Weak Signals in American History: Applying Historical Events to Present Decisions in Business

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Abstract

Certain events in America's history can be utilized by today's business managers in order to make better decisions through the detection of weak signals. Weak signals are early indicators of an impending event or trend, and they are often difficult to detect (Medaris). The early detection and correct interpretation of these signals can have drastic effects. In cases such as Pearl Harbor and 9/11, there were numerous missed weak signals that preceded these tragic events. Had the weak signals preceding Pearl Harbor been correctly identified and assimilated, this great tragedy could have been prevented (Borch). It is not certain that the events of 9/11 could have been prevented, but officials missed a plethora of weak signals that they should have detected and utilized (Borch).

Business leaders can see from these events in American history the importance of signal detection. In today's world, decision makers are constantly receiving multitudes of information, and it is essential that individuals are able to recognize and interpret weak signals. Large companies tend to become complacent and do not actively seek out signals that could help them in the market; this is apparent through the invention of items such as diet soda by garage inventors rather than Coke or Pepsi (Coffman). It is easy to enter into a 'business-as-usual' mode and be lulled into complacency, but it is vital to maintain a proactive approach to signal detection in order to create a competitive advantage.

There are a number of steps companies can take to increase their signal detection. Organizations should promote a sense of mindfulness ("Becoming"). No one should discount something as unimportant or ignore things they do not understand, individuals should be willing to call on experts, employees should feel as though their ideas are important, and executives should encourage new ideas and risk-taking. Another specific tactic is rotating job positions or

moving employees to new locations in order to promote the use of new and expanded mental filters and models. This would result in increased signal detection. Companies must also have a system in place to effectively prioritize and utilize weak signals once detected.

Organizations can experience great success through the detection and interpretation of weak signals. Companies such as Starbucks are evidence of this. Signal detection can be a great source for competitive advantage, and today's companies should promote this theory as a crucial aspect of decision making. Signal detection is an example of how organizations can learn better practices by looking at history's lessons.

Introduction

The collapse of the subprime market was perhaps one of the biggest shocks in recent history. Its effects were widespread and devastating. Most of all, it seemed to catch virtually everyone by surprise, and it wreaked havoc on the market. The most intriguing part of this, though, is that the collapse did not, in fact, catch *everyone* by surprise. Hedge fund manager Kyle Bass predicted the subprime securitization crisis before anyone else. He conducted extensive research on the mortgage and securitization industries and said he discovered a ticking time bomb with the potential to explode at any moment ("Boom"). Bass drew this conclusion from his research on the relationship of housing prices to income, inventory of unsold homes, and the lack of mortgage industry regulation ("Boom"). This information was available to anyone who wanted to look for it, but Bass was one of the few people who chose to acknowledge the warning signs. In 2001, Edward Gramlich, a governor of the Federal Reserve, spoke of lenders convincing under-qualified buyers to take out mortgages that they could not afford to pay (Shoemaker). Gramlich, along with Sheila Blair of the Treasury Department, researched and discovered that approximately fifty percent of subprime mortgages were from poorly supervised and poorly regulated non-bank lenders ("Boom"). They attempted to get the Federal Reserve to increase the regulation of subprime lenders but to no avail ("Boom"). Gramlich also attempted to get the Fed examiners to investigate national bank mortgage lenders, but the Chairman Alan Greenspan did not heed these warnings (Andrews). In 2001, Blair tried to institute a code of "best practices" for subprime lenders, which would be verified by outside monitors; however, no lenders agreed (Andrews). Much of the market was built upon derivatives, which are financial instruments allowing investors to speculate on the future price of commodities or shares without buying the underlying investment ("Buffet"). In 2002, Warren Buffet insisted that these

complex financial instruments are time bombs that could harm buyers, sellers, and the entire economic system ("Buffet," Shoemaker). He even classified derivatives as "financial weapons of mass destruction" ("Buffet"). Also in 2002, Federal Reserve Chairman Alan Greenspan stated that the "extraordinary housing boom cannot continue indefinitely" ("Boom"). Nothing can continue to increase forever, and he knew that the market would eventually decline. Other warnings included the chief U.S. economist at Goldman-Sachs saying that home prices would decline in 2007, and the board of one Dutch bank foreseeing such problems in the near future that it sold itself (Shoemaker).

With all of these warning signs, one has to wonder why no one actually did anything to prevent the subprime collapse. The key financial players, such as Northern Rock, Countrywide, Bear Stearns, Lehman Brothers and Merrill Lynch simply ignored the warnings of danger from respected peers and financial analysts, but why (Shoemaker)? It is impossible to know for certain, but one possibility is that the decision makers within those institutions did not pick up on the "weak signals" that foretold of an inevitable collapse.

A weak signal can be classified as unstructured information, and it is difficult to understand at the time what its implications may be for an organization (Ilmoa). Weak signals can also be defined as "imprecise, early indicators of an impending important event or trend" (Medaris). A signal is simply "an event in which some living system or other element in the environment transmits a message in the course or as a result of its actions or behavior" (Coffman). This term has been used recently in organizational strategy literature, with a focus on proactive management to adapt to change.

Signal detection theory "holds that the detection of a stimulus depends on both the intensity of the stimulus and the physical and psychological state of the individual" ("Signal").

Signal detection theory explains how and why individuals perceive some signals and not others. This theory gave birth to the concept of "weak signals." Weak signals are essentially unclear observables that warn about the probability of future events. They can be found in nearly any aspect of life, and too often they go unnoticed. Missing weak signals can have disastrous effects, such as the collapse of the subprime market. Even when weak signals are noticed, it is of the utmost importance to correctly analyze and interpret them. Individuals are flooded with signals throughout the day, and these signals can be sorted into three main categories (Coffman).

The first category of signals encompasses those that are beyond an individual's perception. Most of these signals are transmitted on frequencies or across channels that individuals cannot access, for various reasons (Coffman). The second category of signals includes those that are able to be perceived but go unrecognized by mental models (Coffman). These are signals that are simply ignored for any number of reasons because individuals utilize models that filter out the majority of signals so they can focus on the ones that they think are important (Coffman). Lastly, signals can be classified as ones that people perceive, recognize, and utilize (Coffman). This is when signals become useful, but they unfortunately do not enter this category a large amount of the time.

Signal detection theory can be applied directly to the recent financial crisis. Though some people did pick up on the warning signs of the subprime collapse, none of the key financial players actually acted on the information others knew was present. Despite warnings from analysts and businessmen, most of the key financial players simply ignored the weak signals warning of a collapse; therefore; it was much worse than it needed to be. The observation and interpretation of weak signals can make an extreme difference in such situations. It is difficult to perceive which pieces of information are important and what every signal means. Even if those

in decision making roles had detected the warning signs, they might not have understood the implications of such signals. The unheeded warnings that preceded the subprime collapse are cogent examples of undetected or misinterpreted weak signals leading to disastrous consequences. Some of the darkest days in American history have been preceded by weak signals that could have provided warning had they been interpreted correctly. Today's managers and executives can also make better decisions with the detection of weak signals.

Today's decision makers are constantly receiving a multitude of information and signals. Many times, decision makers are under the impression that they can reduce their uncertainty by simply gathering more data. The truth is that making more sense of the data already obtained often proves to be much more helpful. Simply gathering more and more information may result in decision makers missing critical signals and pieces of information that they should have noticed. These missed signals can make a huge difference in the quality of the decision reached. Today's managers and executives can also make better decisions with the detection of important weak signals. Fortunately, this topic has recently become more popular in strategic planning (Ilmoa). Signal detection theory research began in the fields of psychology, physiology, and neurology; it has more recently been adopted by organizational strategy researchers.

In today's world, individuals must be able to make complex decisions in a rapidly changing environment (Ilmoa). This applies to those in government agencies, organizational groups, military officers, and business executives. Issur Harel is quoted in an article by Arthur Weiss stating, "We do not deal with certainties. The world of intelligence is the world of probabilities. Getting the information is not usually the most difficult task. What is difficult is putting upon it the right interpretation. Analysis is everything" (Weiss). This quote reflects the importance of not only obtaining information but also of interpreting the information in the

correct manner. Gathering more information does not always provide clarification; interpretation of information provides clarification.

There have been numerous events in the course of history that occurred primarily due to missed weak signals. These events range from the recent financial meltdown to the collapse of the United States automobile industry to the tragedies of Pearl Harbor and 9/11. Both the Japanese attack on the Pearl Harbor base and the terrorist attacks on the World Trade Centers have been touted by historians as prime examples of missed weak signals making a world of difference. Some have said that both of these events could have been prevented had the weak signals that forewarned of disaster been detected, assimilated, and correctly interpreted. While this is impossible to prove in either case, it is much more likely that it is true in the case of Pearl Harbor (Borch). There were indeed weak signals in both situations; and while the two events may appear similar, the warning signs in each case were drastically different. The detection and analysis of weak signals could have prevented the attack on Pearl Harbor, but it would not have helped in stopping the tragedy of September 11th (Borch). The one thing that both of these attacks can do, though, is help future decision makers. These events reflect the importance of signal detection and analysis. Future decision makers can use the lessons from these two events in order to understand the important role that weak signals play in nearly every type of situation. It might not be immediately apparent to use national history to improve corporate decision making; however, business executives can use the events of Pearl Harbor and 9/11 to aid their process of making decisions.

Historical Weak Signals

Pearl Harbor

Historians have often referred to Pearl Harbor as a model of strategic surprise due to missed weak signals (Wohsltetter). The historical event occurred on December 7th, 1941, at the US Pearl Harbor base on Hawaii's island of Oahu. The global environment at this time was tense. World War II had been underway since 1939, and the United States had managed to stay out of the conflict for slightly over two years despite pressures from other countries. US relations had grown especially tense with Japan. This all came to a head when the Japanese launched a surprise attack on the Unites States base on the morning of December 7th. This attack, however, should not have been a surprise for the United States since there had been numerous weak signals warning of danger.

Tension between the US and Japan had been increasing for years preceding Pearl Harbor. As early as 1939, "the Japanese government began censoring newspapers and magazines concerning the war, ordered its officers to have no contact with Americans, and denied all foreign requests to visit naval facilities" (Borch). There was a public increase in Japanese troop and ship movements, as well as two changes in the Japanese naval call signs (Klein). The US knew that the new military cabinet in Tokyo had set a deadline for negotiations with the US to succeed and was willing to be more aggressive (Klein). The Japanese also increased their troops at multiple global sites, and they created a list of British, American, and Dutch targets (Klein).

When the Japanese attacked Pearl Harbor in 1941, they utilized an air carrier strike; this method is characterized by launching aircraft from a ship. They also utilized submarines with torpedoes to destroy the ships in the harbor. Many believed that both an air carrier and a torpedo attack on Pearl Harbor were nearly impossible and completely improbable due to the location

and the shallow waters. The Americans felt strongly that Japan would not bother to attack Pearl Harbor with an air carrier strike because the location was not ideal; they believed Japan would choose a more vital location. The Americans were also unaware that the Japanese had developed torpedoes which could be used in shallow depths. The base of Pearl Harbor should have been prepared for an air carrier strike, however, because it had been shown multiple times that such an attack was indeed possible and perhaps probable. Air carrier attacks had been shown to be possible as early as the 1930s, during war games at the Naval War College (Borch). Following his Asia tour in 1924, Brigadier General Billy Mitchell specifically spoke of a carrier attack on Hawaii being a probability (Borch). Yet the commanding officers at Pearl Harbor in 1941 still felt that such an attack could not be executed. Further proof existed after the British sunk the Italian Fleet at Taranto utilizing a carrier air strike on November, 11th, 1940 (Hickman). This was the first air carrier strike in history, and it showed the rest of the world that this method of surprise attack was possible. However, the United States continued to disregard the possibility of an air carrier attack on Pearl Harbor.

The attack on Taranto was quite similar to that on Pearl Harbor, but there were also a few key differences that should have allowed the commanders at Pearl Harbor to be better prepared than those at Taranto. The Italians did not have radar, could not see the large number of approaching aircraft, and were therefore easily surprised (Hickman). This is in direct contrast to the fact that Pearl Harbor had radar and knew planes were approaching but still did nothing to prepare. Since the US knew of the Taranto attack, the commanding officers at Pearl Harbor should have realized that an air carrier strike on their base was possible. The US also knew that their relationship with Japan was disintegrating and might lead to war, as well as the fact that the Japanese preferred surprise attacks (Borch). This should have allowed the military to prepare for

the possibility of a surprise attack, but they did not. The information available to the US showed that there were warnings and time.

Admiral Husband Kimmel and General Walter Short assumed their duties as the head Navy and Army commanders at Pearl Harbor in early 1941. Both commanders knew at the time that their main objective was to ready the base for war with Japan (Borch). Shortly after taking command, they received an assessment by the Secretary of the Navy and the Secretary of War. The assessment concluded, "It is believed easily possible that hostilities would be initiated by a surprise attack upon the Fleet or the Naval Base at Pearl Harbor" with "an air bombing attack" or "an air torpedo attack" (Borch). The two commanders also received a Joint Estimate from General Martin and Admiral Bellinger on March 31st, 1941 (Wohlstetter). This document included warnings about the possibility of a surprise attack on Oahu preceding a declaration of war, specifically in the form of an air attack (Wohlstetter). It went on to specify that a dawn attack would be most difficult to detect and that a single submarine might indicate greater numbers of undiscovered forces (Wohlstetter). The naval air defense plan for Hawaii even warned of a dawn assault, which is exactly how the Japanese executed their mission (Kahn). The two commanders, therefore, had received ample warning to ensure their base was prepared for such an attack. The base, however, was far from prepared.

Kimmel and Short had been instructed by Washington to "cooperate in the defense of Hawaii," but they in fact did not do so (Borch). Even by December 7th, the Army and Navy defense systems were not coordinated; no one was manning the coast-watch stations, no one was deploying anti-aircraft guns, and the ammunition was locked (Borch). Both officers thought that the other was responsible for taking care of these tasks (Borch). In addition, Kimmel and Short had agreed that the Navy would conduct long-range reconnaissance, especially at the suggestion

of the Joint Estimate from Martin and Bellinger (Wohlstetter). However, Kimmel later determined that he did not have sufficient aircraft to watch all avenues of approach; therefore, he decided to watch none without ever informing Short of his decision (Borch). Kimmel had also not ordered torpedo netting to be placed around the ships, which were kept cold and could not get underway quickly if attacked; in addition, ship hatches were left open for an inspection following the weekend (Borch). Short was under the impression that Kimmel was keeping his ships ready and that the harbor was secure. On the Army side, Short had not been using barrage balloons over the harbor; these balloons would have effectively countered dive-bombing aircraft (Borch). Short also kept the Army aircraft lined up wingtip-to-wingtip to prevent any type of sabotage, which left them more vulnerable to an attack (Borch). Kimmel thought that the aircraft were positioned in such a way that an air attack would not destroy them all so easily. In summary, the two commanders had both dismissed the likelihood of a Japanese attack and had not worked together toward anything. These facts are evidence that these two men did not correctly interpret the signals they received. This was a direct factor in the success of the Japanese attack, and the lack of Army and Navy coordination had dire consequences.

The United States intelligence had spent months trying to decipher Japanese codes before they eventually experienced a break-through with a system entitled Purple (Kahn). This system was only applicable to Japanese diplomatic messages, and the US depended on it for all intelligence (Kahn). On December 3, 1941, the US intercepted a Japanese code message that foretold of war with the United States. Officials in Tokyo were instructing the Japanese embassy in Washington to “burn codes” and “destroy cipher machines” (Kahn). President Roosevelt read the message and declared “this means war” (Kahn). There were no communications between Tokyo and Washington, though, which referred in any way to a specific attack on Pearl Harbor

(Kahn). In addition, the Navy had learned that the Japanese changed their call signs on November 1, 1941, and again on December 1, 1941; these quick changes alone were sufficient warning that something was going to happen (Wohlstetter).

While a crucial aspect of the United States' unpreparedness for the attack on Pearl Harbor was the lack of horizontal cooperation between the Army and the Navy, there was also poor vertical communication from Washington to Hawaii. Washington had been receiving information that warned of an impending war. Signs included increased messages to Japanese sources in Manila and Pearl Harbor in the week prior to the attack, as well as the focus of the Japanese on dividing Pearl Harbor into zones with each ship identified (Klein). The Peruvian ambassador even warned the American ambassador of a rumor from the Peruvian embassy in Tokyo that concerned a potential Japanese attack on Pearl Harbor (Klein). Those in Washington, however, did not relay all of their information to those at Pearl Harbor. The Pearl Harbor commanders had been receiving mixed messages about the probability of an attack on the Hawaiian base. On October 16, 1941, the Navy warned the fleet commanders that Japan might attack the US ("Pearl"). Army staff in Washington disagreed with the Navy's statement, though, and the War Department sent a very different message to the commanders shortly after the first ("Pearl"). This second message said that officials did think Japan would change their foreign policy in the near future, and that they did not believe Japan would attack the US any time soon ("Pearl"). Kimmel and Short received yet another message on November 27, 1941, from their superiors in Washington that sated, "This dispatch is to be considered a war warning. Negotiations with Japan...have ceased and an aggressive move by Japan is expected within the next few days" (Borch). On December 6, 1941, there was a message from Commander-in-Chief of the Asiatic Fleet on sightings of Japanese ships in the Camranh Bay; this should have alerted

everyone to imminent danger (Wohlstetter). Also on December 6th, there was a sighting of an unidentified ship in Hawaiian waters by the USS *Wright*; this never reached Fleet Intelligence in Hawaii (Wohlstetter). A further example of poor communication was a message on the morning of the attacks. Washington intercepted a written Japanese message on December 7th that involved war threats ("Pearl"). The US did not take the 7:30 am Hawaii deadline seriously, though; officials in Washington sent a last-minute warning to the Pearl Harbor commanders which General Short did not see until hours after the attack ("Pearl").

On the morning of the attacks, there were multiple signs that something was about to happen. At 6:40 am, the USS *Ward* sank an unidentifiable submarine at the entrance to Pearl Harbor and immediately informed Kimmel's staff (Borch). The only person who took this incident seriously was watch officer Lieutenant Harold Kaminski, who followed protocol and tried to reach the Commandant's aide; he then contacted the fleet duty officer and took the initiative to send a message to the duty destroyer to get under way immediately (Wohlstetter). This was over an hour before the attacks. It was a clear warning that something was wrong, because there was no reason for an unidentifiable submarine to be near the base of Pearl Harbor. It should have given the Navy over an hour to prepare for whatever might happen. However, Kimmel and his staff were still arguing over the implications of the sinking when the bombing began at 7:45 (Borch).

There was a second warning on the morning of the attacks that commanders also disregarded. At 7:02 am, Army radar sites detected a large number of unknown aircraft approaching the island of Oahu (Borch). Lieutenant Colonel Kermit Tyler, who received the report, simply dismissed the detection and decided that the aircraft were friendly B-17s flying in from California (Borch). He justified this dismissal because of the music playing on the radio

that morning; he had a bomber pilot friend who told him that B-17s used this music for homing (Klein). While neither this radar warning nor the submarine sinking would have been enough on its own to warn of an oncoming attack, the combination of these two signals should have raised a huge red flag for the commanders of Pearl Harbor.

In fact, no one realized anything was wrong until the Japanese planes were upon the base and dropping bombs. Despite a lengthy list of warning, the Japanese were still able to successfully attack in two waves for ninety minutes; and they left a path of destruction in their wake. The US lost numerous battleships, destroyers, and cruisers, as well as aircraft. The attack killed thousands of Americans, and it brought the US into World War II. The summary of the weak signals warning of the Pearl Harbor attacks can be found below in Table 1.

Table 1: Summary of Weak Signals Preceding Pearl Harbor Attacks

Summary of Weak Signals Preceding Pearl Harbor Attacks
• Japanese censoring of newspapers, magazines, etc.
• Increase in Japanese movements with more troops at multiple global sites
• Japanese officers not permitted contact with Americans
• Japanese denial of all foreign requests to visit naval facilities
• Change in Japanese call signs on Nov 1 and Dec 1of 1941
• Tokyo cabinet set deadline for successful negotiations with US
• Japanese compilation of British, Dutch, and American targets
• Knew Japanese preferred surprise attacks
• Assessment by Sec. of Navy and War stating easily possible for Japanese surprise attack on Pearl Harbor via air bombing and torpedo strike
• March 31 1941 Joint Estimate warning of possibility of surprise attack on Oahu in the form of an air attack
• Joint Estimate specified dawn attack hardest to detect and a single submarine would be a sign
• Hawaii's naval air defense plan warned of dawn assault
• Dec 3 1941 message from Tokyo telling embassy in US to burn code books and destroy cipher machines
• Increased messages to Japanese sources in Manilla and Pearl Harbor during preceding weeks
• Japanese focus on sectoring Pearl Harbor into zones with each ship identified
• Peruvian ambassador warned of rumor concerning a planned attack on Pearl Harbor

- Oct 6 1941 warning from Navy that Japan might attack US
- Nov 27 1941 message from Washington saying war warning with aggressive Japanese move predicted
- Dec 6 1941 sightings of Japanese ships in Camranh Bay
- Dec 6 1941 sighting of unidentified ship in Hawaiian waters
- Intercepted Dec 7 1941 morning message that threatened war
- Sinking of unidentified submarine at Pearl Harbor entrance at 6:40 am on Dec 7
- Detection of large number of unidentified aircraft approaching base at 7:02 am on Dec 7

9/11

The terrorist attacks on the United States on September, 11, 2001, were one of the worst shocks the nation had ever experienced. The attacks took the US by surprise and left it devastated. One of the most intriguing aspects of this fateful day is that it should not have been such a surprise; there were weak signals that pointed to the possibility of the 9/11 attacks. The global environment preceding the attacks had included a declaration of a holy war against the United States, but the country had been lulled into a false sense of security by decreased terrorist activity and increased "successes" against terrorism (Parker). The culmination resulted in one of the most devastating terrorist attacks in history, when al-Qaeda hijacked and crashed multiple commercial airplanes into American targets. Al-Qaeda can be classified a militant Islamic group with a global presence, which was founded by Osama bin Laden in the late 1980s. Multiple countries have designated this group as a terrorist organization. Similar to the events that preceded Pearl Harbor sixty years earlier, the world experienced multiple weak signals in the years preceding the events on 9/11.

The United States government knew that the nation was a prime target for terrorist attacks, especially from-Qaeda. The nation had believed itself immune in the 1970s and 1980s, but events during the 1990s challenged this belief (Parker). Al-Qaeda attacked US embassies in

Kenya and Tanzania in 1998, and the organization later attacked the USS *Cole* in Yemen in 2000 (Borch). The attacks on the embassies showed that al-Qaeda was capable of launching coordinated and simultaneous attacks (Parker). Though these events were tragic and were weak signals warning of potential terrorist actions on US soil, the nation was not put on any higher alert for possible attacks on their homeland. US leaders should have realized that these events were warnings because it showed that al-Qaeda was not afraid to attack the US, and that the aggressive organization had the capability to do so. The CIA knew that al-Qaeda was plotting more attacks on the US, since receiving both veiled and explicit threats from intelligence services (Klein, Parker).

The attacks of September 11th consisted of hijacking commercial airliners and crashing them into multiple targets. The US should have known that this was possible due to earlier signals. The possibility of Islamic terrorists potentially turning airplanes into weapons emerged in the 1990s (Klein). In 1994, an Algerian group hijacked an Airbus A-300 with the intention of crashing the jet into the Eiffel Tower, but they were stopped by French counter-terrorists during a "refueling" stop in Marseille (Parker). In 1995, intelligence indicated that the 1994 bombing of a Philippines Airlines flight to Tokyo was actually a training session for an attack on the CIA headquarters (Klein). Officials knew that al-Qaeda was capable of hijacking civilian airplanes (Borch). Security experts theorized that terrorists might use commercial airplanes as flying weapons over ten years before the attacks in 2001 (Borch). In 1993, Marvin Cetron wrote a report discussing the threat posed by airplanes as bombs, specifically writing that, "Coming down the Potomac, you could make a left turn at the Washington Monument and take out the White House, or you could make a right turn and take out the Pentagon" (Borch). In addition, the CIA's Counterterrorist Center had discussed airborne suicide as a terrorist tactic (Borch). It

was therefore well known that terrorists might utilize airplanes as weapons, but the US was less than prepared for this type of attack.

Though many believed that US homeland security was top-notch, there was proof otherwise in the years preceding the attacks. There had been "numerous studies, blue-ribbon panels, and presidential commissions warning that air security was inadequate and vulnerable to terrorism" (Parker). One of these recommendations was made in 1997 by Vice President Al Gore's commission suggesting that the contractors who operated airport security screening be required to be certified by the government (Parker). In addition, the same commission proposed that the multiple government agencies responsible for tracking suspected terrorists combine their information and make it available for airline databases to identify suspected terrorists who might attempt to purchase airline tickets (Parker). Nothing was ever done to resolve any recommendations on improving the system's weaknesses. In fact, the government had already identified two of the suspected terrorists, but they were able to board planes using their own names on 9/11 due to the lack of integration (Parker). Officials had simply not done anything to prevent these men from boarding planes.

The United States knew that the World Trade Center towers were a target for terrorists. The World Trade Center was attacked by a truck bomb in 1993 (Klein). In addition, the Federal Aviation Administration received information from terrorism specialists that provided two reasonably plausible scenarios. One scenario included planes being crashed into nuclear power plants, and another involved targets such as the White House, the Capitol, the Pentagon, and the World Trade Center (Klein). This was disregarded.

There was a direct warning of a specific attack on the World Trade Center that officials simply dismissed. In 1998, intelligence agencies learned of a plot involving Arabs flying a plane

into the building (Klein). The information received even stated that the plane would contain explosives, and that it would be flown from a foreign country (Klein). The FBI and FAA dismissed this information as being too "far-fetched" (Klein). Though this is not exactly how the actual attacks occurred, it is extremely similar. This warning should not have been so easily dismissed by officials.

There were multiple weak signals directly preceding the attacks, as well. During the summer before the attacks, the Director of Central Intelligence George Tenet issued multiple urgent warnings that the US should implement the highest possible level of anti-terrorism alert (Parker). The CIA briefed President George W. Bush on August 6, 2001, informing him about warnings of possible al-Qaeda hijackings and attacks on US soil (Parker). These repeated warnings and briefings went unheeded, perhaps due to the fact that Tenet persisted so strongly that leaders began to tune him out.

Only two months before the September 11th attacks, an FBI agent from Arizona sent the "Phoenix memo" to his superiors in Washington (Klein). This July 10th memo contained the agent's concerns that terrorists were being trained at Arizona flight schools, and that the suspects were preparing for a terrorist mission (Klein). The receivers of the Phoenix memo did not take the agent's warnings seriously and did not even share the information with their superiors (Klein). Therefore, this warning was also ignored, marking yet another missed signal.

One month before the events of September 11th, the FBI denied a request from the Minnesota office to investigate al-Qaeda member Zacarias Moussaoui (Klein). FBI Special Agent Coleen Rowley recommended that someone search Moussaoui's belongings, but this never happened (Borch). In fact, Moussaoui received fourteen thousand dollars from the roommate of a man believed to be the leader of the 9/11 hijackers (Klein). In addition, a flight

academy in Minneapolis warned that Moussaoui was one of its students who exhibited suspicious behavior (Parker). He reportedly acted in a manner which suggested he planned to use his training to execute a hijacking (Parker). This, in fact, turned out to be accurate, though he was not investigated. This was another in the list of missed signals.

Just weeks before September 11, 2001, the FAA sent four information circulars that warned the aviation industry of a possible terrorist hijacking (Klein). These alerts were not a high priority for the FAA, and no one acted upon them (Klein). The White House even received alerts from the CIA concerning impending terrorist attacks on US soil, but this did elicit a reaction either (Klein). In addition, the CIA was aware that two suspected terrorists had entered the US in 2000, but the CIA agent who requested to inform the FBI never received a response (Klein, Parker). The FBI did not find out about the two suspects until August of 2001, when it was too late to track them; these two terrorists were able to successfully hijack planes on the morning of the attacks (Klein, Parker). This compilation of dismissed warnings and missed signals likely had a significant effect on the ability of the terrorists to execute the 9/11 attacks.

The country as a whole did not take the threats of an attack on US soil seriously, and as a result, airline companies did not prepare for the worst case scenarios. Many of the lax policies and procedures further allowed the terrorists to execute their plans more easily than should have been possible. Security was not tight on domestic flights, which allowed the suspects to bring box cutters and knives on board (Parker). Cockpit doors were not reinforced, and captains had never been instructed to always leave them closed; in fact, pilots had been taught to acquiesce in the case of a hijacking, with the belief that the hijacker would want to live as well (Parker). This meant that on the morning of September 11th, it was relatively simple for the hijackers to access the cockpits and threaten the pilots in order to gain control of the planes. Nothing about the

airline system was prepared for the strategies of the terrorists, despite the fact that multiple agencies had discussed the approach as a possibility. Therefore, 19 terrorists boarded four planes on September 11th, 2001, and successfully hijacked them. They flew two of the planes into the World Trade Center twin towers and one into the Pentagon; the last plane crashed into a Pennsylvania field as the passengers revolted against the terrorists. Almost 3,000 people were killed on 9/11, and the nation will forever remember this day. Though there were numerous weak signals that could have warned of the impending attacks, nothing was done to prevent the events of September 11, 2001. The summary of these weak signals preceding the 9/11 attacks can be found below in Table 2.

Table 2: Summary of Weak Signals Preceding 9/11 Attacks

Summary of Weak Signals Preceding 9/11 Attacks
• 1993 report by Marvin Cetron discussing threats posed by airplanes as bombs, specifically noting how easily White House or Pentagon could be attacked
• 1993 truck bombing of World Trade Center
• Knew bombing of Tokyo flight in 1994 was training for attack on CIA headquarters
• Algerian hijacking of commercial plane in 1995
• Attacks on US embassies in Kenya and Tanzania in 1998
• Discovery of 1998 plot involving Arabs flying plane into World Trade Center disregarded
• Attack on USS Cole in 2000
• Reception of veiled and explicit threats of more attacks on US
• Declaration of Holy War against US
• Discussion of airborne suicide as terrorist tactic by CIA's Counterterrorist Center
• Presidential commissions, blue ribbon panels, and studies warning that air security inadequate
• Unheeded recommendations to certify airport security contractors and combine terrorist information into airline database
• Two of terrorists who boarded planes on 9/11 had been ear-marked by government
• Scenarios from terrorist specialists including one similar to 9/11 received by Federal Aviation Administration
• Warnings from CIA Director during preceding months to implement highest level of anti-terrorist alert
• Jul 10 2001 memo to Washington about terrorists training at Arizona flight schools for terrorist mission

- Aug 6 2001 briefing to Bush warning of al-Qaeda attacks on US soil
- Denial of Aug request by FBI to investigate Zacarias Moussaoui
- Warning from Minneapolis Flight Academy that Zacarias Moussaoui exhibited suspicious behavior
- Aug FAA issuance of four circulars alerting aviation industry of possible hijacking
- CIA alert to White House of impending terrorist attacks
- CIA aware of two suspected terrorists in US

Comparison of Pearl Harbor and 9/11

The events of Pearl Harbor and 9/11 are extremely similar in a number of ways, but there are also a few critical differences. On the surface, it seems as though the events could be completely paralleled. Both were surprise attacks on American soil that left the country shocked and devastated. Both resulted in a large number of casualties and massive physical destruction. Most importantly, both events were preceded by numerous weak signals that could have been detected and put together. In both cases, officials did not think such an attack would ever happen, despite evidence to the contrary. The main similarity between Pearl Harbor and 9/11 is that the decision makers in both scenarios knew that an attack was probable and that it could come in the form it did (Borch). The biggest difference between Pearl Harbor and 9/11 comes with further inspection of the days of the attacks and the events that preceded them. The weak signals that warned of Pearl Harbor should have been enough to prevent that fateful day, whereas it is not clear that anything could have been done to prevent the events of 9/11, even if someone had put together all of the weak signals.

While neither attack was preceded with information that pointed directly to the location and method of the attack, the commanders at Pearl Harbor received sufficient signals beforehand to have prevented the attack. Those in Washington and Honolulu knew that an attack on the US was imminent, that an attack on Hawaii was probable, and that the Japanese had the ability to

attack them in Oahu (Borch). Kimmel and Short simply chose not to maintain a high enough level of vigilance, despite the signals. They knew their enemy, knew that an attack must come by sea, had received multiple warnings, and had the resources to be more vigilant (Borch). When comparing this with 9/11, there were many fewer direct signals and warnings preceding the 2001 attacks. No one knew a terrorist attack was imminent- simply that it was possible. No one knew that it would be al-Qaeda that attacked the US, or that it would be through the use of commercial airlines as suicide missiles. Yes, officials did miss numerous weak signals in this case as well. However, it is impossible to determine if the events of September 11th could have been predicted, even if all of the signals had been correctly analyzed. There could have been increased airport security, different training techniques for pilots to handle hijackings, and perhaps even sky marshals on flights. The most that could have been done would have been to infiltrate terrorist cells in order to gain more intelligence about possible terrorist actions. These steps might have had an effect. While the attack on Pearl Harbor was allowed to happen due to missed weak signals, the September 11th attacks might not necessarily have been prevented.

Applying History to Business

Students often learn that history repeats itself, and everyone knows that history holds valuable lessons for the future. In this case, historical American events should be applied to present and future business decisions. The analysis of historical American events such as Pearl Harbor and 9/11 shows that missing weak signals can have disastrous effects. Both of these events were preceded by multiple weak signals warning of the potential for attacks. In both cases, these weak signals were essentially disregarded because they had not been interpreted and

integrated correctly. Had these weak signals been detected and correctly interpreted, the results might have been extremely different in these cases. This is significant for business decision makers today, because they are constantly facing weak signals and often times do not notice. If decision makers in today's world would put the effort forth to detect and correctly interpret weak signals, they would be better able to make good decisions.

There are a number of techniques that decision makers can utilize in order to better detect and interpret weak signals. As stated previously, the first category of weak signals are those that are outside of an individual's perception (Coffman). These signals are not received because individuals cannot access their frequencies or channels of transmission (Coffman). Examples of this abound; companies are constantly missing out on opportunities because they are not picking up on weak signals. For example, video games were introduced by a 'work-in-the-garage' inventor, rather than the leaders in the board game industry (Coffman). Further proof of this phenomenon is that industry leaders did not invent disposable diapers, Coke or Pepsi did not invent diet sodas, and Swiss watchmakers did not invent digital watches (Coffman). "Market leaders were amazingly myopic in their perception of emerging markets in their own backyard" (Coffman). Does this mean that companies get so big that they do not even care about new opportunities? Surely this is not the case. Large companies surely do not want to remain stagnant; they should want to continue to grow and innovate. In order to do this, companies need to be able to detect signals of emerging markets and new opportunities on the horizon. This is not as difficult as it might seem. The fault lies in the design of most organizations; they simply do not have the ability to recognize useful weak signals (Coffman). This must change, however, so that individuals and groups can "tune in" to the correct frequencies and recognize these valuable signals (Coffman). In order to recognize these signals, individuals and organizations

must construct systems and processes designed to catch them (Coffman). This will better enable companies to take advantage of signals they might have missed before. With proper training and practice, individuals can learn to see what others cannot (Heeger). This is the first step in beating the competition. Companies must promote a culture within their organization that emphasizes to employees the need to actively seek out weak signals. Companies should not discount something that seems unimportant, because it might make a large difference if interpreted correctly.

This ties in with the next category of weak signals, in which signals are perceived but unrecognized by current mental models (Coffman). There can be numerous reasons that individuals ignore signals; individuals design and utilize mental models with the purpose of filtering out most signals in order to focus on the ones that they think matter most (Coffman). Whether or not an individual thinks a signal matters or not often depends on previous experiences. This model system is necessary, since it is impossible to be actively thinking about every single thing that is occurring in a given moment. The problem comes when individuals become too complacent. Models can filter out such a large amount of signals that some signals might as well not exist (Coffman). New models and filters are often created and expanded when individuals are exposed to new environments (Coffman). This means that a constantly changing environment should increase awareness. Individuals will be better able to pick up on weak signals if they can keep themselves from entering into the 'business-as-usual' mode that lulls them into complacency.

Detecting weak signals and correctly interpreting these signals has the potential to make an extremely large difference in a company's success. This detection and interpretation can make the difference in creating a new product, entering a new market, gaining a competitive

advantage at something, or simply beating the competition. In order to ensure that an organization's decision makers take advantage of possible opportunities while also diverting potential disasters, they should take a few key steps to remain proactive.

First of all, company leaders should encourage a questioning and thoughtful culture within their organization ("Becoming"). This environment starts with the top managers and trickles down to lower-level employees. Everyone should feel comfortable questioning anything that they do not understand or that they think might be unusual. If employees do not feel psychologically safe, they will be hesitant to question their superiors. This culture of mindfulness can be promoted in multiple ways. Mindful companies tend to be preoccupied with failures, reluctant to simplify interpretations, sensitive to operations, committed to resilience, and deferent to expertise ("Becoming"). This means that no one should discount something as unimportant, but rather they should investigate it to fully understand the situation. Employees should not simply overlook things they do not understand; they should seek answers. Individuals should also be willing to admit when they do not understand something in order to bring in appropriate experts for assistance. No one person can know everything, so he or she must be willing to ask an expert for help. Employees should also feel as though their ideas are important, and executives should encourage new ideas. They should also encourage risk-taking. In order for this type of culture to take root in a company, executives at the top levels must encourage such mindfulness and give lower-level employees the ability to question.

Another more specific tactic that would increase the detection of weak signals involves employees' jobs. It is easy to become bored and too complacent when doing the same job day in and day out. For this reason, it would be beneficial for companies to implement a system where employees are trained with the ability to perform multiple different jobs. In such a system,

employees would perform the same job for no more than a few months before rotating into a different position in the company. Though this might decrease employee productivity and efficiency initially, it would allow employees to remain more engaged and focused throughout their careers. This, in turn, would increase their awareness of their surroundings so that they would be more likely to pick up on a weak signal. By constantly rotating jobs, they will be placed in new environments that will keep their minds more active. A similar alternative to this approach would be to relocate employees every few years. Putting people in new places would bring in a fresh set of eyes to see things differently. This would increase detection of weak signals as well. Employees would be working with different individuals in different locations, which would keep them from becoming bored or complacent in their job. They would therefore constantly be constructing and expanding their models and filters. This would better ensure that someone would detect and correctly interpret a weak signal that might otherwise go unnoticed.

While it is important for employees at all levels to be aware of weak signals, it is especially vital for managers and executives to be able to pick up on these signals. There are a number of techniques that managers can utilize as well. Those in upper levels of organizations should focus on the big picture in order to be aware of the environment as a whole (Medaris). If managers become too focused on one small aspect of the company, they can easily miss something else that might be even more important. They must also be open to ideas that do not follow the status quo or seem to be unimportant (Medaris). Reading industry materials and scanning the environment are good practices, and executives should also be aware of trends in other industries (Medaris).

Another important aspect of signal detection is utilizing the weak signal in a beneficial manner. Companies should have an ongoing process to recognize weak signals; in addition,

companies should be able to prioritize and act upon weak signals after detection (Medaris). It can even be beneficial to have a task force solely in charge of seeking out weak signals and determining the effects they could have on the business (Medaris). There must be a system in place so that companies can act upon the weak signals these individuals might detect.

An example of a company that has experienced great success due to signal detection is Starbucks. Experts have praised Starbucks for picking up on weak signals concerning the coffee shop trend (Medaris). The founder of Starbucks saw that cafes were becoming increasingly trendy in the European market, and he used this information to make his coffee shop chain desirable to the majority of Americans (Medaris). He detected the weak signal that Americans enjoyed relaxing enough to frequent places such as coffee shops as a social outlet, despite their hectic lives (Medaris). Starbucks has now become one of the most successful coffee shops, simply because it was one of the first to pick up on weak signal indicating a market trend, and the company founder was not afraid to take the risk. Companies will always be reactive and will never lead the way if the company leaders are not actively seeking out such signals. Companies who promote signal detection will be prospectors and market leaders because they will know how to take advantage of opportunities while avoiding disasters.

It is vital that companies be constantly evolving in order to maintain a competitive advantage in today's ever-changing business world. Executives and managers must be innovative and aware in order to keep their company at the top. Promoting the signal detection theory within an organization can make a drastic difference in the company's level of success. Historical events such as Pearl Harbor and 9/11 show business leaders the importance of signal detection in avoiding disaster, while success stories such as Starbucks illustrate the usefulness of weak signals as aids in proactive decision making.

Works Cited

Andrews, Edmund L. "Fed Shrugged as Subprime Crisis Spread." *The New York Times*, 18 Dec. 2007. Web. 19 Apr. 2012. <http://www.nytimes.com/2007/12/18/business/18subprime.html>.

"Becoming a High Reliability Organization." Agency for Healthcare Research and Quality. Apr. 2008. Web. 4 Apr. 2012. <http://www.ahrq.gov/qual/hroadvice/index.html>.

"Boom Bust and Blame 5: Warning Signs." CNBC, 2009. Web. 3 Apr. 2012. <https://www.cnbc.com/id/31189232>.

Borch, Fred L. "Comparing Pearl Harbor and "9/11": Intelligence Failure? American Unpreparedness? Military Responsibility?" *The Journal of Military History* 67.3 (2003): 845-860. Web. 4 Apr. 2012. <http://www.jstor.org/stable/3397329>.

"Buffet Warns on Investment 'Time Bomb.'" *BBC News*. 4 Mar. 2003. Web. 4 Apr. 2012. <http://news.bbc.co.uk/2/hi/business/2817995.stm>.

Coffman, Bryan S. "Weak Signal Research." *MG Taylor Corporation*. 16 Jan. 1997. Web. 4 Apr. 2012. <http://www.mgtaylor.com/mgtaylor/jotm/winter97/infotheory.htm>.

Hickman, Kennedy. "Battle of Taranto: Swordfish Strike." *Military History*. About.com, 2012. Web. 4 Apr. 2012. <http://militaryhistory.about.com/od/worldwari1/p/taranto.htm>.

Ilmola, Leena, and Osmo Kuusi. "Filters of Weak Signals Hinder Foresight: Monitoring Weak Signals Efficiently in Corporate Decision-Making." *Futures* 38.8 (2006): 908-924. Web. 3 Apr. 2012. <http://www.sciencedirect.com/science/article/pii/S0016328705002259>.

Kahn, David. "The Intelligence Failure of Pearl Harbor." *Foreign Affairs* 70.5, America and the Pacific, 1941-1991 (1991): 138-152. Web. 4 Apr. 2012. <http://www.jstor.org/stable/20045008>.

Klein, Gary. *Street Lights and Shadows: Searching for the Keys to Adaptive Decision Making*. Cambridge, Massachusetts: Massachusetts Institute of Technology, 2009. Print.

Medaris, Kim. "Expert: Effective Managers Tune in to Weak Signals." *Purdue University*. 15 Jun. 2007. Web. 22 Apr. 2012. <http://news.uns.purdue.edu/x/2007a/070615T-DavisSignals.html>.

Parker, Charles F., and Eric K. Stern. "Blindsided? September 11 and the Origins of Strategic Surprise." *Political Psychology* 23.3, Special Issue: 9/11 and Its Aftermath: Perspectives From Political Psychology (2002): 601-630. Web. 4 Apr. 2012. <http://www.jstor.org/stable/3792594>.

"Pearl Harbor, Oahu- The Attack: Facts and Information." *The Official Pearl Harbor Tour Site*. 2012. Web. 4 Apr. 2012. <http://www.pearlharboroahu.com/after.htm>.

Shoemaker, Paul J.H., and George S. Day. "How to Make Sense of Weak Signals." *Sloan Review*. Web. 4 Apr. 2012. <http://sloanreview.mit.edu/the-magazine/2009 spring/50317/how-to-make-sense-of-weak-signals/>.

"Signal Detection Theory." *Psychology Glossary*. 1998. Web. 4 Apr. 2012. <http://www.alleydog.com/glossary/definition.php?term=Signal%20Detection%20Theory>.

Weiss, Arthur. "Analysing Weak Signals for Competitive and Marketing Intelligence." Find It Out- Research Secrets and More, 2012. Web. 3 Apr. 2012. <http://awareci.com/2012/03/05/analysing-weak-signals-for-competitive-intelligence/>.

Wohlstetter, Roberta. *Pearl Harbor: Warning and Decision*. Stanford, California: Stanford University Press, 1962. Print.