

Takata's Exploding Airbags: Lessons from a Quality Debacle

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Abstract:

Purpose: This paper examines the case of a major quality debacle with a view to understanding the true cause or causes that led to it and how such financially devastating failures can be avoided by modern day companies.

Methodology/approach: The researcher first developed two detailed cases using well documented, published materials, then proceeded to execute an analysis and search for causes focusing on one of them. Analysis of the first case, buttressed by information gleaned from the second and other well documented cases provided the basis for reasonably solid understanding of the true cause or causes of major quality failure in modern companies.

Findings: The research found that the principal cause of devastating market and financial quality failure in the companies studied was weaknesses inherent in their ethical and moral systems. This was occurred because of failure of top management to design and implement vigorous enforcement mechanisms for ensuring thorough inculcation of ethical and moral principles in quality decision-making. Implementation of quality management systems such as TQM, Six-Sigma and ISO 9000 cannot prevent companies from experiencing these major quality debacles since the key cause of these, effete corporate ethical and moral values, coupled with absence of vigorous enforcement mechanisms, the principal cause of these failures, are poorly addressed by TQM, Six-Sigma and ISO 9000. Only the Baldrige system deals adequately with the need for a robust system of corporate ethical and moral values that deal specifically with the challenge of producing and delivering robust quality. Moreover, only the Baldrige system provides benchmark practices for creating a vigorous enforcement mechanism for ethical behavior in quality management.

Implications for management theory and practice: The results obtained show that current deployment of ethical and moral principles as they relate to product and service quality, and the provision of a vigorous enforcement mechanism for inculcating these values and principles into the management practices of companies are very weak. Moreover, these weaknesses expose many companies to spectacular quality failures of the type studied here. It is incumbent on top management to craft and implement a set of corporate ethical and moral principles that apply to quality and an enforcement mechanism to monitor and ensure adherence to these. It is also necessary for TQM, Six-Sigma and ISO 9000 to integrate these principles and enforcement mechanisms into their systems.

Key words: Baldrige Quality System, ISO 9000, Lean Six-Sigma, TQM, Six-Sigma, Quality Values, Ethical Decision-making, Quality Culture and Values, Catastrophic Quality Failure, Kaizen, Continuous Improvement.

Introduction:

Over the last three decades or so, there have occurred a large number of product and service failures on the part of some of the large and reputable global companies, both domestic and foreign, that have put the survival of these companies in serious jeopardy. In this paper, we focus on one product quality failure, that caused by exploding car airbags made by Takata, in an attempt to understand its true causes and the fundamental lessons that can be gleaned.

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Because they always involve product liability litigation, intervention regulatory agencies, sometimes criminal investigation, agreement to pay large fines with or without admission of criminal responsibility, these cases are extensively documented and high-quality information about them resides in the public domain. In every one of these cases the companies involved were either driven into bankruptcy or brought to the brink of it, or suffered financial losses that wiped out a significant part of shareholder equity.

The relevant regulatory agencies, law enforcement, and civil litigation attorneys always seem to have found out why these extraordinary quality failures took place, but few companies appear to permanently learn the lessons of quality failure prevention that ought to have been learned.

These major quality failures have occurred with astonishing frequency over the last forty years or so even if all the companies involved had reputations for high quality, and some of them were, presumably, benchmarks of quality in their industries. Some were recognized as having *implemented* benchmark quality management systems through Total Quality Management (TQM), sometimes buttressed by Six-Sigma and ISO 9000 Certification. TQM has been widely acknowledged to incorporate benchmark quality systems and processes while Six-Sigma is being increasingly viewed as a necessary enhancement to TQM in the pursuit of very low defect rates of the order of 3.4 Defects per Million Opportunities, DPMO. For many decades now, ISO 9000 Certification has been mandatory for any company that does business in the EU pushing companies to pursue ISO Certification worldwide.

This research proposes to do a critical evaluation of cases where companies experienced spectacular quality failure, with the aim of extracting the core lessons for management that are contained in them and possibly understanding the hidden causes. Three fundamental questions will drive the research agenda;

1. What factors explain the fact that the causes of major quality failures come to exist and fester in companies with benchmark TQM, Six-Sigma and ISO Certified companies until they lead to catastrophic quality failure?
2. Are there discernible patterns in the system of causes that lead to catastrophic quality failures, or do these failures occur as singular events that are unique to each of the afflicted companies?
3. Are there factors that presage the vulnerability of a company to catastrophic quality failure and, if so, what are these?

Definition of Key Concept:

Major Quality Failure or Debacle: we define it as the existence of defects in the products of a company that cause it to fail during use, resulting in loss of life or limb or causing significant psychological trauma. The cost of these defects in terms of product recall, civil litigation, and potential for criminal prosecution is so high as to jeopardize the company's existence. These failures invariably cause extensive and sometimes irreparable damage to a company's reputation.

Literature Review, Research Propositions and Methodology:

Literature review:

There are three broad systems available to modern enterprises that, when effectively deployed, presumably endow a company with the capability to drive quality levels higher to eventually surpass customer requirements predictably. These systems are known in the academic and practice literature as Total Quality Management (TQM), ISO 9000 and Six-Sigma.

Total Quality Management: "Total Quality (TQ) is a people-focused management system that aims at continually increase customer satisfaction at continually lower real cost. TQ is a total system approach (not a separate area or program) and is an integral part of a high-level strategy; it works horizontally across functions and departments, involves all employees, top to bottom, and extends backward and forward to include the supply chain and the customer chain. TQ stresses learning and adaptation to continual change as keys to organizational success. The foundation of total quality is philosophical: the scientific method. TQ includes systems, methods and tools. The systems permit change; the philosophy stays the same. TQ is anchored in values that stress the dignity of the individual and the power of community action." (4, 1992). TQM is embodied in the works of a few early pioneers, Deming, Juran and Crosby. The Japanese variant of TQM is based mainly on the work of Ishikawa, which takes off from Deming and incorporated key elements that are inspired by unique aspects of Japanese thinking. Deming summarized his thinking on quality in the form of fourteen points that when implemented would help top management steer the company towards higher and competitive levels of quality. In the Deming system, management leadership is the key driver of quality performance and human resources are the crucial asset that management can shape and motivate to pursue quality excellence. The fundamental mission is continuous improvement and the crucial tool is the process.

In Deming's view, quality cannot improve until the process improves and eighty percent of the responsibility for improving the process rests with top management. Deming's framework is silent on the problem of ethical behavior in quality management.

Juran is possibly the second most influential thinker in the modern TQM movement. For Juran, breakthrough levels of quality performance can be achieved only if top management commitment to the quality improvement process is achieved. In order to achieve top management buy-in, quality professionals must not present TQM as a cultural revolution, since doing so would merely lead to top management skepticism and resistance.

Instead, quality professionals should work within the existing culture and methods of the company, demonstrate the potential that resides in TQM by judiciously selecting and implementing projects that are likely to succeed' and measuring project impact in terms of dollars and returns that uses the language already used by managers. As a result, the concept of quality cost and the economics of quality feature prominently in the work of Juran. Like Deming, Juran's work is silent on the role that ethics in the TQM process.

Crosby's approach is largely inspired by his experience as an engineer at Ford. He also distills his thinking in the form of a fourteen-point program that emphasizes cost reduction through defect prevention, sound human resource management and education and the measurement and reporting of the level of non-conformance. In the Crosby model, quality improvement must eventually show up as cost improvement which is the cost of non-conformance. Like Deming and Juran, Crosby's model is silent on the problem of providing an ethical framework for quality decision-making supported by an enforcement mechanism to mould the behavior of quality managers.

Ishikawa proposed a Japanese inspired framework that adopts the best ideas of Deming, and incorporates elements that are unique to Japanese culture and manufacturing. These include total respect for people, emphasis on constant learning and continuous improvement (Kaizen), and mastery of basic tools of quality control. Ishikawa is silent on ethical decision-making in quality.

The Baldrige framework is a high-level integration of all the seminal ideas of the pioneers, emphasizing the pursuit of quality excellence. The Baldrige is the only approach that provides a framework for integrating ethical decision-making into the TQM process. It includes a framework for implementing ethical decision-making into the process and identifies benchmark best practices for enforcement. Companies will not be good candidates for the Baldrige Prize if they fail to demonstrate that they have both a framework for integrating ethical considerations into the quality decision-making process and provide a defensible process for enforcing these. A major weakness of TQM in modern corporations lies in the fact that very few companies have adopted the Baldrige framework as the vehicle for pursuing total quality.

ISO 9000 is a framework that emerged out of the EU and its prime concern is to provide formal documentation of the system for managing quality in target companies. One major criticism of ISO 9000 is that it is overly bureaucratic in nature, and it simply promotes formalization of the quality system with not much emphasis on fundamentally transforming it in the pursuit of near-zero defect rates. ISO 9000 does provide guidelines for integrating ethical considerations into the quality management process but is seriously lacking on the provision of benchmark practice or an enforcement mechanism. As a result, many of the most spectacular quality failures of the last thirty years or so occurred in companies that were variously ISO 9000 certified, and in one case studied here, all the company's worldwide operations were ISO 9000 certified.

Six-Sigma: Six-sigma is a high-performing strategy for driving defects out of a company's systems. Six-Sigma is a logical extension of Statistical Process Control, (SPC). Six-sigma methods aim to systematically increase the number of causes that can be brought under control and reducing the defect rate to no more than 3.4 Defects per Million Opportunities (DPMO).

It deploys a management process expressed as 'Define, Measure, Analyze, Improve and Control' (DMAIC). Six-Sigma is tools and techniques driven and is completely silent on the problem of how to integrate ethical values and principles into the quality management system.

Research Propositions:

The central questions of this research can be framed in the form of two general propositions; Proposition one: Spectacular quality failures are not due to happenstance but are the result of weak corporate moral and ethical value systems, coupled with weak enforcement mechanism for these.

Proposition two: The effects of these weak ethical and moral value systems and effete enforcement mechanisms are exacerbated by near absence of ethical and moral principles and enforcement mechanisms from nearly all the approaches to TQM, Six-Sigma and ISO 9000.

Research Methodology:

The research employed a multi-faceted methodology. First, on the basis of an extensive survey of the literature on Total Quality and Six-Sigma and ISO 9000, we identified the core management practices of Total Quality. These generally core practices formed the basis for identifying potential quality debacles that could be used to evaluate the research propositions.

Second, based on published sources, we undertook a general study of these cases in an effort to identify which ones provided a rich enough data set upon which in-depth analysis could be based. The research sought to identify key patterns among these quality failures, and to uncover weaknesses in quality culture and value system that are not at first obvious but that, upon closer examination, show how the quality management systems deviated from benchmark quality thinking. The researcher was particularly prepared to observe deviations that may not be dramatic but which, given a confluence of managerial and competitive pressures, could explain the major quality debacles observed. Third, once the nature and causes of the quality debacles were understood, we embarked upon an analysis of the current total quality frameworks in an effort to understand the extent to which these spectacular failures were the result of failure in the internal management of a company, or of weaknesses in the prevailing total quality frameworks.

TAKATA: THE MAKINGS OF A DEADLY QUALITY DEBACLE:

According to Honda, the first incident of a Takata airbag explosion occurred in Alabama in 2004, spewing shrapnel into the interior of the 2002 Honda Civic involved in the incident and injuring the driver. This case was thought to be an unusual occurrence that only occurred in warm, humid weather and did not trigger any investigation or recall by the National Highway Transportation Safety Administration, NHTSA. Three additional explosions of airbags in Honda vehicles occurred in 2007 but Honda still failed to inform the NHTSA or initiate a recall.

These incidents were the beginnings of one of the worst quality debacles in history that was fed and sustained by a disastrous combination of corporate ambition, pitiful mismanagement, callous disregard for the welfare of customers, the blind pursuit of low cost to the detriment of quality, profound misunderstanding as to the true purpose of an enterprise, plain corporate malfeasance and weak company and managerial ethical and moral values. The lethal Takata airbags triggered what is the most massive recall in history by the NHTSA, affecting 69 million inflators and 42 million vehicles.

On November 7, 2014, the New York Times (NYT) reported that Takata knew about the problems associated with its airbags as early as 2004, when it was reported that an airbag had ruptured and sprayed shrapnel into the inside of the car, injuring the driver. Following that report in 2004, the company ordered its testing laboratory to conduct tests on fifty airbags that it had collected from cars already confined to scrapyards. During these tests, the steel inflators in two of the airbags cracked, which could according to a senior engineer involved in the testing, could lead to explosion. The report in NYT asserted that the company conducted the secret tests outside of work hours to try to ascertain the problem.

According to NYT, the test results identified the airbag inflators as the source of the problem and immediately started searching for a solution. However, the company chose not to inform the NHTSA that they had probably isolated the problem and frantically researched for ways of fixing it surreptitiously, under the radar. Moreover, engineers who conducted the tests asserted that Takata management were incredulous of the test data and directed testing personnel to delete the data from their computer files and to dispose of the tested airbags as garbage. Frantic search for a solution started at least four years before the company acknowledged the problem to the NHTSA in 2014, which means that the company was engaged in a criminal cover-up during the ten-year period that its airbags were maiming and killing customers (28, 2014). That was the second time that middle level management or technical/engineering staff had strongly warned Takata that the airbags the company had designed and was producing would cause death or debilitating injury to passengers. The first warning came even before the airbags were being sold to car manufacturers while the second came on the basis of the hard evidence referred to above.

Initially, the exploding airbags problem appeared intractable because these explosions did not occur in the usual manner during airbag deployment in reaction to a collision but seem to occur randomly without any known triggering event.

When Takata hesitatingly started to admit that the cause of the explosion was defects in the airbag itself, the company asserted that the explosions were caused by improper handling of propellant or because the airbags were being stored and handled incorrectly. However, because all manufacturers that were using Takata airbags in their cars were experiencing unpredictable airbag explosions, the company's attempt to deflect blame towards car manufacturers was untenable.

Takata: Its Origin, Mission, Philosophy, Growth and Development:

From very humble beginnings as a Japanese textile manufacturer, Takata undertook a stunning set of acquisitions and expansions that propelled it to a large global corporation by 2010. Table 1 provides the statement of the company's culture, Table 2 is the statement of the company's mission and philosophy, while Table 3 summarizes key developments in the company's history from its founding to the 2010s. All these tables are copies of the information that appear on the company's website as of December 27, 2017.

Table 1: Takata's Statement of Corporate Culture

At Takata, our greatest asset is the people who work for us. Our talented team is hard working and dedicated to keeping people safe. We promote a collaborative, open culture; as a global business, we encourage our team members to communicate and work with colleagues around the world. Our team is passionate about the automotive industry, focused on delivering quality and innovation for the future. We encourage lifelong learning and provide the resources to help our team members build the foundation for a strong future with us. We strive to promote from within, offering excellent opportunities for career growth and advancement. Join the Takata team today!

Table 2: Takata Philosophy and Mission Statement

Philosophy:

We embrace the pioneer spirit of our founder and are motivated by the preciousness of life.

Mission Statement:

Develop innovative products and provide superlative quality and services to achieve total customer satisfaction.

- Respect various personalities and cultures and keep associates highly motivated under the Takata name to pursue common goals.
- Be an active member of the community and contribute to a better society.

History of Takata:

According to the company, "Takata has been engineering the precision of our products to the millisecond for over 70 years. We have been driven by our dedication to save human life while embracing a pioneering spirit in developing innovative products. Takata has spread this same thought process to all of our locations worldwide. "Somewhere on earth, Takata products have saved the preciousness of human life today". We continue to challenge ourselves and our affiliates all over the world to develop new technologies so that people will be able to experience the joy of life. Our dream is that, some day, there will be zero victims due to traffic accidents. And we hope the day will come when the word "TAKATA" becomes synonymous with "safety".

"In 1933, Takezo Takada establishes Takata Company, a textile manufacturer in Shiga Prefecture. The firm uses its weaving technology to manufacture lifelines." The company grew mostly at first staying close to the vision of its founder. But, with its entry into passive restraint systems in 1963, the company saw a major opportunity to grow rapidly and become a major global corporation, and it pursued that mission with a vengeance. Between 1971 and 2012, the company undertook at least sixty major acquisitions and expansions that saw its operations established in the USA, Europe, Latin America, Africa and Asia outside of Japan, and the company saw itself operating across a number of different cultures and markets. That driving ambition would sow the seeds of the company's eventual demise.

Sowing the Seeds of a Massive Quality Failure:

According to Newton's laws of motion, everything in a moving car moves at the latter's speed. In the event of a crash, the moving car slows down or comes to an abrupt stop, but the objects in the car continue to move at the latter's speed, become projectiles that slam against the dashboard or any other static object in their path.

An airbag works by placing a softer object between the passengers and the static hard objects that they would most likely crash into while simultaneously slowing down the speed of the passengers in the car to minimize the impact when they inevitably hit whatever hard object that they are being thrust towards by the crash. An airbag uses the split second that exists between a car hitting a fixed object and the passengers smashing into either the windshield or the steering wheel to inflate and place a soft object to cushion the impact. An airbag is also referred to as a supplementary restraint system or supplementary inflatable restraint, which means that airbags are engineered so that your seat belt protects instead of harming passengers. Airbags inflate as soon as the car suddenly stops or starts to decelerate in the event of a crash. The airbag inflates and slowly deflates as a passenger's body presses against it, which serves to slow the velocity at which the passenger hits the steering wheel or the dashboard in the event of a crash. Side airbags function in a similar fashion when a passenger is thrust sideways during a crash.

In order to understand the critical decisions that placed Takata on the path to the eventual problems associated with its airbags, it is necessary to know the basic mechanisms behind the functioning of an airbag. The absolutely critical element to the functioning of an airbag is the propellant that causes it to inflate. A propellant is, by nature, explosive material and deploying it safely in an airbag requires a set of mechanisms that both trigger the explosion and rigorously controls it so that the inflation of the airbag and its safe deflation are completely controlled. The critical change that created problems for Takata airbags was the change in the chemical explosive that triggers the inflator, the component that causes the airbag to inflate in a split second and which creates a cushion of air between the passengers and the steering wheel or dashboard. While Takata rivals Autoliv and TRW Automotive use guanidine nitrate as the explosive chemical, Takata switched to using a much cheaper chemical, ammonium nitrate, which is similar to the chemical used in fertilizer and explosives, the kind used by the Oklahoma City bombing that caused havoc to a Federal Government building and led to a huge loss of life and physical injury. Basic common sense should inform any corporate management that if you propose to use an agent of that nature to deploy an airbag in an automobile, you better be absolutely sure that you know all the operating conditions of that airbag and can absolutely control them.

In 1996, Takata started using a new propellant, tetrazole, which proved to be safer than but as effective as the sodium azide used at that time by most airbag manufacturers. The new propellant enabled Takata to win Ford and General Motors as customers, which allowed the company to increase its share of the North American market. But tetrazole was still relatively expensive so in its drive to dramatically reduce cost and to pursue its ambition of attaining a dominant position in the industry, Takata continued its search for a cheaper alternative. The company's research efforts led it to ammonium nitrate, a propellant ten times cheaper than tetrazole. But ammonium nitrate is much more unstable and produces a violent explosion which is more difficult to control in an airbag. In fact, in some instances, the force of explosion of the ammonium nitrate in a deflator is so violent as to shatter the deflator mechanism and rupture the airbag itself, violently spreading shrapnel throughout the vehicle. Shrapnel projectiles were the source of major injury or death.

Further complicating things for Takata was the fact that ammonium nitrate deteriorated over time under conditions of high heat and humidity, became very unstable and could cause an airbag inflator to explode violently either during normal operation of the vehicle, even if the vehicle was not involved in any impact event, or because of minor incidents that should normally not cause the airbag to deploy. The dangerous nature of ammonium nitrate as an airbag propellant was well understood both by engineers at Takata and some of the company's competitors. Despite strong opposition from some of its engineers, the company went full speed ahead with its decision to start using ammonium nitrate as an airbag propellant. One member of the engineering staff, Mark Lillie, in an interview with Bloomberg went on the record in stating his experience at a staff meeting at Takata and recalling his testimony to congress on the Takata debacle, as reported by Bloomberg Businessweek and JALOPNIK (4, 2016; 20, 2016);

"At the meeting, I literally said that if we go forward with this, somebody will be killed, he adds in an interview, echoing his testimony. After the design review, Lillie says he met separately with the engineer who served as the liaison with Takata headquarters in Tokyo. "What I gathered from the conversation was, 'Yes, I'll pass on your concerns, but don't expect it to do any good, because the decision has already been made.'" The head of ASL was Paresh Khandhadia, who holds a masters' degree in chemical engineering and was a "very smooth operator," Lillie says. "Tokyo put a tremendous amount of stock in his credentials."

Neither Khandhadia, who left Takata in 2015, nor his lawyer responded to request for comment. During a deposition last year, Khandhadia was nearly silent, citing his Fifth Amendment right not to testify against himself.”

Further, in the late 1990s, GM got an offer they would find impossible to resist when Takata submitted a price for supplying airbags that was thirty percent lower than what one of its most reputable suppliers, the Swedish airbag manufacturer, Autoliv, was offering. Notwithstanding demands made by GM to reduce its price by thirty percent or risk losing a customer it had long supplied with airbags, Autoliv refused to budge and lost the GM account to Takata. “We just said, ‘No, we can’t do it. We’re not going to use it’” (ammonium nitrate) said Robert Taylor, Autoliv’s head chemist until 2010. It was later reported that for just a few dollars per airbag cheaper, GM was willing to use a device that was critical to customer safety, the technical integrity of which was unproven. The fact that Autoliv, a deeply quality conscious supplier refused to adopt the new propellant was apparently not enough to give GM purchasing managers pause (26, 2016).

Trouble in Manufacturing and the Supply Chain:

The facts reveal that the design of the airbag was fatally flawed and that even if the designed was perfectly executed in manufacturing, or the parts to make it and the airbag itself were transported through a perfectly designed and controlled supply chain, Takata would eventually experience catastrophic failure of its airbags. But the evidence clearly showed that failures in the company’s manufacturing and supply chain system accelerated and exacerbated the magnitude of the quality failure. First, very early in the airbag quality debacle, Takata’s plant in Mexico was clearly identified as the manufacturing source for defective airbags that exploded in 2001 and 2002. On March 30, 2006, Takata’s plant in Mexico that became one of the company’s major facilities for the manufacture of inflators used in its airbags experienced a massive explosion, the cause of which was never acknowledged by Takata.

However, some workers revealed that the explosion occurred in bunkers of ammonium nitrate, the inflator used only in Takata airbags, located next to the plant. The explosion blew up windows in houses miles away but, miraculously, no deaths or injury were recorded. Takata management quickly took credit for the safety and evacuation policy which they claimed was instrumental in preventing loss of life or limb. The company quickly glossed over or covered up what created the need to evacuate the plant in the first place, which was the manufacture and handling of a highly volatile material the stability of which was almost impossible to control in the manufacturing environment that existed in the Mexico plant at the time, that is, high humidity, water sometimes infiltrating into the production process, workers who were under intense pressure to produce, manufacturing processes that were not adequately maintained, workers who did not receive adequate training from the company and whose economic and social conditions did not allow them to disagree with superiors or complain about work safety issues to management, without fear of being severely reprimanded or even losing their jobs.

Following the explosion, management of the Mexican plant implemented a series of incentives such as giving free television sets to employees that were designed to quickly ramp up production. The measures apparently worked very well and Takata’s major customers such as Honda and Ford did not experience any airbag delivery shortages that could have interrupted their production. The pressure to maintain and increase production of inflators was relentless because the Mexican plant had to make up for both lost production time due to the explosion and a brisk demand for cars in the US market as car manufacturers struggled to cope with a demand intensity that had never occurred since before the recession of 2008. In 2014, the US auto industry was on track to deliver over 17 million new cars and trucks to market. Pressure placed on workers to increase and maintain production meant that the factory was cutting corners on quality control and was shipping airbags that would normally have failed basic quality control tests. At the same time that pressure to produce had built to a frenetic pace, reports of explosions of Takata airbags continued unabated and the NHTSA was already leaning on Takata to expand and accelerate recall of all its airbags. Takata management resisted the NHTSA because, the company argued, expansion of the recall would result in a shortage of airbags for new vehicles.

In 2012, workers at Takata’s Mexican plant placed the wrong part in a set of airbag production runs which made all the airbags defective. According to Takata’s own production policies, inflators that were identified as defective, were to be placed in a designated ‘red bin’ and repaired by a team of employees separate from the normal assembly line. Over 350,000 vehicles manufactured by three different manufacturers were eventually recalled because of the wrong part quality defect.

But, in an email in 2011 from a supervisor, Guillermo Apud, and examined by Reuters, Mr. Apud excoriated workers for repairing too many defective parts. In Reuters' translation, it reads; "Rework on the line is PROHIBITED!!!! (*bis exclamations*).

We can't have leaders/materials people/operators REWORKING (*bis capitalization*) material left and right without any control, this is why we have defect upon defect. We need to change NOW!" (*Capitalization and exclamation bis*). Apud did not comment on the email but Berman, an executive at Takata asserted that "the email is an example of the manager performing his supervisory responsibility and enforcing company quality controls."

Again, as reported by DeBord from information developed by Reuters, "Interviews with 21 former and current Takata workers and consultants, along with company presentations and emails reviewed by Reuters reveal the pressure inside the Japanese supplier to ramp up output and drive down costs for inflators—the mechanism that triggers air bags to deploy in a fraction of a second after a crash. The accounts include the concerns of managers that workers broke quality rules to boost output. It isn't clear whether the productivity pressures and quality issues they describe led to specific accidents. But the portrait they draw suggests that top executives at the company (in Japan) were not fully aware of what was going on at the foreign factories that churned out millions of airbags. So far, the Takata problems have led to the recall of over 42 million vehicles and 70 million airbags worldwide." (7, 2014).

The problems did not end in manufacturing. As reported by the NYT, "The internal materials and interviews with the former quality control managers also suggest that quality control problems at Takata stretched beyond its production lines. Airbag modules would get wet during transit, arriving wet at automakers' assembly plants on leaky trucks, the managers said. The problems were addressed in an overhaul of operations at the plant starting in 2004, but local managers struggled to maintain the stricter controls. "the whole situation makes me sick," one manager wrote in a February 2007 email addressed to multiple colleagues in which he complained that checks the center had introduced to try to keep the airbags dry- including hosing down trucks to check for leaks- were being ignored. A 2009 presentation of guidelines on handling inflators and airbags stressed the dangers of mishandling them. The presentation included a link to a video that appeared to show side-curtain airbags deploying violently, sending the inflator hurtling into the car's cabin(The inflator does not rupture in that video)." (30, 2014).

However, Takata's airbags could not do any harm to passengers in a car unless they were chosen by car manufacturers and installed in their cars. Although all car manufacturers who were customers of Takata airbags asserted that Takata was completely responsible for the deaths and injury inflicted by these airbags, there is the unavoidable question of what the car manufacturers knew, when they knew it, and what impact the early available information had on their decisions. Clearly, GM had a very early warning signal when Autoliv, a very reputable, deeply quality conscious Swedish airbag manufacturer that has produced major innovations in airbag design and manufacture, and which was in that business long before Takata, refused to switch to ammonium nitrate, the source of the problem for the troubled airbags, which would result in a significant decrease in cost and price. Somehow, GM's attention and that of its competitors, was so fixated on driving down cost, that they were blind-sided by the safety issues that they should have been alert to at the outset. Exhibit I referred to earlier, may provide insight into the motives and behavior of the car manufacturers. Were five of the world's leading car manufacturers, among them companies that are benchmarks of quality excellence, hood-winked by an airbag manufacturer upstart like Takata, or were these car manufacturers enticed by attractiveness of cost savings to install a dangerous product into their cars, which turned out to be deadly to so many of their customers? And whatever the answer to that question, a second one begs to be answered; what factors in the managerial and internal processes of these companies and their culture and value systems that were so awry as to expose them to these kinds of vulnerabilities?

Exposing Takata's Explosion Cover-up:

Takata initially claimed that they only found out the cause of the airbag explosion problem in 2008, but in the NYT report referred to earlier, Tabuchi asserted that "Takata knew about the defective airbags way back in 2004, and allegedly ordered employees to destroy test data confirming the issue." (30, 2014). Takata also knew that the problem was caused by the deterioration of the chemical inflator, ammonium nitrate, under conditions of high heat and humidity. In an effort to remediate that problem, the company started to use a desiccant, calcium sulfate, a chemical that was thought to keep the ammonium nitrate dry, in all subsequent models of its airbags. However, that only delayed the problem as subsequent analysis of exploded airbags revealed that some of those had been modified with the desiccant. Over time, the desiccant itself deteriorated to the point that it made very little difference to the long term safety of Takata airbags.

Jethro Mullen, writing @CNMMoney, on June 26, 2017, made the following observation; “The sad saga of Takata...has resulted in the implosion of one of the automotive industry’s oldest and most successful suppliers due to technical hubris, mismanagement and a systemic corporate culture of manipulation”, said Scott Upham, the CEO of Valient Market Research.”

Although the car manufacturers attempted to lay the blame for the exploding airbags entirely on Takata, the evidence showed that they themselves were substantially responsible for that disaster. During examination of Takata’s plea agreement, a progress report on the status of the case filed with the court, attorneys for the plaintiffs outlined the statements of facts with respect to each car manufacturer’s conduct, shown in Exhibit 1.

In January, 2017, Takata pleaded guilty to wire fraud charges related to its airbag defects, and agreed to pay a \$1.0 billion fine. The \$1.0 billion fine includes a \$25.0 million criminal penalty, a \$125.0 million payment to the victims of the explosions and an \$850.0 million payment to car manufacturers who used Takata airbags in their cars. Overwhelmed by the scale, intensity and cost of the recall that could easily reach \$24 Billion, Takata filed for bankruptcy protection on June 25, 2017. Key Safety Systems (KSS), a Chinese-owned company operating out of Michigan has offered to buy all of Takata’s operations for \$1.6 Billion. Key Safety Systems intends to steer clear of the defective parts at the heart of the Takata quality debacle. \$1 Billion of the proceeds of the sale will cover Takata’s settlement of criminal charges brought by US authorities.

When Takata was finally forced to admit clear malfeasance in the case of its lethal exploding airbags, the Chairman of the company, Shigehsia Takada, scion of the founder of the company, in a public admission of guilt, stated; “We caused troubles for our supporters, those who cooperated with us and the creditors. On behalf of Takata, I apologize deeply from the bottom of my heart.” as he bowed before the cameras in the typical Japanese fashion of publicly showing contrition. But crucial questions remain. Was Mr. Takada truly contrite or was his act a mere public display? Why did Takata take so long to admit that the product his company manufactured was killing customers, the very people that his organization was supposed to protect? Why did Mr. Takada publicly display contrition only when the NHSTA had irrefutable evidence of Takata’s malfeasance? Why did the company systematically engage in the destruction of evidence when it clearly showed that the product his company manufactured was dangerous causing the death of its customers?

The reader will be reminded that the inherent purpose of the product made by Takata was to protect the safety of its customers in the unfortunate event of a crash, but that very product became a lethal weapon that caused death and injury, and thus destroyed the very safety it was meant to promote.

The Hard Fall of a Former Rising Global Star:

Following the takeover by KSS, Takata will be essentially divided into two separate entities, one to take ownership of the healthy assets of Takata, that is, the part of the company that does not include the manufacture of the toxic airbags, and the other that will be returned to Takata and continue to manufacture a version of the airbags that include a drying agent for absorbing the moisture that is believed to be the trigger that causes airbag explosions. KSS will have no relationship with that latter company. Despite the massive recall and a relentless drive to replace all Takata airbags in the affected vehicles, these airbags are still causing death and injury. On December 21, 2017, the Los Angeles Times reported that Honda recorded one more death from an exploding Takata airbag, which brings the total number of deaths worldwide for all car manufacturers to over twenty. That person died when a Honda 2004 Civic crashed on July 4 in Baton Rouge, Louisiana, and the resultant explosion of the airbag caused the death, in addition to over 300 recorded injuries. According to Honda, the exploding airbag in the 2004 Honda Civic was salvaged from a 2002 Honda Civic.

Takata’s stock was delisted from the New York Stock Exchange on July 27, 2017.

EXHIBIT I: Statement of Facts in Case Against Takata:

“Pursuant to this Court’s Order Appointing Plaintiffs’ Counsel and Setting Schedule (ECF No. 393), and in response to the Status Report filed by the Automotive Defendants (ECF No.1407), Plaintiffs submit this Status Report in advance of the February 28, 2017 hearing to update the Court on the status of this MDL and recent, relevant developments.

A. TAKATA’S PLEA AGREEMENT.

According to documents produced in discovery, including their own, they were focused on the low price of Takata's inflators and concerned that if they stopped using Takata's inflators, they might not have a sufficient supply, which would prevent them from selling vehicles and generating billions of dollars in revenue. Indeed, some of the Automotive Defendants continued to sell vehicles equipped with ammonium-nitrate inflators in 2016, well after allegations of Takata's test-result deception became public, completely disproving their claim that they would have acted differently had they been told the truth about Takata's test results. Although more work remains to be done in discovery, the following are only a few examples of the evidence uncovered thus far with respect to just a few of the Automotive Defendants:

Honda: Honda's emails and internal documents show that it picked Takata's inflators due to their relative "inexpensiveness."

- In 1999 and 2000, Honda was intimately involved in the design of Takata's ammonium-nitrate propellant and chose the "batwing" shape, over Takata's objections.
- During testing of Takata's inflators in 1999 and 2000 at Honda's own facilities, at least two inflators ruptured.
- By the end of 2009, at least 14 field ruptures had occurred in Honda vehicles, including the first fatality, at least 117 by March 2016.

Toyota: Toyota chose Takata's inflators "primarily" because of costs, even though, as early as 2003, Toyota had "large quality concerns" about Takata, and considered Takata's quality performance "unacceptable."

- At least 15 ruptures occurred in Toyota vehicles by 2014, when a nationwide recall was initiated.
- Despite the recall, Toyota continued to equip and sell vehicles with inflators containing non-desiccated ammonium nitrate.

Ford: Ford chose Takata's inflators over the objections of Ford's own inflator expert, who was opposed to the use of ammonium nitrate because of its phase instability and moisture sensitivity—characteristics that make ammonium nitrate unsuitable as an inflator propellant and have contributed to ruptures.

- Ford was aware that numerous ruptures had occurred during testing of Takata's inflators in November 2004.
- Recognizing the risk of Takata's ammonium-nitrate propellant, Ford insisted on adding desiccant, a drying agent, to the propellant for certain inflators beginning around 2005—yet for almost a decade after that, it continued to equip and sell vehicles with inflators containing non-desiccated ammonium nitrate.

BMW: Documents show that "cost saving" drove BMW to choose Takata inflators.

- In 2003, a Takata inflator in a BMW ruptured in Switzerland, with a metal shard ripping through the airbag.
- In March 2010, BMW told NHTSA that it was unaware of any field incidents, despite the fact that it knew of the 2003 rupture in Switzerland."

Analysis And Discussion:

Our observations and analyses reveal that the problems or situations that eventually resulted in catastrophic quality failure in companies were neither sudden nor invisible. Instead, there usually are signals or anomalies that were early symptoms of emergent and potentially significant problems which should have triggered proactive remediation action by management. We noted that in some cases, notably as in the case of Firestone, middle and lower level managers had come to the realization that the company was significantly deviating from its commitment to quality, and communicated their concerns to upper management but were either completely ignored or even reprimanded for doing so. In one of the most flagrant violations of its commitment to quality and the well-being of its customers, Firestone terminated a first line supervisor who resisted management pressure to relax quality standards and accept products that were inferior when measured against quality requirements. That resulted in defective products being delivered to customers, with disastrous consequences for the company. It is a profound and egregious violation of the law, of ethical, and moral standards, and of sound quality management principles and practices. This is particularly abhorrent when one considers that the quality standards and requirements were put in place by the company which had trained lower level supervisors to be knowledgeable about these standards and requirements and had mandated compliance with them.

Decision makers were not driven by sound moral and ethical principles in making crucial quality decisions. For reasons that will be explored more fully subsequently, key decision makers were driven to divorce their responsibility to meet corporate managerial responsibility from their personal moral responsibility to protect the well-being of eventual users of the product or service.

It is as if, under pressure to deliver significant organizational results in a compressed time frame, decision makers were afflicted, temporarily, at least, by a kind of moral schizophrenia where they were driven by two distinct and separate moral systems that did not overlap at the critical decision-making junctures.

Overpowering ambition to produce market results, sales growth, market share, first to market status, or intense pressure to enter a market soon after the market leader, without a vigorous, overwhelming moral framework or code to temper such ambition. It is always true that in any society, institution or organization, overwhelming ambition that is not channeled, checked or constrained by a strong moral or ethical code always leads to socio-pathological behaviour, regardless of whether such code comes from a strong set of religious teachings or values, or simply from the history, tradition or zeitgeist of the broader society in which the company operates.

Pressure to win in the short run that is not tempered by deep rooted conviction that market success is best pursued with a long run orientation. Too many top managements are not completely persuaded, although they superficially profess to be, that all quality battles are fought and won through relentlessly working hard over the long run. Many top managements tend to panic when their companies appear to be losing short term quality battles against their rivals, and are prone to cut corners in an effort to stay abreast, even if these short term actions almost always sacrifice long term quality superiority and dominance. These short term, panic-driven reactions betray absence of very high emotional intelligence that equips key decision makers with the calmness and serenity to bear short term failures and sacrifice short term success in the pursuit of superior quality performance in the long run. In the face of immediate and short-term market and financial failures, these managers are prone to lose their managerial cool and cut corners.

Corporate culture and value systems that deprecate the role of government regulations which seek to protect consumers and the environment and promote a negative view of them, contribute to the likelihood of a company experiencing a major quality debacle. Regulations are seen as uselessly adding to cost, stifling of economic and competitive efficiency, detrimental to the pursuit of profit maximization and unnecessarily slowing down innovation. Embedded in the culture and value systems of these organizations is the conviction that consumer and environmental protection regulation is socialism in disguise, usually crafted by bureaucrats and politicians who have little understanding of practical aspects of the nature and constraints of competition and of the intricacies of running a business profitably. Culture and value system in these companies do little to empower key decision makers to resist pressure to circumvent or ignore consumer and environmental protection regulation and, on the contrary, tacitly encourages key decision makers to ignore or circumvent such regulations 'whenever they can get away with it.' We have seen the pernicious impact of these aberrant culture and value systems at play in nearly every major quality debacle that occurred over the last fifty years or so.

Absence of accurate understanding of the true cost of non-quality: Top managements, in particular, have still not completely internalized the idea that it is non-quality, and not quality, that costs. The broad range of ramifications of the concept promoted by Crosby since at least fifty years ago that 'quality is free', has still not been thoroughly understood by top managers and its implications have not been internalized. Our observations confirm that in companies that experience major quality debacles, top managements hold undauntedly to the concept popularized by Juran that there are costs associated with quality, and that the economic behaviour of these costs shows that there is an optimal quality level beyond which companies should not operate because pushing quality levels beyond that optimal point will result in higher costs. The Juran quality cost model gave management justification for not producing and delivering "too much quality" to customers because doing so would decrease profitability. In other words, the Juran model confirmed in the minds of many top managements what they were always thinking, which is that the best quality performance for a company is to deliver just enough quality, and certainly no more than competitors are offering. We note that in nearly every case of major quality debacle that has occurred over the last forty-five years or so, management sacrificed product quality and safety in pursuit of low cost, sometimes by just a few dollars per unit.

And the face of mounting evidence that their products were failing and causing death and injury, company after company, in an effort to avoid the cost, was reluctant to recall their products and nearly all did so only after severe pressure and threat of legal action from regulatory agencies (Ford Pinto gas tank, GM ignition switch defect, Bridgestone/Firestone exploding tires, Honda, GM, Ford, BMW, Nissan and Toyota decision to use Takata Airbags).

Thus, the logic of the Juran model coheres perfectly with the fundamental thinking of top managers, and it simply gave them an economically plausible basis for rationalizing their thinking. This reasoning implies that a company that is driving hard to produce perfect or near perfect products and service will be less profitable than one that finds its optimal quality level and stays at it. It should be obvious to an astute observer of the global competitive arena in which companies compete, coupled with the reality of the regulatory and consumer protection environment of today, that companies that obstinately adhere to the economics of quality framework as proposed by Juran are bound to get into serious trouble and expose themselves to major quality debacles. Too many top managers have not thoroughly internalized the idea that defects and failures are extremely costly, particularly external failures, and that these dwarf both the cost of defect prevention and the cost of assurance by orders of magnitude (Crosby, 1979). And this is so even where defects and errors do not have immediate, dramatic impact of the magnitude that we refer to as major quality failures or debacles. Defects and errors that appear to be small, relatively infrequent and of little consequence do, in fact, have disastrous consequences for a company's competitive position, market share, profitability and sustainability of strategic position over the long run. These defects and errors insidiously impact a company's reputation, goodwill, customer retention, customer centricity and the strength of its drive to continuously improve and search for perfection. This eventually results in lackadaisical attitudes towards quality and a weak quality culture and value system which sets the stage for major, if not catastrophic quality failure sooner or later. Eventually, the "chickens always come home to roost."

The idea that quality is the major driver of profitability for a company, has not penetrated deep into the managerial psyche of these companies. Companies are still obsessed with driving profits ever higher by either dramatically cutting costs, even to the detriment of quality, or pressing hard on driving sales through aggressive selling and promotion tactics and pursuing these tactics with little regard for the long-term impact on product or service quality. When these companies are missing their profit targets or are losing money and searching for 'profit and cost drivers' they almost never think of quality. The typical profit and low-cost drivers they search for usually include volume, in search of economies of scale, promotion and marketing effort to drive sales, dramatic reductions in direct labor cost, reduction in overhead expenses, aggressive search for parts suppliers in low wage countries, off-shore plant location, to name some of the most popular. Yet, that is exactly what it is and the critical relationships between quality and profitability and quality and low cost were clearly identified and fully explained by Deming several decades ago.

Top managements in these companies have not fully understood that the true purpose of a business is to "create a customer" by delivering a quality product or service. More than sixty years after Drucker averred that the purpose of a business is to create a customer, manager after manager appears enslaved to the erroneous idea that the purpose of a business is to make money. Time and time again, graduate students, middle and higher level managers, when asked the question 'what is the purpose of a business?' the response that comes back resoundingly is, 'a business exists to make a profit', or its crude statement, 'a business exists to make money'. And again, the corporate culture and value system, the approaches to evaluating, promoting and compensating employees, has done very little to rehabilitate managers from that dysfunctional thinking and, in point of fact, constantly nurtures and reinforces it.

But the evidence is overwhelming that making and delivering a quality product is the surest path to the long-term growth, profitability and sustainable competitive position of a company in its market, top managements and key decision makers are still not completely convinced. Nearly all Baldrige Quality Award Winners outperform their competitors in terms of market share, sales growth, return and sales and ROI. But Autoliv's reaction to pressure from GM to reduce the price of its airbags to match that offered by Takata once more proved the point. Autoliv was able to resist pressures from GM to dramatically reduce the cost/price of its airbags, because they knew that they could not produce an absolutely safe product at the cost GM required. History records that GM suffered losses as a result of the Takata quality debacle that ensued, which drove Takata into bankruptcy, while Autoliv continues uninterruptedly to make airbags that surpass customer expectations and protect consumers. Autoliv has succeeded in expanding their business and making a decent profit while staying single-mindedly focused on quality.

In companies that suffer major quality failure, the commitment to make and deliver a quality product or service is not strong enough to cause top managers to be unshakeable in their resolve to take no defective product or service to market, when the company is facing extreme pressure to produce short term financial results or respond to a competitor's successfully competitive moves.

The myth(trap) of invisible defects: there is a rather dangerous idea that is prevalent in some companies that get into deep trouble with the quality of their products and services.

The thinking is that product defects or service errors that are not visible to the customer or that do not have customer-perceptible impact do not affect a company's market place or financial performance in any strategically significant way. That kind of thinking is the quality control equivalent of "what the eyes do not see cannot hurt the heart." (Takata destroying test results that proved its airbags experience deadly explosions, Bridgestone/Firestone, Ford blaming each other for the deadly rollovers triggered by tire ruptures on Ford Explorers).

This thinking has two perverse effects. The first is that managers who harbour this kind of thinking have little motivation to expunge these defects from their products or services, since to them, doing so would impose additional costs and bring no market place or financial benefits. Second, when faced with a difficult quality challenge, managers in companies where that thinking is accepted will almost always deploy strategies to make defects invisible to the customer, covering them up instead of applying resources, energy and effort to make all defects and errors visible so as to systematically expunge them as the surest and most viable means of improving products and services and sustaining market and financial performance over the long run. For example, rather than expend the necessary energy and resources to actually improve the mileage of its cars, Volkswagen managers and engineers used crafty, "too clever by half" software based strategies to try to fool EPA testing personnel into believing that their cars were generating better mileage than they in fact were. Volkswagen was caught red-handed and paid a very heavy price; fines that could total \$30 billion worldwide, an additional reduction of \$25 billion of equity value and a 40-month prison sentence for the engineer who is alleged to have led the scheme.

When efforts to conceal defects and errors result in violation of the law, sooner or later, companies invariably experience catastrophic quality failure and get into very deep trouble in the market place and financially. The thinking that defects that are not visible to the customer or that do not have customer perceptible impact are insignificant for the competitive performance of a company is bound to have very serious competitive consequences at least in the long run, but possibly in the short-to-intermediate term as well. First, the attitude at the root of that kind of thinking will never be confined to the so-called customer-invisible defects but also promotes a certain level of laxness towards other quality areas that produce customer-visible defects. Slowly, but surely, laxness in all areas of quality come to permeate the entire company. Quality excellence is driven by quality culture and values and like the rest of corporate culture, it is inevitable that laxness tolerated in any one area will eventually grow to permeate all other areas. We have observed this time and time again in companies. Poor quality tolerated in one department will, in the absence of speedy and vigorous management action, grow to infect many and possibly all departments. Inferior workmanship that is acceptable in one area will eventually come to be acceptable to all areas. Again, in the absence of decisive management action to quickly expunge it, mediocrity tolerated in one school in a college, university or school system will eventually migrate to all schools. Quality attitudes and values do not remain localized for long. They migrate and spread like cancers and deadly infectious disease and, if not neutralized, eventually become the organizational pandemics that destroy companies.

Second, whatever defects and errors are currently invisible to customers will not be in the long run, and possibly in a shorter time frame.

For one thing, there are always enough probing, diligent, sometimes persnickety, customers who will be curious enough to verify the value they are receiving for money paid. And these will discover sooner or later, that the company had been dealing with them dishonestly and they are likely to let the whole world know. Third, a company that harbours the idea that defects need not be expunged if they are invisible to the customer or the impact of which the customer does not perceive, is likely to face two unanticipated consequences. Sooner or later that company is bound to make a major mistake, either in the area of the supposedly customer-invisible defects, or in a completely new area where quality indiscipline has migrated as a result of tolerating customer-invisible defects, and the whole sham cover-up will just blow up.

And when small defects metamorphose to become cataclysmic failures, regulatory agencies, nemeses of bad, reckless management, force a company to recall a product, at great expense and loss of customer and public goodwill. The indiscipline or callousness that tolerates so-called customer-invisible defects will always migrate to parts of the operation that have a higher propensity to produce defects that are visible to customers and also have significant market impact.

Fourth, competitors are likely to become aware of the customer-invisible defects and errors of a company's product or service, and in their search for market place advantage, are likely to identify and bring these to the attention of customers. A company's competitors can highlight their relative quality advantage to customers by identifying so-called customer-invisible defects and errors in another company's products or services, pointing these out to customers, and using that information in comparative advertising, all in an effort to woo customers away from a competitor. Last, but not least, it is a failure to deal truthfully and honestly with its customers when a company delivers products or services that the company knows to contain defects or errors, even when these defects or errors or their impacts are not visible to these customers. Generally, customers will conclude that they were lied to by the company and when they do discover the truth, and they will discover it sooner than managers realize, customers will be repulsed. Because customers rightly conclude that a company that is untruthful in "little things" is likely to be untruthful in big things, and this destroys whatever trust they had placed in the company.

All the spectacular quality failures studied by our investigation resulted from deliberate, unethical and sometimes criminal conduct of one form or another, on the part of top and middle level managers. In cases where top management was not directly involved in the unethical or criminal conduct, they always tacitly or implicitly allowed it to occur, or turned a blind eye to its occurrence with the hope that they could provide plausible deniability of their involvement. But when subjected to vigorous investigation, in every case where top management plead ignorance, the facts almost always show that it was deliberate ignorance, that if management did not know then they should have known, and ignorance usually turns out to be, at the very least, dereliction of duty. In every single case where top management starts by pleading ignorance of the malfeasance that led to catastrophic quality failures, the violations of law and the fundamental trust of customers that occurred were so egregious and persisted over such a long period of time, that the assertion that top management was unaware that misconduct on the part of subordinates was taking place stretched credulity.

In addition, the history of spectacular quality failures, wherever they occurred, is replete with cases that involved either highly unethical and/or criminal behaviour on the part of companies.

Yet, ostensibly, these corporations were adhering to the quality management principles and practices that are at the heart of the TQM paradigm. We undertook a closer look at the TQM paradigm itself in an effort to ascertain how much emphasis it places on ethical, moral and legal obligations as an integral part of corporate and managerial quality responsibility. Our evaluation revealed that none of the approaches to TQM espoused in the works Deming, Juran, Crosby and Ishikawa, considered to be the foundational underpinnings of TQM, provides any moral/ethical framework for dealing with moral/ethical obligations related to the management of quality.

Also, almost completely absent from these frameworks is any reference to a corporate code of ethics and how it relates to decision-making and implementation in TQM. However, both the Baldrige and ISO provide guidelines for incorporating moral and ethical considerations in their management systems, whereas none of the leading works on Six-Sigma that we examined makes even scant or passing reference to the need for a moral/ethical code of conduct to guide quality decision making. But while ISO simply provides guidelines and parameters for a code of ethics with regards to quality responsibilities, the Baldrige goes much further and addresses the challenges of how to implement such a code of ethics and how to do follow-up on auditing and enforcing compliance to it. The Baldrige also provides concrete examples of the cases of award winners that have implemented a code of ethical conduct in their quality management processes and are successful at auditing and enforcing compliance to it. The Baldrige is far ahead of all other Total Quality frameworks in requiring that companies implement a management process for integrating moral and ethical responsibilities in the management of total quality. The failure of companies to provide a framework for ethical decision making in quality management, specifically formulate and deploy a set of ethical and moral principles to be adhered to by all managers, and the absence of an enforcement mechanisms to ascertain adherence to them is a glaring omission in the formulation and deployment of total quality strategy. This has wreaked havoc on too many companies in the past and it will no doubt continue to do so in the future unless radical action is taken to rectify a problem with potentially catastrophic consequences, as we have argued.

These moral and ethical obligations must certainly be taken deadly seriously if a company is to avoid quality failures that cause harm to customers or that so egregiously violate the trust that they place in a company's products or services, which invariably lead to the disastrous quality failures that either destroy a company or at least drive it to the brink of extinction. Instead, these moral and ethical obligations have been relegated to general statements of corporate ethical principles and norms that are feeble, anemic and platitudinous statements that are found in the "codes of ethics"

That are a standard fixture of corporate policies today. Some of these codes of ethics are bold declarations but are, in fact, so feeble because they are neither constantly drilled into the mindset of management, from top to bottom, nor vigorously enforced with appropriately dissuasive penalties that unambiguously communicate to every employee that unethical behaviour is not an option. The proof that too many corporations are not really serious about cultivating and maintaining high levels of ethical behaviour lies in the fact that “codes of ethics” are callously violated or ignored over and over again in so many companies.

Time and time again, companies own up to their corporate ethical responsibilities only when law enforcement comes knocking at the door with a warrant or when a whistleblower, invariably an employee with a strong moral conscience, has had enough and makes incontrovertible evidence of malfeasance available to law enforcement. Where moral and ethical principles only exist in the corporate code of ethics which, as we have pointed out, is usually more platitudes and good intentions than rock solid moral obligations for which all employees are accountable, and where they have not been specifically integrated into the company’s value system as a set of core quality requirements and obligations toward customers, then these moral and ethical principles are remote to quality responsibilities and requirements and are likely to be overlooked, if not deliberately ignored.

We advance the argument that the vast majority of the cases that result in spectacular quality failure would have been prevented by robust, deeply embedded ethical principles and requirements that rigorously adhered to and enforced through appropriate management audits performance evaluation. We undertook a systematic examination of the level of treatment accorded to ethical and moral responsibilities that are inherent to the task of assuring that a company’s products and surpass customer requirements. These results point to a profound anomaly; either top Management is of the view that there are no specific ethical/moral responsibilities that devolve on those who are executing the tasks and responsibilities that design, manufacture and deliver quality products, or that the competencies to execute these ethical/moral responsibilities are only incidental to the creation and delivery of superior quality, or that the capability to execute these ethical and moral responsibilities can be cultivated and nurtured by communicating the content of the standard corporate code of ethics. We aver that this position is indefensible given the number of catastrophic quality failures that are the result of ethical or moral lapses, or plain legal malfeasance in companies that have and had communicated a standard corporate code of ethics.

Those who are designing, manufacturing, delivering and maintaining the products, processes and services of a company are undertaking activities that are the very essence of the company’s responsibilities to its customers, the activities that literally put customers in the hands of the company. It is mainly through its products and services that a company can do physical and mental harm to its customers, and such harm is invariably the result of inferior quality that is always the consequence of failure to execute fundamental customer requirements. So, the ethical and moral foibles of a company are bound to eventually manifest themselves as inferior products or service quality that harm customers. Therefore, the failure to design and implement ethical and moral norms that are specific to quality, and that are vigorously nurtured and communicated to all employees, since everyone has responsibility for quality (Crosby), will invariably place a company in extreme moral and legal jeopardy. It cannot be otherwise because the purpose of a business is to attract, satisfy and retain a customer and protecting the customers’ well-being, particularly when they are using the company’s product or service, is the primary social responsibility of any enterprise.

The Trouble With Six-Sigma And Iso:

Six-Sigma embodies an impressive array of tools and techniques but does not incorporate a high level corporate quality strategy as TQM does. Therefore, six-sigma has not originated a clear statement of quality culture and values, much less provide a systematic approach for implementing and enforcing adherence to these.

The few elements of quality culture and values promoted in six-sigma have been adopted wholesale from TQM. This is the major reason why Six-Sigma thinking is largely silent on the crafting moral and ethical quality values and Six-Sigma cannot help a company avoid spectacular quality failures. ISO 9000 and its variants have some crucial shortcomings as evidenced by the fact that a number of the spectacular quality failures that occurred over the last forty years or so affected ISO certified companies. All of Takata’s manufacturing plants and the car manufacturers who adopted and used their airbags for at least fifteen years were ISO certified. A mere fifteen months before it declared bankruptcy, the company’s 2015 annual report stated that the majority of its plants were ISO 14001 certified.

Three plants operated by the company's subsidiary, Inflation Systems, Inc. (ISI) in Moses Lake, Washington, LaGrange, Georgia and Monclova, Mexico were ISO/TS 16949 certified. Bridgestone and Firestone which were involved in one of the most spectacular quality failures in modern history were ISO certified companies. Volkswagen which is currently dealing with the latest quality debacle which may cost the company at least \$30 billion of fines and compensation to customers for a scheme that falsified the fuel efficiency performance of its cars has worldwide ISO certification of all its operations. In 2011, Qualitest Pharmaceuticals, a subsidiary of ENDO Pharmaceuticals, had to recall 1.4 million packages of birth control pills due to faulty labelling that could result in unwanted pregnancies or abortions. ENDO was ISO 9000, 9004, 19011, 2000 certified. Honda established Global Quality Standard in 2005, which is based on ISO 9001. As of March, 2011, 43 of their 46 plants were ISO registered. In September, 2011, Honda had to recall 1 million vehicles due to electrical problems that presented a fire hazard. In 2007, Mattel, which is ISO registered, had to recall 11 million toys because they contained lead paint and small magnets that could cause major injury and even death in toddlers. The Chinese manufacturer that made these toys for Mattel was ISO certified. And the list is much longer.

ISO certification does not dramatically improve the capability of a company's quality system, but simply says that the company has provided documentary evidence that its practices and procedures conform to certain parameters. Companies usually become ISO certified by simply developing elaborate documentation of their existing system, without any mandated requirement to improve the innate capability of the quality system before it is documented and certified. The major challenge in driving quality performance higher lies in the ability to execute at a very high level, and elaborate documentation does nothing to foster that. More often than not, a company seeking ISO certification is doing so not with an overwhelming commitment to transform and improve its quality management system, but simply to receive formal declaration that that quality system meets the specifications of sought after new markets, customers or suppliers. In that case, ISO simply certifies what is and does not say what, at the most fundamental and strategic level, the quality management system should be.

Conclusion and Implications for Management:

This research has undertaken an analysis of some of the major cases of quality failure that occurred over the last two decades or so with a view to uncovering and understanding the causes of these. We focused specifically on the case of Takata but referenced other well documented cases that allowed us to develop fundamental insight into what are the root causes of these quality debacles and why top managements appear not to learn from the cases of past failures, even though the facts related to these are always well publicized and exist in the public domain.

First, we noted that nearly all the spectacular quality failures that occurred over the last fifty years of so took place in companies that had supposedly implemented TQM systems of one form or another, that is, systems that conformed to the frameworks espoused by the established approaches found in the works of Deming, Juran, Crosby and Ishikawa. Moreover, a rather large number of the most spectacular quality failures took place in companies that were ISO 9000 certified, or that were or had ostensibly implemented Six-Sigma methods. It was evident that neither substantial or complete implementation of TQM systems, nor attainment of ISO 9000 certification, nor the implementation of six-sigma methods was enough to protect a company from experiencing a spectacular quality failure. And this gave rise to a potentially troubling question that strikes at the very core of the robustness of quality management systems. Why is it that the most advanced quality management systems developed over decades of systematic research and practice did very little to shield companies that supposedly implemented them from the devastating financial and survivability consequences of a major quality failure?

The reason for this observation, while at first perplexing, became clear as we deepened the analysis. Nearly every case of these spectacular quality failure was the result of moral or ethical failure on the part of middle and upper management of these companies. Moreover, every one of these cases involved either deliberate criminal malfeasance or at least criminal negligence.

In every case, middle management was fully aware that they were participating in criminal activity, and top management either knew or should have known of the malfeasance and did nothing to stop it or, in some cases, engaged in illegal actions to destroy or hide evidence that a crime had been committed. Takata is the prototypical example, but not the only one, of this type of management behavior that led to one of the most spectacular quality debacles in modern history.

Furthermore, we observed that in nearly every case, management had early warning of an emerging quality failure well before it became catastrophic but was reluctant to pull the plug on a new product, design or part because it feared that admission that there was a problem would jeopardize the company's market and financial objectives and reputation. In every case, as it turned out, dealing with the quality problem when there was good information on its existence, would have been far better for a company's market performance and would have protected its good reputation. Failure to deal with the emerging quality problem caused it to grow from a manageable problem to a catastrophic failure. Everytime, failure to quickly expunge an emerging quality problem grew to become a spectacular failure. Takata, Bridgestone/Firestone and Volkswagen are merely the latest examples of this fundamental phenomenon. In every case the overpowering driver was either an overwhelming, uncontrolled ambition to pursue very high levels of growth in sales and market share in search of market dominance, or an obsessive commitment to drive costs down in an effort either to boost profits or increase market share. Takata and the car manufacturers that bought its cheap airbags and the case of the Ford Pinto are prototypical examples of that reality.

It would be easy to ascribe these spectacular quality failures to the actions and moral foibles of a few lower level managers. But the pattern of failures and the fact that upper management were frequently involved in covering up malfeasance, or deliberately delayed dealing with the problem in vain attempts to save face or avoid costly recalls, or always had or should have had early knowledge of the problem at its inception means that the cause of the problem goes much deeper. Our analysis confirms that the deeper cause of these spectacular quality failures is a breakdown in a corporate ethical and moral value system that was too effete, or too passively inculcated so that it could not effectively empower a vigorous ethical response in the event of extreme time, cost and competitive pressures. A robust corporate ethical and moral value system would constrain middle and upper level managers to make decisions that do no harm to customers, even if these decisions would somewhat sacrifice the financial and market ambitions of the company in the short term. The fundamental insight and critical conclusion of this research is that all the companies studied lacked such robust corporate ethical and moral value systems. All had a set of corporate ethical and moral principles on paper but these were not supported and driven home by a robust, unswerving enforcement mechanism.

Finally, the research probed the cases studied in an effort to find out why companies that had implemented quality management principles, approaches and methods embodied in TQM, Six-Sigma and ISO 9000 had such weak ethical and moral value systems that were not vigorously enforced. The answer lies in the unanticipated observation that these quality management paradigms are themselves devoid of strong principles and norms of ethical and moral conduct as these apply to quality. This research has reluctantly concluded that modern quality management systems are largely silent on the need to ensure that those designing and producing the products and services of a company are driven by sound ethical and moral values and principles. Quality management largely depends on the overall corporate culture and value system and statement of ethical principles to ensure that managers are fully equipped to deal with moral and ethical challenges as they relate to quality. It is astonishing that of all the TQM approaches touted by quality professionals and available to modern day companies, only the Baldrige Quality Framework makes a vigorous case for an ethical and moral framework for managing key quality challenges and, most importantly, provides the key elements of a rigorous enforcement mechanism for inculcating ethical behavior in quality decision making.

Correcting this weakness in current systems for the management of quality is a pressing matter for research and practice in total quality.

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