MAKE-MAKE TRUCKING

FINANCIAL IMPACT OF SLEEP DEPRIVATION

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EXECUTIVE SUMMARY

Make-Make Trucking has 5,200 trucking drivers and transports materials country wide in their trucks. Sleep deprivation has shown to be a serious threat to our company leaving us susceptible to liability in lawsuits, high mortality amongst our drivers, and close to $411 billion worth of destruction. Our purpose is to give Make-Make Trucking solutions to help decrease sleep deprivation and increase the productivity of our drivers.

Summary of Key Findings

The combination of: technology solutions, administrative solutions, and cognitive test solutions will address the sleep deprivation problem in the trucking industry. The technology solution is to provide truck drivers with SmartCaps, the SmartCap has the following components:

- **Ease of Use:** The SmartCap fits easily in hats, making it easy for drivers to access while being comfortable.
- **Cost:** The SmartCap costs $200 per band.
- **Benefit:** The SmartCap takes real time data of truck drivers, which detects and prevents drivers from falling asleep at the wheel.

The administrative solution is to provide training to create knowledge and awareness, best practices, and tools to overcome sleep deprivation. The training program has the following components:

- **Ease of Use:** The training platform will be online to compensate for truck drivers being on the road.
- **Credibility:** Drivers will be tested on the training to determine the retention of the training and make sure it was understood.
- **Benefit:** The training program will provide drivers with the tools to fix any sleep deprivation problems.
- **Cost:** The online platform of training is a cost-effective way to implement effective training.

The cognitive solution is to perform testing that measures reaction times and motor functions on truck drivers. The cognitive test has the following elements:

- **Time-Frame:** The cognitive tests would be taken every 8 hours of driving.
- **Benefit:** The test prevents drivers from driving while not being fully capable.
- **Efficiency:** The test can be completed in a few minutes.

Summary of Recommendations

Make-Make has the opportunity to combat sleep deprivation in our truck drivers by utilizing solutions consisting of technological and administrative components. Listed below are our summarized recommendations based on the research we have done:

1. Create a plan to implement 1,000 SmartCaps per year for the next five years.
2. Execute a company-wide mandate requiring our truck drivers take cognitive tests after every eight hours of driving.
3. Implement a training program on the importance of healthy sleeping habits.

INTRODUCTION

Make-Make Trucking is a large, long distance, general freight trucking industry that ships materials across the United States. There are currently 5200 drivers who work for Make-Make trucking, creating many opportunities for Make-Make to suffer a loss due to driver sleep deprivation. Sleep deprivation can lead to driving accidents, truck damage, driver mortality, and overall financial risk among the company.

In the following report, we will discuss possible solutions to combat sleep deprivation. Some of the solutions include wearable monitors, cognitive tests, passive information, sleep deprivation instruction, and that hiring of professionals. If Make-Make does not work on combating sleep deprivation among its drivers, it leaves the company vulnerable to $411 billion worth of destruction to property that Make-Make would have to recover.

Purpose

Laid out in the report is detailed research about the effects sleep deprivation has to the health of our drivers and the company overall. There are multiple solutions explored in the report that include both technological and administrative solutions for sleep deprivation. Each of these solutions have been researched and identified if they were feasible options for our company, as well as the possible risks and challenges associated with those options. We then took the conclusions and created a recommendation detailing how to carry out the three most feasible conclusions.

Background

Make-Make Trucking is a general freight, long-distance, trucking company that ships materials across the United States. With over 18,000 employees and 5,200 drivers, it is our company's responsibility to make our employees' health and company's well-being a priority. Sleep deprivation is an issue that causes harm to our drivers, increasing driver mortality and overall unhealthy habits. Accidents that are caused by our drivers who are sleep deprived exposes the company to risk of major lawsuit and high costs in destruction costs. These consequences can be detrimental to Make-Make Trucking and has the potential to lead to the end of Make-Make Trucking.

Scope

The following report covers many different areas related to sleep deprivation and the effects on truck drivers. We will touch on the specific role sleep deprivation plays in the trucking industry as well as possible solutions. These solutions will focus on the following topics: technology, administrative and scheduling. We will look in to the benefits as well as possible limitations in

order to fully understand whether or not each solution would both fix our sleep deprivation problem and fit in to our monetary and time budgets.

Methods

We used the following databases to help us with our research:

Academic Search Complete. This database provided full text versions of publications in many different backgrounds and disciplines. When searching for certain topics on this database, we used keywords to narrow down and find specific information. However, we also focused on the broad background of our topic to find even more information. We used this database to learn about the background of sleep deprivation and the impact of sleep deprivation on the trucking industry.

Business Source Complete. There are many sources we used from this database such as articles from scholarly business journals. We found how sleep deprivation is impacting other companies and how other companies are resolving their problems related to sleep deprivation. We utilized these successes to model our own solutions.

Mergent Intellect. Multiple references were found with this database that were private and public international business data, industry news, facts, figures, and industry profiles. It was helpful to know about other companies' policies and technological uses as it relates to sleep deprivation.

Criteria

In able to recommend viable solutions, we evaluated our solutions based on certain criteria. The following criteria measured the feasibility of our solution options:

- **Ease of Use:** Can any truck driver utilize this solution with ease?
- **Efficiency:** Is the solution a quick process for the truck drivers so it doesn't take too much time away from work?
- **Cost:** Is the solution affordable?
- **Effectiveness:** Does the solution fix the problem of sleep deprivation and increase productivity?

PROBLEM

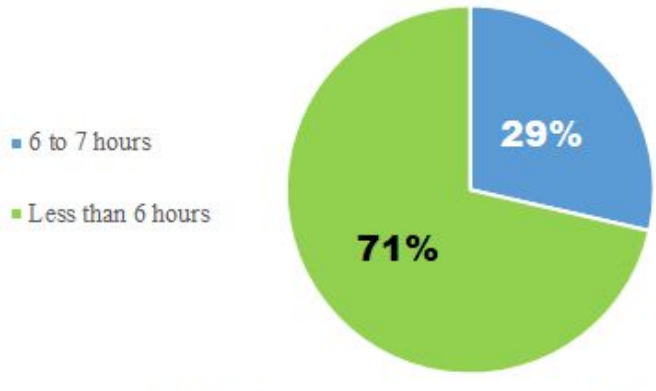
The trucking industry requires employees to drive for long periods of time to deliver products on time. Long periods of driving can create distorted sleeping schedules which results in sleep deprived truck drivers. Our company, Make-Make Trucking, became aware of The Rand Corporation's published study, "Why Sleep Matters - the economic costs of insufficient sleep: A cross-country comparative analysis", to discover the adverse impact that sleep deprivation has on the American economy (Hafner, Stepanek, Taylor, Troxel, & Stolk, 2016). With Make-Make Trucking employing thousands of drivers across the United States, we know that there is a need for change to ensure ultimate safety as well as reduce the financial impact sleep deprivation has on our industry.

Risk of Mortality

In the past, Make-Make Trucking has had employees perform their jobs while being sleep deprived. This decision has not only financially impacted our business but the lives of our employees as well. The Rand Corporation's "Why Sleep Matters" gives detailed information on how people who sleep less have a larger risk of mortality than those who sleep more. With the amount of risk and liability sleep deprivation holds on Make- Make Trucking, we must implement new ideas to reduce the factors that create insufficient sleep and solve this issue.

The risk of mortality with night-time sleep for different sleeping amounts is shown in Figure 1 below.

Figure 1: Mortality Risk for Different Sleep Patterns with Night-time Sleep



Source: Why sleep matters - the economic costs of insufficent sleep (2016)
Designer: Abbigail Roemer

The Rand Corporation's study of "Why Sleep Matters" reports an entire section on how sleep deprivation can create a larger risk of mortality. Figure 1 shows the condensed data of Hafner,

Stepanek, Taylor, Troxel, and Stolk (2016) explaining "the relative all-cause mortality risks for different short-sleep categories, under different types of sleep measured and follow-up periods" (p. 55). To further detail, the pervious pie chart examines the percentage of death possibility when having different amounts of sleep when sleeping at night time. The blue section of six to seven hours of sleep calculates to twenty-nine percent chance of mortality. While the section of less than 6 hours that is blue totals to seventy-one percent probability of fatality. These numbers alone show the impact that sleep deprivation could potentially cause our employees at Make-Make Trucking and to the entire trucking industry.

Financial Impact

In Cabinet Maker's article section of "New research finds lack of sleep costs UK £40fn", it speaks of the Rand Article's findings and discusses numbers of loss that are beyond astonishing.

United Kingdom massive loss of:

- Over 200,000 working days in a year
- Over 1.5 million hours
- £46bn

United States of America facing destructions up to:

- $411 billion a year
- Gross domestic product settling at 2.28%

The fiscal significance sleep deprivation has on the US economy, let alone the world, puts our problems at Make-Make into clear view. The monetary damage from sleep loss that we hold could threaten our business, company structure, and most of all our employees. We have come together to explore several options for a solution to this issue as well as investigate the feasibility of each solution to reach the overall goal of reducing the financial impact of sleep deprivation on Make-Make Trucking.

TECHNOLOGY SOLUTIONS

Technology can be a huge tool used to combat sleep deprivation in truck drivers. As technology continues to evolve and transform the way we go about our daily lives, we can begin incorporating it to better ensure the lives of our truckers as well as other drivers on the roads.

Electroencephalography

Electroencephalography (EEG) technology can monitor brain activity by recording the electric pulses the brain creates. The SmartCap headband could prevent fatal and nonfatal accidents and ensure drivers are well-rested and productive.

Specifications

A SmartCap monitors the wearer's fatigue levels (Lavenduski, 2016). This will allow Make-Make Trucking to know immediately when a driver's fatigue levels are too high and contact the driver before damage is caused.

Capabilities. Because of EEG's high temporal resolution, an alert could be issued within a millisecond of when a driver begins to fall asleep (Gazzaniga, Ivry, & Mangun, 2014).

Feasibility. The SmartCap fits under a baseball cap and communicates with an app utilized by managers to determine when a driver needs a break. A potential issue to implementing the SmartCap is getting the truck drivers to wear the EEG device. However, due to the flexibility of the device, it could fit into the driver's favorite cap. It would be easy to know when a driver is not wearing the SmartCap due to the accessibility of the real-time data.

Cost. Additionally, the SmartCap costs approximately $200 per headband. While this may seem expensive, the benefits far outweigh the cost. (Lavenduski, 2016).

Global Positioning Systems

Other trucking companies have started utilizing Global Positioning Systems (GPS) to monitor poor driving habits and dangerous activities employees perform while behind the wheel.

NexTraq

Tredroc Tire Services has implemented a GPS fleet tracking system created by NexTraq that produces a Driver Safety Scorecard (Fleet Owner, 2017). Through the NexTraq system, Tredroc has been able to decrease unsafe driving habits while increasing productivity. For instance, management may re-route a driver if there is a potential slow-down on the current route.

Cost. Implementing and maintaining a fleet optimization system like NexTraq can be expensive, but it has been shown to improve productivity and would allow Make-Make Trucking to prevent employees from driving recklessly.

Driver-Facing Cameras

Other trucking companies have started to implement driver-facing cameras. These companies have recently come under fire on social media for drivers' privacy concerns. For instance, Swift Transportation has made statements asserting that the safety of their employees and the money saved on liability outweighs the cost of employee privacy.

Pros

The following are positive findings associated with driver-facing cameras:

- People subconsciously improve their behavior in response to being watched (Montpetit, 2017).
- Buzzuto observed a 22% decrease in accidents after implementing a camera system (Morris, 2015).
- Cameras could decrease frequency of accidents, and thus decrease company liability costs.

Cons

The following are negative findings associated with driver-facing camera:

- Drivers view front-facing cameras as an invasion of privacy.
- Drivers could become distracted by the camera, hindering their driving performance.
- If the driver is at fault for a collision, there would be indisputable evidence and the company would then be liable for damages.

Compromising with Employees

There are, however, a couple options to avoid infringement of truckers' privacy rights.

Motion-Sensor Cameras. The motion-sensor cameras would store footage including a few seconds before and a few seconds after the event of a swerve, a hard turn, or a sudden stop. This option would likely be more expensive, but will serve as incentive for employees to drive safer.

Off-Duty Camera Deactivation. With this system, drivers would be required to have the camera recording during active work hours. This would allow drivers to turn off the camera during times the truck is parked and they are going about their own business.

Challenges. This may challenge Make-Make in the regulation of the program, being that executives would have to rely on drivers to follow the guidelines of when to activate the camera. A trucker may boycott the program by deliberately keeping the camera off during active hours, or the driver may simply forget to turn the camera back on after inactive hours. When considering implementation of a front-facing camera system in the trucking company, Make-Make must weigh the cost of drivers' privacy concerns against the benefits of safety and reduction in liability costs.

Heart Rate Monitors

It is common knowledge that heart rate monitors on fitness trackers are an accurate way of tracking sleep patterns. For example, a recent study has shown that Apple fitness watches are sensitive enough to detect sleep-related disorders such as sleep apnea (Tison et al., 2017). Due to the capabilities of the heart rate monitors it is likely that we could also track other sleep-related disorders including sleep deprivation.

The market is currently saturated with lightweight heart rate monitors like:

- FitBits
- Apple Watches
- Polar Global Watches.

While these fitness trackers tend to be expensive (about $250 on average) and have numerous features, Make-Make could easily find a developer to create a simpler heart rate monitor for the company's needs. For example, Make-Make could collaborate with a manufacturer like Garmin to ensure the existence of necessary features like low heart rate alerts when a driver is falling asleep. The Garmin vívofit is a basic activity tracker that costs $100; a similar model could be utilized for Make-Make's purposes, keeping the cost of the product low.

Eye Tracking Technology

Eye tracking technology allows a company to track the facial and eye movements of truck drivers. It can even track the different expressions truck drivers make that can determine sleep deprivation.

The Guardian System from Seeing Machines is one of the best eye tracking technologies out there for commercial use by truck drivers. ("Fleet/Guardian," n.d.).

Characteristics

The Guardian System is a multi-step safe guard against driving while tired. It contains:

- An in-cab sensor

- An in-cab alarm system, complete with seat vibrations and alarm sounds.
- The ability to send all data to be analyzed by the safeguard center.
- The ability to use the analyzed data to come up with a plan.

Benefits

This is a very extensive solution that could have many added benefits for our company moving forward as we attempt to eliminate sleep deprivation in our truck drivers. The benefits of the Guardian System are:

- It contains sensors and alarms that will alert our drivers of possible sleep deprivation.
- It allows us to look at the data and draw conclusions from it.
- It gives our employees the peace of mind knowing that we are doing all we can to protect their well-being.
- It helps eliminate non-fatal and fatal accidents related to sleep deprivation.
- It can detect employees who are using their phones while driving.

Limitations

There are some limitations that have come with our research of this product. Due to our exploratory stage at this time we are unable to:

- Get the exact price of this technology. We can estimate it would cost +$10,000 per truck.
- Determine the exact amount of time it would take for installation and how that would affect our productivity and revenue.

Wake Buddy

The Wake Buddy (“Preventing Sleep Deprived," n.d.) was thought of by a former truck driver, Howard Fields, who was forced in to early retirement due to a sleep related accident he was in. His idea centers around technology that utilizes grip sensors and the pressure of a truck driver’s grasp on the steering wheel. When a driver succumbs to sleep deprived symptoms, they begin to loosen their grip on the steering wheel. In order to prevent such things, the Wake Buddy would sound an alarm to alert the driver that they were not applying enough pressure to the steering wheel.

Benefits

The benefits that could come from the Wake Buddy are:

- It detects the early stages of sleep deprivation.
- It is less extensive and intrusive.
- It is a less expensive technological solution.

Limitations

While this piece of technology could prove very advantageous for our company, at this time the technology is unavailable. The Wake Buddy is in the early development stage and we have no way of knowing when or even if this product will become an actual product for commercial use.

There are also questions we have regarding the Wake Buddy concept. Questions such as:

- Would this technology require sensors being placed on our truck's steering wheels, or would we need new steering wheels installed that contain built-in sensors?
- What does the installation time look like per truck?
- What would the cost of this product be?

Cognitive Tests

Requiring our truck drivers to take cognitive tests after so many hours will allow us to track cognitive functions as well as monitor whether or not they should continue to drive.

Quantified Mind provides numerous cognitive tests that help determine brain functions. These tests consist of topics such as: reaction times and motor functions. ("WHAT MAKES YOU," n.d.). These two categories are directly affected by whether or not a person is sleep deprived. In fact, Killgore (n.d.) stated, "…there is broad consensus that insufficient sleep leads to a general slowing of response speed and increased variability in performance, particularly for simple measures of alertness, attention and vigilance…" (p.1). It has been proven that mental capability drastically reduces the longer a person goes without sleep.

Application Example

Let's say that every eight hours of driving we require our truck drivers to take one of these cognitive tests online. These tests from Quantified Mind would measure response times and motor functions. If they were to pass they could continue driving, if not then they would be required to take a mandatory break. It is important to note we decided on eight hours due to the fact that eight hours is the typical work day in America.

Benefits

This solution can be beneficial for us in a few different ways. We can:

- Prevent any sleep related incidents if we determine our truck drivers do not have the cognitive capability to continue driving.

- Begin to understand the correlation between driving for so many hours and the effects it can have on cognitive functions as it pertains to our truck drivers.

There are also many other positives that come along with this solution. Some of them include:

- The price of the product. The tests themselves are free, but do require internet access. For this reason, we have decided to reimburse our employees for the data usage on their smart phones. If we determine they have been taking these tests they would receive $30 to put towards their cell phone bills each month.
- The amount of time needed per test. You only need a few minutes to complete each test, so it would not require a lot of time from our truck drivers.

Downfall

There is one major downfall to this solution. Initially we would need to have our truck drivers take a base test in order to determine their cognitive capabilities. This may lead some truck drivers to feel uncomfortable or like we are over stepping our bounds. We would not want to alienate anyone and make them feel like we are requiring a “how smart are you test” in order for them to do their jobs. In order to combat this, we would need to clearly state and instruct our employees of our intentions.

ADMINISTRATIVE SOLUTIONS

Sean Kilcarr (2016), says companies who have employees that recognizes how and what they do impact them are important. This idea is correlated with truck drivers being able to recognize when they are sleep deprived, and if they do not recognize it readily, having consistent reminders. Hafner, Stepanek, Taylor, Troxel, and Stolk (2016) state that it is important for employers to identify sleeping issues. To keep both employers and employee's informed, Make-Make Trucking can create awareness about sleep deprivation through training sessions, posters, and reminder memos.

Incorporate Awareness into Training

Like most jobs, training is essential to developing employees to perform at the organizations performance levels. Incorporating awareness & best practices in training sessions for Make-Make Trucking can help reduce sleep deprivation for truck drivers. The awareness combined with the best practices give truck drivers direction, knowledge, and the tools to effectively tackle sleep deprivation. Make-Make Trucking can tackle these training sessions as part of the sleep deprivation cure. Darshan Shetty and Natalie Bartos (2013) state that change management through projects emphasize the importance of training. The change in this case is for Make-Make Trucking to conduct these training sessions with importance and the right resources. Kirkpatrick (2010) says there are three important steps to training effectiveness:

- Have the end goal as the focus;
- Provide the proper resources for training/performance; and
- Have learning be tactical.

A few downfalls to training are cost, time requirements, and qualifications. The cost of training can often be high, but if the online platform is utilized the costs can be reduced. The online platform also allows for flexible time requirements, especially since many employees will be on the road. In another article, Kilcarr (2017), uses Jane Jazrawy's idea of having a healthy mix of online and interactive (in-person) training sessions. Jane Jazrawy is the CEO of a Canada based trucking company, and she has provided Kilcarr (2017) with four tips of online training for trucking companies:

- Understand what you want the employees to learn;
- Do not over-train;
- Use visuals and hands-on practice; and
- Test on the knowledge gained

Figure 2, below, shows some of the advantages and disadvantages of online and in-person training:

Figure 2: Online Training vs. In-person Training

Instructor-led Advantages	Instructor-led Disadvantages	Online Advantages	Online Disadvantages
High in Richness	High Cost	Cost Efficient	Easily Lose Focus
More Engaged	Inconsistent	Flexible	Technology Reliant
Learn from others	Time Away from Work	Referable Documentation	Cheating

Source: Fundamentals of Human Resource Management (2017)
Designer: Quentin Laesch

There are several advantages and disadvantages to both online and in-person training. Upon completion of the training, drivers will be required to pass a test that covers the information from the training. Taking these considerations in mind, training is a viable solution to address the problem of sleep deprivation.

Posters & Memos

Other forms of creating awareness, such as posters or memos, are cheap and quick forms of communication. The administration team at Make-Make Trucking can spread these documents around their buildings and with their drivers. Another possibility is to spread these documents throughout various truck stops that are frequently visited. Both posters and memos are effective in certain areas, but they are not the sole solution. Derek Bloom (2000) adds the idea of mixing posters with frequent contact, since posters alone are not enough to get the message across. The combination of spreading these documents and contact with our employees, Make-Make Trucking's administration team can resolve the issue of sleep deprivation. These posters can mention sleep deprivation directly or correlate it with health concerns from sleep deprivation. A downfall to these forms of communication is that they can often be overlooked.

Sleep Incentives & Workplace Changes

Another solution to increase productivity could be introducing a project that pays drivers to get a good night's sleep. Hafner (2016), says Derek Silverberg, a business reporter, published an

article about Aetna, an insurance company that pays employees to get a good night's sleep. This option gives both intrinsic and extrinsic motivation for the drivers. Extrinsic because they get paid to sleep, and intrinsic because it is good for their health. This idea will create expenditures for the Make-Make Trucking, but the results can increase productivity, which can produce better results than the initial investment. Make-Make Trucking can also make changes to workplace environment, such as brighter lighting and better-quality sleeping amenities (rest stops, truck beds, healthier vending machines, exercise facilities, etc.).

Limitations

Within the administrative section there are a couple of limitations with the price range to support our findings.

Training Program. Training costs for a nation-wide trucking company vary greatly, which restricts the price range for Make-Make Trucking.

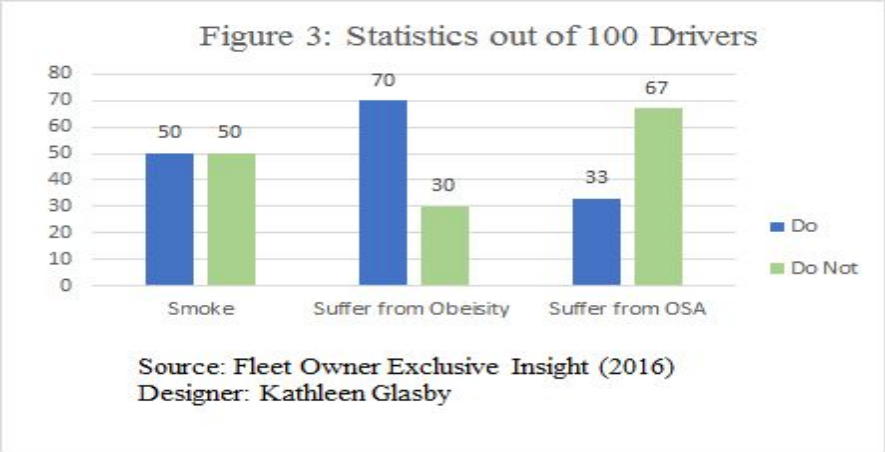
Posters & Memos. Costs associated with the spreading of documentation depends on the extent and reach that Make-Make Trucking wants to go to.

Getting Better Quality Sleep

Sleep apnea is “a serious sleep disorder that causes interruptions of breathing during sleep” (Kilcarr, 2016). With regards to the trucking industry obstructive sleep apnea is present in almost 30% of all truck drivers, causing them to get unproductive sleeping increasing risk of alertness and performance in the daytime. The causes of obstructive sleep apnea (OSA) include the driver:

- Being overweight
- Having a large neck or small airway
- Smoking
- Having high blood pressure
- Having diabetes

Below is Figure 3 which shows the number of drivers with the various symptoms of obstructive sleep apnea:



When looking at the statistics, the causes of sleep apnea are highly present among long distant truck drives; "70% of drivers are morbidly obese, more than 50% smoke, and nearly a third suffer from sleep apnea. A fatigued driver may have as much as a 50% decrease in judgment and decision-making skills, along with a 75% decrease in the ability to pay attention" (Kilcarr, 2016).

Hiring a dietitian

Dietitians are "experts in the use of food and nutrition to promote health and manage disease. They advise people on what to eat in order to lead a healthy lifestyle or achieve a specific health-related goal" (Bureau of Labor Statistics, 2017). More specifically a dietitian:

- Creates materials to better educate about healthy food choices
- Promote health through speaking to groups about diet, nutrition, and good eating habits to prevent diseases.
- Create and change meal plans to increase effectiveness and tailor them to meet the needs of the client.
- Asses patients' health and nutritional needs.

Hiring a dietitian helps with three of the six causes of sleep apnea. A dietitian would help to regulate: weight, dealing with obesity, high blood pressure, and diabetes. The average salary of a dietitian is $58,920, meaning if we were to hire two, combating the high number of drivers in our company it would average to be $117,840 increased cost to salaries but save us on productivity.

Hiring a dietitian could cause distant or distrust among drivers. Drivers may believe that the company does not believe that the drivers can take care of themselves properly. Another issue that may arise is that the drivers will not follow the new diet plans and health options that are suggested by the dietitian.

Sleep Environment

An alternative strategy for decreasing drivers' sleep deprivation is to increase quality of sleep by creating a better sleeping environment.

Specifications

To achieve this goal, Make-Make can provide high quality pillows, mattresses, and blankets.

Feasibility. The company may either pay for these products in full or encourage employees to buy the products with a company-issued partial stipend or coupon.

Qualifications. According to Dwyer (2014), a "good" mattress should relieve joint pain and increase blood circulation. These factors are even more important for truckers, who typically sit in one position all day (and often through the night).

The driver's sleep environment would be more comfortable with a:

- Box spring mattress
- Memory foam pillow with firm and soft sides, cooling gel, hypoallergenic material, etc.

Even if a trucker cannot get enough hours of sleep due to their schedule, the quality of their sleep will at least somewhat make up for it.

Circadian Rhythm. Another way to reach this goal is implementing a set schedule for drives with specific wake-up and sleep times. A person's circadian rhythm is properly maintained through keeping a set sleep schedule with no added naps (Stewart & Marcellin, 2012). If Make-Make's drivers were to maintain a regimented plan for which hours of the day will be active (devoted to work) and which hours will be devoted to sleep, their circadian rhythms would be less disrupted. This would improve the quality of their sleep and increase feelings of wakefulness, which would in turn increase productivity and alertness while they drive.

SCHEDULING

A driver's schedule is closely related to sleep deprivation. Therefore, governments regulate driving time to prevent this problem. Since the late 1930's, the federal government regulated driving hours for the long-haul truck drivers and currently the Federal Motor Carrier Safety Administration (FMCSA) has the regulatory authority.

Late 1930's: The first law

Payroll Managers Letter (2007) shows that the regulations were:

- A total of 10 hours of driving without a break in a day,
- Drivers drive less than 10 hours without a break, they cannot drive more than 15 hours in a day,
- To restart their 10-hour and 15-hour requirements, drivers need to take constant 8-hour breaks,
- For break in the sleeper berth, the law requires at least two hours of breaks for drivers,
- Drivers can drive 60 hours in the prior seven days.

Try to change the law

The drivers came up with new technologies and improvement of trucks' functions which help driver's driving in worse conditions. Thus, Payroll Managers Letter (2007) shows that in 2003, the FMCSA revised regulations and the revised regulations were:

- Increase daily driving hours from 10 hours to 11hours,
- Decrease daily on-duty hours from 15 hours to 14 hours,
- Increase daily off-duty requirements hours from 8 hours to 10 hours,
- Keep the sleeper berth requirements that at least two constant hours of breaks,
- Keep 60 hours weekly on-duty hours, but 34 hours of consecutive off-duty hours to restart the 60 hour weekly on-duty hours.

Rejected from the U.S. Court of Appeals

Refrigerated Transporter (2009) reports that the FMCSA Administrator John Hill said that the fatalities in truck accidents declined 5,240 to 4,808 between 2005 and 2007. Also, Hill said that only one driver died in an accident because of that driver drove 11 hours in one day. However, the U.S. Court of Appeals blocked to change the FMCSA's new regulations. The court determined that the FMCSA did not provide the clear explanations of this methodology's critical elements, so FMCSA needed to provide better explanations for 11 hours driving and 34 hours restart provisions to change the driving hours requirement.

Challenges

For scheduling, the law has remained the same since the late 1930's, so we just need to stick with these regulations and assign schedules to our drivers to prevent sleep deprivation. We have better technology and newer trucks to protect our drivers from sleep deprivation, but it cannot perfectly prevent sleep deprivation in our truck drivers. Moreover, we cannot push our drivers to follow company made schedules while they drive a truck because all drivers have different time management methods for their driving. For instance, one driver could prefer driving for 5 hours and take a 30-minute break, but if we say that you need to drive 8 hours straight and have a 2-hour break because that is our company's policy. For drivers, that is not only a big pressure from the company, but also can lead to an accident because of the different time managements.

CONCLUSIONS

The Make-Make Trucking team has listed the conclusions below resulting from our findings:

1. Utilizing the SmartCap headband is one of the solutions that has the most benefit when compared to cost per employee. Each headband costs about $200 and can almost instantaneously alert management if a driver is fatigued. This option also allows the wearer to fit the headband into their favorite headwear, and thus decreasing any uncomfortably of wearing the smart headband.

2. The Wake Buddy is not feasible at this time. There are too many questions regarding the concept. We do not know whether or not the Wake Buddy will ever enter production and that directly affects whether we know if this product will fit in to our monetary and time budgets.

3. Implementing a company-wide mandate requiring our truck drivers to take cognitive tests from Quantified Mind every eight hours is something that could benefit our company. This solution is a low-cost, easy way to combat sleep deprivation.

4. Implementing a company-wide training program to create knowledge and awareness, teach best practices, and provide tools to overcome sleep deprivation. Make-Make Trucking can incorporate this training in addition to any training drivers already go through, or mandate it online to compensate for drivers being on the road. Additional company-wide training is a feasible option with low-to-medium costs associated with it.

5. Hiring a dietician will allow for our employees to have a proper regulated diet and to live a healthier lifestyle. It would cost an additional $58,920 in salaries per year, but hiring dieticians would give the ability to greatly increase the quality of sleep that Make-Make's drivers would gain at night. This is a feasible option although it comes with risks. There are no guarantees that the drivers would follow the expertise given by the dietitians and that becoming healthier is a large part to do with personal accountability.

6. Scheduling is not related with financial losses from sleep deprivation because the law is very strict for the driver’s schedule. Even with the have better technologies and improved trucks, the U.S. Court of Appeal still wants to see more evidences that drivers can drive more hours per day and in a week. Therefore, as a company, we cannot do anything with the schedule.

RECOMMENDATIONS

From our extensive investigation and detailed analysis on the impact of sleep deprivation in the trucking industry, our team at Make-Make Trucking has developed the recommendations below for our organization to utilize.

1. **Create a plan to implement 1,000 SmartCaps per year for the next five years.** Purchase 1,000 SmartCap headbands and plan a training program for the 1,000 selected truck drivers. Each consecutive year purchase 1,000 more SmartCaps until all active drivers are equipped with a headband. The training plan should consist of correct usage and the importance of using the SmartCap to decrease sleep deprivation.

2. **Execute a company-wide mandate requiring our truck drivers to take cognitive tests after every eight hours of driving.** We would announce to our employees of this new mandate and instruct them of the reasoning behind it. It is important to make our employees aware that this is for their safety and not a judgment on their intelligence. Once we have done that we will show our employees how to access the Quantified Mind tests. Finally, we will make it known to our employees that we will be reimbursing them for the data required to take these tests on their personal smart phones. This reimbursement will come each month in the form of a $30 check to each employee after we have checked that they have been taking the cognitive tests.

3. **Implement a training program on the importance of healthy sleeping habits.** Make-Make Trucking will spread documentation to create awareness to the drivers of the training programs. Training sessions will take place at Make-Make Trucking facilities and will also be placed in an online format for drivers on the road. Drivers will be tested upon completion of the training.

APPENDIX A: REFERENCES

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