Manufacturing defects in the automobile industry, a case study of the remote causes and effects of Toyota's transmission malfunctions in cars

Bebeteidoh Oyinkepreye Lucky, Stephen Takim

***Abstract*— Over the years, the automobile industry has been continuously bedevilled by the continuous recall of vehicles as a result of manufacturing defects. The recall of vehicles in the automobile industry is not limited to any particular manufacturer. Defective components or parts have always been attributed for the reason for the recalls, while some have attributed it to uncontrolled growth and expansion. For automobile companies to keep up with the growth in the automobile industry; it must be ready at all times to satisfy its numerous customers with quality, reliable and affordable products. Reliability of the product is essential to keep a good customer base. The competitive nature of the automobile industry requires that companies comply with international safety standards in the manufacture of cars while ensuring that components and parts supplied to production shop floor are capable (CP), and where defects have been identified, Failure Mode Effect Analysis and Critical Analysis (FMECA) be carried out on such components. The aim of this research paper is to investigate the causes of manufacturing defects in the automobile industry, a case study of the remote causes and effects of Toyota's transmission malfunctions in cars. In other to achieve this, the number of recalls from various automobile companies was investigated, with a detailed case study analysis, with SWOT and PEST analysis on the case study company.**

***Index Terms*— Manufacturing, defects, Toyota, transmission, recalls, strategy**

I. INTRODUCTION

The automobile industry has evolved overtime from the era of the vehicles that were powered with steam, dubbed "horseless carriages", through the era of the high pressure steam engine, (American Museum of Cars ND) to the mass production of the Ford Model T in 1909. Since the invention of the automobile over fifty years ago, it has brought with it more deaths and enormous sorrow and deprivation to people (Nader1965). With its perceived problems, the motor car has been called 'the machine that changed the world' (Womack *et al*. 1990). The auto industry is a representation of the technical spectacle by humankind, as one of the fastest growing sectors in the globe. Its active development stages are explained by sort of rivalry, life cycle of product and the demands of consumers.

The automobile industry today is occupied with issues of product safety, customers request for new styling features and making the automobile more comfortable (Biswajit *et al*. 2007). The famous era of the automobile came in the 1950/1960 where companies like the Ford Motors, General Motors (GM) and Chrysler where holding sway in America. The transfer of Ford Motors mass production model to Western Europe and Japan after World Wars I & II, brought about two important trends, first which was industrial advancement which led to the growth and production of the German and Japanese auto markets, and the second important trend which was as a result of the oil embargo from 1973/1974, which led to the export of fuel efficient vehicles to the United States of America from Japan (Biswajit *et al*. 2007).

The amount of vehicle recalls in the U.S. has increased substantially over the past twenty years, with over 30 million cars recalled in 2004 (Yong-Kyun and Hugo 2013). The Japanese auto maker Toyota Motor's place in the international automotive business where it is seen as a market leader looks unstable following a run of recalls which began in late 2009; as a result of floor mats making accelerator pedals to stick, (Business Monitor International, 2010) haven long been tagged as the acme and innovation of Japan's industrial strength and manufacturing quality. (Wu *et al*, 2010).

With the Toyota Production System (TPS) which prides it first as a safety related company, secondly as a company that is bent on the quality of cars that they build and thirdly as a company that puts much interest on the volume of vehicles produced, (Monden 2012: xxvi), Toyota is faced with a massive problems related to quality that has cost lives, and are also faced with colossal nightmare as a result of bad public relations which has put the company on edge. (Southworth 2010: 32). This has led to massive recalls, that has come as a test to the *''The Toyota Way''* production philosophy (Joshi 2003).

The automobile environment has become very intricate and demanding. Several factors can be attributed to the various recalls that have been made over the years by Toyota, to correct the manufacturing '*defects'* that have necessitated the recalls.

As it is known presently the functionality and features of cars have become very complex, with the increase in the number of wires, computer chips used in auto electronics, and sensors; it has become very bewildering in the testing of quality control along with problematic uncertainties and interferences (Feng, 2010). Toyota informed the general public that the defects found in its vehicles that were recalled had caused no accident and could be repaired in an hour and will cost the company millions of dollars (Kubota 2012). Before the recalls due to transmission glitches in 2009, the leadership position that Toyota has built in quality as reported by Consumer Reports

Bebeteidoh Oyinkepreye Lucky, Department of Marine and Mechanical Engineering, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria

Stephen Takim, Department of Mechanical Engineering, Cross Rivers State University of Science and Technology, Calabar, Cross Rivers State, Nigeria

and J.D Powers hadn't been compromised except on the pages of newspapers and the electronic media (Liker and Ogden 2011:158).

The high rate of vehicle recall as a result of defects in manufacturing, has led to both manufacturers and end users suffering the brunt, in safety and financial terms. In the past, failure of products were adjudged to local or functional mistakes in product design, the manufacturing process, or improper use of materials used in the manufacture of parts used in vehicle assembly, it is known knowledge that product quality and safety can have significant repercussions on an international scale (Marucheck 2007).

Several researches have been done in areas of vehicle recall over the years (Yong-Kyun and Hugo 2013), (Minhyung 2010) and (Kubota 2012), but little has been done in the area of finding out the root cause of these defects and if it is as a result of Toyota's manufacturing strategy. The objective of this study is to determine if defects are as a result of Toyota's manufacturing strategy, to examine the role of suppliers in the manufacture of cars and to determine the role of Toyota's Just-In-Time manufacturing technique.

This paper is organised as follows, in other sections literature review, methodology, collection of data described and discussion, while the final section has the conclusion and recommendation, with an added appendix which shows the case study, the swot and pest analysis

A. *LITERATURE REVIEW:*

The United States alone accounts for 22,000 deaths, about 29.5 million injuries, and over 700 billion dollars in losses as a result of 'unsafe' and 'defective' products statistics has shown (Xiuli, Baozhi and Hanqing 2012). According to Europa (1985) a defective product is that which doesn't deliver the necessary safety that an individual is expected to get from every product he or she purchases, while taking the following into consideration:

- How the product is presented.
- How the product is put into use.
- How long it takes to circulate the product.

James R. Evans and William M. Lindsay (2005) defines "*defect"*as a distinct abnormal characteristics of a manufactured item with respect to its quality. While Crosby (2005) looking into defects defined it to mean when manufactured products, do not conform to the expected or accepted standard of quality but does not necessarily mean a failure of that product. The European Union (EU 2010) in its assessment of ''*defects"* categorised it into three, namely *''minor defects''*, *"major defects"* and "*dangerous defects"*.

According to VOSA (2013) a vehicle is said to be defective if a piece of its design or manufactured part is likely to bring about a major threat of death or injury to the user. The United States Code for Motor Vehicle Safety (Title 49, Chapter 301) defines "*defect"* as every form of deficiency associated with the construction, component and performance of automobile or automobile equipment (Safercar.gov 2010).

Minor Defects (As defined by the EU 2010)

- When there is no meaningful consequence on the well-being of the passanger and automobile.
- When a reassessment is not essentially vital.

1) Major Defects

- Might affect the safety of the automobile and also put other road users in danger with more significant non-adherence.
- Making use of the affected automobile will subject to limitations pending when it passes a technical audit.

2) Dangerous Defects

- Dangerous defects puts road users at instant danger.
- Automobiles under this cartegory should be taken off the road.

Such vehicles even if repaired has to be properly re-examined, and must must pass a technical audit before been put back on the road.

B. Defects in Automobiles Leading to Recall:

The recall of automobiles by manufacturers has been attributed to one form of *'defect'* or another; vehicle recalls can pose a serious problem for manufacturers (Kumar and Schmitz 2011). This has left both regulatory agencies, customers and the media al a loss. Manpreet *et al.* (2011) describes product recall as the withdrawal of a product from the market as it was manufactured and sold to the customer. Their research went further to state that recalls which are undertaken as a result of dearth in safety, implies that the product stands as a possible danger to the user, and companies make announcement advising customers to discontinue usage of such products. In an earlier research carried out by Dawar and Pillutla (2000:215) product *'defects'* was defined as product harm tragedy, that are discrete in nature, having good publicity in which products are found to be *'dangerous'* and *'defective'*. The FDA U.S defines product recall as the correction or removal of a marketed product; the FDA feels are in violation of the laws of the United States of America, while the National Highway Traffic Safety Administration covered by an Act of the U.S. Congress (National Traffic and Motor Vehicle Safety Act 15 U.S.C. 1381 OF 1966) to enforce safety standards of vehicle manufactured in the U.S. or imported into the U.S. for use, defines recalls as;

- When a motor vehicle equipment or motor vehicle fails to act in accordance with the Federal Motor Vehicle Safety Standard.
- When the vehicle or equipment has *'defect'* present in it.

According to Nader (1966:41), the manufacture of automobiles using defective and substandard parts and components is conventional fact to industry watchers and workers, with "*defect"* ranging from windows falling off its channel, handles of doors falling off, oil leaking from engines, wheels of manufactured cars falling out of alignment, coupled with damaged head-lights. In the result of a product failing, it must either be fixed or replaced, in any of the cases the product must be tracked, transported and the manufacturer must apologize for the error (Genichi Taguchi and Don Clausing 1990). Young-Kyun and Hugo (2011) in there research added that when a defect is found out by the manufacturer or regulatory agency, which in the case of the United State of America is the National Highway Traffic Safety Administration,(NHTSA) a decision has to be taken whether a recall will be issued, and how many units and models that will be affected. Due to the heterogenous nature of vehicle recalls due to defects, each defective unit is known to have a different threat level. In the words of Southworth (2010) Toyota as an organization or certain people inside Toyota have wandered away from the guiding principles of

the company, and the issues affecting Toyota can only be explained by those people.

1) Recall from other Manufacturers:

Below is a brakedown of the biggest recalls of all time in the automobile industry as published by Sauter *et al.* (2013) in the Wall Street Journal and Fox Business (2010).

- **General Motors (1971):** The recall of over 6.7 million cars covering the period between 1965 and 1970. The recalls were as a result of seperated motor mount which permit s the car engine to elate and cloud thereby making the throttle of the car to increase momentarily. Company officials initially denied the existence of any *'defect'* . Not until a letter from consumer advocate Ralph Nader to then GM Chairman, informing him that the motor mount failure leads to vehicle accelerator been jammed, shifting of gears, and power loss in the braking and steering system.
- **Volkswagen (1972):** In conjunction with NHTSA, Volkswagen recalled 3.7 million cars as a result of the loosening of the screws securing car windshield wipers of model manufactured from 1949 to 1969, which made drivers to struggle during snowy conditions and rain storms.
- **Ford (1972):**As a result ofseat belt webbing braking from its connection Ford Motors recalled over four million vehicles for fixing. The resultant result of this *'defect'* is that driver will not be able to lock in the shoulder harness as a result of brakage of the grommet. This recall affected vechile models manufactured in Fords factory lines in the U.S. from 1970 to 1971.
- **General Motors (1973):** In 1973 G.M once again issued recalls for over three million vehicles, from the Oldsmobile, Chevrolet, Pointac and Buick lines. The drivers ability to steer the vehicle became an issue due to stones finding there way into the engine compartment and getting stuck. General Motors in correcting this 'defect' had to construct a gravel shield over the steering coupling of the car.
- **General Motors (1981):** In 1981 over five million vehicles were recalled by General Motors for its Chevy Malibus and Buick Regals brands, as a result of damage done to the car frame and lower rear control from the fracturing of the bolts, which in turn affects the car suspension system. All vehicles affected were manufactured from 1970 to the early 1980s. In caseswhere the bolts fracture, the vehicle control arm will be released from the car, bringing about a loss in control.
- **Ford Motors (1981):** Ford Motors recalled over twenty-one millionvehicles of itsMercury and Lincoln brands from 1970 through 1980. The recall was made as a result of *'defective'* parking gear that could refuse to engage, even after the driver of the vehicle has engaged the car to park and the indicator lights showing the car to be in park. As a result of this 'defect' over six thousand accidents, one thousand seven hundred and ten injuries and ninety-eight fatalities, that were attrubuted directly to transmission slippage.
- **Audi 5000 (1978-1986):** Long before Toyota's unintended acceleration surfaced, Audi recalled over three hundred and eighty-nine thousand,one hundred and two cars manufactured between 1978 through to 1986 as a result of unintended acceleration.
- **Honda Motors (1995):** As a result of belt buckle failure, Honda Motors was forced by the National Highway Transport Safety Administration (NHTSA) to recall over three million cars in 1995. The recall affected vehicles manufactured from 1986 to 1991 model years, in the Acura line. The seat belts in the models recalled had the possibility of breakage.
- **Ford Motors (1996):** Ford Motors in 1996 recalled over seven million cars and trucks as a result of *'defective'* ignition switch, which resulted in the vehicle short circuiting. The *'defect'* was capable of causing fire in the vehicle steering column. Vehicles affected were the Mercury and Lincoln manufactured from 1988 through 1993. The Los Angeles Times in its 1996 article reported that most of the fires affected vehicles that were parked, and had been shut off for hours.
- **Ford Motors (1999-2009):** After issuing a recall in 1999 to address issues relating to short circuiting affecting its speed control system, the report of the recall noted that it could lead to under hood fire in three different models manufactured from 1992 through 1993. In 2005 problems with the speed control deactivation still led to more recalls, which affected about five million, two hundred thousand SUVS and pickup trucks. The recalls were followed by subsequent ones in 2006, 2007 and 2008.

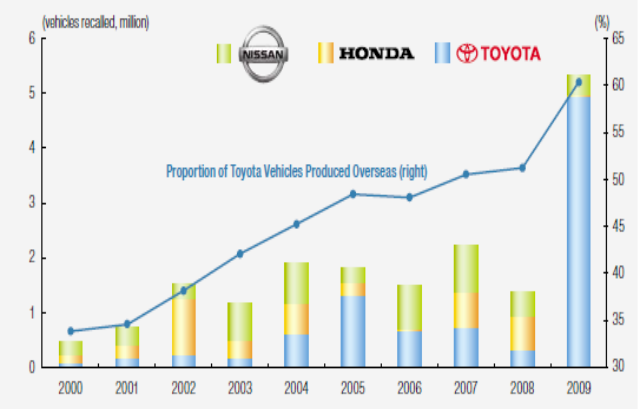

Figure 1: Toyota, Honda and Nissan's overseas production and Recalls (Minhyung 2010).

Figure 1 shows the overseas production and recalls for Toyota, Nissan and Honda. From 2000 through 2009, there is a steady increase in the production of cars and also recall from Toyota Recalls (Minhyung 2010).

2) Recalls from Toyota:

The tragic accident in 2009, in San Diego, California in which the Saylor family comprising Mark Saylor, his wife, his daughter and brother-in-law lost their lives, when the Lexus in which they were travelling careened out of control at over 100mph, and plunged into a ravine after colliding with an oncoming car, (Liker and Ogden 2011:60-61) has once more brought Toyota to the public glare with issues of *'defects'* leading to a recall. There is no gainsaying that Toyota has brought this upon its own head, while noting that recall is a common phenomenon in production, the mere fact that Toyota allows cars it has manufactured to go out with *'defective'* brakes and accelerators shows that something is wrong (Pilling, 2010). Liker and Ogden (2011:69) described as an overreaction the recall Toyota made on the issue of floor mats leading to unintended acceleration, that it was not the floor mat in general that caused the death of the Saylor family. While differing from the position of Liker and Ogden, Lehane, Fabiani and Guttentag (2012:96) averred that at the time of the Saylor accident Toyota was well aware of safety and quality issues with unintended acceleration, citing a 2009

Los Angeles Times report in which the paper investigated Toyota's quality and safety practices in which the under listed results were gotten;

- The installation of drive by wire systems dating back to 2002 was the beginning of Toyota's acceleration issues.
- A total of 1, 200 complaints was received from Toyota customers for uncontrolled acceleration and unintended acceleration even after the floor mats were replaced.
- Toyota tried to stop the release of the data gotten from on-board vehicle recorders that had experienced uncontrolled acceleration.
- There has been more recorded death from uncontrolled acceleration involving Toyota car than all other car manufacturers put together.

This goes contrary to the Toyota's Production System, according to Monden (2012:219) the satisfaction of the customer and the quality of the manufactured product is and end in itself in Toyota, while noting that product quality is an essential part of the TPS. In a related development Liker (2010) while describing the issues of recall with Toyota put it in a more subtle way that incidents' leading to each recall made by Toyota is small. In a later research by Cole (2011) the researcher averred that recalls associated with the quality and safety of Toyota's products was on the increase, that between February to August 2010, Toyota made thirteen distinct recalls, which affected both new and old models having issues relating to fuel leakage and steering control. According to Lehane, Fabiani and Guttentag (2012:95-101) the exact issues with Toyota whether technically called a *"defect"* or not, the basic fact was that the self-acceleration of vehicles actually happened, in some cases leading to fatalities. In the words of the researcher Toyota needed to tackle the problem as it arose, instead of insisting that there was no technical defect, rather than trying to construe the main reason as to why the accidents were happening, in other to stay away from the feared word "defect".

Toyota's image among its customers clearly suffered with the recalls, the release of several survey data reports swelled by media reports have not helped the Toyota brand name (Cole 2011), a negative effect on stock price and adverse media reports for publicly managed companies can cause a major crisis for manufacturers (Kumar and Schmitz 2011). In the year 2007 Toyota recalled over five million cars as a result of its all-weather floor mats sold in its Lexus ES 350 and Camry 2007 to 2008 models. The all-weather floor mats could shift forward as the vehicle is in motion, thereby making the accelerator pedal to become stuck. Toyota issued another recall in 2009, for it Toyota Sienna 2004 model for carpet covers that also become stuck to the pedals leading to unanticipated acceleration. The following year 2005 saw another 1.1 million cars to the recalled by Toyota (Sauter *et al.* 2013).In the year 2012 Toyota made several recalls affecting its Lexus RX350,Lexus RX400h, Lexus ES,Lexus IS, Tacoma, Camry, RAV4, Scion iQ, and Veneza. According to Stoy (2012) in March 2012 Toyota recalled around 682,000 vehicles, comprising 495,000 of its Tacoma trucks as a result of *'defective'* driver's side airbags that may possibly fail to deploy and approximately 187,000 Veneza crossover wagons and Camry Sedans, as a result of brake light problems because of glitches during the production process. In June 2012 Toyota again made another recall of nearly 3.8million vehicle to address issues with floor mat entrapment, this particular recall affected its Lexus RX350, RX400h, ES, IS, others are Toyota Camry, Avalon, Tacoma, Tundra and the Hybrid Prius all 2010 models. Toyota earlier in 2009 had issued similar recalls for the above vehicles. August 2012 saw Toyota issue another set of recalls for its RAV4 manufactured from 2006 to early 2011and the Lexus HS250h sedans 2010 model, as a result of glitches with the rear suspension arm. Toyota warned its customer to ensure that the nuts on the rear suspension is properly tightened, to avoid rusting that may in turn make the arm to separate. Figure 2 shows the pedal assembly with the *'defect'* as shown in the circle on the left hand side. Toyota added a precision reinforced bar to stop the pedal lock.

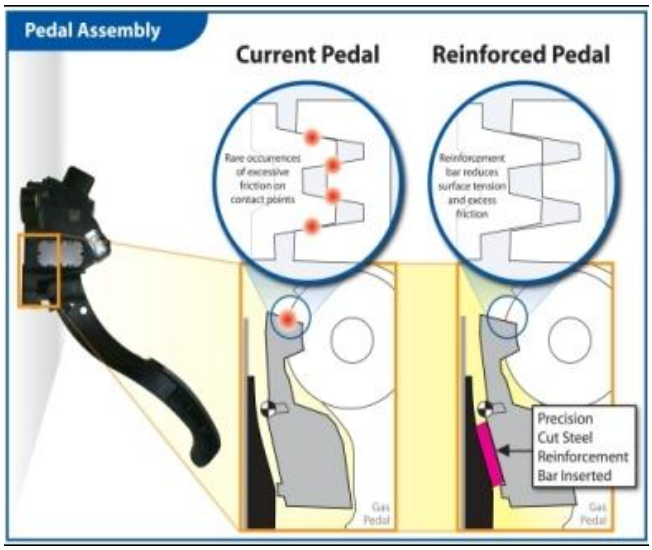

Figure 2 Show the recalled pedal and the replacement pedal (Cars UK 2010)

The recall of vehicles continued in October 2012, with Toyota announcing the recall in the United States of about 2.47 million vehicles, to repair *'defects'* with power window switches that might cause a fire threat. The recalls affected the Toyota and Scion models manufactured between, 2007-2009, the Camry Hybrid, RAV4, Yaris, Scion XD, Scion XA, Highlander, Highlander Hybrid, Corolla and Matrix. The power window in the driver's side might become sticky, in the event of the driver using a commercial lubricant to remedy the situation, might lead to fire. Toyota has to provide special grease to its dealers to address this particular defect. By November 2012, Toyota recalled over 670,000 in the United States for its popular hybrid car the Prius, to fix *'defects'* with water pumps and steering. Of the 670,000 recalled, about 350,000 were for defective electric water pumps, the work of the pump was to circulate engine coolant, through the drivetrain component of the car, which it was not doing properly, which in turn stops the hybrid powertrain when the car is in motion. The steering defect had to do with the splines linking the steering shaft to the steering gear box which could bend sooner or later with vigorous steering. This recall also affected over 2.77 million globally. In the early days of the month of November, 2012 Toyota recalled almost 11,200 Scion IQ vehicles to examine the fore passenger occupant-classification system (OCS) weight sensor cables and fix brand-new protective covers over the sensors. In a press release issues by Toyota, it informed its customers that there was an object close to the cables under the fore

passenger seat which could come in contact with the cables and cause harm overtime. Dependent on how damaged the cable are , the vehicle airbags may not deploy as intended or the seat belt and airbags pretensioner may be wrongly triggered (Stoy, 2012).

According to a Bloomberg News Report of 5/06/2013, Toyota is set to recall about a quarter of a million of its Prius and Lexus Hybrid model built in the year 2009, of which 91,000 are in the North America. Both model are been recalled due to faulty breaking system (Bloomberg BusinessWeek, 2013). In early April 2013, CNN Money reported that Toyota was recalling about 1.7 million cars around the globe, as a result of airbag malfunctions. The recalled cars cut across the popular Corolla, Tundra and Matrix models. In this report Toyota attributed the fault to the supplier of the airbags Takata Corp., a Japanese firm that supplies part to Toyota (CNN Money 2013). With over 6 million cars recalled in 2014 by Toyota as a result of faulty airbags manufactured by Takata, Toyota is very much enmeshed in defects (Edmunds.com, 2015)

C. Causes of Defects

During manufacturing, quality 'defects' will have several roots (Timmings 2004: 210-214) and these roots are listed below;

- Operator errors
- Process condition change
- Composition proportion change
- Material distribution

D. Toyota's Company Strategy:

"Probably at no point in the history of man has there been so much discussion about the rights and wrongs of the policy makers… [Citizens have] begun to suspect that the people who make the major decisions that affect our lives don't know what they are doing…….They don't know what they are doing simply because they have no adequate basis to judge the effects of their decisions. To many it must seem that we live in an age of moronic decision making"……. Churchman (1968).

1) Strategy:

The task of growing or rebuilding a clear strategy is the primary duty of an organization, which depends on the leadership. With a good number of people against the making of trade-offs and choices in an organization, a clear knowledgeable outline to guide strategy is an indispensable counter weight. It is necessary to have strong leaders who are ready to make choices (Porter 1996).

"The threats to strategy are seen to emanate from outside the company, because of changes in technology or the behaviour of competitors. Although external changes can be the problem, the greater threat to strategy often comes from within. A sound strategy is undermined by a misguided view of competition, by organizational failures, and especially by the desire to grow" ……. Porter, 1996

Strategy can be defined as 'a pattern in a stream of decisions' (Mintzberg 1972). According to Grant (2010:201) and Grant (2013: 210) the primary reason companies come up with strategies is to bring about a position of competitive advantage over its rivals, which boils down to achieving success. While Russell and Taylor (2006:33-37) describe strategy as how a firm accomplishes its mission. Strategy provides unity in the firm, consistency in decision making, and keeps the firm focused and moving in the right direction. In achieving an effective strategy, a firm has to do diverse activities, different from what its competitors do, or by performing it better than its competitors. According to Hill (2005:31) Strategy represents the aspects of the direction a company is taking, what a company wants to do and how it can be implemented. The direction has to do with the approaches the company will employ to help it select the markets it will be competing in now and in the future, while understanding the competitive drivers in its chosen market, and being able to access how it can influence its market share compared with that of its competitors. The implementation has to do with how the company can equal or improve on the competitive drivers that are involved, by making as priority where and how its time and money are spent. Karnani (2006) in a working paper titled Essence of Strategy: Controversial Choices, defined strategy as set of unified choices: the geographical area in which the company will be competing, the source of its competitive advantage, the significant plan it intends to offers to its customers, and the organizational design it requires in executing the strategy. Slack, Chambers and Johnston (2010:62) in there book Operations Management defines strategy as the complete outline of the actions and decisions, that impacts on the long-term route the business in going to take. Strategy also includes the following:

- The setting of far-reaching objectives that guides the firm in the direction of its complete goal
- The shaping of the direction which will enable the firm to achieve the set goal
- Avoiding short-term objectives and stressing for long-term
- Doing away with individual activities, while dealing with the complete picture
- Avoiding any distractions and confusions in the day-to-day activities and running of the firm

In their paper in the Harvard Business Review, Eisenhardt and Sull (2001) described strategy as a strategically importantactivity, that is guided by a handful of modestrules which are exceptionaland different. The difference does no evolve from large core competence or tightly linked activities, as with accepted strategies. It arises from cultivatinguncomplicatedrules and staying focused on key strategic processes. With the emmergence of a pattern from the strategic process, the outcome can be a long term competitive advantage to the company, and the length of time the advantage will last can not be predicted by anyone. In an earlier research by Porter (1996) while differing from the views of Hill(2005:31) and Russell and Taylor (2006:33-37) avarred that it is not all business decisions taken by a firm that is strategic. Porter (1996) explaining further said that a decision can only be strategic if it involves a firm wilfully doing '*contrarily*' from what its rivals are doing and if the result of that disparity puts the firm in a maintainable advantage.

In 1970 through 1980 the Japanese started a worldwide revolution, initiating practices such as continous

improvement and total quality management. This made Japanes manufacturers have quality advantage and reduced manufacturing cost for many years.In all the Japanese firms rarely developed anyclear-cut strategy. Most Japenese firm emulate and imitate one another, where rivals offer all product varities of their competitors, and try to match each others plant configurations. The gap of operational effectiveness between the Japanese manufacturers and their western counterparts is presently narrowing, the Japanese firms are progressively been caught in a trap of their own making. For the Japanese to escape the mutually negative conflict now damaging theiraccomplishments, they have to learn strategy (Porter 1996)

2) Types of Sytategy:

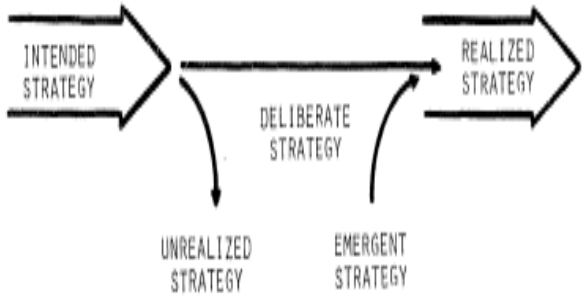

Figure 3 Types of Strategies (Mintzberg and Waters 1985)

Mintzberg and Waters (1985) in there research came up with the different types of strategies namely;

- Intended Strategy
- Delibrate Strategy
- Realized Strategy
- Unrealized Strategy
- Emergent Strategy

As shown in figure 3, Mintzberg and Maters (1985) describes emergent strategy as that which instills a lot of order, there must be consistency in action over time. Once there is no consistency it basically means there was no strategy or could be simply called an unrealized strategy. While the intended strategy is defined as the exact goals in an organization,expressed in atangible level of facts, where there should be nomisgivings, about what was anticipated before the action was taken. Secondly, for the reason that organization can be termed as a group action, in other to despel any percieved distrust that the aims were organizational, they must have been common to all actors, and thirdly these collective intentions must have been realized as intended, which means there must not have been any interferance from any external force.

3) Toyota's Strategy:

Toyota's long-term vision in 1950 was for 1 out of every 4 persons in the world to be driving a Toyota. In which case Toyota's goal in 1950 was to have a 25% global market share, at the particular time the company was putting the Toyota Production System and the Toyota Way in place. The company's goal of achieving a 25 percent global market share then, was more daring and did not put her into any problem, it is then difficult to believe that over 50 years later that a strategy to grow the company market share by 15% will derail her (Liker and Ogden 2011).In 1970 Toyota had just a 2% share of the United States light trucks and car market. In 1980 Toyota's market share inched to 3%, in 1990 it rose to 8%, by the year 2000 it has risen to 9% and got into double digits by 2006 when it rose to 13%, while the same year saw the fall of General Motors market share in the United States down to 26% (Stewart and Raman, 2007). According to Cole (2011) the root causse of Toyota's problems with quality, can be traced back to 1995 when then President Hiroshi Okuda set a company global growth strategy target, which included moving Toyota's world wide market share to 10%. This was later morphed into a new target of 15% by 2010.

Toyota in pursuing growth intended to overtake General Motors as the No. 1 automobile manufacturer in the world. Giving his testimony in the U.S. Congress oversight committee on the 24th of February, 2010, Toyota's CEO Mr. Toyoda admitted that in the pursuit of growth his company over stretched the Toyota Production System (TPS) to its elastic limit and in so doing became 'confused' about some of its guiding principles (safety, quality and volume), which made it great; and in so doing forgot its focus of satisfying its customers, its ability to stop think and make improvements (Hutchins, 2010). However in a later research by Shim and Steers (2012) both researchers avarred that in Toyota's quest to expand rapidly in the global automobile marketplace, it had to rely on electronics that are newly developed and in most cases stayed uncertified. Further more with Toyota's management feeling comfortable with the '*Toyota Way'* , this made both executives and managers apparently feeling that everything was running smoothly. In a more recent research Fan, Geddes and Flory (2013) attributed Toyota's quality issues and recalls which began in 2003, to its rapid growth which put strain on its design, manufacturing and engineering processes.

The rapid growth of Toyota placed so much stress on technology and management system, particularly over long distances and across national cultures. As professor Jeffery Kingston of Temple University, Japan put it "Toyota is so used to dealing with successes that when they have a problem, they're not sure how to respond", and in the words of Professor Kenneth Grossberg of Waseda University, he added that "Toyota's management cannot turn on a dime. They have so much invested in doing things the Toyota Way (Shim and Steers 2012). According to Andrews *et al.* (2011) Toyota's effort to become bestselling automobile manufacturer in the world, might have been one of the factors that damaged some of its fundamental values and somewhat liable for the crisis Toyota found itself. In other to be very a dominant player in the auto market, Toyota made its presence felt in all geographic fronts, while also diversifying in its product development.

Liker and Ogden (2011) while not agreeing with the position taken by Hutchins(2010), Cole (2011) attributed the root cause of Toyota's problems to customer satisfaction rather than its target to grow it market share globally by 15%. In the words of the researchers, what persons who support the "market-share-centric" views fail to realise is that Toyota's quest to grow its global market share fell out of its customer satisfaction goal Vision 2010;''To be the most admired

automobile firm in the globe" Toyota knowing that the vision is difficult to actualise, turned it to definite targets, which gave birth to the 15% growth strategy.

4) Manufacturing Strategy:

The manufacturing strategy of a firm can be viewed from several vantage points. It is defined as the idea for repositioning an organization from its present position to where it hopes to be. In determining a good manufacturing strategy, organizations are faced with a wide range of choices. In the hierarchy of industrial, corporate, functional and business strategies, manufacturing strategy can best be described as very functional. Manufacturing strategy can further be described as how an organization makes use of its activities in achieving its business goals. The manufacturing strategy a firm adopts is dependent on the geographic location. It is implemented in a sequence, that begins with the formulation of strategy, which is at times described as 'intended strategy', which is what a company intends doing. It should be of note that what is formulated is not what is actually done, so 'intended strategy' is followed closely by 'deliberate strategy' which is the action taken by an organization to achieve its intended strategy. This is accompanied by 'Emergent strategy' which are actions not originally intended, but executed as a result of changing situations. The next in line is the 'realised strategy' which is the outcome that occurs, while 'unrealised strategy' is the expected outcomes that do not materialize (Miltenburg 2009). Manufacturing strategy is one of the important functions that support the successes of the overall objectives of an organization. Manufacturing strategy is an array of production guidelines designed to increase performance along with trade-offs, among success criteria to meet the manufacturing task determined by corporate strategy (Ghazinoory, Khotbesara and Fardoei 2011).

Miltenburg (2005) averred that in formulating a manufacturing strategy an organization must have to do the following:

- Customer requirement must be taken into account
- Competitors must be taken into account
- Manufacturing capabilities must be taken into account
- Consideration of all options available to manufacturing
- List the yields that manufacturing will deliver and indicate, in detail, the most favourable set of changes needed to achieve them

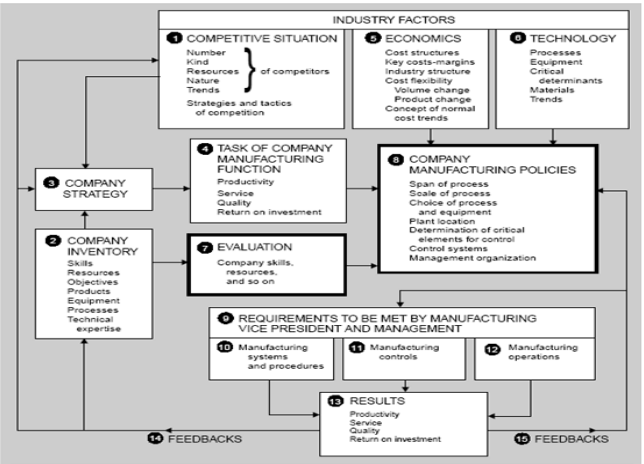

Figure 4 Manufacturing policy determination process (Skinner 1969)

KEY:

1. What other manufacturers are doing.

2. What we have in stock or can acquire to compete with.
3. How can we compete?

4. What has to be accomplished by us in other to compete?
5. Economic hindrances and openings common to the particular industry.
6. Hindrances and openings common to the technology.
7. Our evaluated resources.
8. How we should set up ourselves to match resources, economics, and technology to meet the task required by our competitive strategy.
9. The implementation requirements of our manufacturing policies.
10. Basic systems in manufacturing.
11. Controls of cost, quality, flows, inventory and time.
12. Selection of operations or ingredients critical to success.
13. How we are performing.
14. Changes in what we have, effects on competitive situations, and review of strategy.
15. Analysis and review of manufacturing operations and policies.

Various connotations of manufacturing strategy have been given by several authors and researchers. The policy determination model of Skinner (1969) encourages company executives to see the determination of manufacturing policy as an orderly sequence of steps as shown in figure 4; it shows that manufacturing policy must originate from corporate strategy, and the process of determining the manufacturing policy is the process by which top management can manage production.

5) Toyota's Manufacturing Strategy:

Toyota set a target to achieve 15% market share, which will make it the biggest automobile manufacturer in the world (Liker 2010). According to Fan, Geddes and Flory (2011) The reputation of Toyota brought about many benefits including market share, financial strength and customer loyality, as a result of its growth. But it put strain on engineering, design and production leading to several quality issues, which began in 2003. In his research on Toyota recalls, Cole (2011) traced the reasons for the quality problems to firstly outgrowth of Toyota's executives ambitions for rapid growth and secondly the increased complexity of the company's products. The strategic focus on growth wraped the "order of Toyota's traditional priorities", in which case growth has taken over Toyota's traditional focus on quality. Historically Toyota had been known to be a conservative company, but its aggressive growth targets were out of character.

The expansion of Toyota gave its managemnt little or no opportunity for modifying its systems and practices to accommodate strong growth. Organizational motivations, became cockeyed towards growth. Without policies that guard the traditional focus on quality, important decisions affecting new product development, production and supplier management became prejudiced in favour of delivery , cost-cutting, meeting sales and profit target. Cumulatively they had negetive impacts on the product quality. With the

growth policy in place accelerated design cycle strained the production and development system of Toyota, human resources was pushed to the limit, thereby creating the needed condition for quality failures. The supplier management system and its overall performance was not left out of the growth debacle. About 70% of the value added in the manufacture of vehicles come from suppliers, so the consequences of complexity and growth was felt althrough the company supply chain. Design works had to be deligated to contractor engineers outside Toyota for as much as 30% of its developmental works, and bring in new suppliers because existing ones could not keep up with the demand. Facing internal man power shortages both in Japan and overseas plants, Toyota had to hire contract engineers in other to boost engineering capacity. This new policy challanged the company's established way of doing things.

II. METHODOLOGY:

This research paper will be limited to Automobile manufacturing in the United States of America, concentrating on Toyota Motor Corporation, an automobile company specialised in the manufacture of cars, trucks and buses. In its manufacturing range there are cars like the Camry, Corona, Corolla, Lexus, Land Cruiser, Sequoia, Rav 4, Hiace Bus, Coaster Bus, Tundra and Tacoma Trucks. Data for this research was obtained from interviews conducted, transcripts of Toyota executives appearing before the United States Congress and Senate, the BBC 2 video "The Recall" and case study methodology, as our research methodology. Case studies are regularly regarded as "qualitative by definition" but quantitative can be used, the hypothesis usually emerges from the study, though a careful theoretical framework should be at hand at the commencement (Swetnam2004:38).

This research will contribute substantially to automobile suppliers, manufacturers and regulatory agencies in the United States of America by providing a detailed analysis on the causes of defects and to recommend ways by wish companies can ensure that their products are within the process control limit. The research is also valuable for further study.

In carrying out this research, the researcher is quite aware of ethical issues involved. According to Orb, Eisenhauer and Wynanden (2001) ethical issues are existing in every type of research been undertaken, the procedure of the research generates tension between the research aims in making generalization for the benefit of the public, and the participants rights to privacy. While Fisher *et al.* (2004:54-55) in describing why ethical consideration is needed in research averred that researchers should avoid treating people in an unfair manner and information gathered in research should not be used to harm people, while noting that would be researchers should not expect favours from companies or individuals, to also remember issues of confidentiality and anonymity. '

III. CONCLUSION:

The literature review and the case study of this research project, confirms that manufacturing defects abound in the automobile industry. Even with the huge sums of monies automobile firms put into research and development annually. The external business environment of Toyota, which includes P.E.S.T (political, economic, socio-cultural and technological) has shown that there is so much external influence on the organization. These external factors have tremendously affected the organizational culture (Toyota Way), its response to customers, acceptance of responsibility, and its inability to come to terms with the fact that Toyota is now a global company, and no longer the Japanese company started by the Toyoda family.

The internal factors of the firm such as company strategy, leadership style, company culture, mode of communication, goals and policies, commitment of management, level of response by top management to issues and employee training to mention a few, have also been identified by the researcher as having a significant bearing on the failure or success of Toyota.

Internal and external factors affect automobile companies such as Toyota and as such have to be properly managed, in other to reduce all issue leading to recall of automobiles. When these issues leading to defects are properly managed, monies will be saved, organizational rating and image will improve and sales of manufactured products will also improve significantly.

1) Issues of Manufacturing Defects in the Automobile Industry:

Manufacturing defects come in different forms during production and this has led to several firms recalling products the world over. This same issue of defect is also high in the automobile industry, with auto companies recalling millions of cars annually to correct one form of defect or the other. Defects in automobiles have led to several deaths in the U.S, while auto manufacturers have also spent lots of money to manage issues arising from manufacturing defects.

Causes of these manufacturing defects could be ascribed to human or operator errors (parallax error, bending, hertz deformation, and Abbe's principal), change in production conditions, composition proportion change, material distribution, and environmental factors.

Furthermore the researcher observed that an operator error plays a major role in the production of defective materials. While Toyota and other automobile companies will place the reason for defects at the door steps of their suppliers, these components and parts are manufactured by equipment's that are managed and controlled by humans.

In the course of undertaking this research, the researcher was able to identify other issues leading to defects in manufacturing, from the semi structured and unstructured interviews conducted. While all the interviewees agreed that the JIT technique was good for manufacturing, they also agreed that Toyota has kept a very good relationship with its suppliers. They all supported the fact that the JIT technique puts much pressure on the suppliers of Toyota (first tier suppliers and lower tier suppliers). This same pressure is being felt by the first tiers supplier's and flows down the supply chain to other lower suppliers who provide components and parts for the first tier suppliers.

It was also discovered in the course of the research that the growth of Toyota also contributed to parts and components being defective. Toyota's supply chain was stretched to the limit; this was as a result of new plants been built all over the world to meet up with its growth strategy.

Through the increase in the number of production plants, the traditional supplier could not meet up with supplies; which led to a particular part being used for several model of cars, thereby increasing the number of cars to be recalled in the event of defects.

2) The Role of Toyota's Manufacturing Strategy

Toyota's drive for growth could best be described as the corporate strategy of the firm at the time it was implemented. While growth of every firm is necessary, Toyota left its core principles behind while in the pursuit of growth.

While the then president of Toyota, Akio Toyoda identified Toyota's core principles as first safety, second quality and third volume. However, these principles became confused.

In pursuit of growth, volume became the number one priority, while safety and quality were pushed behind. While the researcher acknowledges the fact that building a clear strategy is a responsibility of leadership of the organization as attested to by Mintzberg (1972), Grant (2010) and Hill (2005), adequate preparation was not made to cater for the expected growth, which ended up over stretching the TPS and went contrary to the Toyota Way.

The growth strategy put much strain on Toyota's design system and its manufacturing and engineering process as attested to by Andrews *et al.*(2011), Shims and Steers (2012), Fan, Geddes and Flory (2013). While Liker and Ogden (2011) had a contrary view, both researchers attributed Toyota's problems to customer satisfaction. This particular view of Liker and Ogden (2011) still runs contrary to principle 1 and 5 of the Toyota Way. The researcheragrees with the contributions of otherresearcherswho believe Toyota's drive for growth put much strain on the company, thereby leading to its high rate of recalls as a result of manufacturing defects.

The researcher was able to deduce that when strategy is formulated by a firm, proper measures must be put in place for it to realize this strategy. Manufacturing strategy is an element of corporate strategy, and an important function that supports the successes of the overall objectives of the organization. While much was known about Toyota's strategy for growth, little is known about the manufacturing strategy framework that was adopted by Toyota.

While the researcher acknowledges the top-down method in the development of manufacturing strategy, in which the manufacturing task is dedicated to carrying out detailed manufacturing jobs; which is derived from marketing strategy and corporate strategy, little could be said of Toyota's manufacturing strategy.

3) Role of Suppliers in the Manufacture of Cars and Toyota's JIT Technique

Suppliers play a major role in the manufacture of cars, from tier one, to other tiers in the automobile industry. While the JIT technique has helped Toyota to get its products to the consumer when needed and to reduce high inventory; interviewee's described the technique as that which puts much pressure on the suppliers.

From the supply of minor components and parts to that of major components, Toyota depends on a particular supplier or might depend on a narrow number of suppliers, which is always difficult to replace. While the researcher acknowledges the relationship Toyota has with its suppliers from design of parts, right through to the manufacturing, the same cannot be said of the relationship when issues of defect arise. Toyota should endeavour to stand by its suppliers when manufacturing defects arise from the manufacture of parts supplied to it.

Case Study Findings:

- **Leadership** – The drive for growth by Toyota was a corporate decision. From the model of Skinner (1969) and Hill (2005), the manufacturing strategy function stems from decisions taken by the corporate executive (corporate strategy), which should be guided through from its intended stage (intended strategy) to its realized stage (realized strategy) as described by Mintzberg and Water (1985). Although Toyota realized the corporate strategy which was to achieve a higher market share, in doing so the manufacturing strategy function which handles productivity, service, and quality was not properly taken care of; which resulted in the quality issues leading to manufacturing defects. Some will argue that the defects from Toyota did not arise from the production shop floor, which the researcher also acknowledges; it is Toyota's responsibility to also carry out rigorous statistical process control checks on all components supplied to it.
- **Philosophy** - Toyota is known for its TPS and Toyota Way. These are philosophies that have seen the company grow to the top of the auto industry and also allowing it to make huge profits. Toyota while growing its market share kept its so much cherished philosophy aside. It left its traditional first safety, second quality and third volume, behind it. This was attested to by its CEO Akio Toyoda. Toyota also while growing its market share is believed to have stuck to its TPS (Lean), which also enabled it to reduce inventory, and waste during production; but in turn paid out huge sums of monies running into billions in the maintenance of defective cars, and payment to lawyers and court judgement against it. This is also a huge waste, which TPS is supposed to handle. The Toyota Way principle five says "Get quality right the first time, by building the culture of stopping to fix problems". Issuing recalls as a result of manufacturing defects, shows Toyota did not get it right the first time.
- **Sources of defects** – The sources of defects from can best be ascribed to operator errors, process condition changes, composition propotion changes and material distribution.
- **Government** – In the course of the research the author observed that Toyota was singled out for the sessions with the U.S. Congress and Senate. NHTSA as a regulatory agency also had so much pressure put on Toyota, while the issue of recall is known as an industry problem.

IV. RECOMMENDATION:

After a detailed and extensive research which analysed critically several literatures on the subject manufacturing defects in the automobile industry, a case study of the causes and effects of Toyota's transmission malfunctions in cars; we recommend the following;

- **Philosophy-** Toyota's lean philosophy and TPS has been a great system been applied by several companies the world over. Getting quality right the first time will reduce the amount of monies spent on handling issues of recalls. Toyota should endeavour to stick to its Toyota Way and lean philosophy, which enables it to eliminate all forms of waste; by doing this Toyota and its suppliers has to forge a better working relationship. Sticking to its lean philosophy should

not be limited to its production plants alone; it should cut across the whole supply chain, as shown in figure 9

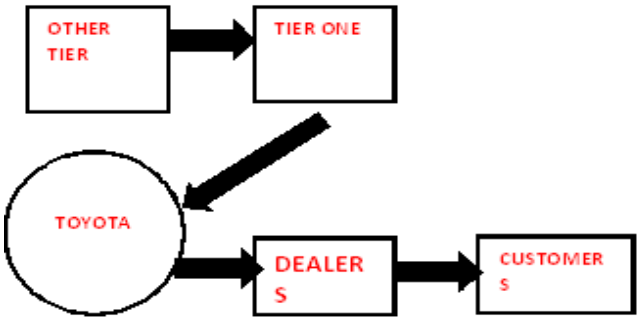

Figure 9 Toyota's Supply Chain (Authors, 2015)

- **Handling the Causes of Defects 1**-Toyota U.S. and its suppliers should endeavour to exhaustively make good use of FMEA (Failure Mode Effect Analysis), and to ensure that measurement uncertainty errors are reduced to the barest minimum. Measurements should be taken repeatedly and averages gotten and calculated. Measuring instruments have to be calibrated carefully. The researcher will like to note that no matter how good an operator is, there will always be error; these errors known as measurement uncertainty errors could be reduced using Gauge R&R.

Table 3 A typical FMEA table(Lewis 2013)

Failure Mode	Specific Cause	Effect of Failure	Likeliness of Failure	Detectability of Failure	Severity of Failure		Risk Priority
	· Likeliness of Failure: 1-10 with 10 representing most likely · Detectability of Failure: 1-10 with 10 representing most difficult · Severity of Failure: 1-10 with 10 representing most severe · Risk Priority: (Likeliness of failure) x (Detectability of Failure) x (Severity of Failure)						

Benefits of FMEA- Failure Mode Effect Analysis comes with several benefits, which are listed below (Lewis 2013)

1. FMEA is a method that simplifies process improvement
2. It identifies and eliminates every concern at the early stage of the development of a design or process.
3. Increases external and internal customer contentment
4. FMEA specifically lays emphases on prevention
5. This system may be necessary to meet an applicable QSS (Quality System Standard)

- **Handling the Causes of Defects 2**-Another method the researcher would like to recommend to Toyota and its suppliers is to ensure that the Process Capability (C_P) is rigorously done and to ensure that all processes are stable.
- **USAGE OF ISO 26262 Functional Safety Standard**-The researcher would like to recommend the usage of ISO 26262 functional safety standard due to the increasing complexity presently in the automobile industry. This standard offers guidelines and recommendations all through the development phase of the product (N.I 2013)

Major Components of ISO 26262-ISO 26262 makes use of systematic steps for the management of functional safety and the regulation of product development process, from conception to decommissioning (N.I 2013)

1. Provision of safety lifecycle for automobiles with complete support which tailors the important activities at the life cycle stages
2. The provision of a specific risk based automobile method for determining the classes of risk
3. Makes use of Automotive Safety Integrity Level (ASIL) for the specification of the safety requirements necessary for the achievement of any residual risk
4. ISO 26262 makes provision for the confirmation and validation procedures to guarantee an adequate and satisfactory level of safety to be achieved.

Implementation of ISO 26262 tolerates using a basic standard in measuring the safety of any system during operation. It addition it make available the referencing of particular components or parts of a structure because of a basic expressions delivered by ISO 26262. This standard provides a way in which the safety of any system is measured (N.I 2013)

REFERENCE:

[1] Acar, W., and Druckenmiller, D.A (2010) 'Designing insightful inquiring systems for sustainable organizational foresight'. Futures, Vol. 42, pg. 405-416.
[2] Affinity Learning Centre (2007) '4P's of the Toyota Way' [Online] available from < http://affinity.editme.com/4Ps> [02/07/13]
[3] Alfaro, J. and Rabade, L., (2008)'Traceability as a strategic tool to improve inventory management: A case study in the food industry'.International Journal of Production Economics, 118 (1), pg.104–110.
[4] Al-Zoubi, M.R., (2013) 'The Impact of Intellectual Capital on SWOT Analysis among Jordanian Banking Industry "Empirical Study". International Journal of Business and Social Science, Vol. 4, No. 2, pg. 123-137.
[5] Amaratunga, D., Baldry, D., Sarshar, M., and Newton, R. (2002) 'Quantitative and qualitative research in the built environment: application of "mixed" research approach'. Work Study, Vol. 51, No. 1, pg. 17-31.
[6] Amponsah, R. (2012) 'The Real Project Failure Facts and the Effects of Culture on Project Management in Ghana'.ICBE-RF Research Report, No. 45/12.
[7] An. S and Gower. K.K (2009) 'How do the news media frame crisis? A content analysis of crisis news coverage'. Public Relations Review, Vol. 35, pg. 107-112

[8] An Introduction to Automobile (ND) [Online] Available from < http://web.iitd.ac.in/~achawla/public_html/736/1-Automobile_intro-v5_1.pdf> [12/06/2013]
[9] Anand, G. and Kodali, R. (2010) 'Analysis of Lean Manufacturing Frameworks'. Journal of Advanced Manufacturing Systems, Vol. 9, No. 1, pg. 1-30.
[10] Andrews, P.A., Simon, J., Tian, F., and Zhao, J. (2011) 'The Toyota crisis: an economic, operational and strategic analysis of massive recall'. Management Research Review Vol. 34, No. 10, pg. 1064-1077
[11] Andriopoulos, C., and Dawson, P. (2009) Managing Change, Creativity and Innovation. London: Sage Publications
[12] Anon (2008) 'Quality counts: 'The Toyota blueprint for improvement and growth'. Journal of Strategic Direction, Vol. 24, No. 4, pg. 5-9.
[13] Asmita, J. (2013) Product Recall: A failure of Toyota Production System [Online] available from <www.asmedu.org/publications.htm> [18/06/13]
[14] Badewi (2013) 'Positivism V.S Interpretivism '.MIS Research Methodologies [Online] available from < http://misresearchmethodologies.blogspot.co.uk/2013/03/mis-research- methodology-course-2.html> [18/07/13].
[15] Barney, J. (1991) "Firm resources and sustained competitive advantage," Journal of Management, 17(1), pp. 99-121.
[16] Basu, R and Wright. J.N (2008) 'Total Supply Chain Management'. 1st edn. Oxford: Elsevier
[17] Bauer. A, Bowden. R, Browne. J, Duggan. J and Lyons. G (1994) 'Shop Floor Control Systems: From design to implementation'. 1st edn. London: Chapman & Hall
[18] Baxter, P., and Jack, S (2008) 'Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers'. The Qualitative Report, Vol. 13, No. 4, pg. 544-559.
[19] BBC Two (2010)'Total Recall: The Toyota story'. Media Services Lancaster Library, Coventry University.
[20] Behi, R., and Nolan, M. (2004) Ethical Issues in Research. London: Mark Allen Publishing
[21] Berniker, E., and McNabb, D.E (2006) 'Dialectical Inquiry: A Structured Qualitative Research Method'. The Qualitative Report, Vol. 11, No. 4, pg. 643-664
[22] Biswajit, N., Saikat B., and Rittwik, C. (2007) 'Changing Features of the Automobile Industry in Asia: Comparison of Production, Trade and Market Structure in Selected Countries'. Asia-Pacific Research and Training Network on Trade Working Paper Series, No. 37
[23] Black, J.T.(2007). 'Design rules for implementing the Toyota Production System. International Center for Automotive Research, (2011), Contribution of Toyota Motor North America to the Economies of Sixteen States and the United States in 2010'.[Online] Available from < http://www.cargroup.org/assets/files/toyota.pdf> [13/06/2013]
[24] Black, S., and Porter, L. J. (1995), 'An Empirical Model for Total Quality Management'. Total Quality Management, Vol. 6 (2)
[25] Blasio, D.A., and Veale, R. (2009) 'Why say sorry? Influencing consumer perceptions post organizational crises'. Australasian Marketing Journal. Vol. 17, Issue 2, pg. 75- 83
[26] Bloomberg Businessweek (2013) 'Toyota Recalls Prius, Lexus Hybrid on Brake Faults' [Online] Available from <http://www.businessweek.com/videos/2013-06-05/toyota-recalls-prius-lexus-hybrids-on-brake-faults> [02/07/13].
[27] Boin, A. (2005)The politics of crisis management: Public leadership under pressure. London: Cambridge University Press
[28] Brown, D.M., and Laverick, S. (1994) 'Measuring Corporate Performance'.Long Range Planning 27 (4), 89-98
[29] Bunniss, S., and Kelly, D.R (2010) 'Research paradigms in medical educational research'. Journal of Medical Educational, Vol. 44, pg. 358-366.
[30] Burt, B. A. (2001) 'Definitions of Risk'. Journal of Dental Education 65 (10), 1007-1008
[31] BUSM (ND) 'Introduction to Research and Research Methods'. [Online] available from <http://www.brad.ac.uk/management/media/management/els/Introduction-to-Research-and-Research-Methods.pdf> [05/08/13].
[32] Cadle, J., and Yeates, D. (2008) A Project Management for Information Systems. 5thedn. London: Pearson Education Limited
[33] Cars UK (2010) 'Toyota Recalls: 180,865 UK cars affected'. [Online] available from < http://www.carsuk.net/toyota-recall-180865-uk-cars-affected/> [25/06/13]
[34] Chandra, S., and Kodali, R. (1998) 'Justification of Just-in-time manufacturing systems for Indian industries'. Integrated Manufacturing Systems, Vol. 9, Issue 5
[35] Churchman, C. W (1968). 'The Systems Approach'. New York: Dell Publishing Co.
[36] CNN (2010), 'Toyoda, Inaba Testimony before Congress'. Transcripts, Aired February 24, 2010. [Online] Available from < http://transcripts.cnn.com/TRANSCRIPTS/1002/24/rlst.01.html> 13/08/13
[37] Cole, E.R (2010) 'Toyota's Hyper Growth and Complexity Trap'. Harvard Business Review, [Online]Available from < http://blogs.hbr.org/cs/2010/02/toyota_the_downside_of_hyper_g.html> [07/07/13].
[38] Cole, E. R (2011)' What Really Happened to Toyota'?MIT Sloans Management Review, Vol.52, No.4, pg. 29-36
[39] Cole, E.R (2011) 'What happened to Toyota'?EOQ [Online] Available from < http://www.eoq.org/fileadmin/user_upload/Documents/Congress_proceedings/Budapest__June_2011/Proceedings/12_1_cole_slides.pdf> [01/07/13].
[40] Collis, J. and Hussey, R. (2003). 'Business Research: A Practical Guide for Undergraduate and Postgraduate Students'. 2nd edn.. London: Macmillan.
[41] Coombs, W.T (2007) 'Protecting Organizational Reputations during a Crisis: The Development and Application of Situational Crisis Communication Theory'. Corporate Reputation Review, Vol. 10, No. 3, pg. 163-176.
[42] Coombs, W.T., and Holladay, S.J (2002) 'Helping Crisis Managers Protect Reputational Assets: Initial Test of the Situational Crisis Communication Theory' .Management Communication Quarterly, Vol. 16, No. 2, pg. 165-186.
[43] Coombs, W.T., and Schmidt, L (2000) 'An Empirical Analysis of Image Restoration: Texaco's Racism Crisis'. Journal of Public Relations Research, Vol. 12, Issue 2, pg. 163-178.
[44] Cooper. D.R and Schindler (2011) Business Research Methods. 11th edn. New York: McGraw-Hill
[45] Corbin, J., and Morse, J.M (2003) 'The Unstructured Interactive Interview: Issues of Reciprocity and Risks When Dealing With Sensitive Topics'. Qualitative Inquiry, Vol. 9, No. 3, pg. 335-354
[46] Creswell, J. W. (2013) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications, Incorporated
[47] Crosby,D. C. (2009) 'Why Zero Defects Always Works, It's your decision to make it so' [Online] available from<http://www.qualitydigest.com/inside/twitter-ed/why-zero-defects-always-works.html> [03/06/2013]
[48] Currie, D. (2005) Developing and applying study skills. London: CIPD
[49] Dawar, N., and Pillutla, M.M (2000) 'Impact of Product-Harm Crises on Brand Equity: The Moderating Role of Consumer Expectations'. Journal of Marketing Research. Volume 37, pg. 215-226.
[50] De Leeuw, E. D. (2005) 'To Mix or Not to Mix Data Collection Modes in Surveys'. Journal of Official Statistics 21 (2), 233-255
[51] Denzin, N., and Lincoln, Y (2005) 'The Sage Handbook of Qualitative Research'. 3rd edn. London: SAGE Publications.
[52] Department of Commerce United States of America (2007), International Trade Administration; Foreign-Based Companies in the U.S. Auto Industry. [Online] available from < http://www.trade.gov/mas/manufacturing/oaai/build/groups/public/@tg_oaai /documents/webcontent/tg_oaai_003760.pdf> [16/06/2013].
[53] Derek Swetnam (2004) Writing your dissertation. 3rd edn. Oxford U.K:How to Content Books Ltd.
[54] Dietz, G., and Gillespie, N. (2012) 'The Recovery of Trust: Case studies of organisational failures and trust repair'.Institute of Business Ethics [Online] available from < http://www.ibe.org.uk/userfiles/op_trustcasestudies.pdf> [25/03/13]
[55] D.O.T (2011) 'FACT SHEET: Unintended Acceleration in Toyota Vehicles'. [Online] available from <http://www.dot.gov/briefing-room/us-department-transportation-releases-results-nhtsa-nasa-study-unintended-acceleration> 23/08/2013
[56] Dybicz, P., and Pyles, L. (2011) 'The Dialectic Method: A Critical and Postmodern Alternative to the Scientific Method'.Advances in Social Work, Vol. 12, No. 2, pg. 301-317.

[57] Easterby-Smith, M., Thorpe, R., and Jackson, P. (2012) 'Management Research'. 4th edn. London: Sage Publications.
[58] Eisenhardt, M.K.,Sull, N.D (2001) 'Strategy as Simple Rules'. Harvard Business Review[Online] available from < http://www.chuckthomas.net/PhilaCenter/Class_5/HBR-StrategyAsSimpleRules-R0101Gp2.pdf> [28/06/13]
[59] Europa (1985), Summaries of European Union Legislation, Defective product liabilities [Online] available from< http://europa.eu/legislation_summaries/consumers/consumer_safety/l32012_en.htm> [30/05/2013]
[60] European Union (2010) 'Commission Recommendation 2009/40/EC'.
[61] Official Journal of the European Union[Online] available from<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:173:0074:0096:EN:PDF > [07/06/2013]
[62] Goetsch, D. L., and Davis, S. B. (2006) 'Quality Management: Introduction to Total Quality Management for Production, Processing and Services'. 5th edn. Upper Saddle River, New Jersey, USA: Pearson Education, Inc.
[63] Fan, D., Geddes, D. and Flory, F. (2011) 'The Toyota Recall Crisis: Media Impact on Toyota's Corporate Brand Reputation'.Corporate Reputation Review, Vol. 16, Issue 2, pg. 99-117.
[64] Feng, Y. (2010) Toyota Crisis: Management Ignorance? – A Swedish Case of Consumers Perceptions. Masters Dissertation in Management of Innovation and Business Development, 15 ECTS. [Online] available from <http://hh.diva-portal.org/smash/record.jsf?pid=diva2:349746> [10/06/2013]
[65] Fink, S. (1986). 'Crisis management: Planning for the inevitable'. New York: AMA
[66] Fisher, C., Buglear, J., Lowry, D., Mutch, A., and Tansley, C. (2004) Researching and Writing a Dissertation for Business Students. London: FT Prentice Hall.
[67] Food and Drug Administration, (2013). 'What does recall mean'? [Online] available from <http://www.fda.gov/AboutFDA/Transparency/Basics/ucm218233.htm> [22/06/13]
[68] Fossey, E., Harvey, C., McDermott, F., and Davidson, L. (2002) 'Understanding and Evaluating Qualitative Research'.Australian and New Zealand Journal of Psychiatry, Vol. 36, No. 6, pg. 717-732
[69] Fox Business (2010) 'The eight most infamous car recalls in history'. [Online] available from <http://www.foxbusiness.com/personal-finance/2010/08/20/infamous-car-recalls-history/> [22/06/13]
[70] Frontline (2010) 'Toyota's quality lapse'. Industrial Engineer, Vol. 42 Issue 3, p14
[71] Ghazinoory, S., Khotbesara, R.M., and Fardoei, S.R (2011) ' Manufacturing strategy formulation process: case study of Iranian manufacturing companies'. Technological and Economic Development of Economy,Vol. 17:4, pg. 627-644
[72] Genichi, T., and Don., C. (1990) 'Robust Quality, Design products not to fail in the field; you will simultaneously reduce defectives in the factory'. Harvard Business Review, Vol. 68 No 1, pg. 65-75
[73] Grant, R.M (2010) Contemporary Strategy Analysis. 7th edn. West Sussex: Wiley and Sons
[74] Grant, R.M (2013) Contemporary Strategy Analysis. 8th edn. West Sussex: Wiley and Sons
[75] Gray, D. E. (2004)Doing Research in the Real World. London: SAGE Publications.
[76] Guillemin, M. and Gillam, L. (2004) 'Ethics, Reflexivity, and "ethically Important Moments" in Research'. Qualitative Inquiry, 10 (2), 261-280.
[77] Hancock, B. (2002) 'An Introduction to Qualitative Research'. Trent Focus Group [Online] available from <http://faculty.cbu.ca/pmacintyre/course_pages/MBA603/MBA603_files/IntroQualitativeResearch.pdf> [05/08/13].
[78] Hancock, B., Ockleford, E., and Windridge, K. (2009) 'An Introduction to Qualitative Research'.National Institute of Health Research (NIHR) [Online] available from <http://www.rds-sc.nihr.ac.uk/wp-content/uploads/2011/07/5_Introduction-to-qualitative-research-20091.pdf> [05/08/13].
[79] Haimes, Y.Y (2009) 'On the Complex Definition of Risk: A System-Based Approach'. International Journal of Risk Analysis, Vol. 29, Issue 12, pg. 1647 – 1654.
[80] He, H., Zhou, D., and Peng, S. (2011) 'Transmission System Design of FSAE Racing Car Based on Computer Technology'. Proceedings of International Conference of Information Technology.
[81] Heller, V.L., and Darling, J.R (2012) 'Anatomy of crisis management: lessons from the infamous Toyota Case'. European Business Review, Vol. 24, No. 2, pg. 151-168
[82] Hill, T. (2005) Operations management. 2nd edn. New York: Palgrave Macmillan
[83] Hill. A and Hill. T (2011) Essential Operations Management. London: Palgrave Macmillan
[84] Hirotaka, T., Emi, O., and Norihiko, S. (2008) The Contradictions that drive Toyota's Success.Harvard Business Review [Online] available from < http://hbr.org/2008/06/the-contradictions-that-drive-toyotas-success/ar/1> [18/06/13]
[85] Ho-joon, L. (2010). 'Confidence in Toyota drops'. Asiaone Motoring, [Online] Available from <http://motoring.asiaone.com/Motoring/News/Story/A1Story20100216-198910.html> 21/08/2013
[86] Honda (2009) 50 years of investing in America 1959-2009. [Online] available from < http://www.honda.com/news/local_news_content/[5032]_Honda_in_America.pdf> [16/06/2013]
[87] Honda (2013) Quality Initiatives; Aiming at 120% products quality. [Online] available from <http://world.honda.com/CSR/quality/> [16/06/13]
[88] Hox, J.H., and Boeije, H.R. (2005) 'Data Collection; Primary vs. Secondary'. Encyclopaedia of Social Movement, Vol. 1, pg. 593-599.
[89] Hutchins, D. (1999) Just In Time. 1st edn. England: Gower Publishing.
[90] Jainury, S.M., Ramli, R., and Rahman, M.N.A (2012) 'Applying Lean Principles, Tools and Techniques in Set Parts Supply Implementation'.World Academy of Science, Engineering and Technology, Vol. 72, pg. 519-523
[91] James, R.E., and William, M.L. (2005)The Management and Control of Quality. 6th edn. USA : Thompson South Western.
[92] Janis, I. (1989)'Crucial decisions: Leadership in policy making and crisis management'. New York: Free Press
[93] Jensen, C. (2010) 'Toyota Extends Warranty on Troubled 2001-2003 RAV4'. New York Times [Online] Available from < http://wheels.blogs.nytimes.com/2010/07/13/toyota-extends-warranty-on-troubled-2001-3-rav4/?_r=0> [09/08/13].
[94] Jimmerson, C., Weber, D., and Sobek, D.K (2005) 'Piloting Lean Principles at Intermountain Healthcare'. Journal on Quality and Patient Safety, Vol. 31, No. 5, Pg. 249-257.
[95] Johnson, G. and Scholes, K. (2002) 'Exploring Corporate Strategy: Text and Cases'. Harlow, Essex: Pearson Education Limited.
[96] Joshi, A. (2013)'Product recalls: A failure of Toyota production system'. ASM'S International E-Journal of on-going Research in Management and IT. [Online] E- ISSN-2320-0065
[97] Kajornboon, A. B. (2005) 'Using Interviews as Research Instruments'. E-Journal for Research Teachers 2 (1)
[98] Kane, S., Liberman, E., DiViesti, T., and Click, F. (2010) 'Toyota Sudden Unintended Acceleration'. Safety Research & Strategies, Inc. [Online] available from <http://www.safetyresearch.net/Library/ToyotaSUA020510FINAL.pdf> [10/08/13].
[99] Kang, M. (2010) 'Risks of Global Production Systems: Lessons from Toyota's Mass Recalls'. SERI Quarterly, Vol. 3, No. 3, pg. 64-71
[100]Kang, S. (2010) 'Toyota's Toyoda Rises to Restore Consumer Confidence'. Top News [Online] available from <http://topnews.co.uk/28611-toyota-s-toyoda-rises-restore-lost-consumer-confidence> 21/08/2013
[101]Karnani, A. (2006) 'Essence of Strategy: Controversial Choices'. Ross School of Business, Working Paper No. 1032.
[102]Kelly, A.M. (2012). 'Has Toyota's Image Recovered from the Brand's Recall Crisis?' Forbes Magazine, [Online] available from < http://www.forbes.com/sites/annemariekelly/2012/03/05/has-toyotas-image-recovered-from-the-brands-recall-crisis/> 21/08/2013
[103]Khan, D.I, Virtanen, S. and Verma, A.K (2012) ' Automotive Transmission System Design Based On Reliability Parameters'. Journal of Reliability and Statistical Studies, Vol. 5, Issue 2, pg. 59-76.
[104]Kirchhoff, S.M and Peterman, D.R (2010),'Unintended Acceleration in Passenger Vehicles'. Congressional Research Service, 7-5700.

[105]Knowledge@Wharton (2010) 'Quality on the Line: The Fallout from Toyota's Recall' Strategic Management. [Online] available from < http://knowledge.wharton.upenn.edu/article.cfm?articleid=2423> [03/07/13].
[106]Kothari, C. (2004) Research Methodology: Methods and Techniques. London: New Age International
[107]Koumparoulis, N.D (2013) 'Pest Analysis: The case of E-shop'. International Journal of Economy, Management and Social Sciences, Vol. 2, No. 2, pg. 31-36
[108]Kubota, Y. (2012) Toyota to Recall 20million Vehicles for Defects. Reuters[Online] available from <http://www.reuters.com/article/2012/11/14/us-toyota-recall-prius-idUSBRE8AD09A20121114> [12/06/2013]
[109]Kumar, S., and Schmitz, S. (2011) 'Managing recalls in a consumer product supply chain – root cause analysis and measures to mitigate risk'. International Journal of Production Research, Vol. 49, No. 1, pg. 235-253.
[110]Kvale, S. (1996) Interviews An Introduction to Qualitative Research Interviewing. London: Sage Publications.
[111]Lander, E., and Liker, J.K.(2007)'The Toyota Production System and art: making highly customized and creative products the Toyota way'.International Journal of Production Research 45 (16), 3681–3698.
[112]Lalonde, C. (2007)'Crisis management and OD: Toward the conception of a learning model in crisis management'.Organizational Development Journal, Vol. 25, No. 1, pg. 17-26
[113]Lean4it (2013) TPS house for IT management. [Online] available from < http://www.erp4it.com/erp4it/2010/08/tps-house-for-it-management-version- 01.html> [27/07/13].
[114]Lehane, C., Fabiani M., and Guttentag, B. (2012) Masters of Disaster,The Ten Commandments of Damage Control. New York:Palgrave Macmillan.
[115]Lenaghan, J., and Smith, C. (2004) 'The Interiors Plant Shutdown: Using Dialectic Inquiry in a Complex Ethical Decision'.Journal of Management Education, Vol. 28, No. 2, pg. 207-223.
[116]Lewis, P. (2013) M72 Quality Class Notes. Engineering and Computing, Coventry University.
[117]Liker, J.K (2010) 'The Wrong Lessons from Toyota's Recalls- And the Truth'. Harvard Business Review, [Online] available from < http://blogs.hbr.org/research/2010/03/does-media-coverage-of-toyota.html> [07/07/13].
[118]Liker, J.K. (2010) 'Can Toyota Hansei its Way out of the Crisis?' HBR Blog Network [Online] available from < http://blogs.hbr.org/cs/2010/02/can_toyota_hansei_its_way_out.html> 19/08/2013
[119]Liker, J .K (2010) 'The way back for Toyota'.Institute of Industrial Engineers, Vol. 42, Issue: 5, pg. 28-33.
[120]Liker, J.K., and Meier, D. (2006) The Toyota Way Field Book; A Practical Guide for Implementing Toyota's 4Ps. New York: McGraw-Hill

[121]Liker, J.K., and Morgan, J.M. (2006)'The Toyota Way in Services: The Case of Lean Product Development'. Academy of Management Perspectives, Vol. 20, No. 2, pg. 5-20.
[122]Liker, J., and Hoseus, M. (2008) Toyota Culture; the Heart and Soul of the Toyota Way. New York:McGraw-Hill.
[123]Liker, J., and Ogden, T.N (2011) The Toyota Recall: Missing the Forest for the Trees. Ivey Business Journal [Online] available from < http://www.iveybusinessjournal.com/topics/marketing/the-toyota-recall- missing-the-forest-for-the-trees> [01/07/13]
[124]Liker, J., and Ogden, T.N (2011). Toyota Under Fire; How Toyota Faced the Challenges of the Recall and the Recession to Come Out Stronger. New York: McGraw- Hill.
[125]Litman, T. (2012) 'Evaluating Research Quality: Guidelines for Scholarship'. Victoria Transport Policy Institute. [Online] available from < http://www.vtpi.org/resqual.pdf> [13/07/13].
[126]Liu, P. (2010) 'A Brief Understanding of International Business Strategy; A Case Study of Toyota.Acculine Precision Manufacturing,[Online] available from < http://www.acculine-mfg.com/literature/1_Toyota_International_Strategy__Sponsored_by_Acculine .pdf> [07/07/2013]
[127]Lourenço, S. V., and Glidewell, J. C. (1975) 'A Dialectic Analysis of Organizational Conflict'. Administrative Science Quarterly 20 (4), 489-508
[128]Management Study Guide (2012) Secondary Data. [Online] available from< http://www.managementstudyguide.com/secondary_data.htm> [16th December, 2012]
[129]Manpreet, H., Hari, B., and Aleda, V.R (2011) 'Safety hazard and time to recall: The role of recall strategy, product defect type, and supply chain player in the U.S toy industry'.Journal of Operations Management, Vol. 29, Issues 7-8, pg. 766-777.

[130]Marucheck, A.S. (2007) On product liability and quality control. IIE Transactions 19, pg. 355–360.
[131]Mauret, J. (2012) 'Project Management and Scope Definition'.Maldives Muslims Me. [Online] available from < http://virginauthor.wordpress.com/2012/05/27/project-management-and- scope-definition-by-jane-mauret/> [27/07/13].
[132]Maynard, M. (2008). 'Toyota tries flexible global strategy'. New York Times [Online] Available from < www.nytimes.com/2008/02/21/business/worldbusiness/21iht-side.4.10282419.h> 01/07/2013
[133]Miltenburg, J. (2005) Manufacturing Strategy: How to Formulate and Implement a Winning Plan. 2nd edn. New York: Productivity Press.
[134]Miltenburg, J. (2009) 'Setting manufacturing strategy for a company's international manufacturing network'. International Journal of Production Research. Vol. 47, No. 22, pg. 6179-6203.
[135]Mintzberg, H. (1972) 'Research on strategy-making', Proceedings of the 32nd Annual Meeting of the Academy of Management Minneapolis. [Online] available from <https://faculty.fuqua.duke.edu/~charlesw/s591/Bocconi-Duke/Papers/new_C12/Of%20Strategies%20%20%20Deliberate%20and%20Em ergent.pdf> [28/06/13].
[136]Mintzberg, H., and Waters. J.A (1985) 'Of Strategies, Deliberate and Emergent' Strategic Management Journal, Vol.6, pg. 257-272
[137]Minhyung, K. (2010). 'Risks of Global Production Systems: Lessons from Toyota's Mass Recalls'. SERI Quarterly, 3(3), 64-71.
[138]Monden, Y. (2012) Toyota Production System: An Integrated Approach to Just-In- Time. 4th edn. New York: Taylor and Francis
[139]Montgomery, D.C. (1991). 'Introduction to Statistical Quality Control'. Vol. 2. New York: Wiley
[140]Morrell, K. (2011) 'Evidence-based dialectics'. Organization, Vol. 19, No. 4, pg. 461-479
[141]Natasha, M., Cynthia, W., Kathleen, M., Greg, G., and Emily, N. (2005) Qualitative research methods: A data collector's field guide. Family Health International.
[142]National Instruments (2013) ISO Functional Safety Standard. [Online] available from < http://www.ni.com/white-paper/13647/en/> 05/09/2013
[143]Neale, P., Thapa, S., and Boyce, C. (2006) Preparing a Case Study: A Guide for Designing and Conducting a Case Study for Evaluation Input. Pathfinder International Tools Series, [Online] available from < http://www2.pathfinder.org/site/DocServer/m_e_tool_series_case_study.pdf > [06/08/13].
[144]NHTSA (2011) 'Vehicle Characterization and Performance Study of Toyota Camry's'. VRTC Report DCD9157-1. [Online] available from < http://www.nhtsa.gov/search?q=toyota+transmission+recalls&=Search+Again > [09/08/13].
[145]NHTSA (2013) Motor Vehicle Safety Defects and Recall Campaigns. [Online] available from < http://www.nhtsa.gov/Vehicle+Safety/Recalls+&+Defects/Motor+Vehicle+Safe ty+Defects+and+Recalls+Campaigns> [22/06/13]
[146]Nortje, F.D and Snaddon, D.R (2013) 'The Toyota Production System's Fundamental Nature at Selected South African Organizations – A Learning Perspective'.South African Journal of Industrial Engineering, Vol. 24, No. 1, pg. 68-80.
[147]Ono, T. (1988) Toyota Production System: Beyond Large Scale Production. New York: Productivity Inc.
[148]Perry, J. L., and Katula, M. C. (2001) 'Does Service Affect Citizenship'? Administration and SocietyVOL. 33 (3), pg. 330-365
[149]Philip, C. (2005) Zero Defect, Ten Step Supplementary Paper. [Online] available from < http://tenstep.altarum.org/completeI/qualitycorner/700PhilipCrosbyZeroDefec ts.pdf> [31/05/2013]
[150]Pilling, D. (2010) How Toyota engineered its own downfall. Financial Times [Online] available from <http://www.ft.com/cms/s/076f7700-167a-11df-bf44-00144feab49a,Authorised=false.html?_i_location=http%3A%2F%2Fwww.ft.co

m%2Fcms%2Fs%2F0%2F076f7700-167a-11df-bf44-00144feab49a.html&_i_referer=#ixzz2VHmQ75zB> [23/06/13]

[151]Piotrowski, C., and Guyette, R.W. (2010)'Toyota Recall Crisis: Public Attitudes on Leadership and Ethics'. Organization Development Journal, Vol. 28, No. 2, pg. 89-97.

[152]Porter, E.M (1996) 'What is Strategy'. Harvard Business Review [Online] available from <http://www.ipocongress.ru/download/guide/article/what_is_strategy.pdf>[28/06/13]

[153]Priem, R.L., and Price, K.H (1991)'Process and Outcome Expectations for the Dialectical Inquiry, Devils Advocacy, and Consensus Techniques of Strategic Decision Making'. Group & Organization Management, Vol.16, No. 2, pg. 206-225.

[154]Prowse, M., and Camfield, L. (2013) 'Improving the quality of development assistance: What role for qualitative methods in randomized experiments? Progress in Development Studies, Vol. 13, No. 1, pg. 51-61.

[155]Psarakis, S. (2011). 'The Use of Neutral Networks in Statistical Process Control Charts'. Quality and Reliability Engineering International, Vol. 27, pg. 641-650

[156]Raelin, J. A. (2012) 'Leadership in Participatory Organizational Change'. Journal of Organizational Change Management 25 (1), 7-23

[157]Rajenthirakumar, D., and Shankar, R.G (2011) 'Analysing the Benefits of Lean Tools: A Consumer Durables Manufacturing Company Case Study'. International Journal of Engineering, Vol. 9, Issue 3, pg. 335-339.

[158]Ralph, N. (1966) Unsafe at any Speed, the Designed-in Dangers of the American Automobile. New York:PB Special, Pocket Books.

[159]Ravikumar, M.M, Marimuthu, K. and Chandramohan, D. (2009) 'Implementation of Lean Manufacturing in Automotive Manufacturing Plant [TEL]'. International Journal of Applied Engineering Research, Vol. 4, No.4, pg. 2041-2050

[160]Resnik, B. (2011) What is Ethics in Research and Why is it Important?National Institute of Enviromental Health Sciences. [Online] available from < http://www.niehs.nih.gov/research/resources/bioethics/whatis/> [25/06/13]

[161]Riley, C., and Wakatsuki, Y.(2013) 'Honda, Nissan and Toyota in massive recall' . CNN Money [Online] available from < http://money.cnn.com/2013/04/11/news/toyota-honda-airbag-recall/index.html?iid=EL> [02/07/13].

[162]Ruddick, G. (2010) 'Toyota Boss: We can win back the customer's confidence. We are doing a better job'. The Telegraph [Online] available from < http://www.telegraph.co.uk/finance/newsbysector/transport/7384418/Toyota-boss-We-can-win-back-the-customers-confidence.-We-are-doing-a-better-job.html> 21/08/13

[163]Russell, S.R., and Taylor, .B.W (2006) Operations Management; Quality and Competitiveness in a Global Environment. 5th edn. New Jersey: Wiley

[164]Safercar.gov (2010) Motor Vehicle Defects and Safety Recalls: What Every Vehicle Owner Should Know

[165][Online]available from<http://www-odi.nhtsa.dot.gov/recalls/recallprocess.cfm> [26/05/2013]

[166]Samson, D. (1991) Manufacturing and Operations Strategy. 1st edn. Australia: Prentice Hall

[167]Schrage, M. (2010) 'The Toyota Brand: Struggling Online and Off'. Harvard Business Review, [Online] available from <http://blogs.hbr.org/schrage/2010/02/the-toyota-brand-struggling-on.html> [07/07/13].

[168]Schonberger, R.J (1986) World Class Manufacturing; A Lesson of Simplicity Applied. London: The Free Press.

[169]Shafer, S.M., and Meredith, J.R (1998) Operations Management; A Process Approach with Spread sheets. New York: John Wiley & Sons, Inc.

[170]Shakespeare, S. (2013)'Toyota must target media'. YouGov [Online] available from < http://yougov.co.uk/news/2013/01/30/toyota-must-target-media-recover/> 21/08/2013.

[171]Shim, S., and Steers, R.M (2012) 'Symmetric and asymmetric leadership cultures: A comparative study of leadership and organizational culture at Hyundai and Toyota'Journal of World Business. Vol.47, pg. 581-591

[172]Silodrome (2013) Ford Model T Assembly Line. [Online] available from < http://silodrome.com/ford-model-t-assembly-line/> 14/06/2013

[173]Simon, W., Mauricio, F. B., Hui M.W and Yi-Li C. (2010) 'Can theToyota Way Overcome the Recent Toyota Setback? A Study Based On The Theory Of Constrains'. Journal of Advanced Manufacturing Systems, Vol. 9, No. 2 (2010) 145-156.

[174]Skinner, W. (1969)'Manufacturing- Missing Link in Corporate Strategy'.Harvard Business Review, Vol. 47, No. 3, pg. 136-145.

[175]Strategic Management Insight (2012) 'PEST AND PESTEL Analysis'. [Online] available from <http://www.strategicmanagementinsight.com/tools/pest-pestel-analysis.html> [07/08/13].

[176]Southworth, T. (2010) Printing Lean: The 800-Pound-Gorilla. Label and Narrow Web [Online] available from <www.labelandnarrowweb.com> [28/01/2013]

[177]Spear, S., and Bowen, H. K (1999) 'Decoding the DNA of Toyota Production System'. Harvard Business Review, [Online] available from < http://hbr.org/1999/09/decoding-the-dna-of-the-toyota-production-system/ar/1> [18/06/13]

[178]Spear, S. (2010) 'Learning from Toyota's Stumble'. Harvard Business Review, [Online] available from < http://blogs.hbr.org/cs/2010/01/learning_from_toyotas_stumble.html> 27/06/13]

[179]Spiridonicia, A. (2011). 'The Use of Statistical Process Control in Pharmaceuticals Industry'.Journal of Lucarari Stiintifice, Vol. 54, No. 1, pg. 271-275

[180]Stewart, A.T., and Raman, A.P (2007) Lessons from Toyota's Long Drive.Harvard Business Review [Online] available from <http://hbr.org/2007/07/lessons-from-toyotas-long-drive/ar/1> [01/07/13].

[181]Stoy, A. (2012) Complete Toyota recall list includes Camry, RAV4, and Highlander SUV. Autoweek, [Online] available from <http://www.autoweek.com/car-shopping/articles/2012/10/complete-Toyota-recall-list-camry-rav4-highlander-corolla.html> [24/06/13]

[182]Sugimori, Y., Kusunoki, K., Cho, F., and Uchikawa, S. (1977) 'Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system', International Journal of Production Research, 15:6, 553-564

[183]Takeuchi, H., Osono, E., and Shimizu, N. (2008) 'The Contradiction That Drive Toyota's Success'. Harvard Business Review, Vol.86, No. 6, pg. 96-104.

[184]Taneja, S., Pryor, M., and Sewell, S. M. (2012)'Toyota Recalls: A Strategic Leadership Perspective'. International Journal of Business & Public Administration, 9(2), 125-140

[185]TEDCO INC. (ND) Statistical Process Control Basics. [Online] available from < http://tedco-inc.com/wp-content/themes/weaver/images/TEDCO-SPC.pdf> 20/08/13.

[186]Teich, S.T and Faddoul, F.F (2013) 'Lean Management- The Journey from Toyota to Healthcare'. Rambam Maimonides Medical Journal, Vol. 4, Issue 2, pg. 1-10.

[187]The Economist (2010) The machine that ran too hot.[online] available from < http://www.economist.com/node/15581072> 20/08/2013

[188]The Geography of Transport Systems (2013) Assembly Line of Ford T Model, 1913. [Online] available from < http://people.hofstra.edu/geotrans/eng/ch2en/conc2en/assemblyft.html> [23/05/2013]

[189]The History of Cars (ND) [Online] available from < http://www.lemaymuseum.org/files/library/0f1d86fd9c3683b4.pdf> [13/06/13]

[190]The Toyota Production System (ND) High Quality and Low Cost. [Online] Available from <http://web.mit.edu/2.810/www/lecture09/14.pdf> [16/06/13]

[191]The Productivity Development Team (1998) 'Just In Time for Operators'. Oregon: Productivity Press.

[192]Timmings. R (2004) Basic Manufacturing. 3rd edn. London: Elsevier

[193]Toyota (1995-2013) History of Toyota; History of Technological Development[Online] available from <http://www.toyota-global.com/company/history_of_toyota/> [27/06/13]

[194]Tucker, L., and Melewar, T. (2005) 'Corporate Reputation and Crisis Management: The Threat and Manageability of

Anti-corporatism'.Corporate Reputation Review, Vol. 7, No. 4, pg. 377-387

[195]U.S Senate (2010) Toyota's Recalls and the Government's Response, [Online] available from <http://www.gpo.gov/fdsys/pkg/CHRG-111shrg66219/html/CHRG-111shrg66219.htm> 08/09/2013

[196]Van Maanen, J. (1998) Qualitative Methodology. London: Sage Publications

[197]Vartabedian, R. and Bensinger, K (2010) 'Doubt cast on Toyota's decision to blame sudden acceleration on gas pedal defect'. Los Angeles Times, [Online] available from <http://articles.latimes.com/2010/jan/30/business/la-fi-toyota-pedal30-2010jan30> [10/08/13].

[198]Vehicle & Operator Service Agency (2013) Vehicle Defects, Things to consider before reporting a Safety Defect [Online] available from< http://www.dft.gov.uk/vosa/onlineservices/vehicledefects.htm> [26/05/2013]

[199]Viaggi, D., (2013) 'Developing Improved Tools for the Economic Analysis of Innovations in the Bio economy: Towards a Life Cycle-Strengths-Weaknesses-Opportunities- Threats (LC-SWOT) Concept?'Journal of Management and Strategy, Vol. 4, No. 2, pg. 17-25.

[200]Voss, C.A (1987) International Trend in Manufacturing Technology, Just-In-Time Manufacture. U.K: IFS Publications Ltd.

[201]Wayne Stottler (2004) Improving Service Quality at Honda. [Online] available from <http://kepner-tregoe.com/pdfs/articles/qpblendedlearning.pdf> [16/06/13]

[202]Weaver, K. and Olson, J.K (2006) 'Understanding paradigms used for nursing research'. Journal of Advanced Nursing, Vol. 53, No. 4, pg. 459-469.

[203]Williams, J. (2011) How to Write a Complete Dissertation: Research Paradigm and Philosophy. Dissertation Writing Tips [Online] available from < http://www.howtodo.dissertationhelpservice.com/research-paradigm-and-philosophy> [15/07/2013].

[204]Womack, J., Jones, D., and Daniel, R. (1990). The machine that changed the world. New York: Free Press.

[205]Williams, M. (2000) 'Interpretivism and Generalisation'. Sociology, Vol. 34, No. 2, pg. 209-224.

[206]Xiuli, L., Baozhi, C., and Hanqing,X. (2012) 'Study on Principles of Product Defect Identification'. Procedia Engineering, Vol. 43,pg 393-398.

[207]Yang, J., and Pan, J.C (2004) 'Just-in-time purchasing: an integrated inventory model involving deterministic variable lead time and quality improvement investment'. International Journal on Production Research, Vol. 42, No. 5, pg. 853-863.

[208]Yong-Jyun, B., and Hugo B. (2011) Do Vehicle Recalls Reduce the Number of Accidents? The Case of U.S Car Market. [Online] available from < http://ms.cc.sunysb.edu/~hbenitezsilv/recall.pdf> [07/06/13].

[209]Yong-Kyun, B.A.E and Hugo, B. (2013). 'The effects of Automobile Recalls on the Severity of Accidents'. Economic Inquiry, Vol. 51, No. 2, pg. 1232-1250.

[210]Zanasi, R., Visconti, A., Sandoni, G., and Morselli, R. (2001) 'Dynamic Modeling and Control of a Car Transmission System'. Proceedings IEEE/ASME International Conference.