

BUSINESS INSIGHTS

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Charles R. Roberts
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Price/Cost Analysis and Negotiation Strategy: What Role Does This Play in the Acquisition and Contract Management Field?

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ABSTRACT

This study was designed to describe and explore potential issues associated with price and cost analysis, as well as negotiation strategy, and to produce recommendations for solutions to the potential issues within the field of contract management. Issues pertaining to training, technology, regulations, and education, which factor into the efficiency of price and cost analysis and negotiation strategy, are identified. Results and recommendations for the specified issues are discussed.

Background

The United States Government, as well as private companies and entities, have utilized negotiations strategies and analysis of price and cost to successfully agree to contract parameters throughout their history. Strategies relating to negotiations and price and cost analysis should be utilized to properly arrive at the most cost-effective solution to awarding a contract as well as bidding on one. Many private sector companies utilize strategies that may be characterized as improper or unethical, but they still may be awarded the contract. Also many Government and private sector companies utilize negotiation and analytical strategies that may under or over value the contract terms and parameters. This could cause the entity to under or over value the contract or lose an opportunity to close the deal. Problems may also arise with how the entity determines accurate pricing or costs related to a job or contract or the type of negotiations strategies that the entity chooses to utilize. Additionally, there may be concerns with the amount of resources that the entity may have that could help determine the most accurate data collection results or the proper parameters that the contract should contain. Concerns may also be present in relation to the technology and data collection programs that can allow a contractor or analyst to gather information and analyze the data to formulate the best possible decisions regarding pricing and negotiation strategy. Government contractors, analysts and procurement specialists within both the public and private sectors should be able to access as much information as possible to formulate the best possible decisions regarding contracting. Also, negotiations strategies and parameters should be clearly specified to all parties involved so that each side has an equal amount of capability before entering discussions. There are a variety of discrepancies within the fields of contracting and procurement that must be addressed to ensure an equal playing field for all entities wishing to succeed in both the Government and private sectors.

There are many resources that can be viewed regarding the understanding of price analysis, cost analysis, and negotiations. The consensus remains the same throughout all these sources in relation to both the Government and private sector. According to the Oak Ridge Institute for Science and Technology, all procurement actions should involve the analysis of price and cost regardless of whether the organization is a vendor or a sub recipient (2018). This resource also lists viable information that can affect adequate price competition, as follows:

- Specifications not definitive
- Restrictive tolerances
- Production capacity limits for those eligible to bid
- Analysis of previous prices paid
- Comparison of vendor's price with the in-house estimate
- Comparison of quotations or published price lists from multiple vendors
- Comparisons with GSA prices

Statement of Problem

Price and cost analysis, as well as negotiation strategy, are vital in both the Government and private sectors. It is important that all individuals who have an influence on Government contracts understand the parameters of price and cost analysis and that they utilize proper negotiation strategies so that each award is deemed fair and reasonable. Several issues can arise within contracting and procurement if the methods used to arrive at an award are deemed unfair or unreasonable. Questions can be asked in relation to this issue, such as what is the responsibility of the contractor or procurement analyst in relation to price and cost analysis? Were the negotiations strategies utilized fair and reasonable? Did the individuals involved in contract negotiations possess all the tools and information necessary to properly negotiate and arrive at an agreement?

Questions such as these should be answered in full when analyzing a contract proposal and award. All parties involved in data analysis relating to price, cost, and negotiation strategies should be given a fair chance to collect all the data available and be able to utilize this data to formulate an accurate decision. When dealing with contract proposals and awards, a substantial amount of money can be lost through inadequate information analysis, and possible lawsuits can arise from improper negotiation strategies and analyses.

Significance of the Problem

Government contractors' and procurement analysts' abilities to properly analyze price and cost information, as well as utilize proper negotiation strategies within the scope of their duties, can weigh heavily on the outcomes of contract awards. The individuals involved in contract awards need to be armed with the tools necessary to make a fair and reasonable decision with regard to awarding a contract. Individuals associated with the Government or within the private sector who are armed with minimal or inadequate knowledge and skills to complete their designated assignment and role could provide inaccurate analysis of the contract itself. Also, individuals who cannot negotiate within the scope of the rules and regulations set forth by the Government or private sector laws should not be associated with the contract. These issues can be mitigated before the individuals in question attempt to work on the contract and any parts of the contract analysis. Ramifications could be felt by both the Government and private sectors should a contract be awarded or agreed upon when individuals that have participated in the process make a mistake in analysis of price and cost or negotiations. These issues should be identified beforehand to ensure that all parties involved with the contract have the knowledge and skills to properly analyze and execute the contract negotiation and award. The significance of having poorly armed contracting employees operating within the Government, as well as private sector, needs to be addressed to ensure that each contract proposal and award is of the highest standard concerning analysis and negotiation.

Research Findings

This study explores potential issues within the field of contract management relating to the tasks or price and cost analysis and negotiation strategy. There are many potential issues that can be found within the job functions relating to contract management. These issues must be recognized by both the private and Government sectors to ensure that the employees associated with price and cost analysis, as well as negotiation strategy, are performing their duties accurately and efficiently.

The following sections of this discussion will focus on the issues relating to price and cost analysis and negotiation strategy, and make recommendations presenting possible solutions to the issues found. This study will utilize research previously conducted to analyze the potential issues while making recommendations on potential approaches to solving the issues found through this project. The governing bodies that oversee the job functions associated with price and cost analysis and negotiation strategy should look at the issues presented and ascertain how to mitigate the problems before substantial losses are realized as a result.

These recommendations come from the analysis of the data recovered during research for this study as well as from responses of 26 survey participants that were involved in an

earlier survey conducted in a related project. The survey was directly distributed to current employees working within the field of Government contracting, and these professionals offered their insights into the potential issues that face price and cost analysis and negotiation strategy. The following key issues were identified.

Training is instrumental to the success of a company. Training protocols can be found within a wide variety of Government contract management functions as well as private sector functions. Training issues can be seen within a variety of the research sources that were recovered during the course of this project. Many of the issues previously described potentially could have been solved with improved training protocols to ensure a heightened level of efficiency and accuracy. One key indicator found within the descriptive research concerns the level of documentation that is associated with price and cost analysis. The Government Accountability Office (GAO) issued a report concerning the amount of well-documented independent Government cost estimates prepared by different entities within the Government structure. Each entity displayed well under the necessary level of documentation that should be associated with cost estimates levied by the analysts who worked on the data. Proper training protocols should have been in place to ensure that each of these estimates was documented well enough to substantiate the cost estimates. As a result of this analysis into cost documentation, the GAO made the following recommendations to encourage better documentation of cost findings:

- The GAO recommends that additional training be implemented as well as issuing reminders to officials to ensure that guidance on when to prepare an independent government cost estimate (IGCE) is followed.
- Guidance clarification is recommended to ensure that each participant in the formulation of an IGCE prepares the proper documentation.
- Ensure that, when appropriate, contracting staff document differences between IGCE and final contract award value in the contract file.

Training protocols should consistently be revisited to ensure that they are current and in line with the constantly changing environment associated with price and cost analysis as well as negotiation strategy. The survey results indicate that there may not be consistent training implemented to ensure that each individual associated with contract management is provided with the necessary skillset to accurately complete their job designation. There should be stringent guidelines regarding training of each employee to ensure that the company retains skilled individuals that can adapt to each situation to the best of his or her ability.

Ethics in negotiations is paramount for the success of the contract and for the image of the entities involved. Ethical negotiation standards can be seen throughout a variety of descriptive research on the subject. Both the Government and private sectors are required to practice proper ethics regarding negotiation standards, and improper use of tactics could result in the loss of the contract as well as sanctions levied by the governing bodies. A variety of parameters are recommended in association with contract negotiations to ensure that the ethics of the negotiation are not violated. The descriptive research collected within this project and the survey results indicate that there are some issues associated with ethical negotiation.

Each entity involved within the negotiation must understand the proper way to negotiate a contract, and each should ensure that the outcome of the negotiation is a win for each side. There are several recommended techniques involved with contract negotiations that can help to ensure that there are no ethics violations involved with the negotiation. These techniques include the following:

- Obtain information on contractor position
- Identify all assumptions involved with the contract
- Clarify matters affecting costs associated with the contract
- Resolve any inconsistencies that may be present
- Obtain both short- and long-term satisfaction for both sides
- Avoid deception when negotiating terms of the contract

These techniques, among others, can help ensure that each party is fully satisfied with the outcome of the negotiation and no ethics violations are present. Ethical practices should be of extreme importance to all parties involved. If each side adheres to certain guidelines associated with a negotiation, then ethics violations can almost always be avoided.

Both the descriptive research and the survey conducted in this project indicate a possible issue with the level of technology utilized by price and cost analysts associated with contract management. Technology within the field of price and cost analysis can provide a basis for accurate data analysis. Many price and cost analysts are using outdated technology that could hinder their performance, and this can cause issues such as overpayment and loss of capital by the company for whom the analysts work. There have been reports of overspending by price and cost analysts that could have been mitigated through the use of up-to-date technology. According to reports by the Federal Aviation Administration (FAA), there were not effective cost and price analyses conducted for several contracts that were reviewed by the FAA. This resulted in overpayment of funds totaling roughly \$700,000.

According to the FAA report, contracting officials and price and cost analysts were using outdated information to arrive at their conclusions, thus resulting in a staggering number of overpayments. This could directly be linked to outdated technology and a lack of updated information provided to the parties involved in the analysis. The entities in question should provide the technology and information that will allow their analysts and contract professionals to create accurate findings to ensure that no overspending is present as a result of their analyses. The FAA report also states that the agency does not utilize a contract writing system, which could help provide immediate data verification to detect errors at the time of contract award. When handling high cost and volume contracts, there should be sufficient technology present to ensure that overspending does not occur. Each agency or company handling the analysis of cost and price should ensure that they allot funds toward technological advancements that will assist price and cost analysts with their tasks. Thousands of dollars can be lost in association with improper price and cost analysis standards, and these issues can be mitigated with updated technology and procedures.

Regulations concerning price and cost analysis and with negotiation strategy have been found throughout the descriptive research conducted for this project. The survey conducted

also dealt with regulations associated with these functions. The results of the survey were mixed regarding knowledge of current regulations as well as the consistent addition of regulations to oversee the actions of analysts and negotiations. Fair and reasonable negotiations are regulated to ensure that each party involved within the scope of the negotiation practices ethical actions. Both public and private companies should always ensure that they have met the standards set forth by the governing bodies, and should ensure that each of their participants within the price and cost analysis field, as well as negotiation participants, adhere to the regulatory standards set forth.

Governing bodies such as GAO must provide clear guidelines regulating the negotiation practices of their subsidiaries as well as the private entities involved in contract negotiation and in price and cost analysis. Regulations should be updated on a yearly basis, and these regulations should be enforced with consequences for failures to comply. Clarity and conciseness should always be present when implementing regulations to ensure that each party that falls under the regulation has no problem with understanding the implementations. The governing bodies should also conduct random audits of the contract agreements as well as the price and cost analysis to ensure that the dealings are above board and no violations are present. When handling contracts of high importance, further regulations should be present to ensure transparency and proper use of funds associated with the contract. Training policies should be in place to ensure that each member of the contracting team is aware of current regulations and is adhering to those regulations within all of their dealings.

Educational requirements have proven to be somewhat of an issue for individuals that hold positions associated with price and cost analysis and negotiation. Educational requirements should be standard as they relate to these types of positions. Many instances of poor decision making reported by the GAO and FAA could have been mitigated with proper educational requirements used to fill positions associated with price and cost analysis and contract negotiation. Technology usage, regulatory awareness, and analyses associated with price and cost are areas where education comes into play. Many companies require a minimum of a bachelor's degree to be considered for such positions associated. The issue arises when companies only require a bachelor's in any subject, as opposed to a specific degree that directly relates to the job function. Many individuals holding a general degree are accepted into a specific type of job, and they do not often have the necessary education for the job. The survey conducted for this project asked about educational requirements and practices within the selected company. The results were positive relating to the educational standards, but there were some negative responses.

Companies should always seek to hire qualified individuals who have education or training that directly correlates to the specified job function. Entry level positions should be filled with individuals who are newly graduated from their institution, and subsequently can be promoted from within after a specified amount of hands-on training and job experience. Companies also should look for individuals with years of education and experience with other companies that accomplish tasks similar to the parent company's desired direction. Companies should take the time to provide funds toward graduate education to develop their employees for future growth and success. Many of the issues found within the descriptive research asso-

ciated with this project could have been mitigated through the use of continued educational practices as well as proper vetting of new applicants before hiring. Individuals in charge of educational standards should always seek to improve their processes to ensure that the right people are selected in accordance with the direction of the company as well as the specified tasks that the employees will be handling.

Recommendations

The descriptive and quantitative research conducted throughout this project has allowed this researcher to identify potential issues within the price and cost analysis and negotiation strategy sector of contract management. The recommendations within this section provide insights into possible solutions to these issues.

1. Training protocols should always be held in a high priority, and they should be updated consistently to ensure that each individual associated with price and cost analysis as well as negotiation strategy possesses the tools necessary to succeed.
2. Technology should always play a part in price and cost analysis to ensure that minimal mistakes are made, and technology can also help to mitigate potential misappropriation of funds within contract agreements.
3. Regulations should be implemented and enforced, and consistent audits of price and cost analyses, as well as negotiation practices, should be conducted to ensure that no individual is taking advantage of the system.
4. Ethical guidelines should always be enforced to ensure a fair and reasonable atmosphere as well as a mutually beneficial agreement for all parties involved with the contract negotiation.
5. Education should be a high priority as it relates to the appointment of contract professionals associated with price and cost analysis and negotiations, and companies should invest in the continued education of their employees to ensure that each individual possesses the right skillset for the job.

These recommendations can help contract professionals and their parent companies maintain profitability, as well as build a consistent, successful atmosphere within the contract management field.

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Malaysia Airlines Flight 370: A Failure of Risk Management

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ABSTRACT

The disappearance of Malaysia Airlines Flight 370 (MH370) is one of the greatest mysteries in the history of aviation. This research paper is centered around the recent publication of Mr. Larry Vance, renowned aviation accident investigator, entitled MH 370: Mystery Solved, which proposes the disappearance of MH370 was a deliberate, preplanned act of the pilot. This paper provides details of the plane's disappearance and offers a general risk management plan or procedure that, had it been implemented, may have been able to mitigate the risk of flight MH370 as well as risks to all current commercial flights.

Introduction

The disappearance of Malaysia Airlines Flight 370 (MH370) is widely viewed as one of the greatest mysteries in the history of aviation. What could cause a huge passenger airplane to simply disappear into the night? Evidence shows that MH370 flew to the southern Indian Ocean, and that it is now resting at the bottom of the sea. When the investigation authorities suspended the official search for MH370 in January 2017, after nearly three years of searching, many people were disappointed by the lack of definitive answers as to what caused the airplane to disappear. The hope for answers was renewed when a privately funded search for wreckage was restarted in January 2018. Once more, the renewed search has failed to find the wreckage. This research began, basically, as a book report centered around the recent publication of Larry Vance, renowned aviation accident investigator, entitled *MH370: Mystery Solved*.

According to Vance, the disappearance of MH370 was a deliberate, preplanned act, conducted by a pilot who followed the exact sequence of events that he intended to follow. The pilot's intention was to fly the plane to a predetermined location in the southern Indian Ocean, and to ditch the airplane in such a way that it would remain intact, and to cause the airplane to sink to the depths of the ocean without leaving a trace. Fortunately, there were two shortcomings in his planning; and because of these two shortcomings, evidence was left behind about what happened. First, the pilot was unaware that he could not disable the airplane's systems in such a way as to make the airplane completely disappear from all electronic tracking. Second, he did not anticipate that pieces of the airplane would be dislodged during the controlled ditching, and that the dislodged pieces would be sufficiently buoyant to float until they reached the shoreline.

The Incident

Malaysia Airlines Flight 370 was a Boeing 777-200ER airplane that departed Kuala Lumpur International Airport in the dark of

night, at 42 minutes past midnight local time on March 8, 2014. The destination was Beijing, China. On board were 12 Malaysian crewmembers and 227 passengers. The planned flight duration for MH370 was 5 hours, 34 minutes. The captain had ordered enough fuel for a flight endurance of 7 hours, 31 minutes, allowing some two hours of contingency fuel. The flight departed normally from Kuala Lumpur and climbed to its planned cruising altitude of Flight Level 350. It proceeded toward its first en route electronic waypoint—the IGARI waypoint. (Airplanes navigate along an assigned route by tracking through a series of fixed locations, known as waypoints, which provide a more-or-less straight-line track to their destination.) In the area of the IGARI waypoint, the airplane was in a transition zone. It would leave the airspace controlled by the Kuala Lumpur Air Traffic Control (ATC) sector, and enter the airspace controlled by the Ho Chi Minh ATC sector. The reply from the airplane to Kuala Lumpur ATC was, "Good night, Malaysia Three Seven Zero." As has been well documented, this was the final radio communication with MH370.

Figure 1 shows MH370's chronological progression and suspected flight path. Less than two minutes after that final radio transmission, a significant anomaly occurred on board MH370. Something happened on board the airplane that caused the airplane to disappear from all ATC radar screens. The electronic tracking signal from the airplane completely disappeared. This electronic signal is transmitted from the airplane by a radio unit called a transponder. The transponder signal is sent in response to an interrogation from a ground-based radar facility. After the transponder signal disappeared from radar screens, MH370 was essentially invisible to ATC. From that point on, after the transponder signal disappeared, there was no more ATC interaction with MH370.

Essentially, at 01:21 local time (39 minutes after departure) MH370 simply disappeared. It was only after some 17 minutes that the Ho Chi Minh ATC sector controller noticed that MH370 had not checked in, and that sector checked with the Kuala Lumpur ATC sector to see what might have gone wrong. The Kuala Lumpur ATC sector contacted the other ATC sectors

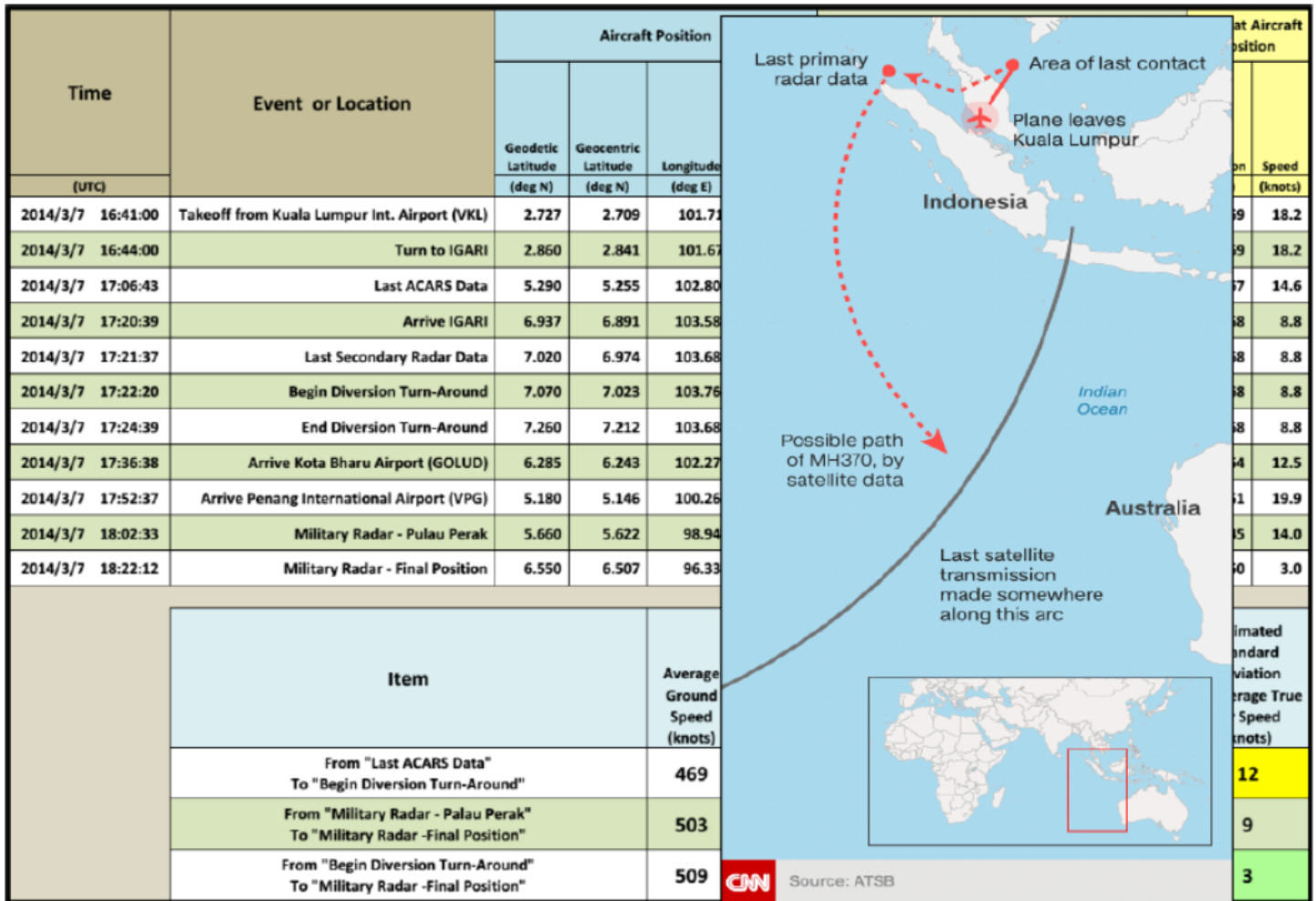


Figure 1—MH370 Chronology and Flight Path

along the flight-planned route, but none of them had established contact with MH370.

The Investigation

It was not until some 5 hours after MH370 had disappeared from electronic radar tracking that the Kuala Lumpur Rescue Coordination Centre was activated, and a search-and-rescue operation was initiated. Over time, investigation officials learned more about the history of the flight. In the days following the disappearance of the MH370, investigators studied recorded radar from a number of different radar sources looking for primary radar returns they could attribute to the airplane. They discovered that after MH370 disappeared electronically from the civilian ATC radar screens near the IGARI waypoint, it had remained visible on some military radar screens. From studying these primary radar returns, they discovered that almost immediately after crossing the IGARI waypoint, and at virtually the same time as the transponder signal disappeared, MH370 diverted completely away from its original flight plan. Instead of following its expected course straight ahead toward its destination, it first made a slight right turn, and then an immediate and aggressive left turn, to basically reverse course.

Investigators found that MH370 then followed an unexpected track that took it first to the southwest, near Penang Island, and then to the west over the Andaman Sea north of Indonesia. Af-

ter passing the northern tip of Sumatra, Indonesia, MH370 turned to the south and flew for some six hours in a southerly direction. They calculated that the airplane ended its flight in the southern Indian Ocean, west of Australia.

By digging further into the records, investigators discovered another anomaly that had occurred early in the flight of MH370. They found that there had been an unexpected loss of communication between the airplane's aircraft communications addressing and reporting system (ACARS) and the satellite through which it was communicating (Figure 2). Unlike the transponder signal, it was not possible for the investigators to determine an exact time for when the ACARS was disrupted. That is because, unlike the transponder, the ACARS transmissions occur only intermittently. On MH 370, the routine scheduled transmissions were to occur every 30 minutes. The last successful routine ACARS transmission from MH370 occurred 25 minutes after departure, 14 minutes prior to the disappearance of the transponder signal. The next routine ACARS transmission was not received. Investigators could then conclude that the disruption to ACARS happened sometime during that 30 minutes, within the same timeframe that the transponder signal was lost. To put context to this information about ACARS, it is Vance's contention that the pilot intentionally turned off the transponder, and intentionally tried to disable the ACARS functioning. The pilot took both actions in a relatively short timeframe. Fortunately, the pilot was not aware that he did not disable one specific ACARS satel-



Figure 2—Flight 370 Continued to Send Engine Data Via Satellite During the Ordeal

lite connection to do with engine monitoring. It was this remaining electronic connection with the satellite that investigators used to figure out that the airplane had flown to the southern Indian Ocean.

As shown in Figure 4, the Boeing 777 aircraft has an excellent reputation when it comes to safety. Just under 1500 have been built [\$300M each] which have accumulated more than five million flights and 20 million flight hours. Only 6 aircraft have been lost in an accident, which is a really low number considering the number of aircraft and flights. One would not

have an overwhelming reason to expect a catastrophic failure in such a proven aircraft. The particular airplane in question was relatively new with little or now 'squawks' in its maintenance records. Therefore, investigators are pressed to identify any likely failure scenarios that match those of MH370.

The Theory

There is a strong suggestion, based on the physical evidence (Figure 3), that the pilot(s) intentionally ditched MH370 on the ocean surface. First of all, the scenario supported by the offi-

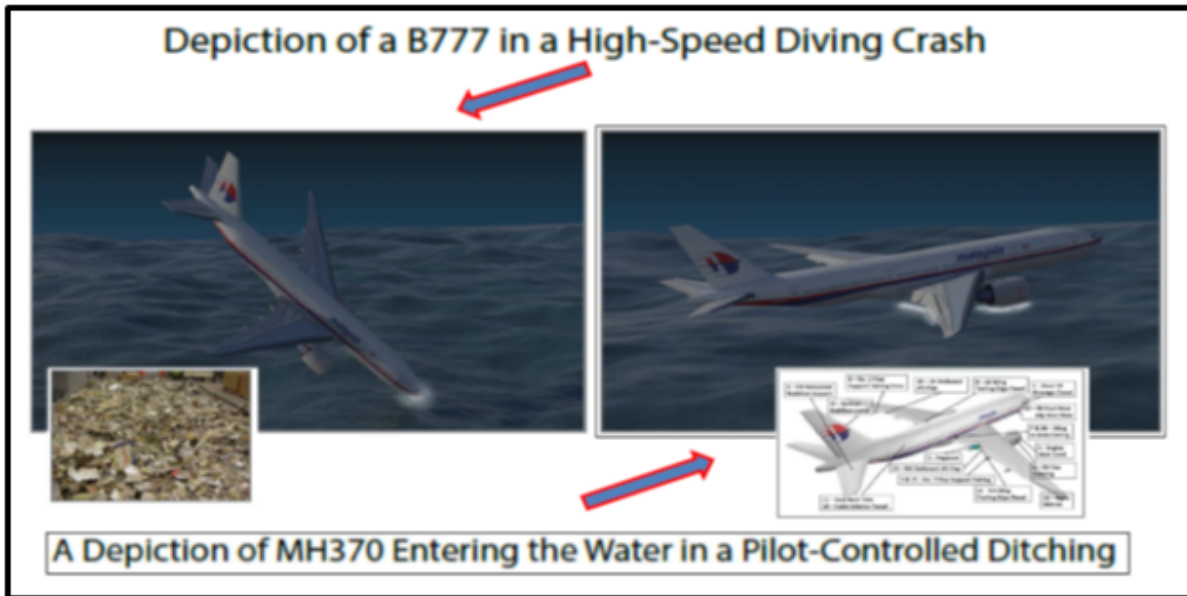


Figure 3—Two Possible Crash Scenarios and the Resulting Debris Fields

Accident Rates by Airplane Type

Hull Loss Accidents | Worldwide Commercial Jet Fleet | 1959 through 2016

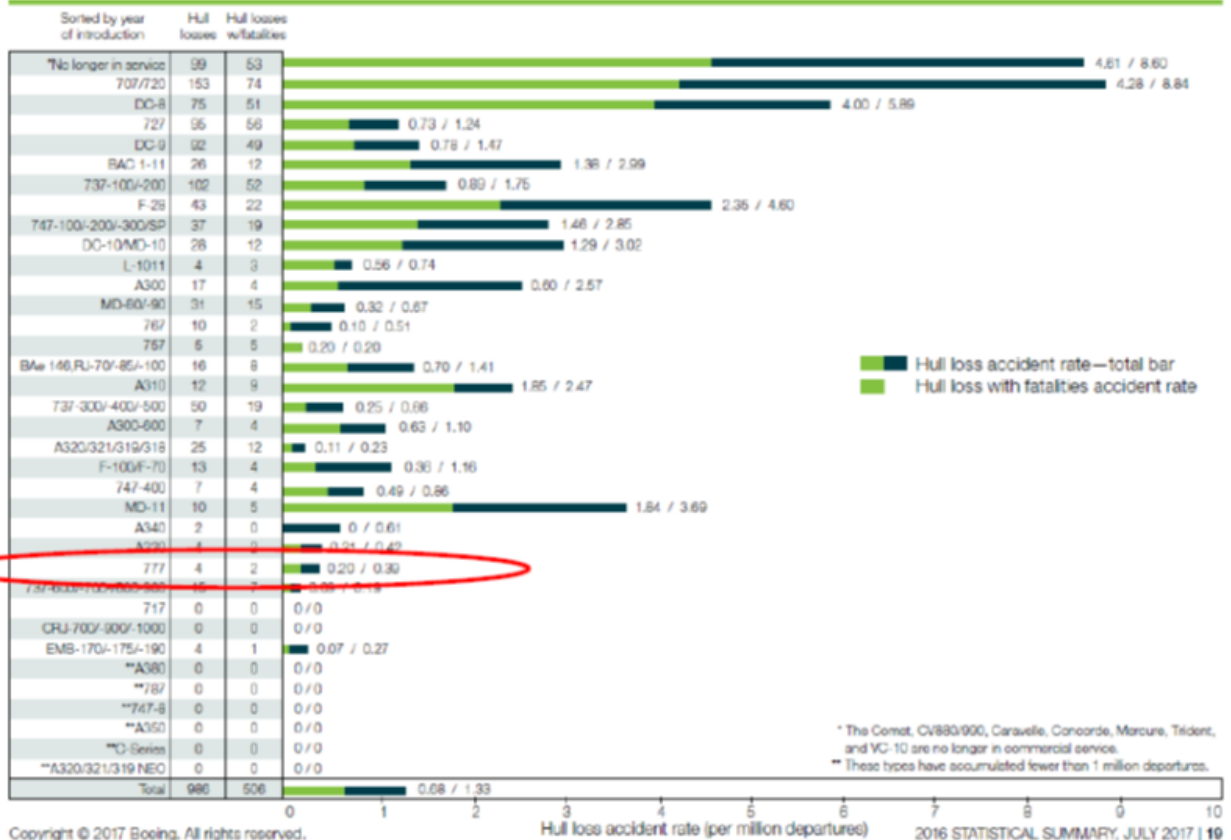


Figure 4—The Boeing 777 Has Over 1500 Planes Produced and Scores Very Low Failure Rates!

cial investigation suggests MH370 took a high-speed diving crash into the water. If true, this would have produced tens of thousands of pieces of floating debris. However, only twenty pieces of wreckage confirmed to be from MH370 have been recovered to date. Each recovered piece had drifted to the east coast of Africa. Most of these pieces had remained buoyant because of the honeycomb materials used in their construction. A high-speed diving crash would have created at least hundreds of additional wreckage pieces with honeycomb type construction. A high-speed diving crash would have created many pieces of other types of floating debris, including seat cushions, luggage pieces, clothing, life jackets, personal effects, neck pillows, etc. One would have seen this type of debris arriving on the coast of Africa in significant amounts. The reason that more floating debris has not appeared is that it was never created in the first place. There was no high-speed diving crash.

The earliest physical evidence that MH370 entered the water during a pilot-controlled ditching came with the recovery of the flaperon from the right wing. The recovered flaperon survived basically unscathed. There is no reasonable conclusion that the flaperon could endure such an extreme impact and still look the way it does. The high-speed diving crash theory supported by the official investigation simply does not make sense based on this evidence alone. The wings, flaps, and flaperons are all hollow cavities. The water forces would cause the leading edges of these structures to cave in and split open. The explosive

forces from water would invade through the open leading edge and rupture these pieces from the inside out. Vance believes that the pristine condition of the recovered flaperon from MH370 is sufficient all by itself to dismiss any support for the high-speed diving crash theory.

The trailing edge of the flaperon has been shredded away progressively, from the back towards the front. The original trailing edge is completely gone. It looks like it has been eaten away or eroded. The official investigation offers no opinion about how the erosion happened. Most certainly, this erosion damage does not fit in any way with their theory of a high-speed diving crash.

It is not difficult to envision how the trailing edge erosion on the MH370 flaperon actually happened. Visualize the airplane in a controlled ditching configuration, flying just above the water surface, with the landing gear retracted up and the flaps extended down. The airplane would be in a slightly nose up attitude, flying at about 140 knots (161 mph), and slowing down. It would be slowly descending and about to touch the water. The engines would be the first to contact the water by touching the tops of swells and waves. The force of the water contact would rip the engines off very quickly. The extended flaperons would be next to touch the water. The trailing edges of the flaperons would start to touch the tops of the swells and waves, and then the entire flap system would be dragged through the water.

This is the scenario that led to the erosion on the trailing edge of the flaperon.

The compression fracture was caused by the spanwise crushing forces along the trailing edge of the right wing. Spanwise forces could not have been created in a high-speed diving crash. The spanwise crushing forces were created when the right wingtip dug into the water during a pilot-controlled ditching event.

There was “V-shaped” black smudging witness markings on the outside of the seal pan endplate. This smudging was created when the severe spanwise force caused crushing between the outboard end of the flaperon and the endplate. The location of the smudge witness marks shows the relative positions of the flaperon and the outboard flap when the crushing occurred. This witness mark evidence is proof that the flaps were extended when MH370 entered the water.

There was damage around the edges of the entry hole for the flap support track to extend into the seal pan. The support track and carriage assembly caused that damage when they were pulled out through the hole. This could only happen if the wing was going forward, while at the same time the flap was being held back. The flap was extended and was being pulled through the water. It is impossible for that scenario to be created in a high-speed diving crash.

The witness mark damage inside the seal pan shows that the failing flap section moved in two different directions—at one time moving forward and at another time moving aft. A high-speed diving crash would explosively rupture the wing in a tiny fraction of a second. The entire airplane, with all its pieces, would have only massive forward momentum. In a high-speed diving crash scenario, it is physically impossible for the flap to

have moved so that it could create damage while traveling in two opposite directions.

The significant inward bend in the flap’s push/pull rod proves it was experiencing a significant spanwise (inboard) bending load before it finally broke. Such a spanwise force could never be created in a high-speed diving crash.

The overlapping gouging on the recovered flap section confirms the presence of compressive buckling loads along the fracture line. The spanwise loading caused the trailing edge of the wing to buckle in a wave pattern. It was buckled downward at the seam line where the recovered flap section ultimately broke free from the rest of the flap. In a high-speed diving crash, it would be impossible to create such spanwise loading and compressing buckling.

Figure 5 shows locations of major pieces recovered. There is more that can be learned from recovered wreckage pieces. There are three individual pieces of wreckage that have been identified as being from inside the passenger cabin of MH370. One is part of the R1 door on MH370—the most forward door on the right side of the airplane. Another part of the wreckage is a piece of cabin interior panel; it could not be determined exactly where it had been installed in the passenger cabin. The third piece of wreckage is a seat back trim panel—the panel that encases the In-Flight Entertainment monitor. It could not be determined to which passenger seat it had been attached. We know that there was significant spanwise loading that was compressing the trailing edge of the right wing into the fuselage. As this compression along the trailing edge of the right wing built up, the crushing pressure against the fuselage would eventually be too much for the structure to resist. Eventually, the wing root structure would have crushed through into the fuselage. It would create a breach or hole in the fuselage

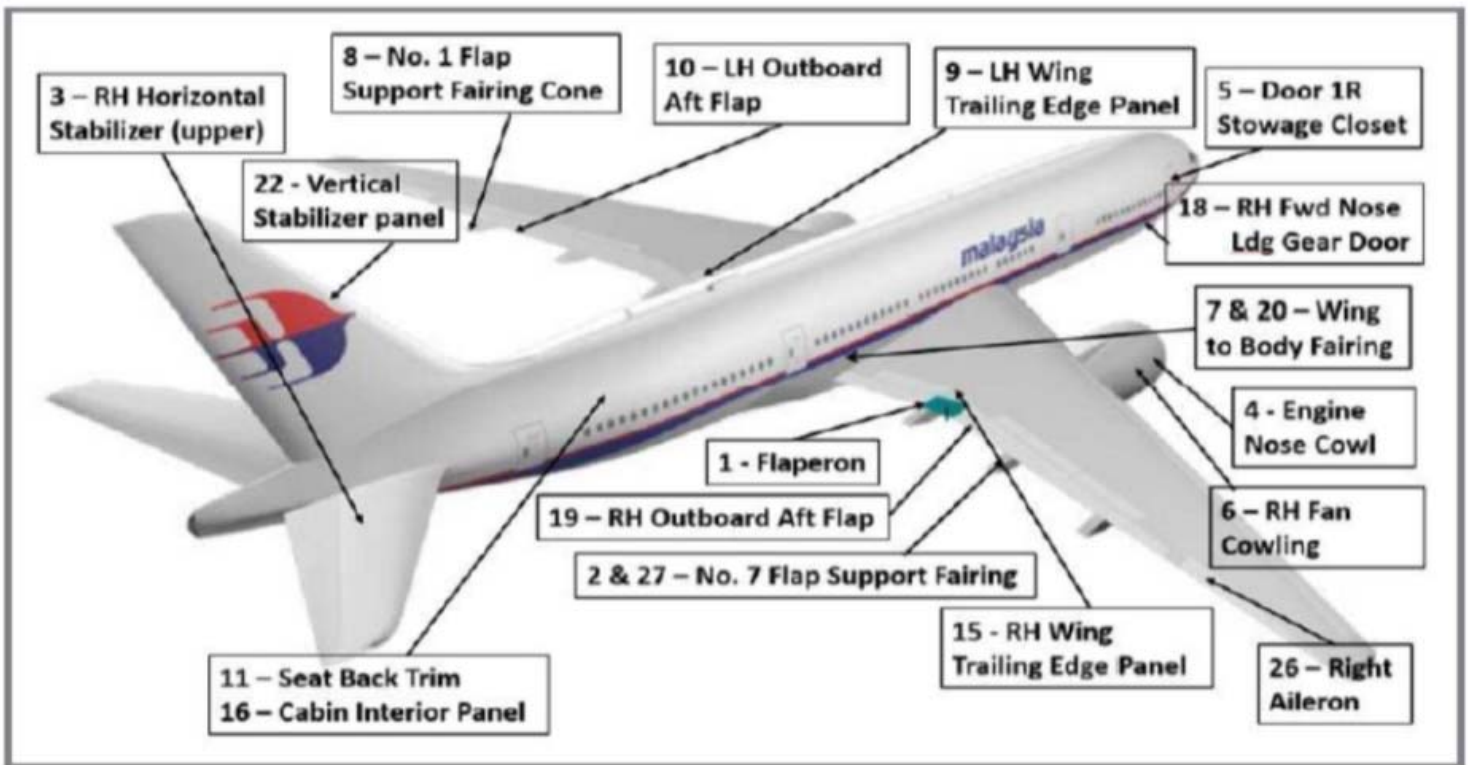


Figure 5—Depiction of the Recovered Wreckage Pieces from MH370

through which the small interior pieces could escape. The wreckage pieces could easily have been torn free as part of the crushing contact inside the fuselage. These were the only interior pieces found from MH370.

Among the pieces of wreckage that have been recovered are three small pieces that broke free from the tail structure. There is no direct physical evidence to confirm exactly how they broke free. One possibility is that they were simply torn free by the force of the water against the tail during the controlled ditching. Another possibility is that they were dislodged when they were struck by some piece that had broken free of the airplane.

Three pieces of the recovered wreckage are bits dislodged from the flap system. Two pieces were dislodged from the engine cowlings. Engine cowl pieces would be particularly susceptible to being dislodged during a controlled ditching, given that the engines would be first to enter the water. We would expect to see those pieces. Another two pieces are from what is called the wing-to-body fairing. One fairing piece was positively identified as being from the right wing. The crushing at that exact location during the controlled ditching would make us expect to see those pieces. Another wreckage piece was identified as part of the right-hand nose gear forward door. In a controlled ditching, that area of the airplane's forward underside would be subjected to extreme water forces. There would be a high potential for this nose gear door piece to be dislodged during a controlled ditching. A final piece is from a bottom panel on either a wing or the horizontal stabilizer, which is part of the tail. After analyzing all twenty pieces recovered from MH370, each piece can be directly connected to a controlled ditching event.

Over the six plus hours that MH370 flew southbound, a satellite communications network generated seven contacts between the airplane and the satellite, basically one per hour. These contacts are known as "handshakes." The speed of the signal transfer is known, and the position of the satellite is known. With that information, experts can calculate the airplane's location based on the time it takes for the signals to travel back and forth. Fortunately, the pilot's actions to cut off all electronic contact with MH370 failed to fully shut down the airplane's capability to contact that system.

A dedicated group within the official investigation team, led by the Australian Defense Science and Technology Group, conducted an analysis of these handshakes. They were able to reconstruct the basic path of the airplane as it flew over the southern Indian Ocean. The results of their work were used to direct the official investigation's search for wreckage. Resources were directed to the areas of the ocean identified as most likely to contain the wreckage.

Their calculations assumed MH370 was flying as an unpowered airplane, with no pilot input; and the airplane eventually ran out of fuel at high altitude and descended at high speed into the ocean. If you accept the evidence that a pilot was controlling a functional airplane, then you have to accept that the DTS group calculations are not valid. During the flight south, the pilot could have changed altitude or changed the power setting. That would affect fuel consumption and maximum range. It is not possible to know how much fuel remained in the tanks after the last handshake. Therefore, it is not possible to accurately predict how long or how far the airplane flew after the

last handshake. It is not possible to establish the time the airplane entered the water.

In January 2018, a privately-owned company launched a second search for the wreckage of MH370. There were four search areas identified by using sophisticated drift modelling and ocean drift experimentation using replicated wreckage pieces. The ongoing search for the wreckage started to wind down as it became increasingly apparent that the wreckage would not be found. By starting with basic inaccurate assumptions, it is not surprising the chosen zones of ocean bottom did not contain the wreckage of MH370.

The official investigation looked into the backgrounds of the pilots, and apparently found nothing problematic. But there had to have been something amiss, given that MH370 disappeared because of the actions of the pilot. In this event, there was a high degree of preplanning. The available evidence cannot prove this with certainty, but Vance thinks most people would agree that these were the actions of one pilot acting alone. Before the flight, the airplane was uploaded with the fuel load needed to take it to the chosen ditching location. It is the captain, not the company, who always makes the final decision about how much fuel to carry for any given fuel load.

The selection of the controlled ditching site informs us about the pilot's intention. It was not some random place where the airplane was about to run out of fuel. It was specifically chosen because it met a number of requirements for the pilot. The chosen location provided the daylight conditions necessary for a successful control ditching. The remote location provided an ideal place to descend to the ocean surface without much potential of being spotted by a passing vessel. The location was ideal to hide the wreckage. The pilot probably researched the topography of the ocean bottom to find a location with underwater ridges and canyons that would hide the airplane and where exploration would be unlikely.

The evidence of a controlled ditching confirms the pilot's intention to make the plane disappear. The evidence shows the intention was to keep the airplane structure intact, so the airplane would sink without releasing any floating debris. The plan was to sink the airplane with everything still inside, so as not to leave a trace. All the evidence tells us that this did not happen impulsively. Everything was meticulously planned, step-by-step, and over a significant timeframe.

Some of the top air safety agencies in the world were involved in the MH370 investigation. According to the authorities, the official accident investigation included experts from Malaysia, Australia, China, United Kingdom, United States, and France. There was also a criminal investigation that had equally impressive international representation, including Interpol. There were other countries represented in an unofficial capacity. Many people around the world, some with claims of expertise, followed the investigation closely.

Despite the availability of all this expertise, the MH370 investigation was clearly deficient. It failed to recognize and properly interpret the evidence that was available. Lessons must be learned about what went wrong, and why it went wrong, and steps must be taken to prevent this from happening again. By all accounts, the MH370 investigation was established according to international standards and agreements. When the airplane disappeared, it was the responsibility of Malaysia, the

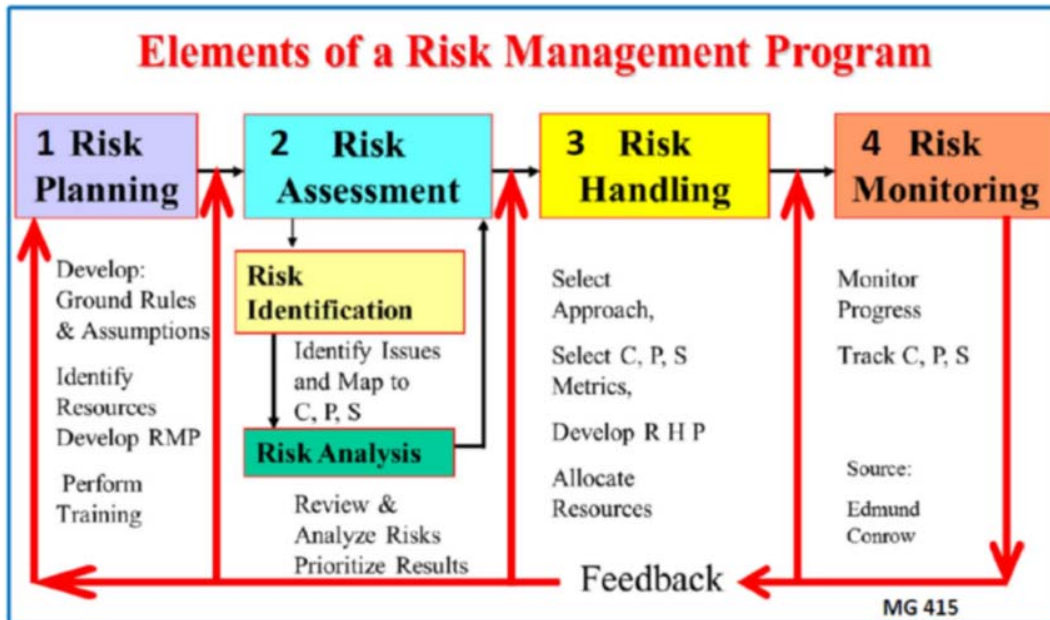


Figure 6—Diagram of a Risk Program that Might Have Prevented the MH370 Tragedy

country where the airplane was registered, to take the lead. Other countries have obligations and entitlements to participate (such as the country where the airplane was manufactured, where the engines were manufactured, etc.)

By international agreement, Malaysia was required to launch two parallel investigations. They must launch an independent safety investigation that looks for accident causation from a safety of flight perspective. They must also launch a separate criminal investigation to look for criminal involvement. This parallel investigation setup is basically the same in every country. It is a necessary setup, the proper setup, and Vance has no issues with it.

The evidence confirms that the airplane is at the bottom of the southern Indian Ocean. It is in a location specifically chosen by the pilot to make it unfindable. The fuselage of the airplane is basically intact, and all the occupants are still inside.

Conclusion

Figure 6 shows a general risk management plan or procedure that might be used in mitigating the risks of commercial flights and specifically MH370. It is a 4-phase program that includes initial Risk Planning, Risk Assessment, Risk Handling, and Risk Monitoring. Just as critical to success and attention to these four elements is continuous feedback, as illustrated in

- NO FORMAL RISK MANAGEMENT PLAN - MITIGATION RECOMMENDATIONS**
- Mitigate pilot’s ability to modify flight-plan, load extra fuel, or miss-operate critical systems (autopilot, coms, radar transponder, etc.) except for certain emergency conditions
 - Improve background and security vetting of pilots and support personnel within Malaysian [All] Airlines system
 - Emplace procedures or provisions for preventing hijacking or commandeering of flights (e.g. Air Marshalls, remote override of critical systems)
 - Improve communications/coordination with military radar and other military flight management capabilities

Figure 7—Recommendations for MH370 Type Commercial Flights to Mitigate Risks [McCain]

the figure by the red arrows. Effective risk management does not end with creating a program plan or procedure, but continues to monitor in real time the activity and compares desired outcomes with actuals. Note that basic 'systems engineering' protocols are incorporated in the monitoring and measurement of 'metrics' which pertain to the activities' cost, performance, and schedule. In the case of the MH370 incident, it is likely that a standard set of guidelines would be developed that monitored pilot actions and behavior prior to, during, and after flights. Deviations between expected and observed behaviors would be immediately flagged and investigated, while either 'holding' the flight or substituting other flight crew or equipment.

The lack of any formal Risk Management Program or Protocols being in place for the ill-fated flight MH370 begs for examination of the Malaysia Airlines, and all airlines for that matter, to adopt such efforts. Figure 7 shows a list of recommendations that, if followed within the context of the comprehensive programs outlined in the previous Figure 6, would have stopped cold the alleged terrorist plot seemingly implemented by one or both of the pilots. Even if the theory turns out to be non-exact in this case, the determined development, implementation, and continuous monitoring of risk factors associated with such flights would undoubtedly reduce the risks of another such event occurring. As many professionals in risk management frequently remark, "It's not knowing what we don't know that gets us." At least, a formal risk management effort would crack the shell on this tough nut! If one life is saved, any expense incurred can be justified.

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The Application of Lean Concepts in Perishable Products Supply Chains

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ABSTRACT

In today's global market, the ability to apply lean concepts to transport perishable food products quickly, efficiently, and cost-effectively is critical to a company's overall profitability, as well as customer satisfaction. The challenge for operators of supply chains is to eliminate waste in a manner that makes economic sense to all participants within the chain. This paper focuses on the challenges of eliminating or reducing waste within the perishable foods supply chain (PFSC). It offers suggestions for improving this type of supply chain by applying lean practices that started as a production and manufacturing strategy and has now been applied to numerous industries, including a PFSC.

Introduction

The concept of lean strategies was first widely implemented in Japan and initially applied to the production and manufacturing processes of companies. The goal was continuous improvement and the elimination of waste, including time, at any possible milestone within the production process (Abushaikha, Salhieh, & Towers, 2018). According to Madhani (2017), "A lean supply chain strategy is aimed at reducing costs, i.e., creating cost efficiencies in the supply chain by effectively managing inventory and focusing on improving the quality in the supply chain, i.e., employing continuous improvement techniques thus eliminating waste." Over time, lean strategies were studied and also applied to operations, logistics, and warehousing. However, when it comes to the perishable foods supply chains (PFSC), it is important to distinguish the differences in characteristics of perishable foods as compared to functional products that have long life cycles and stable demand (Orjuela & Wilson, 2017). In today's global market and constant demand patterns, the ability to apply lean concepts and transport perishable food products quickly, efficiently, and cost-effectively is critical to a company's overall profitability as well as customer satisfaction.

Perishable Products Supply Chains

According to Orjuela and Wilson (2017), an estimated one-third of world food production is wasted or damaged. Furthermore, they contend that with the increased presence of globalization, the distances between the locations where food products are produced and the locations where they are consumed are growing greater, thus requiring more integration of food production and distribution throughout perishable products supply chains. The challenge for the operators of supply chains is to not only eliminate waste, but to do so in a manner that makes economic sense to all participants within the chain. A few statistics demonstrate the challenge of food production and distribution, particularly with regard to the supply of fruits and vegetables. Orjuela and Wilson (2017) found that with the increased global demand for fruits and vegetables, there is a growing diversity in the suppliers, particularly in the developing countries of South America and Asia. Orjuela and Wilson (2017) further found that developing countries account for almost 90% of world fruit production, while developed countries

absorb 80% of the trade. The connecting of these markets through supply chains, especially in developing countries where the transportation infrastructure has not grown as quickly as the need, is the key to meeting global demand. For fruits and vegetables, the goal is to get the product from the production country to the consumption country as quickly as possible.

Grocery store operators refer to the duration a fruit or vegetable can be placed on display for sale and still be usable as a product's shelf-life. The longer a product's shelf-life, the more opportunity there is to sell it to consumers, and the less likelihood the product will need to be discarded due to spoilage. An example of this practice being implemented is at Huntsville International Airport. Many fruits and vegetables that are grown in South America are shipped by air to Miami International Airport and distributed by truck throughout the Southeast. An international freight forwarder and logistics company, Panalpina, looked at options to shorten the time it took to transport products from field to shelf. By flying the fruits and vegetables into Huntsville International Airport, Panalpina estimates they can add at least one day to the shelf-life of fruits and vegetables because of shortened distances to transport the products to the grocery store shelves. In addition, by bypassing Miami's busy international import operation, the time it takes to offload products, inspect them, and load them onto trucks for distribution is also lessened.

In addition to fruits and vegetables, another perishable product market is for fish and meats. According to Raab, Petersen, and Kreyenschmidt (2011), in the United States, the economic damage due to quality loss in beef is estimated at one billion dollars annually. Raab et al. (2011) attributed incorrect handling, improper storage, and poor transport conditions to the loss of shelf-life and ultimately the loss of meat products. Conversely, in 2006, the worldwide demand for fish products was over 110 million metric tons with 77% of the earth's population consuming some form of fish (Parimi & Sreeram, 2018). The supply of fish can be in several forms including live, fresh, smoked, frozen, or processed; however, as with the supply and demand for meat, the global demand for fish has resulted in longer supply chains that must be fulfilled in shorter times to meet consumer needs (Parimi & Sreeram, 2018).

One final area, though not covered in depth in this paper, is

the global transportation of vaccines. According to Comes, Sandvik, and Bartel Van (2018), the lack of reliable cold storage and inefficiencies in cold chain management resulted in high waste rates and poor immunization coverages with more than 2.8 million doses of vaccine being lost due to disruptions in vaccine supply chains. While this is not a perishable food product, it is important to note that vaccines are also susceptible to disruptions in global cold chains. Regardless of the product, identifying waste and applying lean principles is critical to supply chain success.

Challenges and Waste Within Perishable Products Supply Chain

The almost borderless modern business environment has ushered in a new era of supply chain management, especially for PFSCs, and has raised the competitive nature of competition from a firm-versus-firm to a supply chain-versus-supply chain landscape (Laosirihongthong, Adebajo, Samaranayake, Subramanian, & Boon-itt, 2018). Ultimately this means that the challenge of identifying waste within supply chains is of critical importance.

One important factor in eliminating perishable food waste is the proper packaging and storage of products from production through the final sale. This challenge is generally focused on maintaining products at adequate temperatures from harvest to packaging to transportation to shelf. According to Laosirihongthong et al. (2018), it is not only important to continuously refrigerate perishable products for food safety considerations, but also to ensure the quality of the products. However, it is important that PFSCs not over-apply resources in this area or risk introducing an additional waste. As was learned at Huntsville International Airport, refrigeration can be expensive, and it is important for PFSC stakeholders to understand the products they are shipping as well as the acceptable temperature ranges for each product, so resources are not applied when they are not actually required. Fresh meat and meat products have to be processed, stored, and transported in cold conditions within a temperature range of +2 degrees Celsius to +7 degrees Celsius depending on the type of meat (Raab et al., 2011). According to Parimi and Sreeram (2018), fresh fish is typically stored and shipped at ice-melting temperature or below 0 degrees Celsius. For fruits and vegetables, the optimal storage temperature depends on the specific product. Optimal storage temperatures for fruit products such as table grapes, summer pears, apples, and plums range from 0.5 degrees Celsius to -1.5 degrees Celsius (Goedhals-Gerber, Haasbroek, Freiboth, & Esbeth, 2015). Taking all of these parameters into consideration, it is important for PFSC stakeholders to be familiar with the products being shipped including the ideal settings for initial cooling, temperature, and humidity. These parameters should be established for each stage of the supply chain and opportunities identified for eliminating waste through the use of processes, training, and technology.

With the globalization of PFSCs, it is also important to ensure the security of the supply chain. The security of these supply chains should address not only the risk of deliberate contamination, but also natural and accidental contamination risks, all of which can result in waste (Davidson et al., 2017). Security can focus on physical process and cybersecurity risks, along with the application of mitigations. Depending on the characteristics of a given supply chain, the risk associated with each

milestone and stakeholder should be assessed. For example, an established PFSC with few and well-known stakeholders would probably require a lesser level of security than a new PFSC with several stakeholders who have not conducted business previously. Regardless, security plans should address both proactive and reactive measures both to ensure the overall safety of the products within each supply chain and reduce the risk for supply chain stakeholders (Davidson et al., 2017).

Applying Lean Practices to Improve Perishable Products Supply Chains

Given the challenges and waste associated with PFSCs, there appear to be several opportunities to apply lean concepts within the supply chain. These concepts can be applied at the locations of production, during transit from country to country, and during transit from the warehouses to the points of sale. Villarreal, Garcia, and Rosas (2009) state that there are seven deadly sins within supply chains: overproduction, delay/waiting, excess transportation, motion, inventory, space, and errors. While the application of lean practices within PFSCs is ongoing, there have been improvements that are widely applied that focus on reducing waste within the supply chain.

PFSC stakeholders must take into account that the implementation of lean concepts in one area can possibly lead to waste in another. Decisions about applying lean practices cannot be made in a vacuum; rather they should be made taking into account the effects the implementation of lean practices will have on the entire supply chain and each stakeholder. For example, the producer of a fruit product can choose to pick the fruit and immediately load the product into refrigerated trucks for transport to the port. This is a quick and efficient process for reducing this segment's transit time. However, a common best-practice is to immediately send the harvested fruit to pre-cooling prior to packaging (Goedhals-Gerber et al., 2015). According to Goedhals-Gerber et al. (2015), the pre-cooling of fruit products slows the rate of respiration, a chemical process that causes fruit to deteriorate faster. The cost-benefit of each lean practice should be assessed while also considering factors such as the length of the supply chain, the intended market use of the perishable product, and the strategic goals of the supply chain (Villareal et al., 2009).

Within the transportation realm, despite the high cost, the use of air transportation to ship perishable products to the country of consumption is becoming more accepted. The advantage of air transport is speed, thus adding shelf-life to the products (Parimi & Sreeram, 2018). In addition, ongoing improvements in refrigerated packaging technology have dramatically improved the ability of supply chain stakeholders to monitor the location and temperature of perishable product shipments at any point throughout the supply chain (Goedhals-Gerber et al., 2015). This has reduced the risks associated with the air shipment of perishable products as the variations in temperature during loading, unloading, and storage can now be objectively monitored to ensure products are within temperature tolerances (Parimi & Sreeram, 2018).

The mode of transportation that is typically used for the domestic transportation of perishable products is trucking. Trucking facilitates short, medium, and long distance transportation of perishables. The use of refrigerated trucks allows for the transportation of perishable products from the harvest lo-

cation to central distribution centers, from central distribution centers to regional distribution centers, and from regional distribution centers to the retailing points (Villareal et al., 2009). Research by Villareal et al. (2009) further identified that within any of these transportation processes there are several areas that should be assessed to identify opportunities to eliminate waste including:

- The amount of time drivers wait on loaded or empty containers to transport from and to the distribution centers. This can be modified by scheduling deliveries and pickups, allocating the correct number of empty containers needed to satisfy the demand, and scheduling drivers and plant workers to match and maximize the productivity of each.
- The variability of driver wait time because of a lack of a defined pick-up/drop-off schedule. As with driver wait time, the scheduling of deliveries and pickups and maximizing the productivity of plant workers and drivers can be used to improve performance.
- The capacity utilization of the company trucks because of a lack of load planning. This can be improved by assessing truck routes, distances, travelling times, frequencies of service, truck maintenance requirements, actual need of products, and actual need of returned empty containers within the supply chain.
- The use of third-party operators to supplement company trucks because of inefficiencies. If other areas such as driver wait times and capacity utilization are improved, the use of third party operators should be minimized. While it may not be possible or make sense to eliminate supplemental coverage, it can be reduced to an acceptable level.

The other modes of transportation are used sparingly for the transportation of perishable food products. According to Goedhals-Gerber et al. (2015), the use of ships to transport fruits and vegetables short distances from South Africa using refrigerated containers is still accepted. However, as global consumers demand high quality food products and retailers base purchase prices and decisions upon a product's shelf-life, the use of air transport for the international shipment of perishable products will continue to increase. There are still markets in which the use of ships makes sense. According to Parimi and Sreeram (2018), an example of this is the shipment of live, whole fish; this is primarily due to the fact that the live, whole fish are less vulnerable to spoilage than fresh fish.

Conclusion

At the core of the successful implementation of lean concepts is the elimination of waste, or the Japanese term "Muda" (Abushaikha et al., 2018). Although lean started as a production and manufacturing strategy, it is now applied to numerous industries including perishable foods supply chains (PFSC). Perishable products typically have a short life cycle and a highly unstable demand (Orjuela & Wilson, 2017). As global demand for perishable food products becomes more predictable, the emphasis for PFSC stakeholders is to focus on shortening the time it takes to bring food products from the harvest to the table and implementing processes that maximize the values of the perishables. Critical to each supply chain stakeholder is the detailed knowledge of the food products they are shipping. This knowledge allows for the use of predictive food models that accurately forecast the remaining

shelf life of perishable foods and allows stakeholders to make decisions as to which markets are best for their products based on the supply chain options available (Raab et al., 2011). The evolution of technology has given stakeholders further ability to track and monitor shipments using tools such as wireless area networks and radio frequency identification (Raab et al., 2011). As the globalization of the food supply continues to increase, the continued application of lean practices across the air, land, and sea modes of transportation will enable PFSC stakeholders to maximize efficiency, speed, quality, and profitability.

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Application of Lean Concepts in Distribution and Inventory for Waste Reduction

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Global Logistics and Supply Chain Management Major

ABSTRACT

Companies continue to build on implementing lean concepts in their businesses to increase quality while reducing wastes. Lean is a technique used by management to make their organizations more efficient and profitable. By implementing lean concepts, organizations' goal is to provide agile, reliable, and responsive services by leveraging best business practices and technology. This paper will discuss the significance of lean in distribution and inventory management and the tools and techniques used today. It will also address the barriers and complications of incorporating value within the distribution and inventory sectors of the supply chain.

Introduction

The term “lean” was widely adopted from the Toyota Production System. Lean is an approach to reduce *muda* (waste). Recognizing there is a need for lean inventory systems and distribution activities, companies must reduce costs. The necessity to reduce costs means that companies must learn to manage with minimal inventories that are delivered just in time for use. Although lean can be interpreted in many different ways, it is simply eliminating waste from processes that do not add value. By eliminating wastes, organizations become quality-oriented, responsive to customer needs, and are more cost efficient. Determining what is not needed and keeping only what is essential is the balancing act that companies strive to achieve; because to be really efficient, companies have to eliminate what does not work and figure out what is important.

Distribution and inventory management has a continuous relationship that builds on the processes, information, and material flow. Synchronization between the two increases the value of having a responsive and agile supply chain. Hence, this relationship and partnership are key to a successful integrated supply chain. A long-term relationship provides the ability to share assets and integrate planning, technology, and processes (Benton, 2013). Many distribution centers adopt the five principles of lean to become more efficient within the warehouse to control inventory, inventory costs, and storage costs while reducing *muda*.

Implementation of Lean Management

In an effort to implement the lean concepts, managers should prepare all teams and departments for changes, inform all internal and external parties of said changes, and execute those changes. Therefore, a team should be developed to make sure the organization's values and goals are aligned with the lean practices. This team should be instrumental in making sure everyone understands the changes and how it will benefit the company. It is imperative that all parties not only understand the new changes, but embrace them. This sets the foundation to the introduction of the Five Principles of Lean identified by Womack and Jones (2003):

- Specify value—finding what value is important at each stage of inventory control and warehouse man-

agement in addition to being specific about products and locations. The customer defines value; therefore, understanding what the customer values in services and products will help with establishing a focus on delivering “customer value” by eliminating waste.

- Identify value stream—the set of all the specified actions needed to complete a task. These processes are examined to see what value is added. Anything that does not add value is eliminated. According to Womack and Jones (2003), value stream mapping will always reveal three types of *muda*:
 - many steps will be found to be clearly creating value.
 - some other steps will be found to create no value, but to be unavoidable with current technologies and production knowledge.
 - some additional steps will be found to create no value, and to be immediately avoidable.
- Achieve flow—this outlines the step-by-step processes by which goods and services are delivered and eliminates/reduces waste by identifying *muda*. Understanding flow is essential to the elimination of waste.
- Achieve pull—develop a process where customers pull the product from the source/supplier. Dell computers is a perfect example of this principle because they do not do anything ahead of time; instead, they wait until the customer has placed an order.
- Achieve perfection—continue improving with incremental changes leading to further reduction of *muda*. “Achieving perfection is an endless process for involved parties to reduce efforts, time, space, cost, mistakes and all sources of waste, while continuing to offer clients what they want exactly” (Marzouk, Bakry & El-Sai, 2011).

Lean Tools and Techniques

Research has shown that the emerging environment is more sensitive to inventory disruptions and demands more strategic inventory decision making:

“In this setting three primary inventory management imperatives emerge that dictate the need for greater collabo-

ration: (1) a need for lean inventory systems. The necessity to reduce costs means that companies must learn to manage with minimal inventories that are delivered just in time for use or sale. Unfortunately, global lean inventory systems are very vulnerable to external supply shocks and potential environmental disruptions; (2) a need for globally dispersed inventory. Despite tremendous advances in logistics systems (both in terms of responsiveness and reliability), global networks require dispersed, multi-site inventory systems to achieve satisfactory service levels as well as to mitigate risk; (3) a need for rapid-response supply systems. The drive to minimize overall inventory levels in the face of greater environmental turmoil and risk dictates a need for extreme flexibility in information, logistics, and planning systems" (Fawcett et al., 2010).

Value stream mapping (VSM), 5s Technique, and Kanban are the most widely used lean tools in the workplace. For warehouse management and inventory control functions, these tools provide agile, reliable, and responsive services by leveraging best business practices and technology. According to Richards (2011), warehouse management goals are to increase productivity and accuracy, reduce and control cost of inventory and shipping while providing good customer service. Cross functional teams within the distribution and inventory will be able to communicate better which fosters better decision making instead of silo-based decisions. These three lean tools are defined as:

- Value stream mapping (VSM)—identifying all activities in a set of processes
- 5s Technique—sort, set in order, shine, standardize, sustain
- Kanban—a visual workflow method enabling organizations with metrics, focus, and visibility to better manage work and people

Advantages and Disadvantages of Applying Lean Concepts

Lean concepts are useful in small, medium, and large companies because they can improve profitability from driving down costs. A study conducted by Hu et al. (2015) found that small to medium-sized enterprises have indirect advantages applying lean. Although there are many advantages of applying lean, Hu et al. (2015) identified three in their research: closer integration with their supply chain members, spin-off benefits of taking a quality control approach, and facilitation of a high-velocity of learning. Additional advantages of applying lean concepts include:

- Increased profits, reduced waste, efficient processes, and value-added activities
- Controlled costs with minimal inventory, workspace safety and sound practices, fewer delays and better lead times
- Quality control ensuring quality in products and prevention of passing along faulty products if there is quality compliance throughout the process

Since most organizations select lean tools that are simple and inexpensive to use and/or apply, there are some that still fail to implement because of lack of knowledge in lean practices, business practices, complexity issues and concerns, etc. Therefore, disadvantages of applying lean concepts include:

- Failures in equipment and/or labor that can lead to inconsistencies, missed or delayed deliveries, and diminished customer relations
- Increased carrying and storage costs due to excess inventory
- Lower margins for error

Companies that integrate lean practices in their supply chains benefit greatly. These benefits include:

- Better understanding of customers with greater availability to serve them
- Reduction of wasted materials, time, and redundancy in supplier functions
- More cost effectiveness and efficiency with increased return on investments and profit margins
- Fewer risks and enhanced competitiveness

Challenges in Implementing Lean

There are many companies whose business processes and practices are not set up to adopt the lean concept. These companies face many challenges when implementing lean because of limitations and conditions. "Implementation of lean systems is not free from barriers. The lack of resources to invest, the lack of top or senior management involvement and workers' attitude or resistance for successful implementation of the lean system are almost equally cited lean barriers in the literature reviewed. Ensuing barriers are cultural difference, poor leadership, back sliding or lack of perseverance and so on in the descending order" (Jadhav et al., 2014).

Conclusion and Recommendations

In conclusion, lean is an approach to reduce waste. It is necessary to reduce waste in order to streamline business practices and satisfy customers. Customers determine what value is; therefore, any non-added value activities must be reduced or eliminated. Most companies adopt lean practices to accomplish this. Effective implementation of lean in distribution and inventory management occurs when there is a successful transition from functioning as a silo to one of teamwork and cooperation across all business areas. Challenges applying lean concepts in a warehouse include ineffective processes, recurring slow periods in the supply chain, poor layout, and ineffective storage and transfer of supplies. Further research efforts into enablers and inhibitors should be made to expand the understanding of lean concepts and to improve the understanding of lean thinking in warehouse and inventory control operations.

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Addiction: Modern Day Jekyll and Hyde?

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ABSTRACT

*Despite some major differences, Carl Jung and Sigmund Freud, the two leading figures in analytical psychology, held similar views on the role and responsibilities of the ego in the development and function of personality. Both Jung and Freud viewed the ego as directing the conscious behavior of the individual. This definition should never be confused with the common definition of ego which often denotes selfishness or conceit and is considered "egocentric." In Jungian terminology this is described as an inflated ego; in everyday language it is referred to as having a "big head." The research described in this paper utilizes a Jungian approach in analyzing the existing literature to explain how the ego of an individual caught in an addiction is overcome and replaced by the addiction. The individual becomes completely subjugated to the addiction, which takes the place of a higher power and becomes the decision maker for that person. The effects of addiction are memorably described in Robert Louis Stevenson's 1886 novella, *The Strange Case of Dr. Jekyll and Mr. Hyde*.*

Introduction

The dual nature of mankind entails the conflict between good and evil that exists in all of us. Robert Louis Stevenson's well-known novella, *The Strange Case of Dr. Jekyll and Mr. Hyde*, describes the transformation of a respected physician into a violent, bestial criminal through the use of a chemical designed to divide man's good and evil natures. Dr. Jekyll becomes addicted to the emotional and physical release he receives through his evil actions as Mr. Hyde. Even after recognizing the terrible effects of the chemical, he finds himself unable to stop using it. His true self, the natural combination of good and evil, has been overcome by an addiction to pure evil. Stevenson's story has become ingrained in the collective imagination of most English speaking countries to the extent that many people know the plot even though they have never read the novel.



Figure 1—Spencer Tracy As Jekyll and Hyde

According to Stevenson, the plot of the story appeared to him in a startling dream presenting a benign character who suddenly transformed into a malevolent one. It is interesting to note that Stevenson's novella, which was written fourteen years prior to Freud's *Interpretation of Dreams* and several decades before Jung's psychological works were published, can be interpreted as an early forecast and warning of future problems. Scholars and researchers who delve into the dual nature of good and evil in humans continually sift the messages from this story hoping to obtain additional enlightenment on the dual nature of humanity. Anyone interested in the problems surrounding addiction is encouraged to become familiar with the novella's accurate description of addiction and preview of current issues.

The current discussion focuses on chemical and alcohol addiction, only touching briefly on other types of addiction such as sexual, eating, gambling, etc. It is acknowledged that a relatively broad segment of the general population would not agree that addressing the issue of addiction is worth the effort. This segment holds the opinion that this type of problem is caused by a lack of willpower or self-control, laziness, or other personal weakness. It is hypothesized that many people in this segment of the population would respond affirmatively to the following question: "Have you ever known someone who was rapidly moving toward death by overindulgence in alcohol and who had received competent medical counseling warning that if they did not stop they would die in a short period of time, as well as receiving many expressions of concern from family and friends, but still refused to stop and did in fact die?" However, in spite of their positive response, these respondents would not agree the acquaintance was infected with an addiction which suspended and took over their decision making, but instead was lacking in willpower, was lazy, was self-destructive, or lacked self-control. The authors of this paper present a different view of addiction, maintaining that medical and research data provide conclusive evidence that individuals are victims of addiction, sometimes multiple in nature (Carnes, 2001, p. 19).

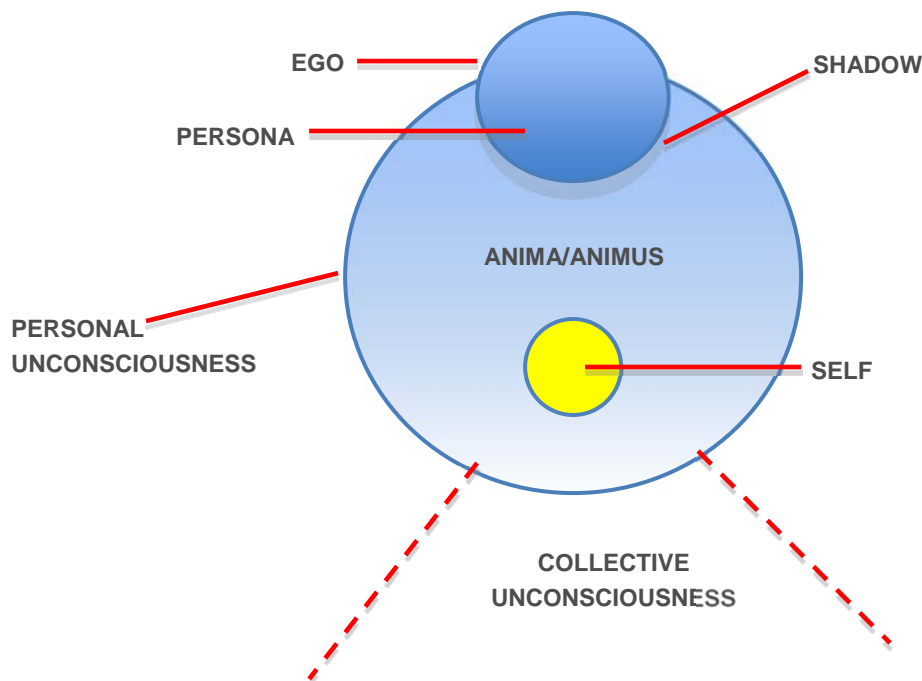


Figure 2—Model of Ego, Personal and Collective Unconsciousness

Addiction and the Ego

Both Carl Jung and Sigmund Freud, the two leading figures in analytical psychology, viewed the ego as directing the conscious behavior of the individual. In an effort to throw additional scientific light on psychological addiction, Schoen (2009) provides the following definition of addiction, which contains two key components:

First the addictive substance, activity, or behavior must ultimately take over complete and total control of the individual psychologically. That is, it must take over control of normal ego functioning, thoughts, emotions, perceptions, motivations, judgments, decisions, actions, and behaviors. And the second part of this definition is crucial: the addiction takes over control in an inherently destructive and ultimately life-threatening way. It is not an addiction unless it is a death sentence—not life in prison, not fifty years with probation or time off for good behavior. It is a death sentence of the mind, of the emotions, of the body, and of the spirit. It is a death sentence to the addict's career, community, marriage, family and friends. It is not an addiction unless it has the lethal capacity and potential to kill the individual. It is not an addiction unless it is the most powerful, controlling, possessive, dictating, and determining agenda in the psyche. It must take precedence over everything else (p. 3-4).

Dr. Jung frequently maintained that psychological messages often are communicated through poetry, drawings, art, religious texts, literature, myths, fables, and fairy tales. He was convinced that in most cases poets, authors, or artists did not intend to convey, and were not necessarily aware of, the deeper messages being communicated in their work, since these messages are drawn from a deeper part of the consciousness

and are examples of knowledge that intrudes from the collective unconsciousness. Jung urged his students to become familiar with, pay close attention to, and make use of these sources of knowledge from the collective unconsciousness in their personal and professional lives.

Figure 2 has been developed in an attempt to present Dr. Jung's philosophy and approach in a graphical form that may be more understandable in classrooms and workshops. It is an attempt to help clarify, define, and further explain and contrast mankind's psychological nature and the respective characteristics of our conscious and subconscious minds. Fox (1940) particularly commends Freud and Jung for their novel modern day research and work in this area. At the same time, Fox notes that while the information may be new to the modern period, it was known, understood, and utilized by many ancient writers. Specifically, Fox calls attention to the Old Testament, Psalm 91 and Isaiah 35, as well as the writings of Moses and John (Fox, 2009, p. 61).

The well known, often-quoted story of Noah comes from early Jewish/Christian literature and provides a good example of lessons from the collective unconsciousness. The story tells how Jehovah, disturbed by the amount and intensity of evil in the world, sent a great flood in an attempt to wipe evil from the face of the earth. The entire population was destroyed except for Noah and his family, who were warned of the coming of the flood and took refuge in the Ark. After many days of rain and flooding, the waters finally subsided and God sent a messenger to assure Noah that it was safe for his family and the rescued animals to leave the Ark. (It is worth noting that the story of the Flood is common across many cultures, including most from the Fertile Crescent region, and demonstrates the depth and breadth of the collective unconsciousness.) After emerging from the Ark, Noah became drunk on wine and was

mocked by his youngest son. In retaliation, Noah placed a curse on the son and the problem of evil, in the form of anger, revenge, and retaliation, reappeared. Here we see that Noah serves as an ancient and abiding example from religious literature of problems caused by overindulgence in alcohol. As Jung would maintain, it also represents an important psychological message coming not from a psychology classroom or textbook, but from religious literature. While this is clearly not an example of addiction, without question the decision-making capability of Noah's ego was temporarily impaired by overindulgence in wine.

Social Costs of Addiction

It is not possible to accurately assess the percentage of industrial, community, or personal losses caused by addiction. It must be recognized that a significant, although unidentifiable, portion of the costs and losses due to drug and alcohol abuse or misuse is not caused by individuals who can be defined as addicts. Many costs are caused by first time users, or by long-time users who are not addicts. The primary difference between the problem user and the addict is that the problem user's ego loses control of the decision making process temporarily, while addiction takes complete and constant control of the ego and becomes the most important aspect of the addict's life. The addict develops a pathological relationship with the addiction that becomes more important than family, job, and even life.

The costs of alcohol and chemical addiction and abuse are staggering, but a significant portion of these losses are hidden in psychiatric and medical care, loss of production, loss of hope, suicide, accidents where alcohol and drugs are unrecognized contributing factors, and the suffering of family members, friends, and coworkers. As one example, Jungian analyst, Lionel Corbett (2007), notes that in many cases one of the parents of a psychopathic individual was an alcoholic. As a child, Adolph Hitler was regularly beaten by his alcoholic father (Schoen, p. 54), which may have impacted his later actions. Research by Shelley Taylor (2004) has demonstrated that children from dysfunctional families, including those with parents who abuse drugs or alcohol, are at an enhanced risk for a broad array of emotional and behavioral problems, health problems, depressive episodes and suicide attempts. Building on Taylor's work, Repetti, Taylor, and Seeman (2002) have shown that children from such families are also likely to engage in drug or alcohol abuse as adults.

The following statistics address some—but certainly not all—of the costs and consequences from alcohol and chemical overindulgence and addiction. According to the National Survey on Drug Use and Health:

substance abuse in the workplace negatively affects U.S. industry through lost productivity, workplace accidents and injuries, employee absenteeism, low morale and increased illness. The loss to U.S. companies due to employees' alcohol and drug use and related problems is estimated at billions of dollars a year (2007).

According to the Occupational Safety and Health Administration (OSHA), a majority of those who abuse drugs are employed. "Of the 17.2 million illicit drug users aged 18 or older in 2005, 12.9 million (74.8 percent) were employed either full or part time." More tragically, additional research indicates "that between 10 and 20 percent of the nation's workers who

die on the job test positive for alcohol or other drugs" ("Workplace substance abuse").

Elliot and Shelley (2005) report that:

47% of industrial injuries and 40% of workplace deaths were linked to alcohol consumption. Almost 14 million Americans use illegal drugs; as workers, they are 3.6 times more likely to be involved in an accident at work and 5 times more likely to file for workers' compensation benefits than nonusers (Nighswonger, 2000). In 2002, nearly 15 million adults had alcohol-related problems (Substance Abuse and Mental Health Services Administration, 2002), ranging from missing a day of work to serious accidents, and approximately 100,000 American lives are lost each year to the effects of alcohol use, either through diseases or accidents.

A report by the U.S. Commission on Civil Rights addressing substance abuse states that:

The social and economic costs of substance abuse in America are staggering. In a report issued in 1993 by the National Institute on Alcohol Abuse and Alcoholism and the National Institute on Drug Abuse, it is estimated that the cost of alcohol and drug abuse for 1995 was \$276.4 billion, of which \$166.5 billion was for alcohol abuse and \$109.8 billion was for drug abuse ("Sharing the dream," 2000).

Addiction Treatment Issues

A major problem when attempting to reduce the problems described through these statistics and to identify a viable treatment for addicts and individuals who abuse alcohol and drugs is that individuals must first self-identify and admit they are confronted with a problem that is beyond their control. As John Sanford emphasized in his Jungian analysis of Stevenson's novella, one of Jekyll's major failures lay in his inability or refusal to accept his responsibility for the evil that resulted from his attempt to split the good and evil aspects of his nature. The addict, as defined in this manuscript, resists acknowledging or taking responsibility for the problem and often refuses to seek or accept treatment, sometimes to the point of death.

In the words of the *Alcoholics Anonymous Big Book*, addiction is "cunning, baffling, and powerful" (Carnes, 1989, p. 238). The 12-step program developed and successfully utilized by AA has been adopted and modified for use in most addiction treatment programs. Treatment success rates for 12-step programs are not as high as desired and the programs have detractors among health care professionals. However, at the present time, 12-step programs represent the most successful approaches to treatment, as long as addicts accept responsibility for their addiction, admit they are powerless to overcome it alone, and consistently follow the 12-step approach.

The first of the twelve steps in these programs is the addict's acknowledgment that his or her life has been taken over by the addiction and he or she has lost control. This reflects the Jungian interpretation of addiction as loss of "normal ego functioning, thoughts, emotions, perceptions, motivations, judgments, decisions, actions, and behaviors" to the power of the addiction (Schoen, 2009, p. 3). Jung believed that true recovery could only come through a spiritual or religious experience

in which the power of the addiction is replaced by a greater power; Alcoholics Anonymous and other 12-step programs are based on this concept (W., 1961). Given the Jungian view that the ego provides the decision-making aspect of consciousness, it becomes clear that the collapse of the normal ego creates a situation in which it is extremely difficult, sometimes impossible, for the individual to acknowledge his or her loss of control and accept the need for assistance in overcoming addiction. Understanding this approach may help managers, human resource professionals, family members, and friends accept addiction as a real phenomenon that can and must be addressed.

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Long-term Effects of Harsh Childhood Environment on the Mental and Physical Health of Children and Adults

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ABSTRACT

Members of the mental health profession have long recognized and researched the devastating effect of stress on humans as well as members of the animal kingdom. This research has provided a large body of worthwhile information that has been utilized in stress management efforts. This paper explores some of this research and focuses primary attention on the impact of a harsh early social and familial environment on the mental and physical health of children, and its continuation into adulthood and throughout the individual's life span.

Introduction

Good mental and physical health begin very early in life. The presence or absence of proper pre-natal care can impact the child prior to birth, and the environment in which a child is raised can have life-long consequences. Extensive research on the effects of a risky family environment has been conducted by Dr. Shelly E. Taylor and her associates. Studies were supported and made possible by grants from the National Institute of Mental Health and other foundations. Taylor and her coauthors define risky families as families in which offspring are exposed to cold, conflict ridden, or neglectful parenting (Taylor, p. 1366).

Findings

Some of the findings from these studies (including findings from earlier studies quoted by the authors) have been condensed and are quoted below.

1. Considerable research suggests that children from risky families are at an enhanced risk for a broad array of emotional and behavioral problems, as well as numerous health problems. A strong, graded relationship was found between exposure to abuse or household dysfunction during childhood and risk for a variety of adult health disorders, including ischemic heart disease, some cancers, chronic lung disease, skeletal fractures, and liver disease. The research also found a similar graded relationship for certain mental health outcomes, including depressive episodes and suicide attempts (Taylor, p. 1370). Early family environment has also been shown to be a predictor for cardiovascular risk (Lehman, Taylor, Kiefe, & Seeman, 2009). Children from risky families are also likely to engage in health-threatening behaviors such as smoking, drug abuse, and alcohol abuse (Repetti, Taylor, & Seeman, 2002).
2. The family's social and biological context, including the family's socioeconomic resources and genetic factors, are major contributors to a risky family social environment (Taylor, p. 1371).
 - a. Socioeconomic status (SES) may act as a marker for the chronic stressfulness of the environment, and constant stress takes a toll on relationships, including those in the family. Low SES has been tied to all of the risky family characteristics, and reductions in SES have been associated with an increase in risky family characteristics (Taylor, p. 1371-72).
 - b. There appears to be some evidence of a genetic origin for certain characteristics that increase the likelihood of a risky family environment, such as hostility in the family. To date, these genetic bases for a risky family environment and its consequences have not been explicitly addressed by researchers (Taylor, p. 1372).
3. The most immediate products of a risky family environment are difficulties in emotion regulation. Children do not do well at recognizing their own emotions, recognizing the emotional states of others, and managing their emotional responses to social situations. These children may exhibit high levels of internalizing (e.g. social withdrawal, anxiety) or externalizing (e.g. aggression, hyperactivity) problems (Taylor, p. 1372). In adolescence, young adulthood, and extending into adulthood, these problems may stabilize into chronic negative emotional states, including chronic anxiety, depression, or hostility (Taylor, p. 1372). Research by McLaughlin & Hatzenbuehler (2009) indicates that stressful life events in childhood, particularly family discord, are associated with fear, anxiety, chronic emotional arousal and increased reactivity to stress-

ors in adolescence and can disrupt the normal development of social competence.

4. Perhaps most important for adult success, children from risky families lack in social competence. The common finding is that risky family environments produce children who are unpopular. In some cases, they are highly aggressive and in other cases socially withdrawn. Individuals who lack social competence may have difficulty attracting or maintaining social relationships. The resulting lack of social support networks is a predictor of all causes of mortality in humans and animals (p. 1373). A lack of social support has been tied to poor immune function in response to stress, to a heightened risk of infectious disorders, and to poor recovery from illness (p. 1374). Research on the relationship between mental health and social support among college students reinforce this, indicating that students with low levels of social support due to factors such as low socioeconomic status, have six times the risk of depression compared to students with high levels of social support (Hefner & Eisenberg, 2009).

Validating reports of early childhood is difficult. Other people with the potential to reconstruct the environment, such as the mother, father, or siblings, may see the early environment differently than the participant and/or have issues of self-presentation that would lead them to provide unreliable or biased reports (p. 1375). Often individuals who could validate such reports are not available due to absence from the family environment or death. Another factor that may invalidate reconstruction of early childhood events is the ability of the human consciousness or mind to suppress or be in denial about painful events of the past.

Conclusion

Problems associated with risky families are serious ones, and they include coronary heart disease, cancers, and liver disorders, among other illnesses. Over the past 30 years, there has been a two-to-three fold increase in suicide and homicide rates in children—outcomes that have been reliably tied to adverse family characteristics. Emotional problems, including depression and anxiety disorders, are at very high levels as well. Risky families may be an important piece of the puzzle represented by these rampant social and public health problems (p. 1389).

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Application of Lean Concepts in Distribution and Inventory Management: Just-in-Time and Total Quality Management

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ABSTRACT

Firms are recognizing that globalization is creating more of a competitive market, forcing the formation of new business strategies. As a result, many firms are incorporating lean philosophies and methodologies in their operations to improve efficiencies, reduce costs and to better align their business strategies with globalization to create a competitive advantage. Lean philosophies are prevalent in production and manufacturing, but also can be applied to inventory and distribution facilities. This paper will discuss how firms can create a competitive advantage by applying just-in-time and total quality management to their inventory and distribution operations.

Introduction

In response to globalization, firms are using advanced approaches, such as lean concepts, to respond to the changing markets and outperform competition. Many firms are pursuing lean concepts throughout their entire supply chain to enhance business operations by designing streamlined, high quality systems that increase productivity, reduce costs, shorten lead times, and increase flexibility. Lean practices can result in improved efficiencies and reduction in costs, because lean focuses on the elimination of waste and value-added activities (Wickramasinghe & Wickramasinghe, 2017). Wastes are considered to be those things which absorb resources but provide little to no value such as waiting time, overproduction, inventory, rework, and transportation (Chongwatpol & Sharda, 2013). Although lean concepts are usually discussed regarding manufacturing and production, this paper will discuss how firms can apply just-in-time and total quality management within their inventory and distribution operations to achieve a competitive advantage.

Just-in-Time

Just-in-time (JIT) can be applied to inventory and distribution management to achieve reduced response times and higher inventory turnovers. JIT is usually discussed in relation to production and manufacturing; however, it can be applied to inventory and distribution management to achieve a competitive advantage. The next discussion will consider how JIT can be applied within inventory and distribution operations and how the benefits include cost reduction and increase productivity.

Cost reduction

As indicated, JIT is used as a cost reduction strategy by diminishing the amount of inventory held. JIT reduces inventory levels since product is received only when it is needed. Firms that reduce inventory levels are also reducing operating costs and positioning themselves to be more agile to customers' demands. This, in turn, allows firms to manage inventory that is only customer demand driven, therefore, permitting firms to develop high inventory turnover which decreases response time (Zhu, Yuan, & Zhang, 2018). Research from Yen Chun Wu (2003) states that utilizing JIT delivery results in inventory

turnover of twenty compared to three or five from traditional settings. Although this figure will vary from each industry and firm, the significance is enormous. First, this indicates that because less inventory is held, less storage space is needed, thus reducing overhead costs. Second, because inventory held is driven by demand, this results in higher inventory turnover, permitting greater cash flow due to fewer funds tied in inventory. JIT does require more deliveries, usually made up of smaller sizes, which can increase transportation costs; however, JIT permits benefits of cost savings by generating quick cash turnover, reduction in storage, and reduced lead times.

Increased Productivity

JIT application in inventory and distribution results, not only in a reduction of costs, but it allows productivity to be amplified through open communication channels and data driven operations such as ABC analysis and RFID technology. Communication requires entire coordination from internal and external shareholders, and data driven concepts provide firms an execution of how to operate. These two critical components promote productivity in JIT which will be discussed further.

Communication

Foremost, the underlying foundation for success in JIT inventory and distribution is an effective communication channel. As discussed, JIT relies heavily on consistent delivery and receiving from the supply chain partners; therefore, strong communication is essential. When applying lean applications to communication, reducing rework and misunderstanding due to distorted information, a more effective, streamlined operation is created. Yen Chun Wu provides insight that customer-supplier relationship requires a special bond which should be described as a "cooperative partnership where both parties work together to build a prosperous future" (2003, p. 1367). Cooperative partnerships and effective communication aid in performance, because they allow all partners to see the entire representation of the supply chain, allowing all partners to make sound business decisions. Yen Chun Wu's study also suggests that a strong relationship between parties yields greater cost reduction and improved efficiencies due to the highly coordinated deliveries (2003). Communication cannot stop at the customer-supplier level. In order for firms to be successful in JIT, they

must provide effective communication channels within the organization. Research by Sisson and Elshennawy (2015) states that employee engagement and sustainment of lean are strongly correlated and considered to be one of the most important factors in lean implementation. Firms need to use dedicated resources such as face-to-face communications, newsletters, and videos to ensure communication is reaching all levels of the firms. Employees are the first line of defense in any lean concept—especially JIT—because they are most impactful on wastes such as motion, rework, time, and defects; therefore, their understanding and support in JIT philosophy helps keep operations running smoothly.

Data Driven Concepts

Aside from effective communication to increase productivity, firms can apply lean practices in how they store inventory and conclude operations through data driven concepts (such as ABC analysis) and employ current technology trends (such as radio frequency identification). Receiving the inventory just in time is half the battle; considering where it is being stored is just as vital. The article, “SKU Classification: A Literature Review and Conceptual Framework,” discusses one of the oldest and most well-known inventory management approaches—ABC analysis. ABC analysis focuses on inventory that is classified through demand value or demand volume. Depending on the SKU classification (value or volume), ABC analysis can determine the best position and location for products. To aid in classification, firms can invest in software such as SAP and ERP to determine operations that best fit the most current demand (Kampen, Akkerman, & Donk, 2012). Product position is important for JIT inventory and distribution, because when considering the elimination of waste, rework and motion are tied into inventory placement. Having the most demanded product closer to the loading bay will assist in faster loading and shipping times. It is also important to keep inventory, especially the rapid moving items, in easy-to-reach places. Strategic placement ensures rework and motion are kept to a minimum, which improves productivity.

The second data driven concept, RFID technology, is fairly new to the industry and is described as “an information and sensor technology that collects data through reader devices and tags that are attached to or embedded inside of objects” (Chongwatpol & Sharda, 2013). Research provided by Chongwatpol and Sharda (2013) state that waste reduction through RFID was paramount, compared to regular 2D barcodes. Research also shows that RFID readers throughout operations can reduce inventory up to 90% and decrease waiting time up to 45%. RFID tags provide real-time data and analytics that can enable the distribution center to make sound business decisions based on current demand such as transportation scheduling and loading. Although RFID tags can increase productivity, it comes at a cost. This is considered one of the major disadvantages (Chongwatpol & Sharda, 2013). RFID implementation can reduce wastes such as inventory and waiting times and allow distribution centers to become more agile to customer demands by promoting successful JIT.

JIT applications in distribution centers can reduce costs and increase productivity. Cost reduction is possible when inventory levels are kept to a minimum, which requires a highly coordinated delivery system where inventory is received just when it is demanded. This highly coordinated system relies heavily on open communication channels with suppliers and

customers, as well as strong communication with internal shareholders. Productivity is increased through communication channels with the entire organization and supply chain in conjunction with ABC analysis and RFID technology.

Total Quality Management

As discussed earlier, lean applications strive to eliminate waste while focusing on the value-added activities. The second lean application that can be applied to inventory and distribution management is total quality management (TQM), which is considered a philosophy and toolkit that focuses on quality within the entire organization. TQM is a much broader concept than JIT, because it focuses on the entire organization and the entire product lifecycle (Gunasekaram, Goyal, Martikainen, & Yli-Olli, 1998). Total quality management strives to optimize product value through quality and, in turn, can provide a plethora of benefits for the company, their business partners, its employees, and, most crucially, the customers, by improving productivity, reducing waste, and improving communication. TQM is emphasized in manufacturing; however, it can be applied in inventory and distribution management by focusing in the areas of the product lifecycle where inventory and distribution affect the product. TQM is considered to be everyone’s responsibility to ensure quality is held to the highest standard. Although inventory and distribution management does not affect the entire product lifecycle, it still plays a vital role in how a product is stored, how it is packaged, how it is transported, and when it is transported. These key drivers may not go directly into the production of product quality, but these drivers go into preserving the quality of the product, which is just as vital and will be discussed in greater detail.

To begin, a distribution center impact on TQM begins at organization and storage. First, distribution centers need to have a facility design and layout that assist in the flow of inventory and aid employees in a streamlined process that reduces time and motion without compromising inventory accessibility and quality. After product is received, consideration in stacking will aid in proper quality standards. Unorganized storage could lead to unwanted incidents and dangerous accidents; therefore, maintaining proper housekeeping, safe stacking procedures, and storage organization are significant in waste reduction, increased productivity, and improved quality controls.

The TQM concept that can be applied in distribution centers is how the material is picked and fulfilled, packaged, and loaded for transit. What goes into the package is just as important as how the packages are loaded onto the trailer; because proper packaging and use of dunnage will preserve product quality. Distribution centers move products throughout the facilities multiple times, causing greater risk of damage each time. The use of dunnage, such as straps, decking, air bags, and corrugated cardboard, provides protection for the product and for the employees. To increase lean efficiencies, distribution centers should keep dunnage and packaging material close to fulfillment stations and loading areas. Just as packaging and loading is vital, it is important to address distribution centers’ role in maintaining quality through education and training. Providing employees continuous training and education on forklifts and machinery will reduce damage to inventory and the products. In general, 85% of quality-related problems arise from the system; whereas, the other 15% are caused from workers (Gunasekaram, Goyal, Martikainen, & Yli-Olli, 1998). Although the statistical makeup of worker induced quality defects is not large, it can be preventable. If quality is

sustained throughout design and production, distribution centers are responsible to maintain it.

The article, "Total Quality Management: A New Perspective for Improving Quality and Productivity," explains TQM as an ongoing operation of continuous improvements that require efforts and responsibility from the entire organization. Successful TQM also requires the entire supply chain to commit to continuous improvement to ensure product is at the best quality it can be, at the lowest cost. As far as it relates to inventory and distribution management, TQM can be as simple as proper packaging and loading techniques for transit and education and training for employees (Gunasekaram, Goyal, Martikainen, & Yli-Olli, 1998).

Conclusion

As discussed, firms implementing lean concepts within their inventory and distribution centers are able to reduce costs and increase productivity to respond to rapidly changing customer demands, which creates a competitive advantage. Throughout implementation, firms are able to reduce waste, which allows cost savings to be passed on from supplier to consumers. Lean concepts also allow firms to rapidly respond to demands, thus creating higher customer satisfaction and service due to low inventory levels and JIT deliveries. JIT also promotes improved productivity throughout the firm because of the elimination of wastes that allows firms to manage inventory only relevant to customer demands. Opening channels of communication increases productivity and promotes better operations, not only through the firm, but through the supply chain. The use of data also increases productivity, because it provides a clear outline of what business decisions need to be made and what operations need to be performed. Total quality management aids in lean operations throughout inventory and distribution facilities because it preserves the quality of the product while it is being moved throughout the supply chain. Although inventory and distribution cannot necessarily add quality, they can focus on proper procedures to pick, pack, and transport inventory without inducing damage. Extensive research shows lean applications to yield positive results for firms; nonetheless, it is important to note that lean implementation is a highly coordinated business strategy that requires the entire firm's participation, along with its suppliers, in order to be a success. This coordinated approach takes time to yield results. Firms can implement lean concepts within their organization to improve operations regardless of the scale of application. Making sound business decisions and providing best practices can start with the simple concept of reducing wastes.

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Space Law

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ABSTRACT

The term 'space law' refers to the international and national laws that govern human activities in outer space. Launch is the riskiest phase of space flight for both passengers and crew on board spacecraft, as well as people and property on the ground; but it is not the only aspect of space travel that needs regulating. The effects of space travel on the environment, oversight of space-related patents, and determining ownership of objects left in space all may require special laws or regulations. This paper explores the current state of space law and projects the regulatory needs for a new era of commercial space flight.

Introduction

Practicing law is not rocket science, but sometimes rocket scientists need lawyers. The term 'space law' refers to the international and national laws that govern human activities in outer space. The prominence of space law has grown in recent years as private companies assume many of the roles traditionally performed by government agencies. Aside from the satellite telecommunications industry, the sole role for private companies in outer space has been as contractors on government space programs.

Launch Risks

Most space missions start the same way—with a rocket launching a vehicle into outer space. Launch is the riskiest phase of space flight. This is due to the technological complexities involved in launching an object into outer space and the enormous amount of combustible propellant required to get it there. The amount of energy required to lift an object the size of a fighter jet into outer space for suborbital space flight would enable a car to drive about two-thirds of the way around the globe.

Launch accidents can harm passengers and crew on board spacecraft and people and property on the ground. Liability for spaceflight activities can arise internationally or domestically. The Outer Space Treaty provides that parties to the treaty take international responsibility for outer space activities conducted by both government and non-government entities.

To date, no U.S. launch failure has harmed a member of the public. Were there to be personal injuries or property damage following the failure of a U.S. government rocket, the government may be liable under the Federal Torts Claim Act (FTCA). The FTCA applies only if the government's actions were negligent or wrongful. Although there have been no reported incidents of third-party property damage from failed launches, several individuals have sued government contractors claiming that their property was damaged by rocket testing activities. The outcomes of these cases are mixed.

There are two schools of thought regarding the proper role of government in regulating commercial human space flight. Some believe excess regulation in the form of safety or design

requirements would stifle innovation and prevent the growth of the commercial human spaceflight industry. Others are uncomfortable with the notion that the government does not do more to regulate the spaceflight industry. These perspectives continue to shape the development of commercial space laws in the United States.

Launch failures of unmanned rockets risk the loss of their valuable payloads, either by complete destruction or by placement in the wrong orbit. Following such a failure, the owner of the satellite must cover the costs of a replacement and the opportunity cost of the delay in performing the services the original satellite was supposed to provide. Disputes between launch providers and their customers have been one of the most fertile grounds for litigation since the commercial launch market came of age in the 1980s.

In 1987, the Indian government hired McDonnell Douglas to launch a satellite manufactured by Ford Aerospace. While mounting the satellite to McDonnell Douglas's Delta rocket, the loading crane's wire hoist cable snapped, damaging the satellite. Ford had agreed to assume full responsibility for any loss or damage to the satellite prior to launch. Following this accident, Ford filed a claim for \$6 million with its insurance provider, Lloyd's of London. Lloyd's paid the claim and then sued McDonnell Douglas for negligence in the planning, testing, and supervision of the satellite mounting process. The case was subsequently resolved out of court.

Environmental Impacts

The operation of launch vehicles can harm Earth's biosphere in several ways. The exhaust produced by rocket engines can introduce harmful pollutants into the atmosphere. The improper handling or storage of chemicals at launch sites can contaminate the local environment. Hazardous materials carried by the launch vehicle can fall back to Earth after an accident.

As shown in Figure 1, there are four main layers in the Earth's atmosphere: the troposphere, the stratosphere, the mesosphere, and the ionosphere. The primary environmental impacts from the operation of launch vehicles are pollution from particle matter released into the troposphere and the release of ozone depleting and global warming inducing gases into the stratosphere. Depending on the type of engine that is used, launch vehicles may release ozone depleting chlorine, hydro-

gen chloride, aluminum oxide, and nitrogen dioxide directly into the stratosphere, all of which can lead to ozone depletion. Engines can also emit greenhouse gases, including water vapor, carbon dioxide, methane, ozone, CFCs, hydrofluorocarbons, and perfluorinated carbons.

Layers of the Atmosphere

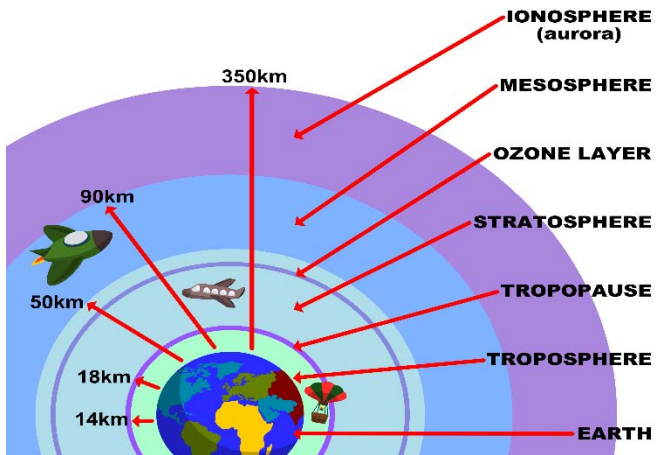


Figure 1—Layers of the Atmosphere

The FAA has analyzed the impact of launch related activities in environmental impact statements (EIS) prepared in connection with the licensing of commercial rocket launches and spaceports under the 1984 Commercial Space Launch Act. EISs prepared in 2001, 2005, and 2008 concluded that the amount of ozone-depleting chemicals produced by launch vehicles would be significantly lower than those produced by industrial sources.

Scientists have also performed several studies on the impact of space activities on Earth's atmosphere. They concluded that annual ozone loss attributed to current rocket launches is "insignificant" at 0.03 percent. However, if the Space Shuttle had launched weekly, as originally planned, the annual ozone loss attributable to rocket launches would have reached 0.2 percent.

Another potential danger to the environment from launch operations is the release of hazardous materials following an accident. This concern is particularly serious when launching spacecraft with nuclear power sources. Nuclear power has been an important source of spacecraft power since the dawn of the Space Age. Nuclear power sources are particularly useful on planetary exploration missions where sunlight is too weak to generate sufficient power using solar panels.

Most space activities are conducted in Earth orbit (see Figure 2). About half of all operational satellites are in low Earth orbit (LEO), at an altitude of between 100 to 600 miles. Spacecraft in LEO travel at about 17,500 mph and take approximately 90 to 100 minutes to orbit Earth. These spacecraft take the least energy to reach orbit, require the least power to communicate with ground stations, and are able to take the highest resolution images of features on Earth.

Medium Earth orbits (MEO) are at an altitude of between 600 and 22,236 miles. Because their orbits are higher, spacecraft in MEO orbit at a slower speed than spacecraft in LEO. MEOs are therefore used to provide a longer dwell time and a larger

coverage area over a given region on Earth as compared to LEOs. For this reason, MEOs are particularly useful for satellite navigation systems, such as the U.S. Global Positioning System (GPS).

Geosynchronous Earth orbit (GEO) is at an altitude of exactly 22,236 miles. A satellite in GEO takes 24 hours to complete its orbit, so it remains continuously above the same longitude on Earth. Because GEO is very far from Earth, a great deal of energy is required to launch a satellite into that orbit. GEO has two unique benefits that make placing satellites there worth the cost. First, a spacecraft in GEO has a commanding view of Earth, making this orbit useful for telecommunications, early warning, and meteorological missions. Second, a satellite in GEO directly above the equator will appear to remain stationary over one point on Earth and is therefore said to be in a geostationary orbit (GSO). Many satellite television stations are broadcast from GSO.

Not all orbits are circular. For certain missions, a more elliptical orbit is desired. Highly elliptical orbits (HEO) have a perigee of 660 miles and an apogee of about 24,000 miles in a single orbit. Satellites speed up as they travel through their perigee and slow down as they near their apogee; so HEO orbits enable long dwell times and large fields of view from the apogee. These orbits are primarily used for communications, scientific research, and reconnaissance missions when GEO orbits are not available.

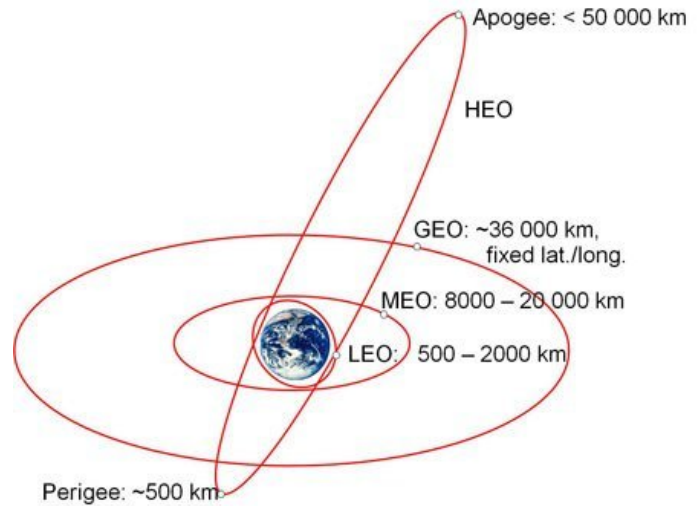


Figure 2—Types of Orbits

Space Debris

Many useful orbital regions of Earth are crowded. The U.S. government currently tracks about 22,000 man-made objects in Earth orbit. It is estimated, however, that more than 500,000 man-made objects larger than a centimeter, and millions of objects smaller than a centimeter, are currently circling Earth. Of these objects, only a small fraction are operational spacecraft. The rest are dead satellites, discarded equipment, spent rocket boosters, fragments from collisions and explosions, paint chips, and other byproducts of human space activities, collectively known as space debris. Because the debris is traveling at orbital velocity, a collision with even the tiniest debris fragment can cause catastrophic damage to an operational spacecraft.

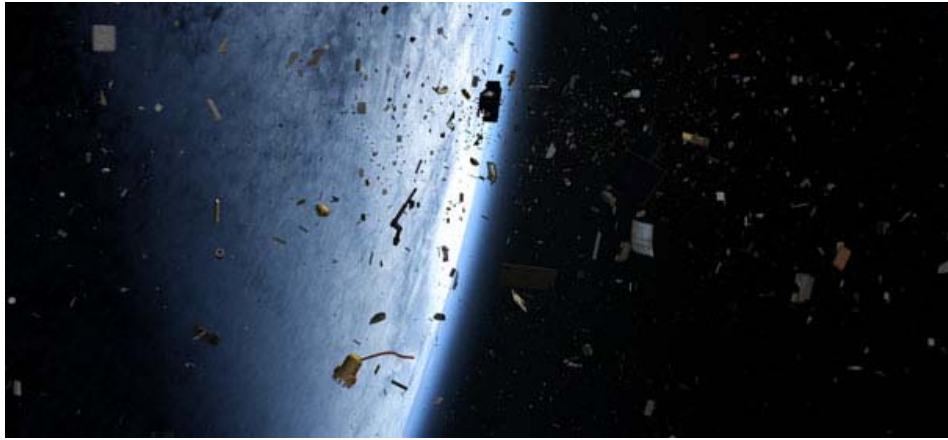


Figure 3—Space Debris in Earth Orbit

Space debris (Figure 3) in low orbit will eventually succumb to atmospheric drag and reenter Earth's atmosphere. Most will burn up, but some fragments will survive reentry and strike the ground. Debris in higher orbits will remain in space for hundreds or thousands of years. To date there has been no litigation over damage caused by space debris to other objects in outer space, and how such litigation would be resolved is not clear. States are strictly liable for damage on Earth or to aircraft in flight, but are liable for damage caused in outer space only "if the damage is due to its fault or the fault of persons for whom it is responsible."

There are generally two ways to remove debris from orbit: self-removal and external removal. For self-removal, a spacecraft at the end of its useful life removes itself from orbit either by reentering into a decaying orbit that will reenter the atmosphere in a reasonable time frame or moving itself into a graveyard orbit out of the way of other spacecraft. Proposed mechanisms for external removal of debris from orbit include, for example, building a spacecraft to rendezvous with and capture debris and ground-based "laser brooms" to sweep debris from orbit. However, this solution would require an international legal framework authorizing the removal efforts.

Legal Patents

As in many high technology industries, patents play a critical role in encouraging investment in research and development of space technologies. A patent is an exclusive right granted by a national government to an inventor to prevent others from making, using, or selling an invention for a limited period of time. In exchange for this monopoly, the inventor must disclose the patented invention to the public. Because patents are granted by national governments, they are inherently territorial and may only be enforced within the jurisdiction of the granting government. For this reason, an inventor must file a separate patent application in each jurisdiction where he wishes to obtain exclusive rights to an invention.

None of the major international space treaties specifically addresses the applicability of national patent laws to activities in outer space. Even so, the 1967 Outer Space Treaty provides that a space object's country of registration "shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body." This principle is similar to the "floating island" principle that exists in maritime law with respect to ships in international waters. Un-

der this principle, countries may extend their laws, including their patent laws, to their registered space objects.

The most significant obstacle to creating a single extraterrestrial patent jurisdiction is the traditional reluctance of terrestrial nations to surrender their sovereignty to international organizations. Although there have been many proposals to establish international authority governing outer space activities since the beginning of human space exploration, the leading space-faring nations have consistently rejected such proposals.



Figure 4—Typical Crashed Space Debris

Reentry Risks

Purposefully returning a spacecraft to Earth intact poses several distinct risks. Mission planners worry about protecting people and cargo on board the spacecraft from the intense heat of reentry and protecting persons and property on the ground in the event of an accident. Regulating these activities is the responsibility of the Federal Aviation Administration (FAA) under the 1984 Commercial Space Launch Act.

The vast majority of commercial space missions end with the spacecraft operator leaving the spacecraft in an orbit that will eventually deteriorate into an uncontrolled atmospheric reentry (crash, see Figure 4) or moving the spacecraft into a graveyard orbit out of the way of other spacecraft. Neither activity requires a FAA license. A license is only required when the operator intends to purposely reenter a spacecraft into Earth's atmosphere and the spacecraft is expected to survive reentry.

Although the FAA has licensed more than 200 commercial launches since 1989, it did not issue its first reentry license until 2010 to SpaceX.

The uncontrolled reentry of spacecraft carrying hazardous material is particularly worrisome. In 2008, the United States shot down its own non-functioning satellite, USA-193, rather than risk its toxic hydrazine propellant surviving reentry and contaminating a populated area. The most extreme case of hazardous contamination caused by the uncontrolled reentry of a spacecraft was the 1978 crash of Cosmos 954. The Soviet Union fission-powered satellite's reactor core failed to separate and boost into a nuclear-safe orbit. The satellite's orbit decayed until it reentered the atmosphere, depositing debris over an uninhabited area of northwest Canada. Of the twelve recovered fragments, all but two were radioactive. The Canadian and Soviet governments eventually settled the claim for C\$ 3million in 1981.

Current Oversight

In response to the Cosmos 954 incident, the Committee on the Peaceful Uses of Outer Space (COPUOS) formed a working group to study nuclear-powered satellites. This effort eventually led to the United Nations General Assembly's unanimous adoption in 1992 of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space. The Principles established nonbinding operating guidelines and criteria for the safe use of nuclear power sources in outer space and notification and assistance requirements in the event of the accidental reentry of space objects containing radioactive materials.

Since the dawn of the Space Age, scientists have been concerned about the contamination of Earth and other celestial bodies as a possible unintended consequence of space exploration. There are two forms of possible planetary contamination. Back contamination is the contamination of Earth from space by the return of astronauts or space objects, and forward contamination is the contamination of space or celestial bodies by earth through human space activities.

In 1958, the International Council of Scientific Unions recommended the establishment of a code of conduct for space missions and research and formed the International Committee on Space Research (COSPAR). That same year, U.S. National Academy of Sciences established the Space Science Board (SSB) and charged it with providing advice on issues of planetary contamination. By 1964, the SSB had recommended sterilization of space probes and endorsed the ICSU Code of Conduct and the establishment of COSPAR. Commonly referred to as the Extra-Terrestrial Exposure Law, additional regulations set by NASA provide them the legal authority for NASA to quarantine returning astronauts who have been "extra-terrestrially exposed." Data from Apollo 11 and 12 showed that lunar material posed no hazards to Earth, and the regulations were repealed in 1991.

The field of space law is not particularly relevant to contemporary commercial space companies because the technology to economically mine and use outer space resources does not yet exist. However, questions concerning property rights do arise from time to time. The drafters of the Outer Space Treaty recognized that the ownership of physical items launched into outer space would be important to government and private space operators alike. Article VIII states the entity that owns

an object that is launched into outer space or landed on the Moon retains ownership of that object. The entity also enjoys all the rights and privileges of ownership that it would enjoy on Earth.

The Apollo astronauts left behind a substantial amount of equipment on the Moon. This includes a U.S. flag (Figure 5), empty food bags, and Neil Armstrong's and Buzz Aldrin's space boots. NASA is concerned the items at Tranquility Base might be unintentionally damaged or contaminated by future spacecraft. In addition to their historic value, keeping the site pristine until it can be methodically studied is important to NASA because the agency would like to understand how these artifacts have been affected by remaining undisturbed on the lunar surface for over 40 years. On July 20, 2011, NASA released what is known as the NASA Recommendations which are recommended operating procedures for private spacecraft operating near historic lunar artifacts. These recommendations are not legal requirements, but guidelines to help inform lunar spacecraft mission planners.

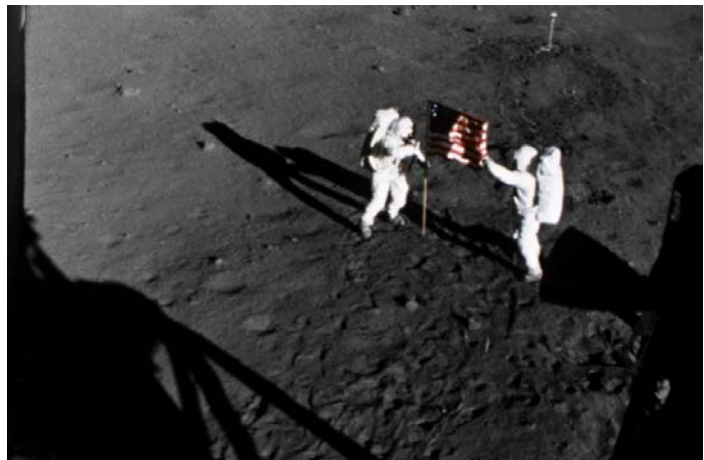


Figure 5—Apollo 11 Astronauts Plant the U.S. Flag on the Moon

Conclusion

Looking forward, we stand at the threshold of a new era of commercial spaceflight. The government-center space age is littered with grandiose predictions, missed deadlines, and programs cancelled before they had a chance to succeed or fail on their merits. But with the historic docking of the SpaceX Dragon with the International Space Station (ISS) on May 25, 2012, the commercial space age has undoubtedly begun.

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Current Trends in the Application of Lean Concepts in Distribution and Inventory Management

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ABSTRACT

The application of lean concepts in distribution and inventory management is complex and involves integral components of the physical distribution elements. The expected result is the lean manufacturing that focuses on the elimination of wastes and the increase of speed and flow of products throughout the supply chain. Many interrelated functions assist to provide the efficient movement of products such as inventory control, distribution or order processing, transportation and logistics, packaging, materials and customer service. In today's global landscape, the competition is fierce; and as technology continually changes, suppliers, along with consumers, continue to demand products that are received efficiently, at the right time and price, all the while continuing to make lean manufacturing a major concern for most companies.

Introduction

In today's competitive market, the application of lean concepts in distribution and inventory management are vital functions to keep material and products flowing, utilizing the physical distribution group of activities associated with the supply of finished goods and products from the production line to the consumers. The application of lean concepts in distribution and inventory management are a collection of components that work together efficiently to create a value chain—not because of state-of-the-art equipment and warehouses, but of lean concepts. The strategy of lean concepts begins by thinking about how to apply the lean principles for eliminating waste, creating flow and implementing pull-based processes to create a value chain driven by customer demand. This paper will identify and analyze current trends and recent applications of lean production concepts in distribution and inventory management, within the physical distribution section of supply chains in private industry.

Lean Production Concepts in Physical Distribution

First, to begin to understand distribution and inventory management, one must examine lean production concepts within the physical distribution section of supply chains in industry. It is important to recognize that physical distribution is managed with a systems approach. This approach considers key interrelated functions to provide the efficient movement of products. This paper includes examples of the application of lean concepts, philosophies, and processes for Toyota, Apple, and Fed-Ex Corporation, along with other companies. Several of these corporations are prime examples of utilizing physical distribution—the movement of finished goods from production to consumer—and the successful implementation of lean concepts in distribution and inventory management. There are six major elements of physical distribution: customer service, order processing, inventory control, warehousing, transportation modes, and material handling.

Trends in Inventory Management

One of the major elements of physical distribution is inventory control. Inventory management is a fundamental component of supply chain management that involves supervising inventory and stock items. Particularly, inventory management presides over the flow of goods from manufacturers to ware-

houses and from there to the point of sale.

There are many kinds of inventory classifications. For example, raw materials are the materials used to manufacture or create a product. Inventory that is a work in progress comprises materials that are in the middle of the manufacturing process. Finished goods are the materials that have completed the manufacturing process, and service inventory consists of inventory or tools that are used by service-providing companies. Finally, in-transit inventory refers to inventory that is currently in the middle of the transit process, whether by plane, train, truck, or boat (ThomasNet, 2019).

It is important to note that companies keep inventory on hand for various needs. First, maintaining on-hand inventory allows business operations to run smoothly, meet unexpected increases in demand, and assure product availability. A strong supply can allow companies to benefit from periodic price reductions when purchasing in bulk. Additionally, if a company maintains a supply of inventory, or if a facility system fails, a company will not be hit too hard in sales, since the inventory supply would still be available. Also, having inventory on hand allows companies to regularly ship products to retailers as needed. For all of the reasons to maintain inventory, it is necessary in today's technological world to have inventory management software. A particular software program designed by Kardex Remstar LLC supports order picking by zone. The software program titled "Smartpick 6000" was created to meet the challenges of order picking issues. The software creates an order fulfillment solution with the utmost efficiency, reducing travel time, and increasing accuracy (ThomasNet, 2014). Interestingly, Apple Corporation's IOS has dominated the inventory management app landscape for several years, although strong inventory management apps for Androids have recently emerged in the market (Wood, 2019). Other stock/inventory control trends to watch in the future are omnichannel retailing, experiential retail, and streaming analytics. The approach, Just-In-Time (JIT), seeks to minimize inventory by reducing safety stock along with having the right materials at the production location exactly when needed. Toyota is a perfect example that individual companies can be involved in multiple supply chains at the same time; and it is important to recognize that expectations and required knowledge can vary across supply chains. Alternatively, ERP systems are an example of IT designed to achieve high levels of internal integration. Powell (2012) states that, as an exemplar of JIT production, Toyota implemented SASP R/3 in the late 1990s to help manage its

supply chains. Obviously, there is a link between JIT and supply chain management, suggesting that JIT has widened its scope from simple leanness into wider inter-organizational relations, where IT is an important enabler toward inter-organizational function integration (Powell, 2012). Today, Toyota Corporation is still using JIT practices in manufacturing facilities.

Inventory management has financial motivations to keep inventories well stocked (ThomasNet, 2019). Inventory is essential to a company's success and bottom line. Simply put, inventory contributes to the business profit margin. Since inventories figure into the company's cost of goods, it is important to maintain inventories. Inventory management relies on detailed records of products and parts as they enter and leave warehouses and points of sale. With the recent emergence of strategic alliances, just-in-time and supply chain philosophies, the warehouse has taken on a strategic role in attaining the logistics goals of shorter cycle times, lower inventories, lower costs, and better customer service (Omoruyi, 2018).

For many companies, business operations center on available inventory, and the inventory management method that a company utilizes is critical to the company's success and bottom line. There are several different methods companies can utilize to keep track of their inventory and determine optimal levels (ThomasNet, 2019). Some common methods include:

- i. first in, first out—this method assumes that the last item acquired is the first to be sold,
- ii. last in, first out—this method assumes that the last item acquired is the first to be sold, and
- iii. lower of cost or market (LCM or LOCOM)—this method involves recording the item at either the historical cost or the current market value, depending on how the value of the item has changed (ThomasNet, 2019).

It is important to determine which inventory management method is best suited to your company and remain vigilant with the inventory management method implemented. For any business, inventory management is crucial for ease of running a business.

Trends in Distribution Management

While inventory management presides over the flow of goods from manufacturers to warehouses, and from there to the point of sale, distribution management refers to the process of overseeing the movement of goods from supplier or manufacturer to point of sale. The ideas refer to numerous activities and processes such as packaging, inventory, warehousing, supply chain, and logistics. Companies are constantly building or relocating warehouse distribution centers or implementing major changes to these facilities to continually improve distribution management. In February 2019, UNFI announced plans to optimize its distribution center network in the Pacific Northwest including building a new facility and expanding another to enhance customer product offerings, create more efficient inventory management, streamline operations, and incorporate best in class technology to deliver a better customer experience (Bloomquist & Swanson, 2019). The facility will utilize a warehouse automation solution that supports the company's slow-moving SKU portfolio (Bloomquist & Swanson, 2019).

Along with brick and mortar warehousing, in today's world, computerization is performing most of the major trends and functions of distribution management. Advanced distribution systems may employ satellite (/knowledge/Satellite.html) tracking and routing (/knowledge/Routing.html) of trucks, electronically tagged pallets or cargo (/knowledge/Cargo.html) containers, and elaborate data monitoring and storage capabilities. Data collected from these activities are used to identify weak spots in the chain and benchmark improvements (*Business Encyclopedia*, Second Edition).

As technology continues to advance, recently, "blockchain" has been introduced into supply chain management. Blockchains are a secure digital ledger that records crypto-currency transactions in a series of blocks (Sissman & Sharman, 2018). Basically, a singular block maintains a timestamp to document the transaction, known as a cryptographic hash. To process these cryptographic hashes, a network of computers works to solve computationally difficult puzzles; and the first participant to solve the problem gets to add his hash to the blockchain and claim credit (or mine cryptocurrency) for processing. Through this course of mining, the assortment of timestamped blocks is added together to form the blockchain; thereby, blocks are then maintained across numerous computers. Although several timestamps and transactions occur on a block, the information cannot be altered or removed after adding it to the blockchain; nor can entries be forged. Basically, an information trail evolves with this level of clarity and permanency. Although cryptocurrencies are the most common application, the public and secure digital ledger can be applied to things beyond money. To demonstrate the utility of blockchain, one can examine private sector examples in the real world. For example, IBM has begun selling blockchain for supply chain as a service for industries across the world. To further expand this service, Maersk, the world's largest container shipping company, has partnered with IBM to create a shipping blockchain by developing a share record of transactions to allow companies to save money while maintaining a competitive edge (Sissman & Sharman, 2018). The benefits of blockchain for lean organizations can have vast cost savings. For example, if you bought a nice diamond, you would like to know it is not a blood diamond. That means knowing with certainty exactly which mine is the source of the diamond with 100% transparency. Companies that are truly lean thinking will want to become familiar with evolving block chain capabilities. There is massive unseen waste that it may help a company to eliminate (Morgan, 2019).

Along with satellites, electronically tagged items and blockchains are the continued use of robotics. Robotic solutions are continually becoming another phase of lean manufacturing while companies are continually eliminating and cutting waste. Vecna Robotics takes continuous learning to the next step. Vecna's unique autonomy stack allows robots to build upon what they already know and share their knowledge with the rest of the fleet. This means when one robot learns, they all learn. Not only do robotic systems replace bulky conveyor belts, they have the ability to repeatedly produce non-stop which creates an uninterrupted and faster workflow with limited non-value-added travel (Francis, 2018).

Distribution management is vital to the overall financial success of a company. The important elements of distribution management provide benefits of organization within the com-

pany and maintaining customer satisfaction. In summary, successful distribution management necessitates selling goods while assuring enough stocks are on hand while managing promotions in those channels and their varying requirements. Further, it also involves certainty that a supply chain is proficient enough that distribution costs are low enough to allow a good or product to be sold at the right price, thereby supporting the marketing strategy and maximizing profit.

Conclusion

In conclusion, it is apparent that the application of lean concepts in distribution and inventory management are vital components to keeping materials and products flowing utilizing the physical distribution group of activities associated with the supply of finished goods and products from the production line to the consumers. Bud T. Miller, Director of Business Process Management for Kapco Global, a distributor of aircraft parts, defined the application of lean concepts clearly—"No matter where a company is in the supply chain, its efficiency gains and losses will affect all suppliers and customers" (Miller 2017). Companies need to continue to develop employees, invest in distribution and inventory technological advances, and ensure that managers are fully equipped to meet the changes in technology in lean application (Ashford & Lindsey, 2013). With tight turnaround times and large financial risks, it is important for all supply chain players to identify areas of waste and improve upon them to create a leaner, more profitable and on-time supply chain (Miller, 2017).

In today's global economy, the application of lean concepts in distribution and inventory management are essential functions to maintaining materials and products continuous flow, utilizing the physical distribution group of activities associated with the supply of finished goods and products from the production line to the consumers. The application of lean concepts in distribution and inventory management affect the ultimate bottom line of a business. Many current trends are available for lean production; so it is critical that companies use caution when choosing the processes and concepts to be utilized. It is a choice that could determine the ultimate existence, success or failure of a business.

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The Application of Lean Concepts in Distribution and Inventory Management to Motor Carrier Transportation

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ABSTRACT

The purpose of this paper is to discuss various aspects of lean transportation, more specifically motor carrier, as it relates to physical distribution. Invented by Toyota Production System (TPS) in the 1930s, the implementation of Lean Manufacturing processes was necessary for high-value manufacturing and is complementary to strategic decision-making regarding manufacture, as stated by Wu (2003). However, Lean can be difficult to implement in specific organizations, especially non-manufacturing organizations. One of the difficulties is identifying which of the many Lean tools to apply and when and how to apply them. The implementation of Lean is a transformational process and needs to support organizational development alongside process improvement. Not only is organizational development important, but the support of upper management and departments is also beneficial to the execution of Lean processes. In this paper, integration of motor carrier transportation strategies is proposed to incorporate factors of Lean processes, as well as the Seven Classical Waste, as it pertains to motor carrier transportation management.

Introduction

Today's competitive environment is characterized by thin profit margins, high consumer expectations for quality products and short lead times; and companies are forced to take advantage of every opportunity to optimize their business processes and operations to cope with the market fluctuations and increasing customer demands. To reach this goal, it is concluded that for a company to remain competitive, it has to focus on addressing the issue of waste and introducing lean methods and practices within its organization. Lean is often associated with manufacturing, when in reality it is ideal for any environment. There is often a lot of confusion about using Lean in a non-manufacturing environment, and areas such as transportation have been left out. This fact may be somewhat surprising as transportation is often not regarded as a value-added-activity and is often actually categorized as waste that should be, if possible, eliminated (Womack & Jones, 2003; Liker, 2004). Lean management, also known as "lean," is production practice which regards the use of resources for any work other than the creation of value for the end customer, as waste, thus a target for elimination; the lean-idea should always be centered on waste and what is really customer services or value-add, according to Womack et al. (2003).

Applying lean management philosophy to motor carriers is an important concept that helps transportation businesses to compete. In this paper, the concept of lean will be applied to motor carrier transportation; ways to implement and improve lean concepts and processes of motor carrier transportation management are presented.

The Role of Motor Carrier Transportation in Supply Chain Management

Little happens in the supply chain without the efficient and reliable movement of finished goods and raw materials. Motor carriage is the most widely used mode of transportation in the United States domestic supply chain and is also useful for shipping goods to an adjacent country like Canada and Mexico. Here are a few facts. Marlina and Natalia (2017) state that "motor carriers account for 72.9% of the value of goods equaling to 70.2% in tons per million transported in the United States alone." The use of motor carriage creates flexibility,

reliability, customization, and standardization in the supply chain which can all be linked back to the Seven Lean Principles. For example, customization can be achieved by scheduling specific route designs for a particular geographic location of a motor carrier. Standardization makes supply chain process flow more efficiently in terms of less risk, time and labor. Reliability is important to reduce variability of shipment. It is often more important that delivery times be reliable and consistent rather than solely fast.

Lean Motor Carrier Transportation—Fact or Fiction?

All organizations involved in manufacturing today are most likely involved in implementing Lean Manufacturing techniques. According to Pakdil and Karen (2015), although the term lean has been used to indicate Lean Production or Lean Manufacturing, it has come to refer to Lean processes that encompass all organizational functions. As Lean is expanded beyond manufacturing, it is usually more difficult to deploy, which leads to the question of how lean can impact motor carrier transportation. In order for the benefits of lean to be fully realized and achieved, transportation management needs to participate and position into Lean implementation. First, let us define Lean. It is defined in many different ways by several authors.

1. At its core, Lean Manufacturing is a continuous improvement program that companies use to become proactive in problem solving where the main benefits are lower production costs, increased outputs, and shorter production lead times (Herron & Hicks, 2008).
2. Lean Management is one of the most advanced management styles, and philosophy focuses on fulfilling customer satisfaction and creating value through waste reduction (Womack et al., 2007; Liker, 1999).

According to Blucher and Ojmertz (2008), waste is often used instead of the term, or as a result of, inefficiency. Road transportation has traditionally been stated as inefficient, both in European countries (McKinnon & Ge, 2006; Swedish Association of Road Haulage Companies, 2018) and in North America (Belman et al., 2005; U.S. Department of Transportation, 2009). No matter how lean is defined, the commonality is creating value at the cheapest way possible while reducing waste.

Concept of Lean Transportation Management for Motor Carriers

With Lean, implementation focuses on delivering the right goods, in the right quantity, at the right time, to the right customer, from the right source, at the right price, at the right quality and at the right service—known as the Eight Rights fundamental goals of logistics (Zhang, Narkhede, & Chaple, 2017). It only seems natural that transportation and logistics professionals would be onboard. But in fact, other disciplines within the organization have been in the lead for years. In order to create operational and financial stability, firms have to manage their transportation process using lean principles. The focus needs to be on the total costs associated with logistics, including motor carrier. The concept of Lean Transportation Management for motor carriers includes motor carrier transport strategy, measurement of performance, understanding transportation cost structure, and daily event management. Ways to eliminate transport waste are discussed next.

Motor Carrier Transport Strategy

Motor carrier transportation strategy should not drive how and when product is delivered; instead, customer expectations need to be fully understood, and transportation strategies should then be developed to meet those expectations with optimal inventory levels. Motor carrier transportation strategy and tactics must support lean inventory strategies such as value, flow, pull and responsiveness.

This will undoubtedly change the transportation methods of the organization. For example, a focus on truckload movements and transportation load building based on economies of scale may not support the customer experience. Products are generally not consumed by the truckload, or even a skid at a time. Rather, small quantities are often preferred to meet consumption needs. Lean transportation means proactively reviewing motor carrier types, matching them to inventory strategies and customer expectations. Less than truckload (LTL) shipments are being replaced by frequent ground package shipments or multiple stop milk runs to gain control, visibility, and delivery stability. This is seen in Walmart Neighborhood Market small format stores. These stores are approximately 41,000 square-foot large and are served using the LTL method of transportation to satisfy its replenishment orders. This results in less inventory, more frequently, thus satisfying the customer needs which is considered a Just-in-Time strategy.

Just-in-Time Strategy

Just-in-Time is a strategy that requires delivery of inbound and outbound material in exact required quantities at the exact required time. A Lean transportation network must be designed to support Lean delivery requirements. Material and goods arrive in smaller quantities on a more frequent, predictable schedule. Once shipment sizes are reduced and delivery frequency is increased, the shipments need to be leveled over available working time. Lean transportation networks need to successfully support the triple goal of increased delivery frequency, reduction of lot sizes and leveled flow of material.

Measure Performance

The saying goes, “You can’t change what you don’t measure.” It is important that shippers see motor carriers as a strategic

partnership rather than just a business transaction. Lean also requires stability in all systems so that planned operations will be executed efficiently. Part of this stability is realized by working with motor carriers that meet the minimum capability requirement set by the organization and that the objectives match. Motor carrier transportation service providers have distinct and measurable levels of performance capability; therefore, in transportation, “you get what you pay for.” To build a lean supply chain, organizations need to build long-term relationships with quality carriers that are stable, dependable, and committed to servicing the organization. This form of measure is tracked using a Transportation Management System (TMS). Information that can be tracked include expediting options, in transit time commitments, damage rates, responsiveness to claim, technology availability for real time visibility, etc. For example, it is important to know how your company will be reimbursed for damaged goods or that inbound and outbound loads are accepted in an acceptable time frame. It is important to note not all motor carrier services are capable of performing in a Lean environment.

Understanding Transportation Cost Structure

All motor carrier transportation costs are made of two distinct areas: unit costs and productivity costs. The significant opportunity for transportation cost reduction is in productivity costs. Focusing on unit costs, or motor carrier rates, will only result in creating instability in the TMS network. Rather, focus is on productivity, such as trailer utilization, total miles ran, equipment idle time, and observance to core carrier routing guidelines. No one wins when shippers beat down carriers on rates to the point where they are running unprofitably. It is a negative impact on the supply chain and physical distribution of goods and services. The real goal is to negotiate carrier rates that are fair, competitive, and equitable for all parties involved.

Perform Transportation Daily Event Management

Optimal and continuous cost reduction is not realized through infrequent transportation network designs and carrier Request for Quotes (RFQ). Cost savings result from well-organized, daily event management and hour-to-hour focus on waste identification and reduction. Every day, start with a transportation plan, execute the plan, and then check actual condition to the plan. Any detection of waste must be documented and followed by problem solving. Create daily route designs, complete real-time track and trace, generate real-time metrics, and complete daily problem solving. This investment and focus on process discipline is indeed the lean way. When daily events are managed successfully, communication is enhanced; and the flow of process that mitigate waste is reduced.

Eliminate Transportation Waste

Transportation in excess of necessary requirements is waste and should be eliminated. The main focus on eliminating waste is how transportation could be the strategic differentiator in the industry. The elimination of waste is a fundamental aspect of Lean as well as when Seven Wastes have been identified and defined. The Seven Wastes, according to Lean thinking transportation discussed later within this paper, allows organizations to deliver the right goods, in the right quantity, at the right time, to the right customer, from the right source, at the right price, at the right quality and at the right service, (known as “The Eight Rights”), yet excess transportation movement creates waste and added costs to the customer.

Customers are generally willing to pay for transportation decisions based on supporting the Eight Rights, which also defines values—the next topic discussed. Walmart has several delivery options. A customer can choose to pick up, for free, at a store of their choosing or pay for shipping to their home address with different arrival options. The main idea here is a customer will pay for the necessary service need.

What is the Value in Lean?

Lean is a business philosophy, not just a tool set or method for overall improvement. As stated earlier, this philosophy was derived from Toyota experiences and its Toyota Production System (TPS). Value is everything for which the customer is willing to pay. In terms of Lean, value should always be considered from the customers' perspective. From the standpoint of motor carriers and transportation management, the value stream for each product or service must be identified. A value stream includes "all the actions, both value added and non-value added, currently required to bring a product from raw materials to the arms of the customer, or through the design flow concept to launch" (Morgan, 2002). First, a value stream map must be created that reflects the current state of the process being treated. This map is then analyzed for waste and value creation; and a future-state map is created, which represents how the process could and should operate.

It is also imperative to create continuous flow by eliminating backflows, scrap, rework and interruptions. Some examples are the use of reverse logistics, confirming delivery time and schedule prior to delivery, minimizing fuel consumption and down time. No stoppages, no waste is an essential theory. In analyzing value streams, work will fall into one of three types:

Value-Added Work: Works that are essential to cause changes to product/services. This category should be maximized as it provides customer value. An example is motor carrier's cost, flexibility and reliability.

Value-Enabling Work: Activities that do not provide direct value to the customer, but must be performed to allow value-added activities later; therefore, these activities are necessary. Examples of value-enabling work occur in technology, training, environment and culture. This category of work should be minimized.

Non-Value-Added Work: Non-value-added work can usually be eliminated quickly and is not dependent on created improvement of others. This work is pure waste and should be eliminated. These have no value since they are of no benefit to the customer. An example of this category is The Seven Waste discussed next.

The Seven Classical Waste

According to Sternberg, Stefansson, Westernberg, Boije af Gennäs, Allenström, and Linger Nauska (2013), all of the waste, whether it is pure or necessary in a process, can be classified as one of the following:

1. Over Production
 - Producing more than is needed before it is needed. To minimize and eliminate over production, Takt time could be utilized. Takt time is used to measure the rate at which a finished product

needs to be completed in order to meet customer demand. Using motor carriers as an example, it is needed to create a load in a route board.

2. Waiting
 - Any non-work time spent on approval, goods or parts is considered waiting. An example in the context of this paper is a truck waiting to pick up or deliver a load. Another example is waiting for specific directions from the dispatch office.
3. Transportation
 - Transportation wasted is considered the effort to transport materials, parts, or finished goods into or out of storage or between processes. In the case of a distribution center, there are outbound and inbound freight. For items that have a high consumption rate, high value, or are perishable, they should not be stored at a far distance from the loading dock. ABC inventory management is a great tool to mitigate or stop transportation waste.
4. Over Processing
 - Doing more work than is necessary is over processing. The first thing that comes to mind is the duplication of work. Any time spent doing work that has already been done, or is not required to be done, is clearly over processing and is an opportunity to transform that capacity into value.
5. Inventory
 - Maintaining excess inventory and/or raw materials, work-in-progress inventory, or finished goods are incurred costs for any organization. Just-in-Time inventory management will aid to lessen inventory waste and add value benefit.
6. Motion
 - Any movement that does not add value is wasted motion. This is related, useless travel done to perform or fulfill a task. One way to minimize motion is by routing motor carrier transportation on the most effective, precise, and direct route which would aid in the occurrence.
7. Defects
 - Repair, fix and rework are thought of as defects. In the case of motor carrier, it is a truck going back to perform a failed delivery to a customer, or having an incorrect delivery or pickup address.

Conclusion and the Future

The traditional methodology of motor carrier manages changing of inputs to outputs; while the Lean methodology is concerned with managing the process by converting inputs to outputs, by minimizing the input flow waste and efficiently maximizing the value of the outputs. Thus, the Lean production methodology has flow management and value in addition to the input conversion and output of the traditional transportation management technique. The assumption can be made that the traditional approach focuses on efficiency rather than value; whereas the Lean approach focuses on minimizing waste, which is referred to as efficiency, and maximizing value of outputs, otherwise known as effectiveness.

Transportation allows organizations to deliver the right goods in the right quantity to their customers at the right time; yet

excess transportation creates waste and added costs to the customer. Whereas Lean motor carrier transportation is also a necessary component for most businesses and adds value that is recognized by customers; consequently, it should be considered a strategic part of any operation. There are, however, often hidden wastes within transportation that must be analyzed using the theories and practices explained in this paper. Motor carrier Lean strategies explain where and how transportation processes may be sub-optimal and how the application of Lean in motor carrier transportation can positively impact overall organizational performance.

The future holds many challenges for the firm deploying Lean in motor carrier management. Applying these principles, Lean transportation is a means to meet these challenges as they are tools to facilitate the development of faster, more flexible and more effective motor carriage transportation networks. To realize this opportunity, logistics professionals need to challenge current transportation standards. This will require tenacity and perseverance while navigating through organizational hierarchies. Changes may be optional today, but will be essential tomorrow for survival or longevity.

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Ex-Offenders as Job Prospects: Concurrently Solving Socioeconomic Problems and the U.S. Labor Shortage

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ABSTRACT

There are many barriers to re-entry for ex-offenders returning to the workplace. There is also a trend toward a labor shortage crisis. If there was a concerted employer focus on actively recruiting and selecting from this pool of relatively untapped workers, it could have far reaching impact in responding to not only the labor shortage, but addressing socioeconomic shortcomings. Stable employment helps to prevent ex-offenders from re-offending, making a good quality job a critical factor in reducing the recidivism rate. Intentional intervention, both on the federal level and employer domain, remains key in successful transition from prison to release into mainstream society. Business executives, HR professionals, and other employees can help break these individuals out of this cycle by considering this source of untapped talent for open roles and encouraging others to do the same. First, two primary questions must be considered: 1) How can states address the crisis in the Department of Corrections with overcrowding, mounting suicide levels, and ex-convict unemployment? and 2) Can there be a solution that the states can implement that can confront both the critical shortage of skilled labor (and non-skilled labor) in an era of economic boom and as it continues to recruit new industries, and while expanding other industries, all while unemployment rates plunge to historic lows? This paper will explore possible answers.

Defining the Problem

Worker Shortages and Leveraging an Untapped Ex-Offenders as U.S. Job Prospects

The United States has over 2.3 million adults imprisoned, which represents a startling 1 in 100 million adults in correctional facilities. Of these, about 1.5 million are in federal custody and almost 1 million in local jails. Based on one Pew Center Report, the United States incarcerates more people than any other country in the world. This fact becomes even more remarkable when compared to China who that despite a much larger number of citizens confine fewer (Blessett & Pryor, 2013). Alsever (2018) asserts with costs in the United States totaling \$87 billion a year to imprison 2.24 million people, the cost appears to have lackluster results since at least half of the released prison population reoffend and return to prison within 8 years of release. As further obfuscation, there are over 38,000 statutes in place that have imposed specific collateral consequences for ex-convicts and in which at least half of these laws deny the previously imprisoned employment opportunities (Westrope, 2018).

There are many barriers to re-entry for ex-offenders returning to the workplace. Some of the most notable are that employers fear liability of negligent hiring claims and ex-convicts lack of access to acquire needed job skills and training while incarcerated that would make them a more viable job candidate (Wishna, 2001; Bushway, Weiman, & Stoll, 2007). Westrope (2018) purports that the most critical step in an ex-convict successfully transitioning back to be a productive member of society is gainful employment as it provides stability, both socially and economically. However, employers continue to avoid hiring those with criminal records (Walker & Allen, 2004).

An important question for lawmakers and employers is: "What if this issue was tackled vertically and could result in solving not only the national labor shortage, but also favorably respond to a multitude of other societal problems that truly matter to individual job prospects, communities, taxpayers, and

employers?" The real answer lies in the fact that underutilized talent pools exist and they span across several populations of viable and job ready workers. If there was a concerted employer focus on actively recruiting and selecting from these pools of relatively untapped workers, it could have far reaching impact in responding to not only the labor shortage, but addressing socioeconomic shortcomings. There are two primary questions to consider:

1. How can states address the crisis in the Department of Corrections with overcrowding, mounting suicide levels, and ex-convict unemployment?
2. Can there be a solution that the states can implement that can confront both the critical shortage of skilled labor (and non-skilled labor) in an era of economic boom and as it continues to recruit new industries, and while expanding other industries, all while unemployment rates plunge to historic lows?

The Labor Shortage and Untapped Supply Chain—An Opportunity

Although the past two decades have brought higher levels of job seekers than job openings, a reversing trend over the past year has yielded more job vacancies than job seekers. In March 2019, the U.S. Department of Labor reported that 6.5 million workers sought to fill 7.6 million job openings reflecting a bulging delta between supply and demand of labor needed (Campbell, 2019).

As a result of these emerging trends that are expected to worsen, there is a nationwide mounting labor shortage crisis. Many parts of the United States are experiencing in the aggregate "full employment." To further add to this conundrum, despite more rural regions of the country experiencing double digit unemployment rates, there are other regions that are projected to soon reach "negative employment" where employers will have to seek alternative methods and means to fill openings outside their normal labor supply chains. This presents an emerging opportunity as there is a growing tsunami of existing

job openings, while at the same time there are those who are largely overlooked or excluded from consideration as job prospects.

While the “underutilized pool of potential talent” spans across several populations of viable job-ready workers to include labor segments such as older workers, disabled workers or workers with special needs, the cornerstone of this article emphasizes the overlooked and underutilized ex-offender segment of our U.S. population that could offer an immediate solution to today’s labor shortage and at the same time serve to improve socioeconomic implications of employing this group of worker prospects.

Revealing Statistics: Framing the Current State

Historical and longitudinal evidence suggests that a minimum of 90% of those incarcerated will be released back into society. In light of this substantive number of ex-convicts returning to their communities, oftentimes it is to a climate riddled with poverty and crime; and recidivism is high. Many argue this is the basis for over 60% of this population being rearrested within 3 years (Blessett & Pryor, 2013).

What remains convincingly clear is that ex-offenders have not, by a large part, been able to achieve success in reintegrating

into society, and especially the workplace. This is a significant societal issue on many fronts, yet real solutions remain elusive due to many factors to include political discourse, government policies, and employment screening laws (Blessett & Pryor, 2013). One study reported that as many as 75% of employers stated they would not hire a job applicant with a criminal record, and of those 49% indicate it is the lack of their reliability as the primary rationale (Herman, 2019). Other researchers have concluded that employers find ex-offender applicants as untrustworthy and predict if hired would be a problematic employee (Hickox & Roehling, 2013). In as much, jobs continue to go unfilled and societal and economic impact is far reaching.

According to a recent extensive study conducted by the Society for Human Resource Management (2019), there was confirmation of the seriousness of the current state of unemployed ex-offenders and the relationship to recidivism. In this study, it was determined that as many as 1 in 3 U.S. adults (or 75 million Americans) have a criminal record. Since 95% of incarcerated persons will be released, there is a significant population of ex-cons with varying degrees of knowledge and skills, that re-enter society without viable options to sustain a quality of life. In fact, one of the important predictors of recidivism is lack of employment. This is both a societal and economic problem. For example, Gross National Product (GNP) is \$78-



Figure 1—SHRM Study Results

\$87 billion less as a result of excluding the formerly incarcerated from the workplace. It is estimated that for each 10 percent drop in recidivism, States could realize an average savings of \$635 million (SHRM Urges Second Chances, 2019).

Focusing on Employer Responsibilities

Hickox and Roehling (2013) note that there has been little attention given to the basis in which employers reject applicants based on their criminal records. As employers continue to rely heavily on criminal records to preclude the hiring of ex-offenders, it severely restricts their ability to be hired into a position for which they would otherwise be qualified. In 2006, the Equal Employment Opportunity Commission (EEOC) issued guidelines as “best practice” recommendations to human resources to avoid blanket policies that restrict the hiring of any ex-convicts. The EEOC noted in its 40-page directive that disqualification of ex-convicts addresses the concern of disparate impact on men and minorities (Richey, 2012). However, evidence continues to purport that employers continue to adopt policies that disqualify ex-offenders. To add to this conundrum, many employers lack clear policies, guidelines, or training related to the use of criminal record information as it relates to making employment decisions and resulting in the disparate and inconsistent treatment, especially among protected groups of ex-offenders. For example, 68% of ex-convicts have protections under the American with Disabilities Act (ADA) and 24% due to mental illness.

Title VII holds that in order for an employer to disqualify an individual job candidate, the employer must be able to successfully argue that there is an overriding business purpose (Herman, 2019). Therefore, based on this intent, it can be argued that the burden of proof is on the employer to demonstrate the employment disqualification is related to the ex-offender’s inability to perform the essential job functions rather than any stigma or biases associated with those previously imprisoned. Consistently, data suggests that when ex-convicts find employment, they are significantly less likely to reoffend (Hill, 2018; Hickox & Roehling, 2013). Therefore, the employment of ex-offenders has historically demonstrated favorably consistent results in reducing recidivism and generating solutions to fill job vacancies.

Employing Ex-Offenders: HR Outlook and Response

The 2019 SHRM study focused on human resource practitioner perception of employing individuals with criminal records. Funded by the Charles Koch Institute, findings revealed 74% of managers and 84% of HR professionals nationwide said they were willing or amenable to the idea of hiring individuals with a criminal record. In fact, only a small minority were unwilling to make the hire or work alongside these individuals (SHRM Urges Second Chances, 2019). However, other previous studies have offered conflicting results indicating only about half of employers would consider the recruitment and hire of ex-offenders (Finn, 2007).

It is well recognized that securing employment is a vital rung in the ladder of opportunity and essential to ensuring the success of individuals with a criminal record. Stable employment helps to prevent these individuals from re-offending, making a good quality job a critical factor in reducing the recidivism rate. Business executives, HR professionals, and other employees can help break these individuals out of this cycle by considering this source of untapped talent for open roles and encour-

aging others to do the same.

Numerous re-entry studies have shown that the key to reducing recidivism, and improving public safety, is properly preparing the offenders for release into a free society and helping them locate a well-paying job. This includes: (1) selecting offenders who are truly motivated to make a change for good; (2) upgrading their educational skills and industrial certifications; (3) sharing certain coping, life skills, and critical thinking skills so that they can be successful on the outside; (4) helping them with critical bridging infrastructure of housing, transportation, and pro-social faces and places; (5) providing them access to empathetic mentors upon re-entry; (6) using drug treatment and strict drug testing accountability plans; and (7) most importantly, finding the offender stable employment in a nurturing and supportive environment. “If individuals with a criminal record can be considered for employment based on their talent and skills, the benefits for the business—and society—are far-reaching,” says Vikrant Reddy, Senior Research Fellow at CKI. “HR professionals are well positioned to provide counsel and generate a tailored set of best practice principles that will benefit both the business and the individuals seeking a second chance.”

As a result of ongoing research and analysis, the Society for Human Resource Management (SHRM) launched a “Getting Talent Back to Work” initiative that promotes organizations offering other qualified ex-offender job applicants the opportunity to return to the workplace. As the largest professional association for human resource practitioners in the world, SHRM has fully invested in this effort by conducting extensive research of best practices in the employment of ex-offenders by thousands of organizations. As one outcome of this research, a toolkit was produced for employers to utilize in the deployment of effective strategies to hire ex-offenders. “Workplaces are transforming quickly, and talent strategies must evolve along with them,” said Johnny C. Taylor, Jr., SHRM-SCP, President and Chief Executive Officer of the Society for Human Resource Management (SHRM). “Organizations can no longer grow without tapping into the reservoirs of potential talent hidden in our communities. In many industries, accessing human capital is now harder than accessing financial capital, so it is a mistake to exclude vetted, qualified candidates because of their source” (SHRM Urges Second Chances, 2019).

While the aforementioned review outlines some promising intentions, the state of employing ex-convicts continues to remain bleak without some national intervention and employer policy changes. As many as 75% of ex-offenders are unable to find work and remain jobless one year after release. Herman (2019) affirms the same finding that his research revealed estimates of less than 25 percent ex-convicts able to successfully gain employment within the same timeframe.

Intentional intervention, both on the federal level and employer domain, remains key in successful transition from prison to release into mainstream society. As an example, when a correctional education program is in place, there is a 43 percent reduction in recidivism. On the federal legislative front, in an effort to reduce recidivism, the 2018 Congress enacted the *First Step Act* that provides for job training and other programs, expands early-release programs, and revised sentencing laws (SHRM Urges Second Chances, 2019). Other regulatory relief has come in the form of *Ban-the-Box Fair Chance Laws* that are now recognized in more than 150 cities and 34

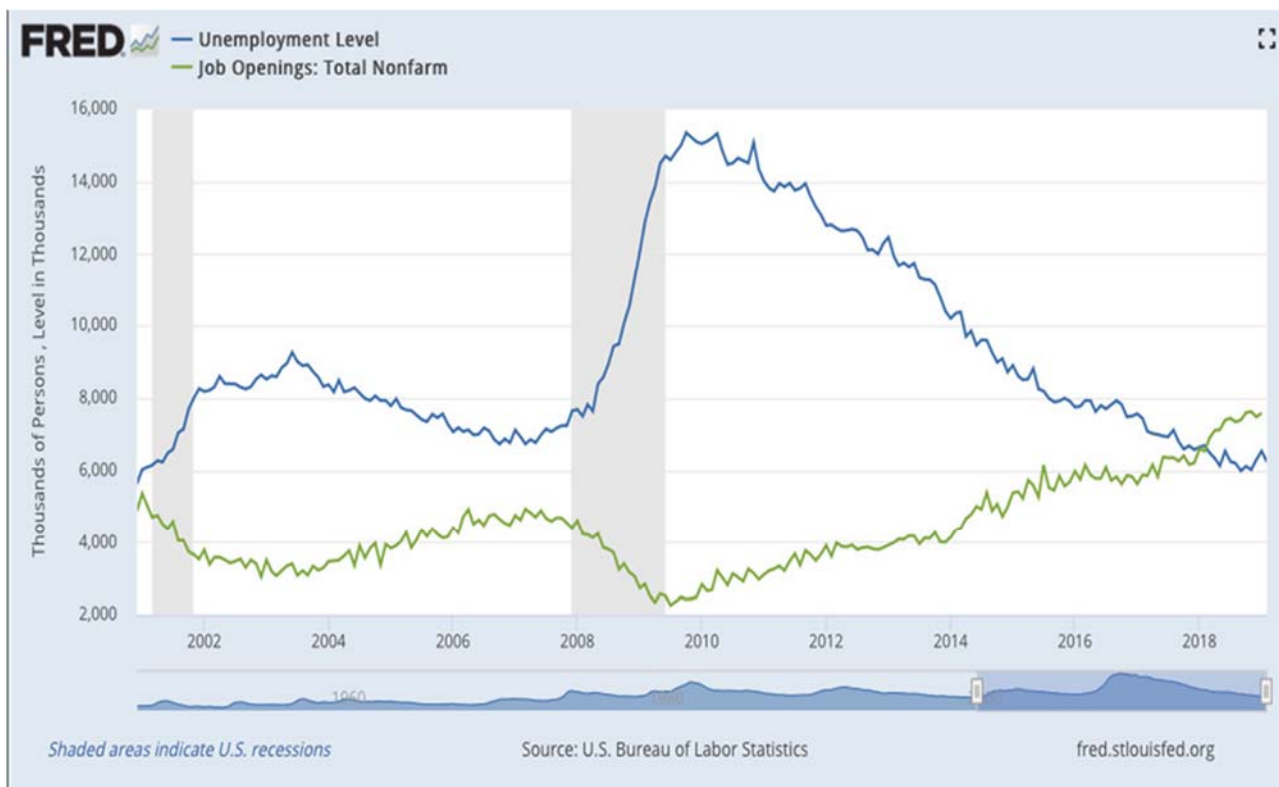


Figure 2—Bureau of Labor Statistics Trends in Unemployment Levels and Job Openings

states (Von Bergen & Bressler, 2016; Maurer, 2019). Subscribing to ban-the-box, Walmart, the nation’s largest employer, removed criminal history questions from its job application a decade ago. The removal does not eliminate the background check, but it offers those who have been previously convicted of a job-related crime a chance to get their foot in the door. The company adopted a supporting process to this new policy in which a candidate can, if they choose to, submit additional information to have their individual circumstances reviewed. Following a similar path, Facebook, Google, and Koch Industries publicly announced their plans in 2016 to consider hiring individuals with criminal records as evidence of support to President Obama’s Fair Chance Pledge (Alsever, 2018). While there have been new adopters of a more liberal hiring stance of ex-convicts, other companies, such as Handy Home Products, has hired both skilled and unskilled workers for their workforce since the late 1990s. As a result, they found that turnover was reduced 60-70%, company temporary labor cost was lowered by \$200,000 annually, and an annual Work Opportunity Tax Credit of \$50,000 was earned (Hiring Social Outcasts, 2001).

The link between having a job and staying out of jail is strong among those who have gone to school, are undergoing training, have received mentorship, or have held jobs through a return-to-work program. The recidivism rate for this group is generally less than 5%, while the national five-year rate of recidivism is approximately 75% for those released from state prison, according to the U.S. Department of Justice.

Revisiting the Problem and Solution: Employing Ex-Offenders as a Solution to the Labor Shortage in the U.S.

The labor shortage problem is clear. However, there is not one definitive answer to solve it; rather a combination of innovative approaches that requires unconventional thinking and broadens our perspective on what is possible when we explore solving more than one problem with multiple solutions. For the two previous decades, the employment landscape has brought higher levels of job seekers than job openings, but a reversing trend over the past year has yielded more job vacancies than job seekers. In March 2019, the U.S. Department of Labor reported 6.5 million workers sought to fill 7.6 million job openings reflecting a bulging delta between supply and demand of labor needed. To elevate concerns, according to the research and projections, this swing is expected to worsen (Campbell, 2019). Job numbers from the Bureau of Labor Statistics in April 2019 reaffirmed this ongoing trend with jobless rates reaching full employment.

At the forefront of finding relevant solutions for today’s labor shortage of over one million unfilled skilled and non-skilled jobs is finding new sources of untapped labor pools. While immigration will continue to augment labor force needs and a continued focus on employer’s attracting and retaining Millennials and Generation Z job candidates, other underutilized pools, such as ex-convicts, continue to lack attention and necessitate examination for how they can be utilized in the workplace. This offers

a real opportunity to change the trajectory of the labor shortage, while also breaking the offender chain by putting this group of worker prospects who want to contribute to society back to work.

An Alabama Case Study: Working to Provide a Corrections Solution through Prisoner Re-Entry Programs and the Employment of Ex-Offenders

Recently, the United States Justice Department found that “Alabama prisons are so dangerous [due to overcrowding and growing suicide rates] that there is reasonable cause to believe that the State is in violation of the U.S. Constitution” (Cason, 2019, para 2). While this statement presents an alarming narrative, the reality emerges that prisons are filled with reoffenders who, in many cases due to lack of ability to find work, live in poverty, rely on public assistance provided through taxpayer dollars, and have a propensity to re-offend in due to lack of social support, effective role models, and an inability to provide for themselves and their families. It becomes a vicious cycle, yet actionable steps could be taken to break this chain.

While there has been limited employer efforts to reemploy offenders in Alabama, the *West Alabama Works Prisoner Re-Entry Ready to Work Initiative* offers one solution in its collaboration with LifeLink CORE to specifically target the offender population leading to their successful re-entry into the workplace. Under this program, Alabama businesses are developing and deploying integrated technology and initiatives to get ex-convicts back to work. In the Auburn Research Park, located on the Auburn University campus, UnicusID, Inc. is offering a corrections and court-supervised release solution with mobile biometric identification, tracking, mapping, and reporting.

Comparably in Georgia, UnicusID’s Shepherd System is currently being used in judicial diversion (as an alternative to jail) allowing a judge to release an offender under supervision while being able to authenticate the offender’s identification and location, set “no-go zones,” allow the victim third-party access to the offender’s location, and determine the offender’s compliance with the judge’s order, all from the comfort of a computer screen. The Shepherd System merely requires the offender to have a compatible mobile device with which they can check in by simply looking at the screen when prompted and allowing the offender to go to work, to church, be with family, and not be confined in a prison cell or being required to wear an undignified and undependable ankle shackle. Company founder Patrick Taylor described the Shepherd System as “a technology revolution in evidence-based offender re-entry programs, and court supervised release, with unlimited future functional upgrades to the Shepherd System as mobile device technology continues to advance.”

According to UnicusID integration specialist Brian Thomas, “If the Alabama Pardons and Paroles Board was currently using the system, it could literally track thousands of parolees by location and compliance from its central office.” The UnicusID Shepherd System allows for a true collaboration of judges, correction officers, the faith-based community, nonprofits, industrial partners and trainers, educators, and drug testing and treatment providers, to holistically support the offenders who are motivated to change and truly want a second chance. Verified accountability has proven to be the linchpin of successful parole and judicial supervision, as much as ensuring that the

offender is regularly around pro-social faces and places, while also remaining drug free.

By employment of such a supporting infrastructure, there is a higher degree of facilitating the hire of ex-convicts. It is suggested to be optimally successful, real solutions must include collaborative business and corrections community solutions such as this.

Summary

Solving Labor Shortages through Intentional Intervention and Strategies

The labor shortage problem is clear, but the critical path lies in the concerted and intentional focus on returning ex-convicts to work, where possible. The Bureau of Labor Statistics has indicated that ex-cons are three times more likely to recidivate if they are unemployed. One student found that almost 90% of parole and probation violators were unemployed at the time of arrest (Lichenberger, 2006). Also conversely supporting this proposition, the United States Department of Justice found that 93% of ex-offenders that were able to find gainful employment during the entirety of their release were able to successfully reintegrate back into society and were never re-incarcerated.

Intentional intervention, both on the federal level and employer domain, remains key in successful transition from prison to release into mainstream society. With these aforementioned considerations, clearly identified challenges, alternatives to consider, and described approaches, organizations have the opportunity to utilize this population of workers to solve not only their labor shortage, but enable this group to make important contributions to productivity and high impact deliverables in the workplace, as well as create a better quality of life for themselves, their families, and their communities.

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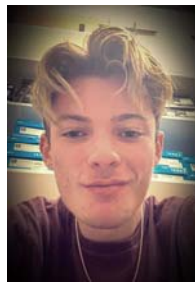


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