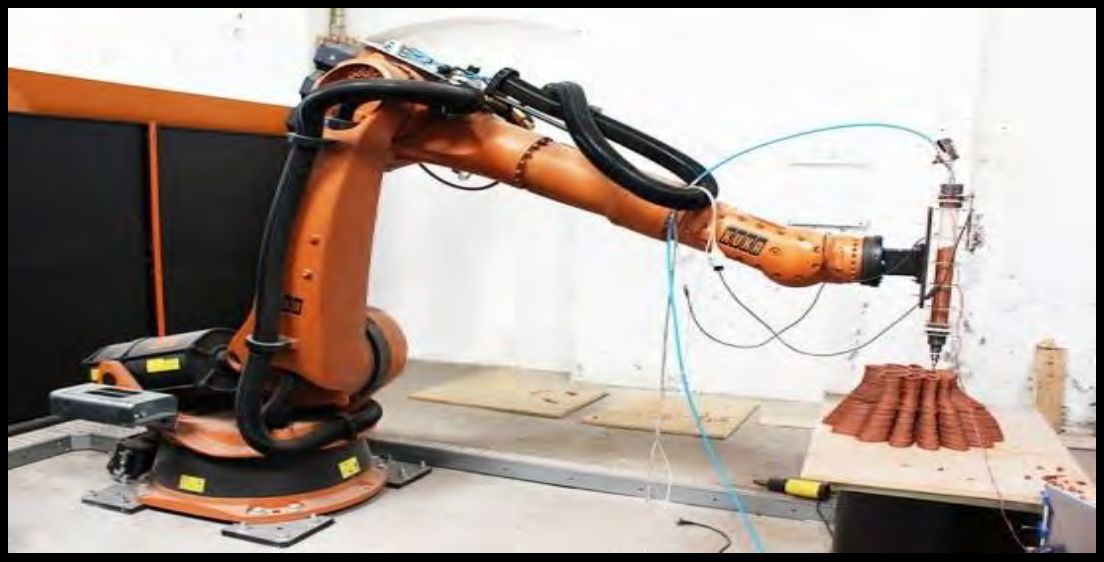
- Overcame issues of inability of using additive manufacturing within certain markets. 3D can be used in creating molds in materials that is not yet developed for AM
- This joint venture helps firms by:
- This eliminated barriers of:
- Time needed to produce casted parts.
- Expense of materials used in creating molds.
- Eliminated wasted materials usage.
- Innovative services provided.

Outsourcing

- Companies who are late movers, and non risk takers will form printing alliances with companies who have casting parts with 3D printing capabilities.
- Lack knowledge of the technology.
- Lack resources for investment.
- Low cost of labor needed.
- Quality of product produced.

Conclusion

3D printing/ Additive Manufacturing technology future is based on strategic planning of technology within any industry of it's use. This technology is growing constantly as new additive materials are added to the AM process. This creates an impact and cost savings on the supply chain and turnover times limits presented to manufacturing. The third industrial revolution is in the preliminary stages as more come to adopt this growing technology.



Authors

Dr. J. Wayne McCain (shown with daughter Amelia) has been a practicing engineering manager for over 30 years and a college educator for over 20 years of that time. 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. He has worked Army and Air Force related defense programs for Thiokol Propulsion and Martin Marietta (now Lockheed Martin) in Denver. Dr. McCain also worked on automated test equipment for the Space Shuttle Program while at United Space Boosters, Inc. Dr. McCain is currently taking additional post-doctoral coursework in Space Systems from the Florida Institute of Technology in Melbourne, Florida. He is a member of SARA and is participating in the JOVE and SuperSID Projects.

Tammie Renee Clark is a senior at Athens State University pursuing a degree in Management of Technology and a minor in Information Systems Management with an anticipated graduation date of August 2016. She holds an AAS in Computer Science from Northeast Alabama Community College and is a member of Delta Mu Delta. Tammie has been married to husband, Darrell, for twenty-six years, and they live in Scottsboro, Alabama with two sons. She enjoys spending time with family, junking for treasures, crafting, and researching ancestry.

SARA/JOVE Activities in a College-Level, Management of Technology (MOT) Curriculum

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Awarded Overall Outstanding Paper, Category: Section VII – STEM (Science, Technology, Engineering, and Math) Education, at the 93rd Annual Meeting of the Alabama Academy of Science, February 17-19, 2016, University of North Alabama, Florence, AL

Abstract

The Management of Technology BS degree program within Athens State University's College of Business is a specialized management degree with particular emphasis on technical risk management, technology innovation management, and overall assessment, identification, acquisition, and implementation of technology within an organization. Specific case studies are used to illustrate MOT principles and provide students with as many 'hands-on' experiences as possible. One such activity has been the development of the Athens State University Radio JOVE Observatory (ASURJO) which includes not only participation in the NASASponsored and Society of Amateur Radio Astronomers (SARA) supported Jupiter decameter emissions monitoring program (Project JOVE), but also the SARA/Stanford University Solar Center SuperSID Sudden Ionospheric Disturbance monitoring program, as well as general amateur radio astronomy observing. Student activities have included receiver hardware and antenna construction/installation; monitoring/ recording/reporting software implementation; general facility design, construction, and maintenance; along with development of related research paper topics and open student 'star parties'. This paper gives an overview of faculty and student activities with examples of student work accomplishments which might serve as guidelines or inspiration for other college-level, radio astronomy-based involvement.

Introduction

Athens State University has been an institution of higher education in Alabama since pre-Civil War times. It is the most tenured institution in the state of Alabama and has an interesting history, having shown many different 'faces' from an all-girls school, a Methodist College, and of late, an upper division university offering 4-year baccalaureate degrees and limited master's degree programs. Part of the campus is shown in the aerial view that comprises Figure 1, with the College of Business (COB) Sanders Hall encircled in red. Within the COB, about one third of the University's students earn BS degrees in Accounting, Human Resource Management, Management, and Management of Technology (MOT), just to mention a few. The MOT degree (depicted in Figures 2 & 3) is a basic business management degree but with special emphasis on managing technology. It is intended for students who find themselves, either intentionally or by circumstances, in a technology-oriented working environment.

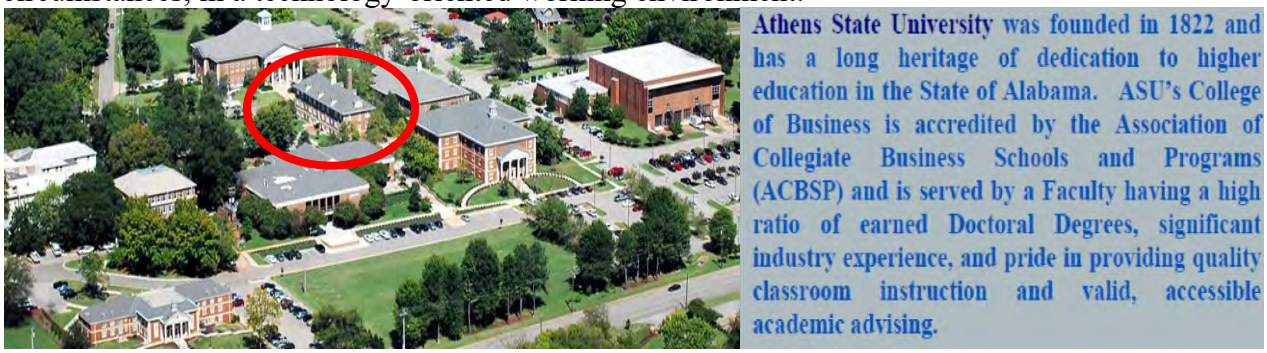

FIGURE 1 – Athens State University serves transfer students from around the world with junior & senior level courses leading to a 4-year bachelor's degree. ASU offers traditional, blended, and on-line courses to over 3500 students.

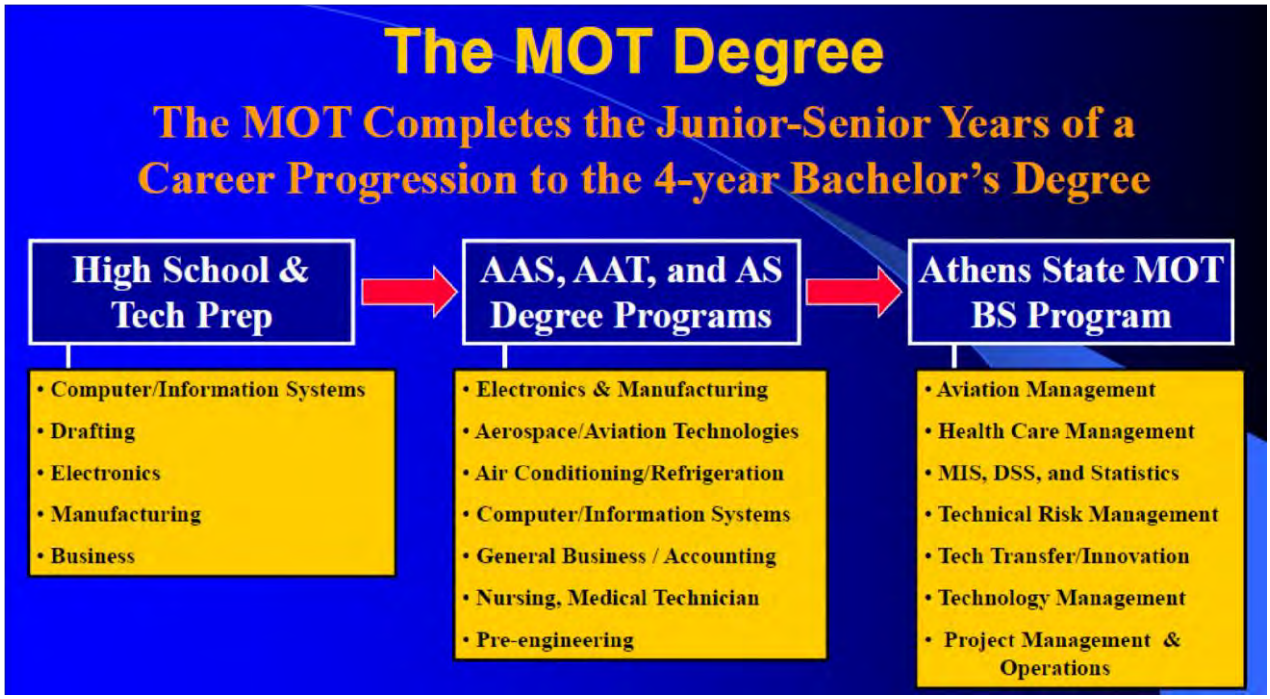

FIGURE 2 – The MOT Degree @ Athens State University finishes a student's progression from high school & tech prep through an associate degree to a bachelor's degree in a technology-oriented management degree.

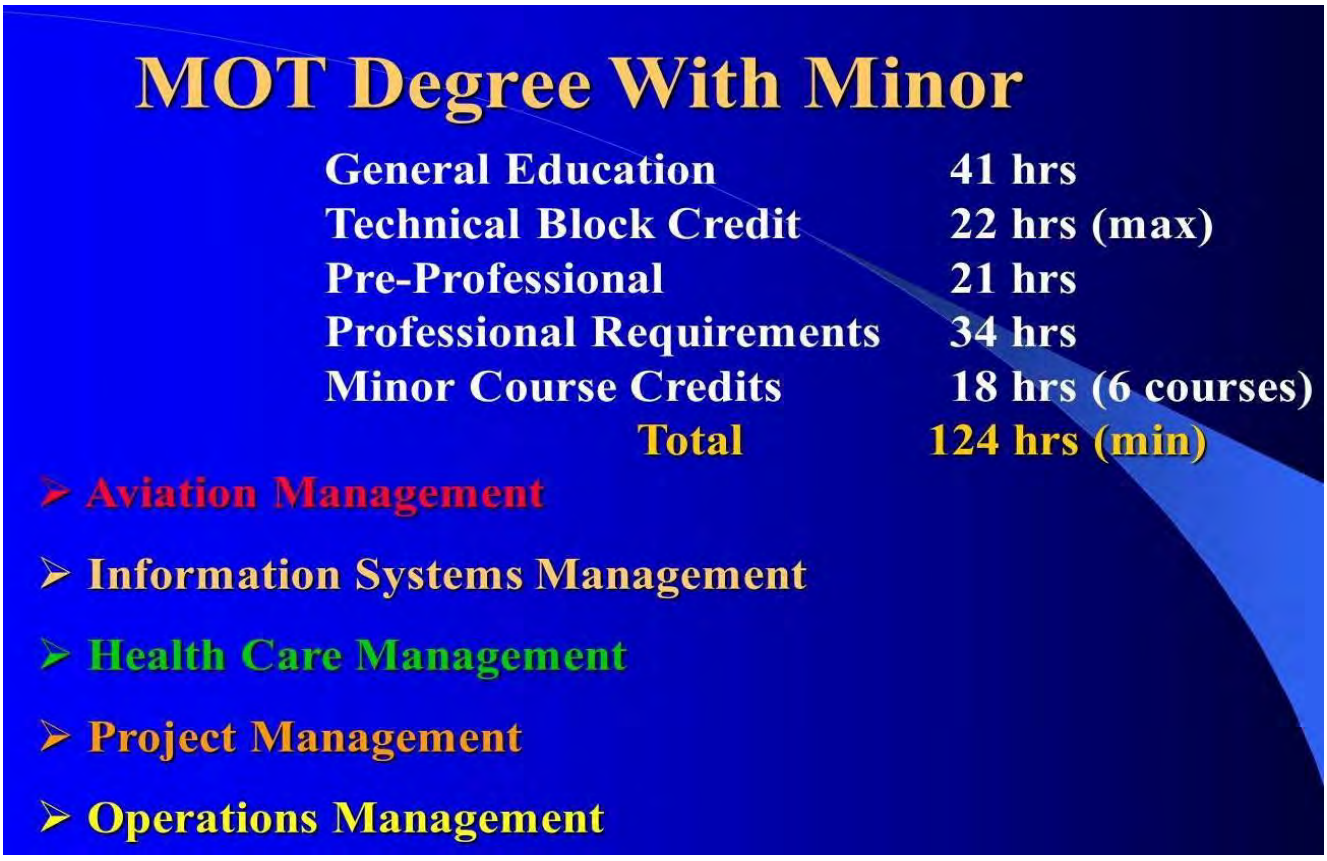

FIGURE 3 – The MOT degree program offers minors (10 available) which allow students to further specialize in a selected technology area or area that addresses their particular work environment.

Over the years since the MOT degree's implementation, The COB has developed and made available several additional minors for the MOT degree that allow students to accrue special emphasis in specific technological areas as shown in Figure 3. All-in-all, the COB offers ten (10) applicable minors and seven (7) certificates as well. The MOT program seeks to give students as many hands-on technology experiences as possible including technologies involved in rapid prototyping [e.g. 3D printing (additive manufacturing) and desktop CNC routing/milling] and the topics of this paper, radio-astronomy related MOT activities.

About three years ago, the COB began equipping a small MOT laboratory with technologies that would allow student involvement and participation in support of primarily three of the MOT classes: Technical Risk Management, Technology Commercialization (innovation development), and the capstone Management of Technology course. In addition, fieldtrips to the United Launch Alliance (ULA) rocket plant in nearby Decatur, and case studies involving nuclear power, facilitated by nearby Browns Ferry Nuclear Plant, have widened the breadth and increased the depth of MOT student involvement. The MOT lab now includes the Athens State Amateur Radio Club (W4CQD), the campus Internet Radio Station, KASU-The Bear (Type 15 low power 89.9 FM on premises), and the relatively new Athens State University Radio JOVE Observatory (ASURJO). The ASURJO corner of the lab includes the JOVE receiving equipment and the SuperSID SARA/Stanford Solar Center gear. The lab also serves as a communications technology museum of sorts as it includes post WWII com technology (Collins KWM series transceiver/station) all the way up through modern-day software defined,

all solid state radios. Figure 4 shows the author along with sons Collin and Carter (aspiring Blue-Man-Group member) working on tuning-in Jupiter signals while reviewing Radio Jupiter Pro predictions.

FIGURE 4 – Dr. Wayne McCain and sons Collin and Carter listen for Jupiter signals while reviewing Radio Jupiter Pro software predictions in the ASURJO lab at Athens State University.

Upwards of two dozen students have participated in ASURJO activities so far, either as volunteers or as part of one or more of the MOT classes. This paper's co-author, Kevin Keenan, is shown in Figure 5. Kevin has been instrumental in implementing and maintaining the SuperSID monitoring system. Kevin is shown installing the Creative HD soundcard in an XP OS computer. He is also credited with installing the SuperSID loop antenna and is at work on a portable version to use primarily for demonstrations at student 'Star Parties'. Kevin is a MOT Major minoring in Aviation Management but his former Navy communications experience and high interest in all communications has driven him towards the ASURJO involvement. All of the MOT lab and ASURJO antennas are installed in the 3 ½ - story attic of the Sanders Hall COB building where they are protected from the elements, lightning strikes, and unauthorized tampering (out of sight, out of mind). Figure 6 shows the JOVE dual dipole array and the SuperSID loop. The main W4CQD ham antenna is a B&W Broadband dipole installed in the roof apex.

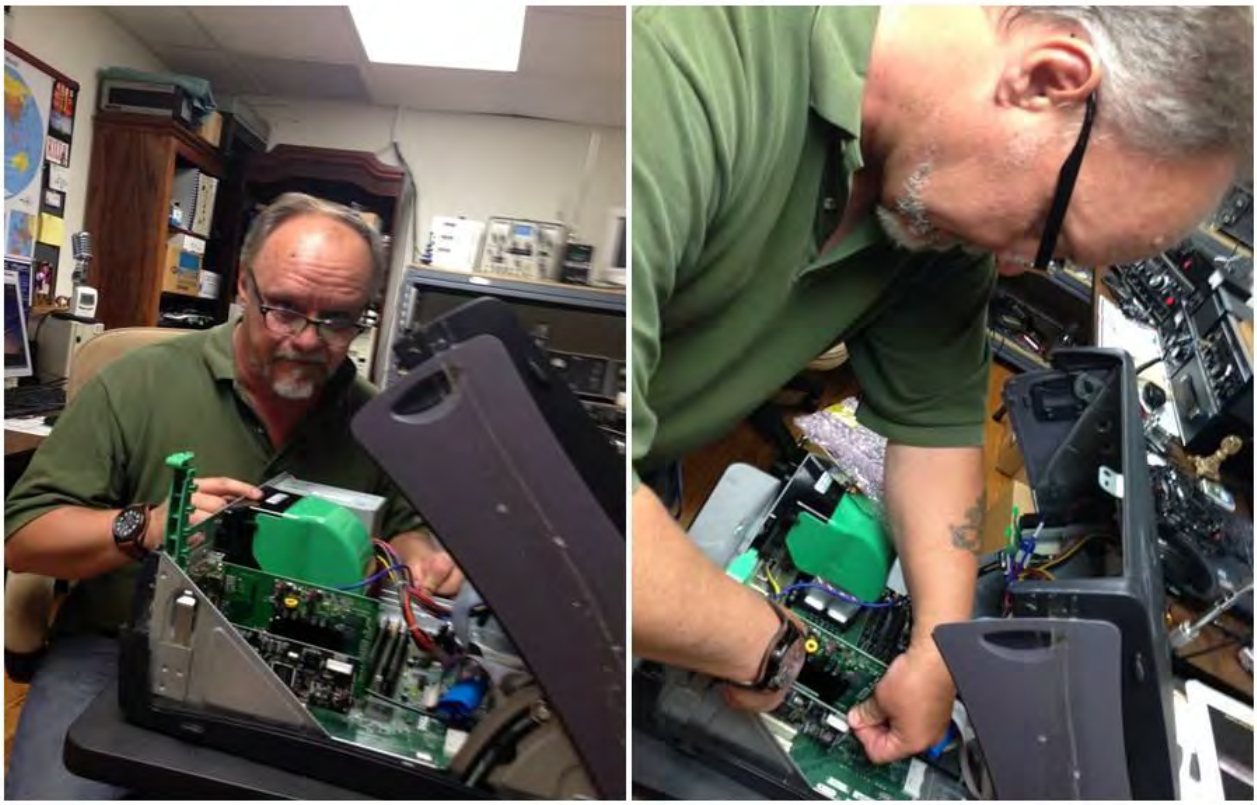

FIGURE 5 – MOT student Kevin Keenan installs the Creative Labs HD sound card required for SuperSID operation as part of the SARA/Stanford Solar Center Sudden Ionospheric Disturbance space weather monitoring program.

MOT student interest has been growing in the SARA/JOVE activities based on exposure to the various topics as part of classes and also due to posting on campus of 'awareness' posters like that shown in Figure 7. Several student star parties have been held corresponding to the recent JOVE teleconference calls which are basically help sessions for JOVE participants and attended generally by James Thieman (NASA Godard), Jim Sky (Sky Publishing), Richard Flagg (RF Associates), and others. These gatherings are of particular interest to our students as the names of these famous people 'come alive' with personalities and a wealth of information on the telecom. Students and professors alike learn to better interpret the received signals and the plots using Jim Sky's SkyPipe and Spectrograph software applications. In the MOT lab, ASURJO receivers consist of the standard MTSU JOVE receiver and calibration tool (standard noise source), ICOM R-75, ICOM 745 (actually a transceiver borrowed from the W4CQD cache), legacy Collins R-388 and Hallicrafters SX101A, several variations of the SDR USB dongles using SDR# software, and the SuperSID receiver used with the Audigy sound card. The laboratory currently uses four computers, each dedicated to a specific application.

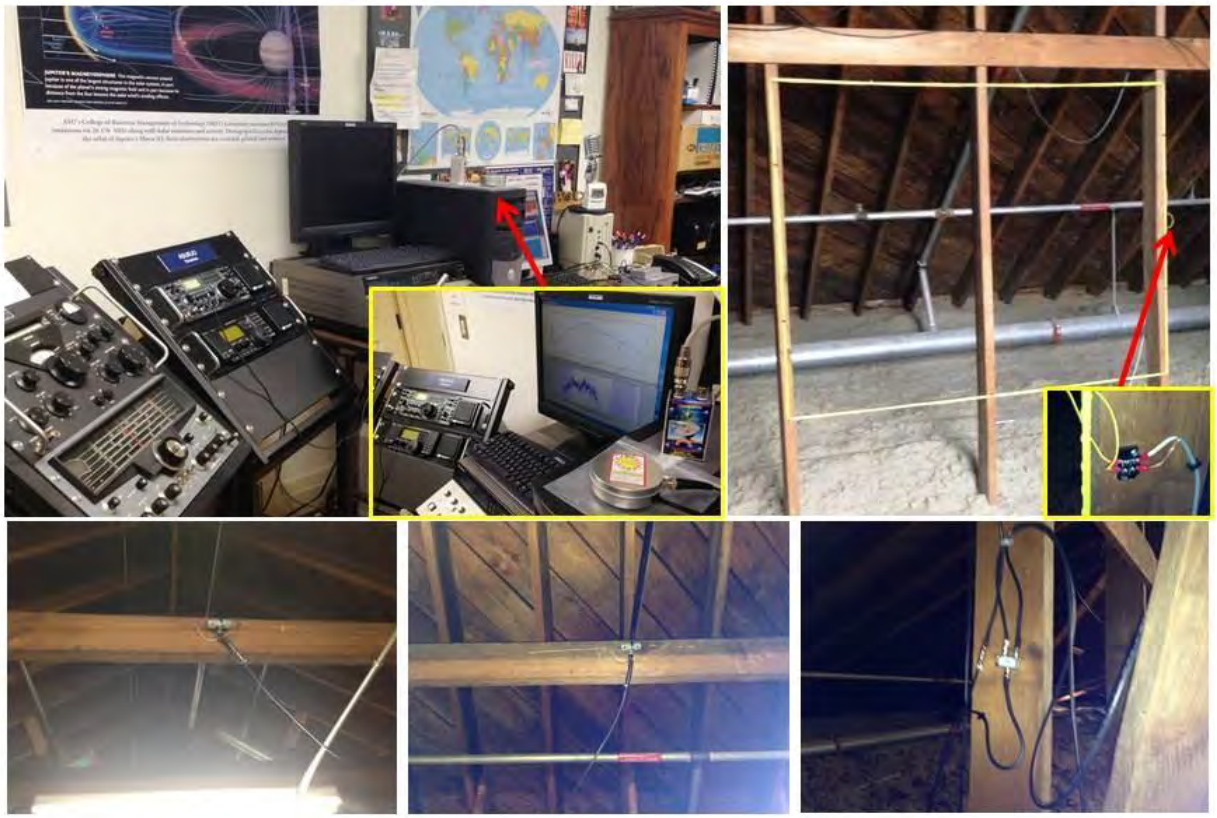

FIGURE 6 – ASURJO lab receivers and antenna installations in the 3 ½-story tall attic of Athens State's Sanders Hall. Not shown is the W4CQD B&W Broadband Folded Dipole, 2 m ham antenna, and campus radio station (KASU – The Bear) transmitter/antenna.

Installation of the JOVE and SuperSID antennas in the Sanders Hall attic may result in somewhat less than optimum performance, particularly for the JOVE application where the dual dipole array steering may be adversely affected by the separation distance to true ground. If this is determined to be a problem, a potential fix has been identified consisting of a chicken wire ground plane placed under the dipoles against the wooden attic floor. The effective separation distance then would be less than ten feet. It is planned to conduct a series of studies on this subject alongside an effort to ferret out the various noise sources in the immediate vicinity of the building. In a non-related, recent exploration of spurious signals in the area, it was determined by the FAA that very strong noise exists in our general area which has been tentatively linked to our local utility services. Unfortunately, the study did not seek to more accurately locate the source (s) of the interfering signals such that remedies might be undertaken. Noise levels generally run between around S-3 to S-4 on the R-75 meter but on occasion exceeds S-8. These conditions are detrimental to most types of observing although many of the typical JOVIAN signals considered 'strong' would likely still be manifested under these conditions. More observations are required to reach any additional conclusions in this matter. No apparent detrimental effects have been noted relative to SuperSID reception with respectable signals for most stations.

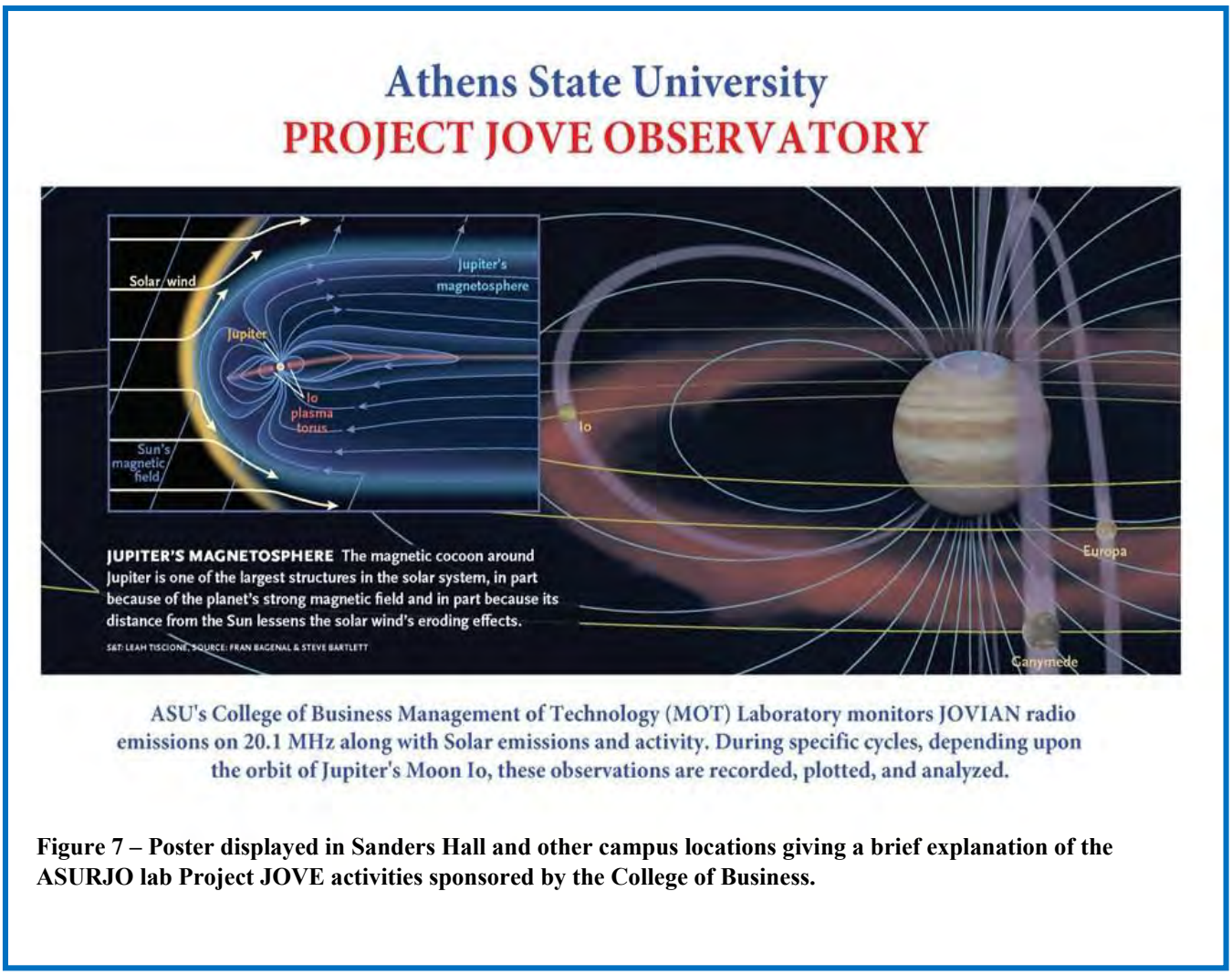

Figure 7 – Poster displayed in Sanders Hall and other campus locations giving a brief explanation of the ASURJO lab Project JOVE activities sponsored by the College of Business.

Recently, our Technical Risk Management class visited the University of Alabama in Huntsville's new Severe Weather Institute - Radar and Lightning Laboratories (SWIRLL) which is boosting the interest of prospective graduate atmospheric science students and reinforcing the university's increasing severe weather and lightning research prominence. Our students had been studying the pros and cons of the current 'climate change' issue wherein SuperSID observations of solar activity came into play. Our visit was to hear renown atmospheric scientist Dr. John Christy discuss factual data gathered there using the latest satellite methods rather than less accurate ground station data. Figure 8 shows students on the observing and 'antenna farm' roof of the new facility. PhD candidate Ryan Wade toured the group through SWIRLL and our students were able to discuss Athens State's SuperSid and JOVE activities and how SID data in particular might be correlated with severe weather outbreaks. Further discussions are planned for the summer term when UA-Huntsville is undertaking a major campaign to the plains of Kansas for severe weather chasing and observation. Also shown in Figure 8 (bottom left) is a glimpse of one of our desktop additive manufacturing (3D printer) machines. Plans include the development of a custom JOVE antenna center insulator that is to have an F-type female connector to allow easier antenna takedown and portability during demonstration events.

FIGURE 8 – MOT students recently visited the UA-Huntsville Severe Weather Institute Radar & Lightning Laboratory (SWIRLL) [top and bottom right] and our Rapid Prototyping Lab, RPL [bottom left]. ASU students appearing in the photo include (top, left to right) Kelci Carter, Wayne Pace, Wes Cash, Cara Cleland, UA-Huntsville's Ryan Wade, Darrell Hawkins, and Patrick Goyer. The bottom row includes Kelci Carter and Ben Sublett at the ASU RPL (left) and Ben atop an observation platform at the UA-Huntsville SWIRLL rooftop. By the way, the little girl scientist-to-be is my daughter Amelia Claire (on platform stairs) who enjoyed the tour and had several astute comments regarding the presentation.

Being business school based, our MOT students frequently ask, 'Why monitor the sun or Jupiter, what's the ROI'? One answer was identified by a significant term research paper related to SuperSID observations by student Ben Sublett who addressed issues surrounding our national power grid's vulnerability to extremely strong solar events. Sublett's research identified no less than three events in the near past that should have set the alarm bells ringing around the world, but have been largely ignored. His paper (Appendix) predicts a likelihood of 0.47 of another event in a 5 decade period. The significance of this type solar outburst could be the potential loss of the entire world's power grid. From that to a total collapse of human society and even possible extinction is a short leap. The primary mechanism would be loss of the large high power transformers typical in power substations. These cost several million dollars each and have about a 14 month lead time (under normal circumstances). Hence, there are few spares on hand. There have been proposed mitigations, one incorporating a special circuit breaker device

that would save the grid yet has a modest cost of only about $1B total for the United States. So far, legislation to fund such measures has gone nowhere. Maybe we should pay more attention to this impending crisis rather than spend upwards of $30B annually on the debatable climate change catastrophe? Figure 9 shows the title page, probability prediction, and the short list of possible mitigations alternatives.

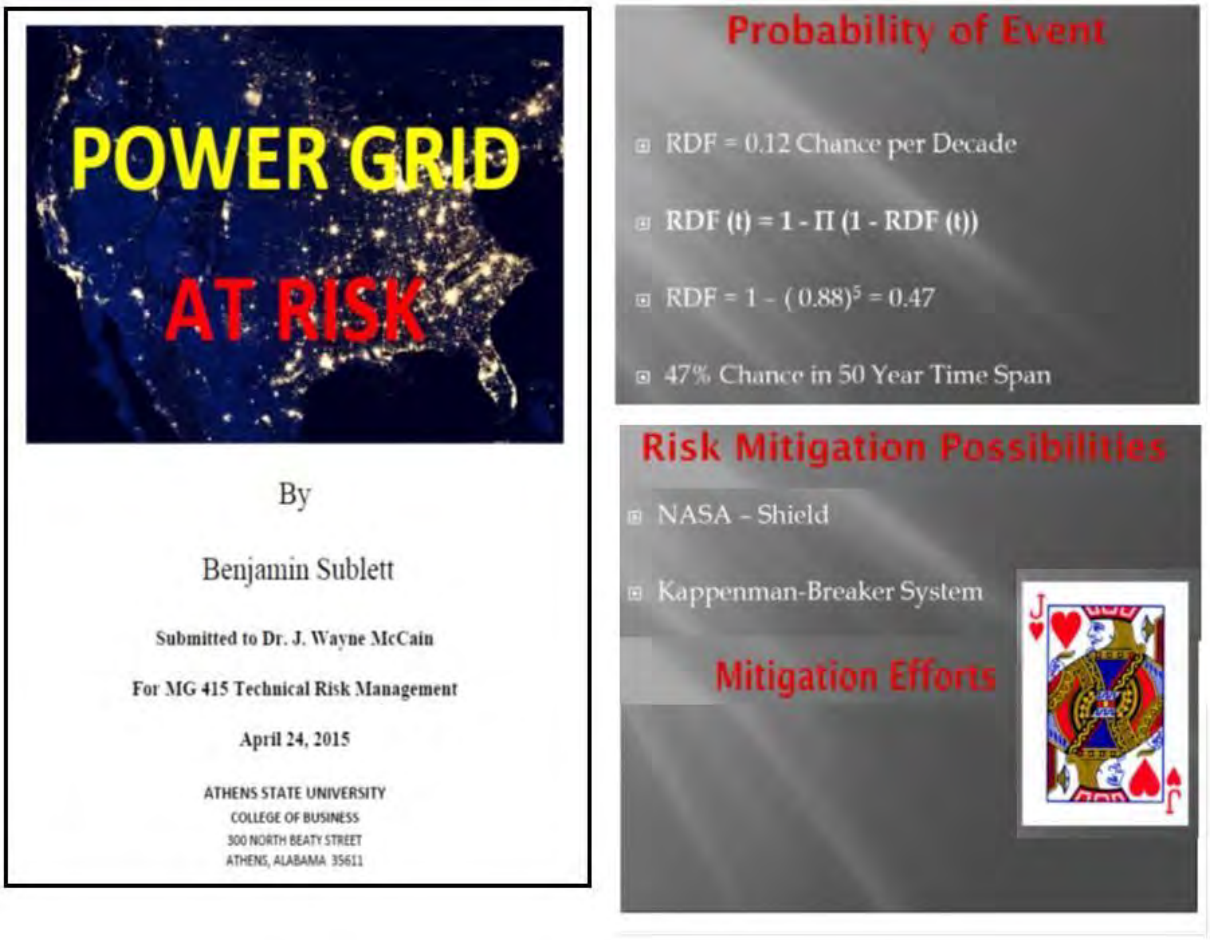

FIGURE 9 – Student Ben Sublett's research paper concerning risks to the national power grid due to significant solar burst events. Ben was partially driven by the SuperSID project.

Other typical scenarios for application of ASURJO activities to MOT classes have included problems and test questions using examples of observing operations and equipment. One such scenario was recently given as part of the Risk Management Final Exam where students were asked to calculate certain risk parameters and probabilities based on the ASURJO equipment configuration, observing predictions from Radio-Jupiter Pro, and hypothetical reliability data. Figure 10 illustrates the scenario. Students seemed to thrive in this type of hands-on environment where plausible conditions are considered!

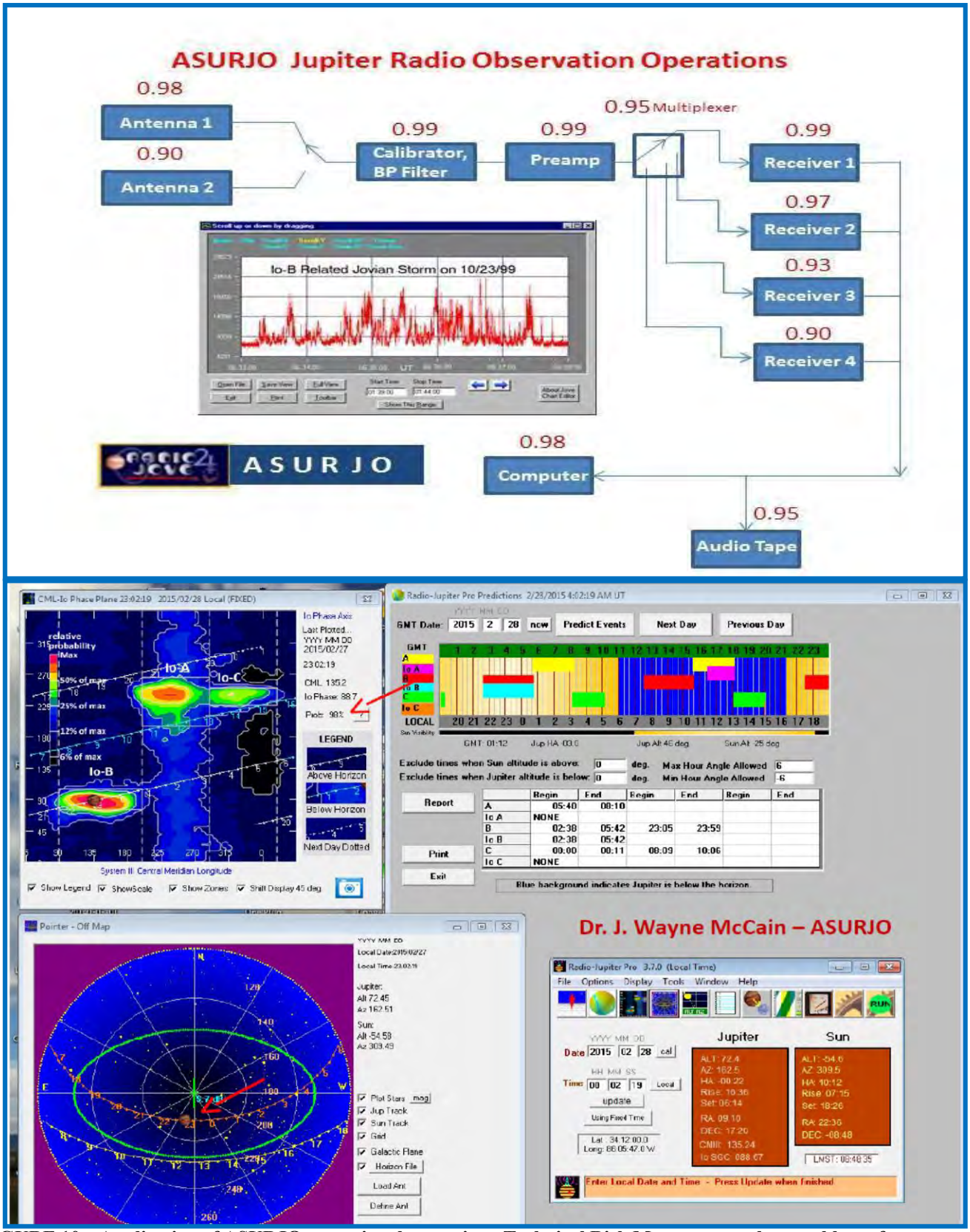

FIGURE 10 – Application of ASURJO operational scenario to Technical Risk Management class problem of predicting the likelihood of JOVIAN signal reception with a given set of operating parameters.

Figure 11 shows typical data from three days of ASURJO SuperSID observations prior to installation of the Creative Labs HD sound card. These data represent signal strengths for one VLF station (NAA in Cutler, ME) operating on 24.0 kHz running a transmit power of 1000 watts. Students can correlate data with NOAA observations increasing the interest and relevancy of the observations.

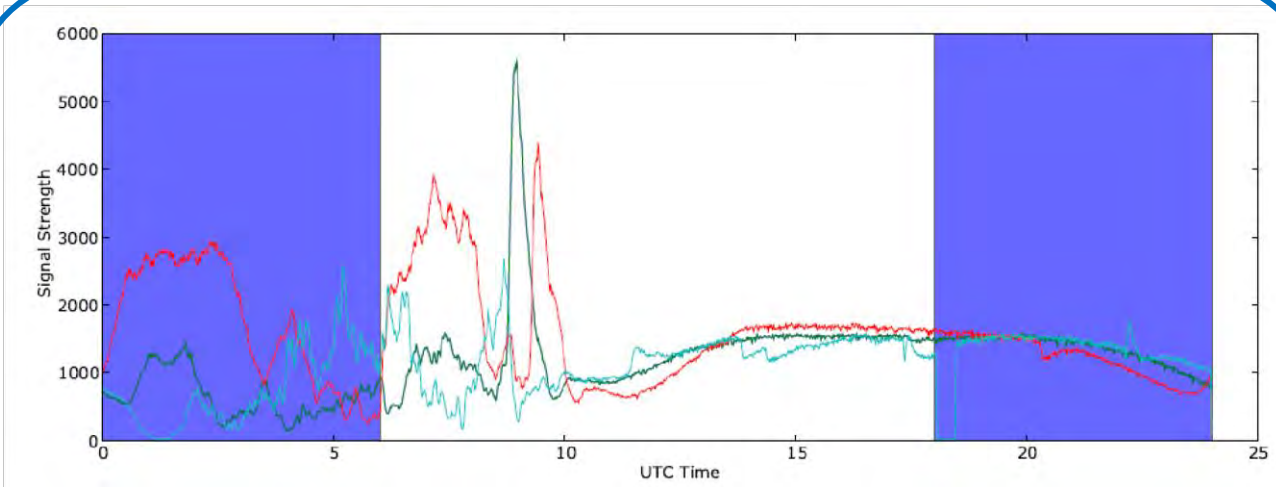

FIGURE 11 – SuperSID data from ASURJO (W4CQD) for April 3-5, 2015 from station NAA. Note the central time zone daytime hours shift from UTC (UTC shown by the blue bars).

Although the ASURJO with JOVE and SuperSID observation capabilities has been in operation only a few months, interest and participation by our MOT students has been encouraging. It is anticipated that classroom and online DL course linkages will be increased and included along with the other activities mentioned (rapid prototyping demos, field trips, etc.) to give students more hands-on, relatable activities. Following is a short list of future goals to help improve and enhance the experiences and expose SARA related endeavors to a wider range of students:

- Complete portable SuperSID and JOVE antenna arrays,
- Promote SARA-related activities in class announcements & schedules,
- Allow and encourage students to do required research on these and related topics,
- Offer extra credit for significant participation and SARA student membership, and
- Expand ASURJO facilities and consider formation of a Radio Astronomy Club.

To date, involving MOT students with SARA-related radio astronomy has definitely been an enhancement to our program. We continue to explore other avenues within this framework for student SARA involvement and highly recommend the concept for other college-level programs.

BIBLIOGRAPHY

Project JOVE Antenna Kit Assembly Manual; RJ1.2, 2015. http://radiojove.gsfc.nasa.gov/telescope/ant_manual.pdf

Higgins, Chuck and James Thieman; Introduction to Jupiter Science; SARA Annual Conference; June 2014.

Higgins, Chuck and James Thieman; Advanced Jupiter Science; SARA Annual Conference; June 2014.

McCain, J. Wayne. "Calculating Subsystem Performance & Reliabilities." Class notes, MG 415 Technical Risk Management, March 2015, Athens State University; Athens, Alabama.

Radio JOVE Receiver Assembly Manual; http://radiojove.gsfc.nasa.gov/telescope/rcvr_manual.pdf

Sublett, Benjamin. "Power Grid at Risk", Technical Risk Management Research Paper, April 2015; Athens State University'; Athens, Alabama.

SuperSID Users Manual; Stanford University Solar Center, 6 January 2010. http://solar-center.stanford.edu/SID/Distribution/SuperSID/supersid_v1_1/Doc/SuperSIDManual_v1.pdf

Authors

Dr. J. Wayne McCain (shown with daughter Amelia) has been a practicing engineering manager for over 30 years and a college educator for over 20 years of that time. 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. He has worked Army and Air Force related defense programs for Thiokol Propulsion and Martin Marietta (now Lockheed Martin) in Denver. Dr. McCain also worked on automated test equipment for the Space Shuttle Program while at United Space Boosters, Inc. Dr. McCain is currently taking additional post-doctoral coursework in Space Systems from the Florida Institute of Technology in Melbourne, Florida. He is a member of SARA and is participating in the JOVE and SuperSID Projects.

Kevin Keenan is a Management of Technology (MOT) major at Athens State University minoring in Aviation Management. Kevin is a retired Naval Airborne Communications Specialist and spent most of his military career flying on Navy P-3 Orion aircraft. Kevin is a junior at Athens State and expects to graduate in 2016. He has contributed to the construction and implementation of the SuperSID and JOVE Projects at the University. Kevin is involved with the Athens State Student Government Association and the Phi Beta Lambda business fraternity. He also does volunteer work in the Athens area for Veterans organizations and others.

Space Tourism Blasts Off!

J. Wayne McCain, PhD
Professor of Management of Technology

Athens State University

Abstract

Earth-bound humans have forever been mesmerized with the possibilities of rocketing into space. Since the U.S. terminated the Space Transportation System program (Shuttle), commercial space activities have ramped up considerably within the private sector. This paper explores the potential, viability, and cost of a space tourism industry, as well as the most recent developments by private enterprises.

Introduction

Earth-bound humans have forever been mesmerized with the possibilities of rocketing into space – the acceleration of blast off, the stupendous views from space, the feelings of weightlessness, the overall tremendous rush of adrenaline, and landing alive and being able to tell the tale! Formerly, mostly astronauts and cosmonauts only have had this opportunity, but that is changing rapidly. We all are now faced with the exciting possibility of becoming "space tourists."

Space tourism is defined as any commercial activity that offers most or at least some of these opportunities to anyone in the general public and it officially became a reality when Dennis Tito paid $20 million to fly aboard a Russian Soyuz to dock with the International Space Station (ISS) in 2002. Then in 2004, Burt Rutan's privately financed SpaceShipOne succeeded in capturing the $10 million X-Prize award for two suborbital flights to 100 km altitude. Since then, the emphasis in space tourism has shifted to these less-than-orbital flights that are becoming more and more "affordable" for the common place space enthusiast. For instance, although not yet flying for hire, Rutan's group has been taking reservations for $200,000 flights on SpaceShipTwo. Since the U.S. terminated the Space Transportation System program (Shuttle), commercial space activities have ramped up considerably with lots of attention on establishing a private-sector capability to serve the ISS with both cargo and crew taxi service. While the latter capability isn't expected to be viable until sometime in 2017, several U.S. companies (apart from the Soviets) have been successful in the space cargo business.

In addition to Burt Rutan's Virgin Galactic organization, nearly a dozen of private ventures are working diligently to be at the space tourism starting gate in the very near future. Table 1 shows a list of ten of these companies listed in alphabetical order. There are generally the two categories of service as aforementioned, suborbital and low Earth orbit (LEO) and between the two, there is an order of magnitude difference in the price tag!

TABLE 1 – SPACE TOURISM POTENTIAL PLAYERS

COMPANY	SPACECRAFT	MISSION	PROJECTED COST
Armadillo (Exos) Aerospace	SARGE [1]*	Suborbital Flight for 2	$110,000 (NV) per person[1]
Bigelow Aerospace	BA 330 [2]	LEO 'Space Station' for 6	$14.5M per person
Blue Origin	New Shepard [3]	Suborbital Flight for 6	$60,000 per person[2]
Boeing	CST-100 [4]	Low Earth Orbit for 6	$15M per person
Orbital ATK	Enhanced Cygnus [5]	Low Earth Orbit for 7	$14.3M per person
Sierra Nevada	Dream Chaser [6]	Low Earth Orbit for 7	$10.3M per person
SpaceX	Dragon V2 [7]	LEO or Deep Space for 7	7.25M per person[2]
Stratolaunch	Cargo/Crewed Rocket [8]	Suborbital or LEO	NV[1]
Virgin Galactic	SpaceShipTwo [9]	Suborbital for 6	$200,000 per person[2]
XCOR Aerospace	Lynx [10]	Suborbital for 2	$95,000 per person[2]

NOTES: All costs estimated or provided by company; 1-Suspended or Not Viable; 2-Includes reuse factors. [J.W. McCain]
*See corresponding [#] in picture collage of Figure 1.

Recent Developments

Enter Jeff Bezos and Elon Musk into the mix and things have changed rapidly. These two self-made billionaires have introduced the enabling technology that makes the basic space tourism rocket ride possible for most – reusability! Bezos (Blue Origin) is Amazon.com's CEO while Mr. Musk (SpaceX) leads Tesla. Both have successfully demonstrated vertical landings and reuse of first stage rocket boosters – the New Shepard and Falcon 9, respectively. Many aerospace experts said that it couldn't be done, just a "crazy" idea, but now it is reality. And with that technology in hand, pricing for rocket flight has been reduced dramatically. What was launch costs in the tens of millions of dollars, is now estimated to less than a million, especially for Bezos' New Shepard (commemoratively named for the U.S. first astronaut into space, Alan Shepard). As Table 1 shows, of currently viable companies who have demonstrated flights, the New Shepard may be able to deliver the experience of a lifetime for under $100,000 per person! Unheard of without the reusability (for New Shepard, both booster and 6-crew capsule are reusable) factor.

Though wings and parachutes have their pros and cons, Bezos is a huge fan of rocket-powered vertical landing. Why? Because—to achieve the vision of millions of people living and working in space—he believes very large rocket boosters (Saturn V class and larger) are required and the vertical landing architecture scales extraordinarily well. A successful vertical landing requires solving the classic inverted pendulum problem, but the problem gets a bit easier as the pendulum gets bigger. Blue Origin (and SpaceX) solved the inverted pendulum problem by using engines with dynamic gimbal ability to balance the vehicle as it descends. In addition, the vertical landing is much more "sexy" than other options like parachutes (note that the Blue Origin capsule descends via parachute but has "soft landing thrusters" that kick in during the last seconds of flight).

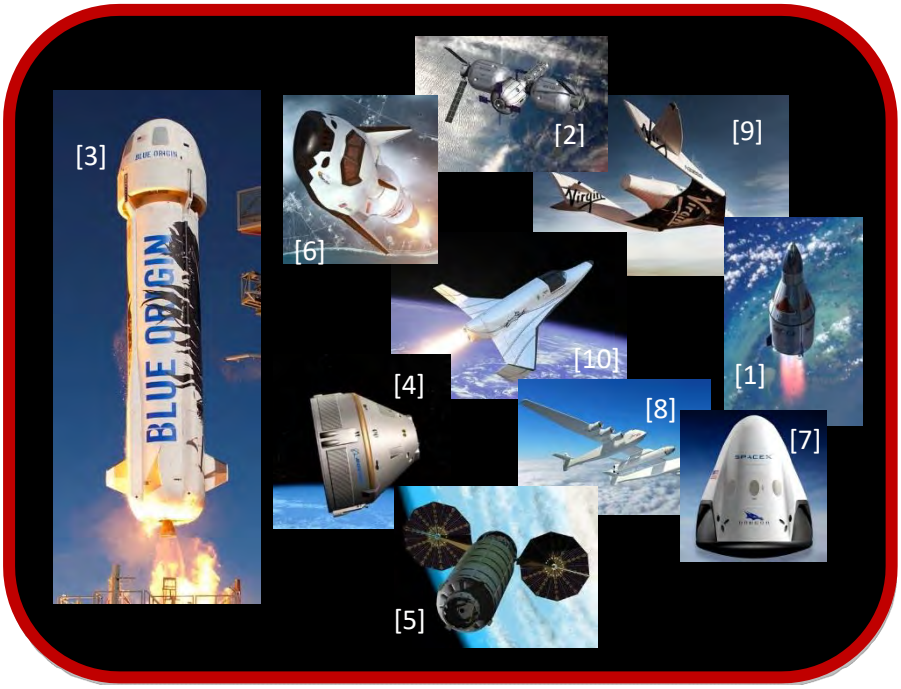

FIGURE 1 – Potential Space Tourism Players' Spacecraft: 1) Exos 'SARGE', 2) Bigelow's BA-330, 3) Blue Origin's 'New Shepard', 4) Boeing CST-100, 5) Orbital-ATK's Enhanced Cygnus, 6) Sierra Nevada 'Dream Chaser', 7) SpaceX Dragon V2, 8) Stratolaunch Suborbital Rocket, 9) Virgin Galactic 'SpaceShipTwo', and 10) XCOR's Lynx.

Figure 1 illustrates the various companies' spacecraft, including the launcher for the New Shepard [3]. While Blue Origin is likely to have the lowest initial price for suborbital flights (~$60k per passenger) others like Virgin Galactic with their reusable "space plane" will be in a competitive range. Both would offer 5-10 minutes of time in "space" with weightlessness and the other thrills. The orbital rides provided by SpaceX, Bigelow and others, while costing $millions, might offer hours or even days of the space environment experience. Risk also differs dramatically between the suborbital flights and LEO, the latter involving a higher complexity of systems and the high velocity, high temperature extremes of orbital reentry. Figure 2 shows the New Shepard booster landing (same booster reused thrice at this writing) with an inset of the SpaceX Falcon first stage booster ground landing. SpaceX is emphasizing ISS resupply missions with future orbital and deep space (Mars?) flights on their agenda. They are not expected to be a competitor with Bezos' New Shepard's flight offerings.

Conclusion

So, what are the expected revenues for the space tourism market, in terms of the suborbital flight regimes? If one assumes that mostly the "wealthy" (say upper 1% of the U.S. population (318 million based on the 2014 census) would take the plunge, that would yield upwards of 3 million potential customers. Further, assuming that 10% of that number might actually go for it, that would be about 300,000 passengers and at $60,000 per flight, yields a potential of $18 billion market! One can see why Bezos and others are excited about the possibilities. Assuming a fleet of Shepards (say 20) and a recycle rate of 2 weeks (520 launches per year) yields [520 x $60,000 x 6 passengers/flight] = ~$190 M per year revenue. Not a fortune by Bezos or Musk standards, but not "peanuts" either!

The viability of such a space tourism industry would certainly fall subject to minimizing launch services and overhead costs. As experienced by other space-aviation related startups (e.g. Amazon's drone package delivery), government regulation/restrictions may also be a pivotal factor. Watch for a launch pad coming to your neighborhood!

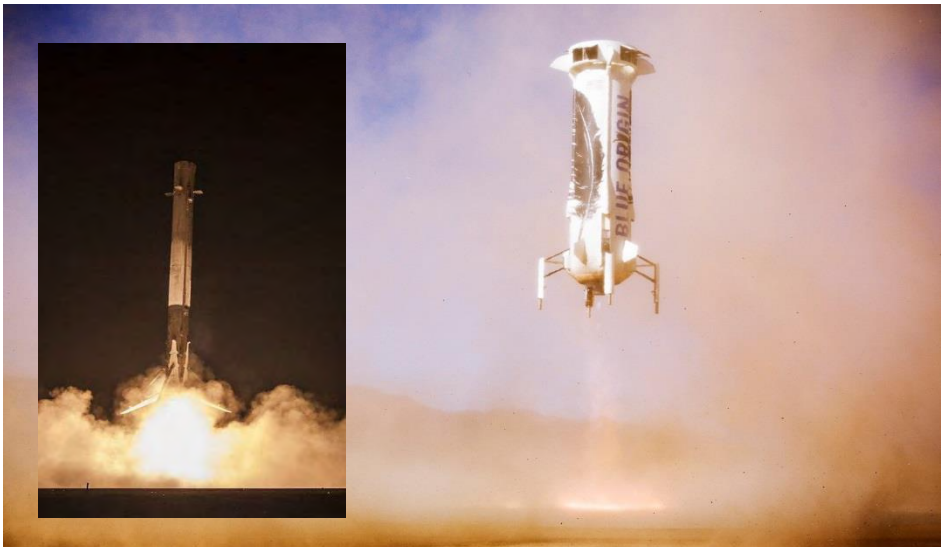

FIGURE 2 – Successful ground return soft landing of Jeff Bezos' New Shepard rocket booster for the third time using the same hardware. Inset is SpaceX's Falcon 9 first stage (orbital vehicle) executing a landing.

References

Blue Origin rocket makes third successful vertical landing. (2016). Retrieved from phys.org website: http://financesonline.com/space-tourism-how-much-should-you-save-for-a-space-trip/

Dinerman, T. (2015). 2016 could be the year space tourism takes off. Retrieved from Observer.com website: http://observer.com/2015/09/2016-could-be-the-year-space-tourism-takes-off/

Howell, E. (2016). Virgin Galactic: Richard Bronson's space tourism company. Retrieved from space.com website: http://www.space.com/15735-top-private-spaceships-countdown.html

Space tourism: How much should you save for a space trip? Retrieved from financesonline.com website: http://www.space.com/18993-virgin-galactic.html

Wall, M. (2012). Now boarding: The top 10 private spaceships. Retrieved from space.com website: http://phys.org/news/2016-04-blue-rocket-successful-vertical.html

Author

Dr. J. Wayne McCain (shown with daughter Amelia) has been a practicing engineering manager for over 30 years and a college educator for over 20 years of that time. 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. He has worked Army and Air Force related defense programs for Thiokol Propulsion and Martin Marietta (now Lockheed Martin) in Denver. Dr. McCain also worked on automated test equipment for the Space Shuttle Program while at United Space Boosters, Inc. Dr. McCain is currently taking additional post-doctoral coursework in Space Systems from the Florida Institute of Technology in Melbourne, Florida. He is a member of SARA and is participating in the JOVE and SuperSID Projects.

The Three-Legged Stool of Economic Development

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Awarded 2nd Place Paper, Category: Section V – Social Sciences, at the 93rd Annual Meeting of the Alabama Academy of Science, February 17-19, 2016, University of North Alabama, Florence, AL

Abstract

Economic development is fundamentally driven by the three-legged stool of a society's ability to communicate, educate, and use its technology; however, these legs are not of equal importance. Communication skills are fundamental to the cooperation and coordination of any effort, whether it is between two people or a multinational organization. Education is one of the ways a society passes on its culture and knowledge. Education is not possible without communication skills; hence, education is subordinate to communication. Improvements in technology are a society's lifeblood to economic development. Throughout the ages, those societies that have made a lasting impact have done so because they were able to pass on their culture, knowledge, and values through the generations; hence, technology is subordinate to education. Societies and their economies depend on their technology for growth. Technology generally builds on prior knowledge for its innovations. Knowledge is shared through education and communication. Without communication, our species would die out. Without education, our culture would die out. Without technology, our economy would die out. These are the three legs of unequal importance forming the basis of our economic stool.

Introduction

"When Gutenberg invented the printing press in 1445, he forever changed the lives of people in Europe and, eventually, all over the world. … The result of all of this was a more literate populace and a stronger economy" (Annenberg Foundation, 2014). Gutenberg's printing press is just one example of a technological development that changed economies and the societies that used them. However, technological developments do not spring into being from nothing. They come from the prior experiences and learning of their developers. Economic development is fundamentally driven by the three-legged stool of a society's ability to communicate, educate, and use its technology; however, these legs are not of equal importance.

Communication

Communication skills are fundamental to the cooperation and coordination of any effort, whether that is between two people or a multinational organization. The drive to communicate and organize information is a basic instinct.

> Currently in the behavioral sciences instinct is generally understood as the innate part of behavior that emerges without any training or education in humans. Much of human behavior is seen as having a major instinctive basis including language … Information behavior is a cognitive process that is not taught, but is innate to humans to the point that people are able to consciously understand that they need to undertake behavior processes of information finding, organizing and using to make sense of their environment. (Spink, 2010, p. 35)

However, instinctive behaviors in humans are also shaped by their environment. Those with highly developed communication skills have a greater potential impact on the people around them. The greatest impact is made by people who can express ideas in ways others understand and find useful. The most useful ideas are those most likely to be shared and spread to others. The spreading of ideas and insights about ourselves and the world is how societies are changed. For instance, Thomas Paine's *Common Sense* had a pivotal role in the American Revolution, and the above mentioned changes in societies and economies resulting from the invention of the printing press only happened because suddenly ideas could be communicated easier and more widely than ever before. With the advent of modern technology and its dramatic impact on our ability to communicate, individuals and businesses now share ideas and engage in transactions on a global stage. This is changing our societies and economies in an ever escalating fashion. The influence is so widespread that some say we have passed from the Industrial Revolution to the Information Revolution (ushistory.org, 2015).

Education

Education is one of the ways a society passes on its culture and knowledge. Formal education in developed countries typically starts with learning the three Rs: reading, writing, and arithmetic. None of this is possible without communication skills; hence, education is subordinate to communication. Educational handicaps can range from illiteracy to inadequate technological

skills. The more technologically advanced a society is, the more it will need a highly skilled workforce. The highest skill levels generally correspond to higher degrees of formal education.

> Education affects social change as it widens the horizons of people ... Adaptability of positive things in the society increases with education and it promotes social change on the whole. The relationship between educational system and society is mutual … Education plays a very important role in molding the character of an individual. It is one of the concrete sources from which one get [sic] information and knowledge and it affects the individual and brings positive change in the society on the whole. (Bano, 2014)

All organizational changes of any type start at the individual level. All individuals have a circle of control, a circle of concern, and a circle of influence (Covey, 2004). As individuals with better ways of living or handling situations share their ideas, their circle of influence expands, and they can influence classes and then masses of people. This is a type of informal education. Whether it is a society, a business, or a family, at the heart of any long lasting change in an organization is this dynamic - learning starts with an individual and it is then communicated in some way to others so they can learn a better way. Truly important insights are typically codified into a society's formal educational system to be passed on to the next generation.

Some insights can only be shared with those who have a background which will enable their audience to understand them. Calculus is not shared with a child and architects typically will not understand a technical paper on genetics. Frequently, higher education involves the building of greater communication skills. This may involve new vocabulary or perhaps a more precise meaning for a familiar word, for example, *mean* as used in economics or *instinct* as used in the behavioral sciences. It may also involve a new language like Latin or Greek for scientific names or the notations used in higher mathematics.

However, there are other communications skills used to educate that are not so obvious. Ideas that influence and change societies are expressed in ways that a society's general population can understand and accept. For example, Newton's Laws of Motion were easily understood and readily accepted, even though they eventually proved incomplete. In contrast, Copernicus' model of the universe, placing the Sun rather than the Earth at the center, was considered not just bogus, but heretical. His model was hard to understand and it defied the common experience of his society. It took centuries before there was wide acceptance of his view. Currently, many developing countries are coming in contact with more highly developed countries and they are experiencing cultural paroxysms as they experience conflicts between their traditional views and those of other cultures. In these types of situations, communication skills that honor a culture's tradition are required to educate a society. Sensitivity to cultural views helps new learning connect with current levels of understanding and fosters acceptance by its population.

Technology

Improvements in technology are a society's lifeblood to economic development. The improvements associated with a settled agrarian society and its attendant specializations are what led to the development of civilization beyond a hunter gatherer society. Throughout the ages, those

societies that have made a lasting impact have done so because they were able to pass on their culture, knowledge, and values through the generations; hence, technology is subordinate to education. It is improvements in our ability to communicate and educate our societies that led to the current age being tagged as the Information Age. So much so that:

> Around the world, the talent hunters are on the prowl. China, India, and the US, the three largest workforces, are the prime contenders in the battle over jobs and skills. Technology's increasing impact across all job sectors has continuously raised employers' demands for more intelligent, well-educated, career-ready workers (Gordon, 2012).

New technology has businesses and governments making demands on higher educational institutions. Both businesses and governments are asking higher educational institutions to reshape themselves in order to provide a workforce that is, not just able to communicate well, but one that is also technologically literate. Gardner Campbell of Baylor University, as cited by James Jorstad, explained the "challenges in using and understanding technologies in higher education" when Campbell suggested, "We can't just bolt the new literacies onto the old. We have to 're-imagine' what it means to be literate, to be a citizen, to be an intellectual in a learning community" (Jorstad, 2009). Colleges and Universities provided the tools that led to the technology used in the Information Age. Now they are being asked to use new technologies to reshape themselves and their product of educated graduates. This was recognized as early as 1988 when the Magna Charta Universitatum was issued by the rectors of European universities and by the World Declaration on Higher Education for the Twenty-first Century, a 1998 proclamation issued at UNESCO headquarters by the participants in the World Conference on Higher Education. "Processes that are taking place … make the creation of a new social contract absolutely essential, from the viewpoint of higher education…. the social responsibility of universities includes assisting the world to get past the global economic crisis" (Hrubos, 2011). Developed societies are demanding their educational systems produce a technologically literate workforce because at least a basic understanding of how to use technology is needed for its populace to operate in a technologically advanced society. In developing countries, technological change "is mainly imported and innovation is inherently connected to trade, …and consequent international technologic transfer" (Vivarelli, 2014). Because technology is imported, the skills needed to develop and innovate using the technology tend to be lacking initially. However, openness between industrialized and developing countries fosters trade and the adoption of and adaptation to skill-intensive technologies "resulting in an increased demand for skilled workers" (Vivarelli, 2014). Across the globe access to the tools and information available through technology will determine a society's overall development culturally and economically in the coming age.

Summary

Societies and their economies depend on their technology for growth. Technology generally builds on prior knowledge for its innovations. Knowledge is shared through education and communication. Without communication our species would die out. Without education our culture would die out. Without technology our economy would die out. These are the three legs of unequal importance forming the basis of our economic stool.

References

Annenberg Foundation. (2014). Renaissance printing and thinking. Retrieved from https://www.learner.org/exhibits/renaissance/printing.html

Bano, A. (2014, Jan/Mar). Role of education in bringing social change. *International Journal of Applied Services Marketing Perspectives, 3*(1), 773-777. Retrieved from http://0-search.proquest.com.athens.iii.com/abicomplete

Covey, S. R. (2004). *The 7 habits of highly effective people.* New York, NY: Simon & Schuster.

Gordon, E. E. (2012). The global talent chase: China, India, and U.S. vie for skilled workers. *The Futurist, 46*(6), 43-47. Retrieved from http://0search.proquest.com.athens.iii.com/abicomplete

Hrubos, I. (2011). The changing role of universities in our society. *Society and Economy, 33*(2), 347-360. doi:10.1556/SocEc.2010.0004

Jorstad, J. A. (2009, July 30). *Educational technology in a challenging economy - an inside view*. Retrieved from educause.edu: http://er.educause.edu/articles/2009/7/educational-technology-in-a-challenging-economy--an-inside-view

Spink, A. (2010). *Information behavior: An evolutionary instinct.* Loughborough, Leicestershire, United Kingdom: Loughborough University.

ushistory.org. (2015). *Living in the information age*. Retrieved from U.S. History Online Textbook: http://www.ushistory.org/us/60d.asp

Vivarelli, M. (2014). Innovation, employment and skills in advanced and developing countries: A survey of economic literature. *Journal of Economic Issues, 48*(1), 123-154. Retrieved from http://0-search.proquest.com.athens.iii.com/abicomplete

Author

Margaret Brown started an IT consulting firm after a thirty-plus year career in the IT field. For her company's long term growth prospects serving the small to mid-sized businesses in her community, she decided she needed formal training and accreditation. She graduated her local junior college with an Associated in Applied Science for Computer Information Systems and an AS transfer degree in Business with a 4.0 GPA. At Athens State University she is earning a BS degree in Management of Technology with a minor in Small Business/Entrepreneurship. She is also working on Microsoft networking certification while juggling her work and family life.

Why Mars?

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Abstract

The first human explorers to reach Mars will be further from Earth than any living person has ever been in recorded history. The very best day on Mars corresponds roughly to the worst day imaginable deep in the wilderness of Siberia! The Martian atmosphere is thin and not breathable. It is overbearingly cold, dusty, and windy. The thin atmosphere offers insufficient protection against radiation from the Sun and deep space. There is no unfrozen water on or very near the surface. There is no known flora or fauna to help sustain human life. A normal fire will not burn. Mars is, in a word, ***desolate***.

Introduction

Humans traveling to Mars is the dream of many that spans several centuries of man's history. Among those dreamers are recognizable celebrities including Werner Von Braun, Percival Lowell, and of late, Dr. Robert Zubrin, the latter being the founder and President of the Mars Society. The driving forces behind these dreams include the facts that show the planet Mars as being the most friendly to humankind in our Solar System, having many of the native resources necessary for "life as we know it.' One of the major obstacles keeping man from journeying to Mars thus far has been the extreme penalties to be paid for transporting the required mass to the planet necessary to sustain the life of the sojourners from Earth. New scientific data accumulated over the last few decades reinforces the idea that mankind can 'live off the land' on Mars utilizing 'in-situ' resources rather than backpacking every single molecule there from our home planet. Several of these concepts will be explored here along with how they might be 'modeled' and validated on the lunar surface prior to full commitment on Mars.

Living on Mars

In one of his original written works, "The Case for Mars," Dr. Zubrin wrote a chapter entitled 'Killing the Dragons, avoiding the Sirens' where he addressed many of the common beliefs and opinions as to why we shouldn't attempt a crewed mission to Mars at this time. Among them is the fear of radiation exposure outside of the protective cocoon of Earth's atmosphere and magnetosphere, both of which contribute in making Earth's surface habitable for humans. On Mars, only a weak magnetosphere is present along with a thin atmosphere consisting mostly of CO_2. So, will humans be required to carry with them shielding of one form or another to prevent significant radiation effects on their health? Maybe not.

As it turns out, Martian soil may be used as radiation shielding fairly efficiently, say a layer approximately 2.5 m thick on top of a buried inflatable habitat would provide enough shielding to return radiation levels to roughly that of Earth. It would also help support the air-tight structure as well, meaning that transportation of a thinner 'liner' from Earth would be even more feasible than it would be otherwise. And, the entire habitat wouldn't have to be underground so there could be a portion of it transparent where occasional periods could be spent 'observing the scenic Martian land and sky scape.' This concept shown in Figure 1, could readily be simulated on the lunar surface using moon soil. While the shielding properties would undoubtedly be non-similar, adjustments to soil thickness can be easily made to make the lunar model's fidelity very representative to that on Barsoom (the fiction-based name for the red planet). So one plan would be to construct a subscale Mars base on our moon to verify construction techniques, tools, maintenance, etc. before trekking to Mars and discovering we had overlooked an obvious design flaw of some kind. An alternative approach would be to install the inflatable liner inside a natural cavern or maybe even 'paint' the inside with an appropriate sealer that would hold pressure (around 14.7 psi total for air as in the ISS, 5 psi pure O_2 for suits), then the overall chore might be reduced in scale.

The figure shows how a portion of the Structure would be buried under ground while there could be an area for gardening, recreation, observation, and other useful endeavors. The same or similar construction techniques could be utilized as a proof of concept on the lunar surface with the appropriate engineering design changes incorporated to maintain a good model likeness between the two different extraterrestrial environments. The adversities, while different, would serve to prove the validity and utility of the in-situ habitat approach to Martian living.

FIGURE 1 – The Martian habitat showing sections buried in Martian soil for radiation protection (Source: The Mars Society)

A related in-situ technology is using Martian soil, atmosphere, and available light to grow food. Table 15-5 in our text shows that, for the most part, the soil on Mars is richer in key nutrients necessary to grow crops and the atmosphere, thin by human standards, is adequate to protect crops from radiation damage. Given these enabling features, it is possible to construct inflatable, transparent domes over the Martian landscape and commence farming, almost as usual. Mars soil is in short supply of nitrogen and potassium, but scientists think that there are no show stoppers. Nitrogen can be synthesized using the same chemical conversion reactions used to make return rocket fuel, just with different feed stocks. Potassium salt beds are likely to be found as relics of the once present Martian seas. Exploration will be required but is anticipated up front. The concept of growing food crops on Martian soil can likewise be simulated on the lunar surface and, in fact, should lunar bases eventually be constructed, will be required anyway. The only question is to what extent that our limited human exploration of space budget should be allotted to validation of sustainment technologies on our moon versus retaining those funds toward the big prize of a human landing and subsequent small colony on Mars? Many of the in-situ resource utilization concepts can be adequately simulated here on Earth; so, therefore, prior proof of principle testing on the moon should not be a prerequisite to crewed missions to Mars in my thinking.

Challenges

One of the critical in-situ resource utilization concepts briefly mentioned that CANNOT be adequately simulated on the moon is the manufacture of rocket fuel and oxidizer from the Martian

atmosphere. The primary enabling technology for Zubrin's Mars Direct plan (wherein we 'throw' a spacecraft directly to Mars without an interim low Earth orbit assembly or layover) requires that the majority, actually about 95%, of the return trip fuel (a term used loosely here to infer fuel/oxidizer) be generated using Martian resources. The Martian atmosphere, albeit thin, consists mainly of CO_2 which can be collected and concentrated using a simple compressor, mixed with the appropriate feedstock and catalysts to be converted to methane, ethylene, water, and oxygen. Unfortunately, there is no lunar atmosphere at all, so no reasonable simulation could be undertaken there that couldn't be done as well on Earth. However, even setting up and demonstrating a propellant generation plant on the moon using feedstocks and resources brought from Earth would serve to reduce risks of failure on Mars to some degree. Figure 2 shows Zubrin's concept of the 'propellant factory' and greenhouse as part of an initial Mars landing site. In the background is one early concept for the Earth return vehicle (ERV) which leaves Earth unfueled and awaits fuel to be manufactured in-situ before the crew from Earth is launched.

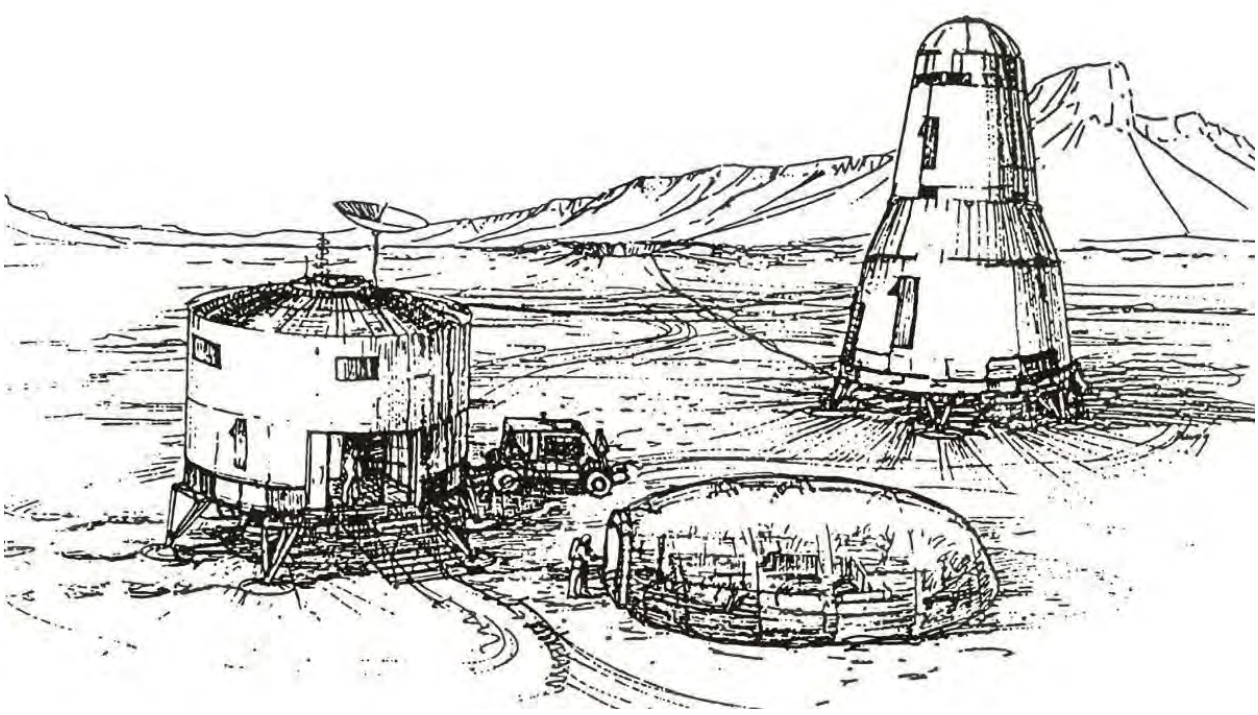

FIGURE 2 - Propellant factory (left), greenhouse (center), and Earth return vehicle (ERV) setting on the Martian surface (Source: Robert Zubrin, Mars Direct).

In spite of its inhospitality to mankind, the planet Mars offers a high potential for discovery of past or present life forms. It is rich in minerals that will support agriculture and manufacturing. It is feasibly subject to being terraformed into an environment that could support a human colony and even offer a profitable existence after the buildup of a suitable infrastructure.

But, communication with distant Earth is difficult and delayed under best conditions by nearly a half-hour. Lacking proper Martian communication satellites around the planet, the window for direct communications with Earth is further restricted to only a few hours per Martian day. Emergency help is 6 months or even years away at best. Cost of Earth supplies is exorbitant. The Martian pioneer must truly 'live off the land' in order to survive.

Risk and Reward

Exploration of Mars is orders of magnitudes higher in cost and risk than the Apollo missions were. The Apollo flights were measured in days while Mars excursions are measured in years! While the case for use of existing technologies for Mars exploration is strong, many space scientists argue that leaps in critical technologies (e.g. propulsion and life support) are required to be successful. The entire Apollo program cost less than $30B and was accomplished from essentially scratch in a decade while some have envisioned a reasonable Mars program to exceed $400B in cost and occupy thirty years of our attention! There seems to be nothing easier for the Mars program - more cost, more risk, more time.

Mission risks on Apollo were mitigated by redundancy where feasible, but their philosophy was one of 'abort and free return' once out of Earth orbit headed towards the Moon. However, the Mars mission will have no reasonable 'free return' option in the case of a dire mission failure or other emergency. Once the commitment to the Mars transfer orbit is made, the soonest the craft could 'free return' is ~ 2 years. Redundancy and contingencies must be the philosophy, therefore yielding substantially higher mission risks (see Table 1 for comparisons).

This is not to say that the Mars mission can't be done or shouldn't be done. As we have discussed in MG 418 Management of Technology class, practical engineers like Dr. Bob Zubrin and others have plans that would seek to build upon Apollo, Shuttle, and the ISS without development of many exotic new technologies. These approaches enable a crewed Mars mission in ten years rather than 30. There are numerous incentives to do so.

Rekindling our youth's imagination and spirit for exploration is an important one. Currently, our children seem more 'lost' in a virtual world of computer games and other various addicting drugs than being clear-minded, aggressive learners and explorers.

Our economy and National growth has weakened to a point where the U.S. is subject to being overtaken by former third-world countries in GNP; we are about to be consumed beyond a point of no-return by our National debt; and overrun by millions of unskilled, illegal immigrants and terrorists demanding benefits and a minimum standard of living. While the world seems to be slipping into political chaos, our armed forces have been deliberately weakened to levels only exceeded by pre-World War I numbers. Our Federal government is run amuck with fraud, waste, and abuse. And, that's the good news.

Here on Earth, we are unprepared to deal with pending disasters such as large meteor impacts or Solar EMP/gamma ray disruptions that may literally destroy society as we know it. Most seem ready to believe ill-supported claims of drastic climate disasters but not the obvious facts of real and impending collapse from within or the inevitable demise of mankind from the aforementioned calamities for which we are not prepared.

Conclusion

Our most needed commodity seems to be a 'Vision of the Future' and real leadership. Having those, along with a workable plan for Mars exploration, would give the U.S. a road map to greatness once again. An invigorated youth, new jobs, and a dream that we as a society could strive for is thus achievable. A sound financial budget where we don't spend twice what we take in at the

National level, where we concentrate on reaching out beyond Earth, not more of being marred in a quagmire of unsolvable social derelictions. That is the target where the U.S. crosshairs should rest. By doing this, we would accomplish greatness for all mankind and sustain the dream of freedom. "Houston, Cimmerium Base here, Aries has landed."

TABLE 1 - Comparison of some Apollo and Mars mission details

Parameter	Apollo	Mars
Crew Size	3	4-6
Duration	≤ 13 days	~913 days
Comm Delay	~1.5 secs	~ 1200 secs
Launches	1/mission	2-3/mission
Liftoff Wt/Mission (kg)	117,934	~235,868
Crew Consumables (kg)	1268	~28,160
Power Generation	Batts/Fuel Cells	Batts/Fuel Cells Nuclear On Mars
Mission Risk	Moderate	High
Risk Abatement	Abort/Free Return	Redundancy/ Contingency

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Dr. J. Wayne McCain (shown with daughter Amelia) has been a practicing engineering manager for over 30 years and a college educator for over 20 years of that time. 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. He has worked Army and Air Force related defense programs for Thiokol Propulsion and Martin Marietta (now Lockheed Martin) in Denver. Dr. McCain also worked on automated test equipment for the Space Shuttle Program while at United Space Boosters, Inc. Dr. McCain is currently taking additional post-doctoral coursework in Space Systems from the Florida Institute of Technology in Melbourne, Florida. He is a member of SARA and is participating in the JOVE and SuperSID Projects.

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