# An examination of Enron Corporation:  Could the Fraud have been Detected Sooner?

**Caesar K. Simpson**

Swiss Management Centre (SMC) University

***Abstract-*** One of the unfortunate results of fraud is major financial commotion that results in atrocious loss for those –inter alia, investors, banks, insurance companies - that dabble in the financial markets (Obiri, 2011; Klimaitiene & Grundiene, 2010). Additionally, occupational fraud[1] tends to have very damaging economic effects especially when the result is bankruptcy (Association of Certified Fraud Examiners, 2010; Klimaitiene & Grundiene, 2010; Obiri, 2011). As such, the ability to detect the likelihood of financial fraud before it occurs or while it is in operation; is of great significance to economic progress (Klimaitiene & Grundiene, 2010; Obiri, 2011). This paper has analyzed the bankruptcy of Enron –the US Energy, Telecommunications, Commodities and Services conglomerate (Kroger, 2004) – through inter alia; its 10K filings with the Securities and Exchange Commission (SEC) and information gleaned from academic journals. The objective was to determine whether Enron's gigantic fraud could have been detected sooner. After employing tools such as Non-Financial Measures; Gross Margin Test; Altman's Z-score Bankruptcy Predictor; Modified Altman's Z-score; Chanos Algorithm; and Beneish Model,  this paper concludes that, it would have been possible to detect Enron's fraud, as early as 1998  or at worst 1999.

***Index Terms-*** Occupational fraud, Fraud detection, Bankruptcy, Corporate Governance

## 1.  INTRODUCTION

Fraud was defined in the KPMG[2] Survey (KPMG 2004) as cited in Coram, Ferguson and Moroney (2006) as:  Any dishonest activity involving the extraction of value from a business, directly or indirectly, regardless of whether the perpetrator benefits personally from his or her actions.  Nouss (n.a), Managing Director—Florida Accume Partners defined Occupational Fraud as "The use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets." Whether it is an intentional or an accidental act of deception (Singleton & Singleton, 2011, p. 40); fraud costs the global economy some USD$ 2.9 trillion on an annual basis (Association of Certified Fraud Examiners, 2010).

Nouss (n.a) averred that three major categories of occupational fraud (see Appendix 1) are:
1. Asset Misappropriations[3], which involve the theft or misuse of an organization's assets. An example of Asset Misappropriation is Yahoo's law suit against the CEO of its 2005 USD$ 1 billion acquisition, Alibaba Group Holdings Ltd ("Suits say Yahoo...", 2011, para2). As Yahoo did not secure its prime asset in the acquisition –the e-payment company Alipay - the CEO Jack Ma discreetly sold or misappropriated the asset to another organisation that he runs; for an amount that was a lot less that its market value ("Suits say Yahoo…", 2011, para 3). According to Association of Certified Fraud Examiners (2010) and Nouss (n.a) Asset misappropriations is the most frequently occurring type of occupational fraud (see Appendix 1).
2. Corruption[4], in which fraudsters wrongfully use their influence in a business transaction in order to procure some benefit for themselves or another person, contrary to their duty to their employer or the rights of another; The empirical studies (ACFE, 2010; Nouss, n.a) found that corruption is the second most frequently occurring type of occupational fraud and only a third of the cases studied involved it (see Appendix 1).

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[1]This occurs when people abuse their positions at work by intentionally misusing company resources for personal gain (Nouss, n.a; Joshi, 2005, p. 6).
[2]KPMG is one of the big 4 accounting firms (Rihab, Sharma, Humphrey & Robson, 2007).
[3]Asset misappropriation occurs when an organization's asset is used for purposes that do not benefit the organisation i.e. personal enrichment, theft, embezzlement etc. (Singleton &
[4]This occurs if for the purposes of fraudulent gain; people abuse a position of trust (Tarantino, 2008, p. 121). In other words, corruption is unethical behaviour such as accepting bribes or kickbacks (Tarantino, 2008, p. 121).
[5]A financial statement that is fraudulent has been deliberately furnished with incorrect information (Zhou & Kapoor, 2011)

3. Fraudulent Financial Statements, which generally involve falsification of an organization's financial statements. Apart from seriously destabilizing the trustworthiness of Corporate Financial Statements (Klimaitiene & Grundiene, 2010; Perols, 2011); financial statement fraud[5] also has a damaging impact on organizational stakeholders such as staff and investors (Perols, 2011). Consequently, market efficiency is reduced while transaction costs increase (Perols, 2011).

Empirical evidences dating far back from 1932 (Flesher & Flesher, 1986) to 2008 (Ferrell, Fraedrich & Ferrell, 2010, p. 402) show that fraud continue to be a global phenomenon and takes average longer time to detect. In this very unstable environment of financial pressures, auditors are taxed with the duty of ensuring that financial statements are free of fraud if such fraud causes a material misstatement in the financials (Perols, 2011). Consequently, the internal audit function within an establishment is a fundamental part of its corporate governance in detection and prevention of fraud (Coram, Ferguson & Moroney, 2008). This fact is supported by a 2004 KPMG fraud survey on both private and public sector establishments in Australia and New Zealand, which concluded that; companies are more likely to notice and self-report fraudulent activity, if there is an. internal audit function (Coram, Ferguson & Moroney, 2008).

Nonetheless, despite all the experiences and precautions mentioned above; fraud still prevailed (Wells, 2001). A recent empirical study by the Association of Certified Fraud Examiners (ACFE) that analyzed 1,843 global occupational fraud cases that occurred between January 2008 and December 2009, found that; 25% of the fraud cases resulted in minimum losses of USD$1 Million while on average the frauds were not detected until they had been occurring for at least 18 months (ACFE, 2010). It is in view of the long period that it is taking to detect fraud in most cases that this paper examines the financial statements of Enron from 1997 to 2001 to see whether the famous Enron fraud could have been detected sooner. The rest of the paper is organised as follows: 2. Fraud Overview, 3. The Enron Fraud, 4. Analysis, 5. Conclusion, and 6. Recommendations.

## 2. HISTORY

### 2.1 History

A remarkable 20th Century financial fraud that involved Kreuger & Toll, Inc. – a large Swedish Match company, contributed enormously to bringing the Securities Act[6] into being, according to empirical study; due to its hidden Ponzi[7] investment scheme (Flesher & Flesher, 1986). The scheme paid huge dividends to investors from its capital and the company which went bankrupt in 1932 escaped detection for quite some time due to unaudited financial statements (Flesher & Flesher, 1986).
In addition to the above, the 1937 McKesson & Robbins fraud known as one the greatest frauds of the 20th century was detected 13 years after it began; had a significant effect on accounting in those days, according to Baxter 1999 as cited in (Shinde & Poznic, 2010). The company which was acquired with ill-gotten wealth and run by Philip Musica, a man with different aliases who was 'proficient' at serious fraudulent activity by the age of 30, generated fictitious inventories and accounts receivable invoices which resulted in some USD$19 million in fictitious assets being declared in their financial statements (Shinde & Poznic, 2010). In fact, had it not been the 1937 recession which affected the cash flow of McKesson & Robbins; that fraud may not have been detected until much later, if at all; even though, the auditing services of Price Waterhouse[8] & Co had been attained since the acquisition (Shinde & Poznic, 2010).

More recently, in 1991, the bankruptcy of the Bank of Credit and Commerce International (BCCI) was regarded the largest bank failure in the world at the time, according to the Financial Times, 1991 as cited in Kanas(2004). BCCI collapsed with a debt of GBP £10 Billion (Liquidators of BCCI...", 2005, para 1) and at the height of the biggest financial fraud that had been detected to that date ("International Bank…..", 1991, para 8); resulted in the Bank of England being sued for "misfeasance"[9] ("Britain's Biggest…..", 2004, para 16). Other notable frauds include WorldCom, which went bankrupt in 2002, Tyco (Kuhn & Sutton, 2006) and Enron (Kroger, 2004), which will be discussed in detail later. WorldCom was the second largest US telecommunications company in 1999 (Kuhn & Sutton, 2006). However, that year, the company founded in 1983 as Long Distance Discount Service (LDDS) by businessmen Murray Waldron and William Recktor, and renamed WorldCom in 1995, experienced a reduction in earnings and an increase in expenditures (Kuhn & Sutton, 2006). This occurred after massive growth in the 1990s; from the acquisition of some 60 communications companies (Kuhn & Sutton, 2006). Consequently, in order to present a suitable expenditure to cost ratio, WorldCom's management stated operating expenses as capital expenditures as this would not be deducted from revenue (Kuhn &

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[6]The 1933 Securities Act has made the disclosure of audited financial statements to investors, a prerequisite for issuing new securities to the public (Rittenberg, Johnstone, Gramling & Schweiger, 2009, p.839).
[7]A Ponzi scheme pays investors out of their own capital or from the capital of new investors (Carvajal & Wynter, 2009, p .4).
[8]Price Waterhouse & Co was referred to as the "finest auditors in the country" at that time, Baker & Bealing, 2006 as cited in (Shinde & Poznic, 2010).
[9]Misfeasance is a Tort Law -Tort is a civil wrong and involves individuals, companies or governments suing over violation rights (Walston Dunham, 2008, p. 217)-, which occurs when a legal act is wrongfully carried out and causes harm as a result (Kennedy, 2009, p. 129).
Sutton, 2006). This fraudulent strategy, turned WorldCom's 2001 'private' loss of USD$ 662 Million into a 'public' profit of USD$ 2.4 Billion (Kroger, 2004).

Furthermore, WorldCom reclassified the value of recently acquired MCI's assets as goodwill, brought future expenses forward by adding them to asset write-down calculations while deliberately calculating bad debt reserves incorrectly; as illustrated in Appendix 2

(Kuhn & Sutton, 2006). Additionally, WorldCom decreased the book value of MCI's assets by several USD\$ Billion and at the same time increased its goodwill by an amount that balanced it (Kuhn & Sutton, 2006). At that time, Accounting Standards allowed amortization of goodwill for up to 40 years (Kuhn & Sutton, 2006). As such, WorldCom was able to spread the expense of the acquired assets by charging only a small amount each year; thereby overstating net income (Kuhn & Sutton, 2006).

## 2.2 Recent Developments

Bernard Madoff's Ponzi scheme –the largest financial swindle in history as of 2009 ("Bernard Madoff was…..", 2009, para 1) erupted in December 2008 as the financial crisis continued (Clauss, Roncalli & Weisang, 2009). Madoff's Ponzi scheme, which was undetected for at least two decades, paid existing investors mostly high society investors and banks ("Madoff Clients ...", 2009, para 2) out of the capital of new investors (Clauss, Roncalli & Weisang, 2009). However, the illiquidity[10] and cash flow problems that occurred during the financial crisis resulted in large investor withdrawal attempts of USD\$ 7Billion ("Bernard Madoff Victims…..", 2011, para 7), during a short period of time (Clauss , Roncalli & Weisang, 2009).Additionally, the severe nature of the recent financial crisis reduced the number of new investors; making it difficult for Madoff to obtain funds to pay his existing investors (Clauss, Roncalli & Weisang, 2009; Sinn, 2010, p. 135). As a result, Madoff 'confessed' his crime (Clauss, Roncalli & Weisang, 2009) and received a more peaceful punishment of 150 years in prison ("Bernard Madoff was…..", 2009, para 3) than the originator of the scheme, Charles Ponzi, whose victims; stormed the gates of his home in 1920 ("Bernard Madoff was…..", 2009, para 4).

The recent financial crisis exposed yet another fraud and this was discovered after the collapse of Lehman Brothers; one of the largest investment banks in the world ("Lehman Brothers...", 2008, para 1) and America's fourth-largest investment bank founded in 1850 (Ferrell, Fraedrich & Ferrell, 2010, p402) - in September 2008 ("Lehman Brothers…..", 2008, para 1 ). Lehman's USD\$ 639 Billion bankruptcy[10] ("Lehman Collapse...", 2009, para 1), which is said to have worsened the recent financial crisis ("Faces of…..", 2009, para 3; Terazi & Senel, 2011), was also the world's largest bankruptcy to date; in 2009 ("Lehman Collapse…..", 2009, para 2). In the wake of the bankruptcy however, it was discovered that; Lehman's auditors – Ernest & Young, one of the Big 4, had allegedly authorized financial statements that made the investment bank's balance sheet appear better than it was (Verschoor, 2011). Repo 105[11] transactions, which described as assets sold, boosted Lehman Brother's financial position for seven years before it went bankrupt in 2008 (Verschoor, 2011). As a result, Ernest & Young was sued by the State of New York – Attorney General Andrew Cuomo for allegedly 'aiding and abetting' Lehman Brothers because the obligation to repurchase the Repo Assets was not disclosed in the audited Financial Statements ("Cuomo sues Ernest & Young ...", 2010, para 1). A recent empirical study by the Association of Certified Fraud Examiners (ACFE) that analyzed 1,843 global occupational fraud cases –that occurred between January 2008 and December 2009; found that; 25% of the fraud cases resulted in minimum losses of USD\$1 Million while on average the frauds were not detected until they had been occurring for at least 18 months (ACFE, 2010).

## 3. THE ENRON FRAUD

### 3.1 History

Enron Corporation has its roots in Omaha, Nebraska in US (Cernusca & Dima 2007; Kroger, 2004). According to Cernusca and Dima (2007) and Kroger (2004), in 1985, Houston Natural Gas merged with InterNorth to form an energy company based in Huston, Texas (US). The company integrated several pipeline systems and hence created the first nationwide natural gas pipeline system. In 1986 Ken Lay, former chief executive officer of Houston Natural Gas, was named chairman and chief executive officer at the young energy company. It's now when the company chose the name Enron Corp. In 1987, after discovering the oil traders in New York have overextended the company's accounts by almost \$1 billion, the company works its loss down to \$142 million. The loss immediately leads to Enron Corp. developing different services in order to reduce the risk of prices wings (Cernusca & Dima 2007; Kroger, 2004).
A year later, Enron Corporation opened its first overseas office in England. In a gathering known as the "Come to Jesus" meeting, the company's new strategy was revealed to the executives: pursue unregulated markets[12] in addition to its regulated pipeline business. Jeffrey Skilling joined Enron Corp. in 1989 and launch Gas Bank, a program under which buyers of natural gas could lock in

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[10]The bankruptcy was brought about by losses incurred in the mortgage market that resulted in the loss of investors' confidence and an inability to find a buyer for the 'broken bank' ("Lehman Brothers Holdings ...", 2011, para 1).

[11]A Repo is a transaction in which an organisation sells its assets in a short term repurchase agreement (Schapiro, 2010, p. 6). This means that, the organisation repurchases the asset at a fixed price at a later date (Schapiro, 2010, p. 6). This transaction can be recorded as debt financing -in compliance with Accounting Standards- or a sale if the organisation gives up ownership of the asset (Schapiro, 2010, p. 6).

[12] Unregulated markets is when there are no government controls concerning business activities that have economic impacts (Goldberg & White, 2003, p. 115).

long-term supplies at fixed prices. At the same time, the corporation started to offer financing for oil and gas producers (Cernusca & Dima 2007).

According to Cernusca and Dima (2007) and Kroger (2004), in 1992, Enron Corporation expended to South America by acquiring Transportadora de Gas del Sur. In the same year, the company started to push to extend on the continent. A year later in England

Enron's Teesside power plant began operations. It would prove to be one of the first successes for Enron's international strategy. In 1994 the corporation made its first electricity trade which would turn into one of Enron's biggest profit centres in the next years. With the establishment of a trading centre in London, part of Enron Europe, in 1995, Enron entered the European wholesalers market. In 1996, construction began on the Dabhol power plant in India. However, the project would be plagued by political problems and eventually Enron put the project up for sale in 2001(Cernusca & Dima 2007; Kroger, 2004). Cernusca and Dima (2007) and Kroger (2004) recorded that a year later; Enron bought Portland General Electric Corp., the utility serving the Portland, Oregon (US), which would be sold in 2001 to Northwest Natural Gas Co. for about $1.9 billion. The same year, Enron Energy Services was formed to provide energy management services to commercial and industrial customers. Enron continued its policy of acquiring companies and in 1998 acquired Wessex Water in the United Kingdom which formed the basis for its water subsidiary[13]Azurix. But a year later, when one-third of Azurix is sold to the public in a public offer[14], the company's problems become apparent as the shares fell sharply after an early rise. The same year (1999), Enron Online, the company's commodity trading Internet site, started to operate. In the last quarter of the year, Enron Energy Services turned its first profit (Cernusca & Dima 2007; Kroger, 2004).

In 2000, Enron's annual revenues reached $100 billion, more than double the year before, reflecting the growing importance of trading. However, the problems with Azurix continued and Rebecca Mark resigned from her position of chairwoman while Enron announced the intention to take the subsidiary private. The same year, The Energy Financial Group ranked Enron the sixth-largest energy company in the world, based on market capitalization (Cernusca & Dima 2007; Kroger, 2004). Cernusca and Dima (2007) documented that in April 2001 Enron disclosed it had owned $570 million by bankrupt California utility Pacific Gas & Electric Co. While the top executives were likely aware of the debt and the illegal practices, the fraud was not revealed to the public until October 2001 when Enron announced that the company was actually worth $1.2 billion less than previously reported. This problem prompted an investigation by the Securities and Exchange Commission[15],which has revealed many levels of deception and illegal practices committed by high-ranking Enron executives, investment banking partners, and the company's accounting firm, Arthur Anderson. At the end of the year Enron's shares closed at $8.63 per share, an 89 percent drop since the beginning of the year. The critical dates in the scandal are October 16, 2001 and November 8, 2001. On October 16, Enron disclosed that it had made a loss of $618 million that quarter, while on the second date it disclosed that it had overstated its earnings since 1997 by $586 million. In other words, Enron's accounts for the previous four years had not shown the true state of its huge indebtedness (Cernusca & Dima 2007).

## 3.2 Analyzing the Fraud
Enron Corporation, which appeared very strong until December 2001, made the voluntary decision to restate its financial statements. This proved to be fatal and the corporation had to go for a bankruptcy (Cernusca & Dima 2007). While the bankruptcy of a small company is taken as a routine, Enron's case is different as the company was ranked seventh by *Fortune 500*[16](Cernusca & Dima 2007; Kroger, 2004). During the 1990s, Enron expended quickly into several areas such as developing a power plant and a pipeline. This expansion, however, required large initial capital investments and long gestation period. By that time, Enron already raised a lot of debt funds from the market and hence any other attempt to raise funds would affect Enron's credit rating. But Enron had to maintain the credit ranking at investment rate in order to continue business. On top of that, the company wasn't making enough profits either, as it promised to investors. Hence, Enron began making partnerships and other special "arrangements" (Special Purpose Entity, or SPE) (Cernusca & Dima 2007; Kroger, 2004). These companies were used to keep Enron's debts and losses away from its balance sheets, therefore allowing it have a good credit rating and look good in front of the investors. Enron's ultimate goal was to overcome the rules of consolidation and, in the same time, still increase credibility. If a parent company (in this case Enron) financed less than 97% of an initial investment in a SPE, it didn't have to consolidate in into its own accounts (Cernusca & Dima 2007; Kroger, 2004). In order to achieve non-consolidation, according to GAAP[17], two conditions must be met:
− the assets must be legally isolated from the transferor (i.e. sold to the SPE); and
− an independent third party owner has to make a substantive capital investment which should amount to at least 3% of the SPE's total capitalization(Cernusca & Dima 2007). The independent third party owner must exercise control over the SPE in order to avoid consolidation. If properly done, the legal isolation and the third party control over the SPE, reduce the risk of the credit. Therefore, off-balance sheet treatment of such a SPE involves enough third party equity.

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[13]Subsidiaries are companies that are partly or completely owned by another company that holds a controlling interest in the subsidiary companies (Kroger, 2004).

[14]The sale of stock by a private company to the public (Kroger, 2004).

[15] "The United States Securities and Exchange Commission (commonly known as the SEC) is a United States government agency having primary responsibility for enforcing the federal securities laws and regulating the securities industry/stock market" (Cernusca & Dima 2007).

[16]The Fortune 500 is a ranking of the top 500 American public corporations as measured by gross revenue, even though eligible companies are any for which the revenues are publicly available.

The third party's equity must be "at risk", otherwise the transferor would be required to consolidate the SPE into its own financial statements (Cernusca & Dima 2007).Therefore, Enron thought that the solution was to find outside investors willing to enter into financial arrangements with them and started several structured entities in the name of SPEs (Cernusca & Dima 2007; Kroger, 2004). To allow the SPE to borrow from the market, Enron, in many cases, provided a guaranty or other form of credit support. Or, in other cases, the SPEs mutually supported among themselves (Cernusca & Dima 2007). Since Enron's accounting treatment of SPEs was

subject to the test of accounting to determine whether the SPE should be consolidated or not, that's how easily Enron achieved the off-balance sheet[18] treatment of all its SPEs (Cernusca & Dima 2007).

Cernusca and Dima (2007) and Kroger (2004) recorded that the corporation followed this policy in financing which ultimately would enable Enron to be valued more attractively by rating agencies and Wall Street analysts. Ever since, the huge debt took place into the subsidiaries and many obligations flew from US companies into Enron's SPEs, while the contracts likely to end up in loses were mentioned vaguely in the footnotes of company accounts. Enron used several related parties in rising of equity and structured its financial arrangements using the loopholes in laws, trying to not consolidate into its accounts by intentionally not fulfilling certain conditions (Cernusca & Dima 2007; Kroger, 2004). Up to end of 2000, no one pointed fingers at Enron. For 2000, the corporation reported $101 billion revenue (see Appendix 3) and the auditors gave a clean report. But, at this stage, Enron announced its intention that during the third quarter of2001, it would book a loss of $1.01 billion and, at the same time, reducing shareholders' funds by $1.2 billion as a result of correcting accounting errors in the past(Cernusca & Dima 2007; Kroger, 2004).

Cernusca and Dima (2007) stated that Dynegy Inc., Enron's rival announced its intention to acquire Enron for about $9 billion which would have offered a "modest premium" for Enron shareholders, if the business would have taken place. Then Enron disclosed it had initiated a plan for restructuring which would negatively impact the fourth quarter earnings as well. The company also disclosed that a note payable for $690 million payable to a partnership has been accelerated for payment because Enron's debt rating was getting downgraded. As a result, several rating companies lowered Enron's long-term rating below investment grade and Dygeny terminated the merger agreement, citing breaches of warranty[19] and agreements in the merger[20] agreement. At this point, Enron's balance sheets came under federal investigation (Cernusca & Dima, 2007; Kroger, 2004). As a result, on December 2, 2001 Enron filed for Chapter 11 bankruptcy protection. At the same time, Enron sued Dynegy for $10 billion alleging breach of contract regarding Dynegy's wrongful termination of it proposed merger. Enron announced that one of the reasons for filing the bankruptcy protection was termination of merger agreement with Dynegy and announced that despite their best efforts to insure a proper merger process, their financial condition has deteriorated significantly (Cernusca & Dima 2007; Kroger, 2004). The financials (see Appendix 3) were to be restated by Enron. In 2000, the profitability was less than 1%, becoming clear that Enron's profits were realizable only if the quality of the revenue is good Enron used SPEs (such as JEDI, Chewco, Raptors, so on) transactions to facilitate accounting and financial reporting abuses. No matter which SPE was used, the aim was non- consolidation. If any of the SPEs would have been consolidated, Enron's true financial position would have been disclosed much earlier (Cernusca & Dima, 2007). Opening new SPEs was considered necessary for Enron to mitigate market exposures on Enron's investments, including investments in energy-related companies. The transactions in derivatives were intending to hedge Enron's risk in certain investments in their subsidiaries or related parties. Therefore, Enron transferred its own equity to SPEs in exchange for a note payable immediately and a derivative[21] contract later, in order to cover the risk of Enron's investments. Hence, if the SPEs were required to pay Enron for loss of value in investments, the stock transferred by Enron earlier would be the principal source of repayment (Cernusca & Dima 2007; Kroger, 2004).

Cernusca and Dima (2007) recorded that in the last two quarters of 2000, Enron recognized revenues of $500 million on derivative transactions with Raptor which offset losses in Enron's merchant investments. In total, Enron was having an aggregate amount of investments in related parties of up to $1.9 billion. After a long trial, Andrew Fastow, the former Enron finance executive has been sentenced to six years in prison. Fastow pleaded guilty for fraud and money laundering in 2004 and also became the chief whiteness in the trial against Jeffrey Skilling and Ken Lay (Cernusca & Dima 2007; Kroger, 2004). His testimony helped convict Lay (who died in July 2006 after a heart-attack) and Skilling, who was sentenced to 24 years in jail. In May 2006, the latter was found guilty on 19

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[17] Generally Accepted Accounting Principles is the standard framework of guidelines for financial accounting in USA. "It includes the standards, conventions, and rules accountants follow in recording and summarizing transactions, and in the preparation of financial statements" (Cernusca & Dima, 2007).

[18] An asset or debt that does not appear on a company's balance sheet. Items that are considered off balance sheet are generally ones in which the company does not have legal claim or responsibility for (Cernusca & Dima, 2007).

[19] A warranty has various meanings but generally means a guarantee or promise which provides assurance by one party to the other party that specific facts or conditions are true or will happen (Kroger, 2004).

[20] The combining of two or more companies, generally by offering the stockholders of one company securities in the acquiring company in exchange for the surrender of their stock (Kroger, 2004).

[21] Defined with irony; derivatives are any investments in the last financial year, which have resulted in losses, Molvar & Green, 1995 as cited in (Scalcione, 2011, p. 10). However, the economic definition of derivatives is; a financial security that is priced by an underlying asset (Scalcione, 2011, p10). Energy derivatives traded by Enron involved energy-natural gas, electricity - as the underlying asset (Kroger, 2004).

counts of conspiracy, fraud and inside trading over Enron scandal. Skilling was found to have orchestrated a series of deals and financial scheme which later lead to loses as they hide debts from investors. Michael Kopper, former executive at Enron, was sentenced to 37 months in jail. Kopper pleaded guilty in 2002 to wire fraud and money laundering[22] and his testimony helped convict Fastow. Michael Koenig, another former executive, served18 months in jail as he helped present false accounts to investors (Cernusca & Dima, 2007; Kroger, 2004).

## 4. ANALYSIS - COULD THE ENRON FRAUD HAVE BEEN DETECTED SOONER?

The primary aim of this paper therefore is to examine whether the Enron fraud could have been detected sooner. This paper uses Non-Financial Measures; Gross Margin Test; Altman's Z-score Bankruptcy Predictor; Modified Altman's Z-score; Chanos Algorithmand Beneish Model to determine how soon the Enron's Fraud could have been determined.

### 4.1 Non-Financial Measures

Brazel, Jones and Zimbelman (2009) found out that auditors can effectively use Non-Financial measures[23] to assess the reasonableness of financial performance and, thereby, help detect financial statement fraud (hereafter, fraud). They argue that if auditors or other interested parties (e.g., directors, lenders, investors, or regulators) can identify non-financial measures (e.g., facilities growth) that are correlated with financial measures (e.g., revenue growth), inconsistent patterns between the non-financial and financial measures can be used to detect firms with high fraud risk.

In Enron's case the Non-financial measures such as reported increases in revenue without a corresponding increase in operations should be seen as an alert to the possibility of fraudulent activity (Brazel, Jones & Zimbelman, 2009). Enron's revenue in 1996 was USD$ 13.3 billion, this increased to USD$ 20.3 billion in 1997 and drastically increased to USD$ 100 billion in 2000 (see Appendix 3) (Cernusca & Dima 2007; Enron, 1998; Enron, 2000). The increase from USD$ 13.3 billion in 1996 to USD$ 100 billion in 2000 amounts to about 700% increase. This is very radical and should have alerted the auditors of Enron. On an annual basis, the 50% revenue increase from 1997 to 1998 and the 30% revenue increase from 1998 to 1999 and the humongous 250% revenue increase from 1999 to 2000 should have been backed by some significant productive changes in business operations (Enron, 1998; Enron, 2000; Nugent, 2003 as cited in Obiri, 2011). However, although Enron was expanding through aggressive diversification[24]; it was making significant losses (Cernusca & Dima, 2007; Kroger, 2004) in the new areas, which should have been a "red flag" for auditors (Enron, 1998; Enron, 2000; Obiri, 2011; Cernusca & Dima, 2007; Kroger, 2004). It is therefore apparent from the above analysis that using Non-Financial measure as a tool according to Brazel, Jones and Zimbelman (2009), the auditors of Enron or other interested parties for example directors, lenders, investors, or regulators could have detected the fraud sooner.

### 4.2 Gross Margin Test

According to Nugent (2003), a gross margin is net sales minus cost of goods sold and the test is a crucial determinant of business success as it measures operational efficiency[25]. An increasing gross margin or converging is an indication of increasing profitability and operational efficiency (Nugent, 2003).A business will attempt to achieve the highest gross profit margin possible. Low profit margins will be an indicator to risk. However, lower profit margins are more credible when the turnover[26] is high. Furthermore, Clayton and Ellison, (2011) also averred that a diverging gross margin can also imply fraudulent activity.

Applying the Gross Margin Test to Enron's case, it is obvious that Enron's gross margin shows a decrease of 52% from 1996 to 1997. It was diverging and indicating operational inefficiencies (Nugent, 2003). There was an increase of 4% from 1997 to 1998; a decrease of 2% from 1998 to 1999; no movement from 1999 to 2000; and a decrease of 1% from 2000 to 2001 (see Appendix 4). This means that as early as 1997, there was a major sign that Enron was experiencing serious operational inefficiencies. Also, while the annual differences from 1998 to 2001 were only minor as shown by the graph trend line in Appendix 4; the fact that they were fluctuating –up one year, down the next and so on, indicates that the financial statements were being tampered with; in terms of items not being reported in the correct financial period (Nugent, 2003). It is consequently ostensible that using the Gross Margin Test, (Nugent, 2003; Clayton & Ellison, 2011; Obiri, 2011) Enron's fraud could have been detected sooner.

### 4.3 Altman's Z-score Bankruptcy Predictor

The Altman's Z-score formula for predicting bankruptcy was published in 1968 by Edward I. Altman, who was, at the time, an Assistant Professor of Finance at New York University (Caouette, Altman, Narayanan & Nimmo, 2008).

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[22] Money laundering is the process of changing large amounts of money that have been gained through illegitimate means (Kroger, 2004).

[23] Any quantitative measure of either an individual's or an entity's performance that is not expressed in monetary units (Obiri, 2011)

[24] Diversification means reducing risk by investing in a variety of assets (Kroger, 2004)

[25] Operational efficiency can be defined as the ratio between the input to run a business operation and the output gained from the business. When improving, operational efficiency, the output to input ratio improves (Nugent, 2003).

[26] Turnover is sales (Tebogo, 2011).

The Altman's Z score model is as follows: $Z = 1.2x1 + 1.4x2 + 3.3x3 + 6.0x4 + 1.0x5$, where:

x1, represents working capital/ total assets ratio

x2 represents retained earnings/ total assets ratio

x3 represents earnings before interest and taxes/ total assets

x4 represents market value/ book value of total debt

x5 represents sales/ total assets
Z represents the entire index.

The formula may be used to predict the probability that a firm will go into bankruptcy within two years. Z-scores are used to predict corporate defaults and an easy-to-calculate control measure for the financial distress status of companies in academic studies. The Z-score uses multiple corporate income and balance sheet values to measure the financial health of a company (Caouette et. al., 2008).
A bankruptcy prediction implies that there could be fraudulent activity on-going or yet to occur. Altman's Z-Score bankruptcy predictor uses a combination of financial ratios[27] to determine whether bankruptcy is on the horizon (Caouette et. al., 2008). If the score is 3.0 or above ('safe zone') - bankruptcy is not likely and if the score is 1.8 or less ('distress level')[28] – bankruptcy is likely. A score between 1.8 and 3.0 is a grey area. Probabilities of bankruptcy within the above ranges are 95% for one year and 70% within two years. If the financial ratios are not high enough; it shows business inefficiency that could have been caused by fraudulent activity. Obviously, a higher score is desirable (Caouette et. al., 2008; Nugent, 2003; Calandro, 2007). Consequently as illustrated in Appendix 5, in 1997 and 1998; Enron's Z-Score was well below the 'distress' level (1.8); although this increased slightly in 1999 and 2000, the Z-Score still remained well below the 'safe zone' (3.0).  In 2001 the Z-score was again 1.8.  There was therefore ample sign of possibility of bankruptcy Enron using the Altman's Z-score Bankruptcy Predictor. Appendix 6 illustration of Enron's Z-Score trend from 1997 to 2001; supports this fact. Using the Altman's Z-score Bankruptcy Predictor, the fraud could have been detected as early as 1998 at worse 1999. This is because the Z-scores for 1997 and 1998 were 1.38 and 1.64 respectively, which were far below the Z-score of 1.8 which is an indication that bankruptcy is likely (Caouette et. al., 2008; Nugent, 2003; Calandro, 2007).

## 4.4 Modified Altman's Z-score
The modified Altman Z-score also provides a way of predicting corporate failure, but differs from the original model in the sense that it can be applied to non-manufacturing sectors (Tebogo, 2011). The original Altman's Z-score model was mostly based on two major conditions, which were that: a company should have publicly traded stock[29] as well as a manufacturing outfit. The modified Altman, however, can be used to analyse manufacturing and non-manufacturing companies, including those with publicly traded stocks (Altman, 2005). This feature makes it ideal for use in analysing the performance of entities such as Enron (Tebogo, 2011).
The modified Z-score model, however, carries only a few variables from the original Altman (1968) model, and may be expressed in any way that suits the investigation (Tebogo, 2011). For instance, it has been expressed as (3.3*EBIT + 1.0*Sales +1.4*Retained Earnings + 1.2*Working Capital)/Total assets by Schallhein and Wells (2006). And, according to Nugent, Pustylnick and Anderson (2010) Igor Pustlynick developed a modified Altman model that has been expressed as follows: $Z = 1.2x1 + 1.4x2 + 3.3x3 + 0.6x4 + 1.0x5$, where:
X1 = Shareholders Equity / Total Assets x 1.2
X2 = Retained earnings / Total Assets x .014
X3 = EBIT / Total Assets x .033
X4 = Market value of Equity /Total Debt x .006
X5 = Revenue / Total Assets x .999

The Pustylnick Modified Altman index for Enron shows that,  right from 1997 to 2001, the modified  Z-scores were far  lower  than 1.8  (see Appendix 7).  For example, in 1997, 1998 and 1999 the modified Z-scores were 1.252, 1.424 and 1.625 respectively. Appendix 8 depicts the general movement of Enron's modified Z-scores over the period; clearly showing that they were even below the distress zone. Such a low Z- score is an indication that a company is on the brink of bankruptcy (Altman, 2005; Caouette et. al., 2008; Nugent, 2003; Calandro, 2007). Should such an analysis of Z-score have been done and monitored in the case of Enron, it was possible that analysts could have identified the problem much earlier as 1998 or 1999, and possibly helped to stop the rot. This implies that although companies can manipulate financial data it is still possible that their deceit could be uncovered where a proper investigation has been done.

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[27] Financial ratios are mathematical calculations that are used to determine the value of a company (Bake & Power, 2005, p. 69).
[28] Condition when promises to creditors of a company are broken or honored with difficulty. If financial distress cannot be relieved, it can lead to bankruptcy (Altman, 2005).
[29] Shares that are traded on a stock exchange or in the over-the -counter market (Nugent, 2003).

## 4.5 Chanos Algorithm
Macey (2003) indicated that the loss in value of its shares from $80 in February 2001 to $1 in November 2001 was an indication that something was amiss, despite the failure by financial analysts to pick this up. Additionally, this was accompanied by the increase in the number of traders who took a short position on the Enron shares, as transactions increased from 2 million shares in August 2000 to 88 million shares in November 2001. The increase in the number of Enron shares traded short was an indication that a large number of

traders considered Enron to be on the way to collapsing, and one of these was James Chanos, who earned his living by borrowing stock from brokers and then selling it, with the expectation that it would fall in value in future Macey (2003). Chanos, being a short seller would later buy stock to replace the one borrowed earlier from the brokers, meaning that if there had been a fall in value he stood to gain- or lose if the value of stock rose. As a short seller, Chanos saw in Enron a company destined to fail since its accounting system appeared murky at a time when its profitability was deteriorating (Daniel, 2002).

By studying Enron's financial data, Chanos quickly realized that the company's stock was over valued[30]. He also noticed that Enron derived more than 80% of its earnings from trading, a characteristic that he associated with a hedging company rather than an energy company. He also realized that there were a number of hedge[31] companies with superior earnings than Enron hence he came to the conclusion that its stock was overvalued. Chanos also figured out that Enron's return on capital was only 7% compared to its cost of capital of 10% (Macey, 2003). Furthermore, Chanos discovered that the company's cost of capital exceeded it return on capital, and that: its cash flow, its return, and profit margins were declining (Gladwell, 2007). This, therefore, meant that rather than creating value, Enron was destroying shareholder's value through its investments, and it was partly on the basis of this observation that Chanos took a short position on Enron stock.

The Chanos Algorithm aims at predicting corporate bankruptcy and it is defined as: Working Capital + Retained Earnings+12 months Trailing EBIT + 12 months Trailing Revenue) ÷12 month Average Total Assets[32] (Tebogo, 2011). The Chanos Algorithm scores for Enron range between 1.168 and 2.090 from 1997 to 2001 (see Table 1 below).

Table 1: Chanos Algorithm

|  | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| Working Capital + Retained Earnings+12 months Trailing EBIT + 12 months Trailing Revenue) ÷12 month Average Total Assets | 1.168 | 1.397 | 1.560 | 2.090 | 1.989 |

From Table 1 above, it is obvious that the Chanos Algorithm scores are positively correlated with both Altman's Z-scores and the Modified Altman Z-scores. Using the Chanos Algorithm scores, there is again enough signals of Enron's financial difficulties and the fraud could have been prevented as early as 1998 or 1999.   This indicates that the Chanos algorithm is as good a measure for predicting corporate bankruptcy as the Modified Altman model. And, the analysis above further shows that James Chanos had used a relatively reliable model in detecting bankruptcy at a time when very few analysts had expected Enron to go bankrupt.

**4.6 Beneish Model**
Wells (2001) wrote about irrational ratios, which have proven helpful in detecting the manipulation of financial statements courtesy of Professor Messod Beneish, an accounting lecturer in the Kelly School of Business at Indiana University. In his paper, Wells (2001) mentioned the following ratios as critical in detecting financial statement fraud: Days Sales in Receivables, Gross Margin Index, Asset Quality Index, Sales Growth Index and the Total Accruals to Total Assets Index[33]. According to Beneish ratios, the Days Sales Receivables Index should be about 1.465 for manipulators, and 1.030 for non-manipulators. The analysis as per Appendix 9 shows that in 2000 there was a possible red flag since the index had exceeded the non-manipulation benchmark[34] of 1.030.

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[30]A stock with a current price that is not justified by its earnings outlook or price/earnings (P/E) ratio and, therefore, is expected to drop in price (Kroger, 2004)

[31] Making an investment to reduce the risk of adverse price movements in an asset. Normally, a hedge consists of taking an offsetting position in a related security, such as a futures contract (Cernusca & Dima 2007).

[32] Working Capital in this document has been used to mean Current Assets, as opposed to Current Assets - Current Liabilities (which has been assumed to imply Net Working Capital (Tebogo, 2011)

[33] According to Beneish, Days Sales in Receivables for non-manipulators should be an average of 1.031, while for manipulators will be 1.465. The Gross Margin Index for non-manipulators is 1.014, while for manipulators is around 1.193. The Asset Quality Index for non-manipulators is around 1.039, while for non-manipulators is 1.254. The Sales Growth Index for non-manipulators is 1.134, while for manipulators is 1.607. The Total Accruals to Total Assets Index is 0.018 for non-manipulators, while for manipulators is about 0.031 (Tebogo, 2011).

[34] A standard by which something can be measured or judged (Wells, 2001).

Similarly, there should have been some concern in 2001 when the index reached 1.487. This reflected an attempt by Enron to boost sales revenue by extending credit terms to its customers; an indication of operating myopia[35.] In addition, the Gross Margin Index was excessively high in most of the period investigated except in 1998, when it was 0.0168. According to Beneish, the index should be around 1.193 for manipulators but 1.014 for non-manipulators. From the analysis, it is very clear that there was a gross manipulation of financial information in 1997, 1999, 2000 and 2001 hence if adequate and proper investigations were done it could have become apparent much earlier that something was amiss (see Appendix 9). As a public company, Enron wanted to portray a good financial

performance to shareholders, and its management knew that as long as financial results were satisfactory the financial markets would have reacted by keeping share prices high (Tebogo, 2011). The chances for earnings manipulation were therefore high hence investigators should have been cautious of the reported results, and taken a decision to place it under watch much earlier. Reflecting on the performance of Enron in 1998, when the index was 0.0168, this could have put its management under pressure to show more favorable results in subsequent years hence the increase seen from 1999 onwards (Tebogo, 2011).

According to the Beneish Model, the Assets Quality Index should be around 1.039 for non-manipulators and 1.254 for manipulators. In all the years investigated, the index exceeded the non-manipulation benchmark (see Appendix 9), which possibly indicated that Enron was capitalizing costs rather than reporting them as period expenses (Tebogo, 2011). Enron would have done this in order to improve the reported profits in the short term, which is consistent with the analysis done for the Days Sales Receivables and the Gross Margin indices. Effectively, Enron was hiding costs as non-current assets (Tebogo, 2011). From the data analysis in Appendix 9, the Sales Growth index showed signs of manipulation. According to Beneish, this ratio should range from 1.134 for non-manipulators to 1.607 for manipulators. Between 1997 and 1999 the index was above the non-manipulator benchmark, which should have been a red flag hence, auditors and other investigators should have raised alarm. And, in 2000 the index was at 2.513, a level that was far above the manipulator benchmark. This should have raised suspicion that the company was perhaps reporting phony sales[36] given the astronomical growth in sales revenue. That is, during the period investigated Enron revenues were growing at exponential rates (Tebogo, 2011). An increase in Total Accruals to Total Assets index is a possible indication that management is trying to manipulate earning through a discretionary authority over the accruals policy[37]. The Beneish model indicates that an index of 0.018 is a sign that there is no financial statements manipulation, while anything from 0.031 and above is an indication of tampering with financial data. And, in the case of Enron it was evident that for all the years reviewed, the indices were all above 0.031 (see Appendix 9), a credible sign that Enron was manipulating earnings by exploiting its credit policy. It is therefore worth noting that all the five Beneish indices above show that there was something going on wrong. Therefore using the Beneish Model, the fraud at Enron could have been detected sooner.

## 5. CONCLUSION

The analysis of the performance of Enron from 1997 to 2001 using Non-Financial Measures; Gross Margin Test; Altman's Z-score Bankruptcy Predictor; Modified Altman's Z-score; Chanos Algorithm; and Beneish Model have all showed that it was quite possible to have predicted its failure much earlier. This paper concludes that, it would have been possible to detect Enron's fraud, as early as 1998 or at worst 1999.

What the Enron case study has shown is that no company is too big to fail, and that there are already tools that could be used in predicting corporate fraud and failure. The fraud perpetrated by Enron's management was so colossal and yet financial analysts chose to ignore all the warnings signs. The case study has also shown that qualitative factors are equally important in the analysis of performance and prediction of corporate fraud. In the case of Enron there were a number of qualitative indicators, which showed that the company had problems and yet very few people paid attention. Surprisingly, the first institution to raise concern about Enron's performance was a newspaper while financial analysts appeared not to be paying much attention (Tebogo, 2011).

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[35]Operating myopia occurs when an organisation attempts to improve short term profitability measures at the expense of long term value creation (Tebogo, 2011).

[36] Phony sales are deceptive sales (Tebogo, 2011).

[37] An accounting policy that measures the performance and position of a company by recognizing economic events regardless of when cash transactions occur (Tebogo, 2011).

**APPENDIX**

Appendix 1: Occupational Fraud and Abuse Classification System
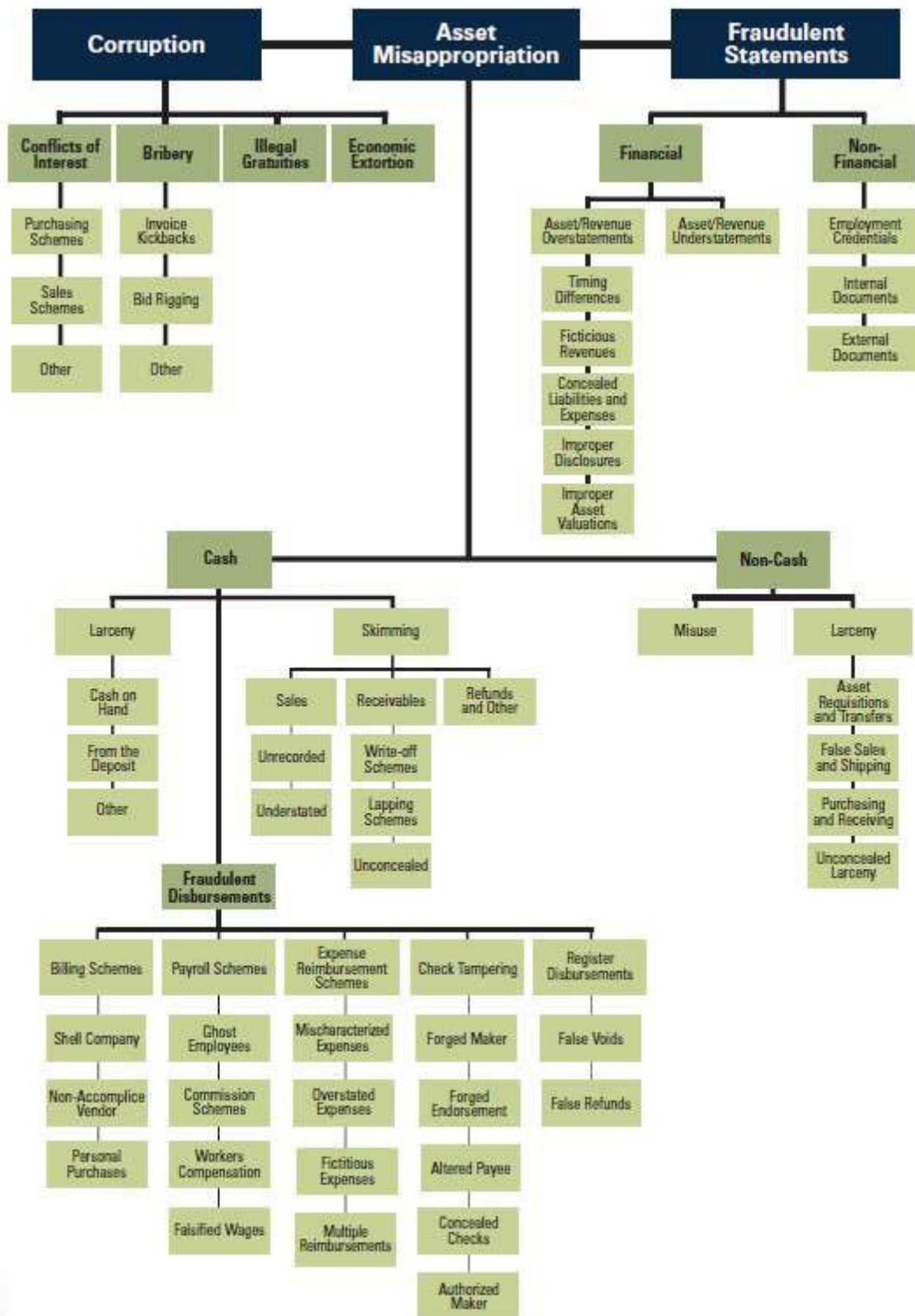
Source: (ACFE, 2010, p. 7)

Appendix 2: WorldCom Fraud Illustrated

| Fraud Scheme | Financial Effects | | | Cite |
| --- | --- | --- | --- | --- |
| | Expenses | Assets | E/R Ratio | |
| Categorizing operating expenses as capital expenditures | ↓ | ↑ | ↓ | Feder and Schiesel (2002) |
| Reducing the book value of acquired MCI assets and simultaneously increasing goodwill for a balancing amount | ↓ | Balanced Effect | — | Eichenwald (2002) |
| Including future expenses in write-downs of acquired assets | ↓ | ↓ | ↓ | Eichenwald (2002) |
| Revising bad debt reserve calculations to boost the valuation of receivables that were subsequently factored | ↓ | ↑ | — | Sender (2002); Feder and Schiesel (2002) |

Source: Obiri (2011)

Appendix 3: Enron's Financial Highlights

| Year | 1997 | 1998 | 1999 | 2000 |
| --- | --- | --- | --- | --- |
| | $million | $million | $million | $million |
| Revenue | 20,273 | 31,260 | 40,112 | 100,789 |
| Total Assets | 22,552 | 29,350 | 33,381 | 65,503 |
| Lomg Term Debt | 6,254 | 7,357 | 7,151 | 8,550 |
| *Shareholders' Fund* | 5,618 | 7,048 | 9,570 | 11,470 |

Source: Adapted from Chary, VRK (2004) as cited in Cernusca & Dima (2007)

Appendix 4: Enron's Gross Margin Analysis
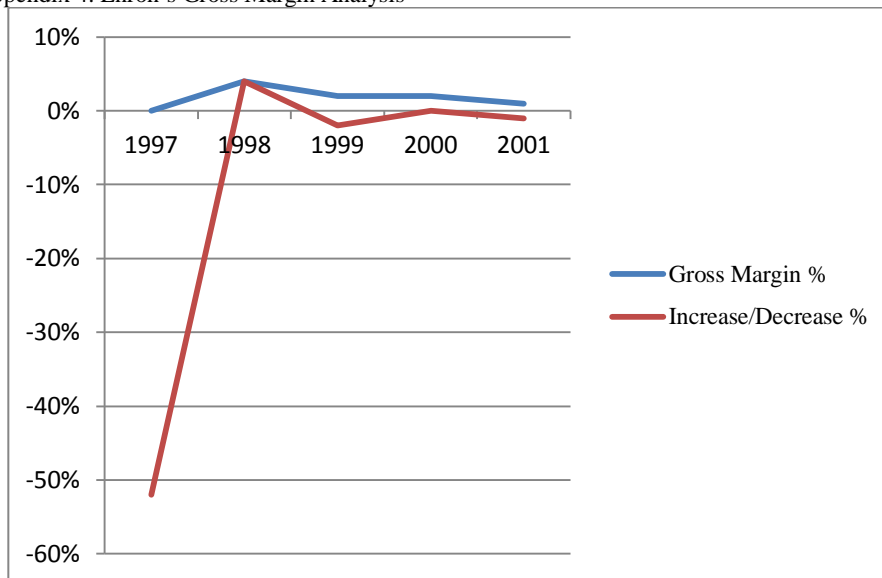


| | 1997 | 1998 | 1999 | 2000 | 2001 |
| --- | --- | --- | --- | --- | --- |
| Gross Margin % | 0% | 4% | 2% | 2% | 1% |
| Increase/Decrease % | -52% | 4% | -2% | 0% | -1% |

Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.

Appendix 5: Enron Bankruptcy Prediction Using Altman's Z-score

| | | Altman's Discriminant Function Algorithm | Enron Z-Scores | | | | |
|---|---|---|---|---|---|---|---|
| Z | = | Z- Score | 1997 | 1998 | 1999 | 2000 | 2001 |
| $X_1$ | = | Working Capital/ Total Assets | 0.01 | -0.01 | 0.01 | 0.03 | 0.02 |
| $X_2$ | = | Retained Earnings/ Total Assets | 0.08 | 0.08 | 0.08 | 0.05 | 0.05 |
| $X_3$ | = | Earnings before Interest and Taxes/ Total Assets | 0.03 | 0.05 | 0.06 | 0.04 | 0.01 |
| $X_4$ | = | Market Value of Equity/ Book Value of Total Liabilities | 0.45 | 0.49 | 1.57 | 1.23 | 1.13 |
| $X_5$ | = | Sales/Total Assets | 0.9 | 1`.07 | 1.2 | 1.54 | 0.75 |
| Z | = | $(1.2*X_1) +$ $(1.4*X_2) +$ $(3.3*X_3) +$ $(0.6*X_4) +$ $(0.999*X_5)$ | **1.38** | **1.94** | **2.47** | **2.51** | **1.56** |

**Safe Zone: 3.0 and above**

**Distress Zone: 1.8 - 2.9**

| | ENRON DATA - US$ | | | | |
|---|---|---|---|---|---|
| Current Assets | 4,113,000,000 | 5,933,000,000 | 7,255,000,000 | 30,381,000,000 | 29,167,000,000 |
| Current Liabilities | 3,856,000,000 | 6,107,000,000 | 6,759,000,000 | 28,406,000,000 | 27,570,000,000 |
| Working Capital (Current Assets - Current Liabilities) | 257,000,000 | -174,000,000 | 496,000,000 | 1,975,000,000 | 1,597,000,000 |
| Total Assets | 22,552,000,000 | 29,350,000,000 | 33,381,000,000 | 65,503,000,000 | 67,260,000,000 |
| Retained Earnings | 1,852,000,000 | 2,226,000,000 | 2,698,000,000 | 3,226,000,000 | 3,525,000,000 |
| Earnings before Interest and Taxes (EBIT) | 565,000,000 | 1,582,000,000 | 1,995,000,000 | 2,482,000,000 | 795,000,000 |
| Market Value of Equity (Common, Preferred, Convertible, etc. Stock Issued) | 6,600,000,000 | 9,500,000,000 | 32,100,000,000 | 62,500,000,000 | 62,500,000,000 |
| Book Value of Total Liabilities | 14,800,000,000 | 19,200,000,000 | 20,400,000,000 | 50,700,000,000 | 55,533,000,000 |
| Sales | 20,273,000,000 | 31,260,000,000 | 40,112,000,000 | 100,789,000,000 | 50,129,000,000 |

Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.

Appendix 6: Enron Z-Score Bankruptcy Predictor
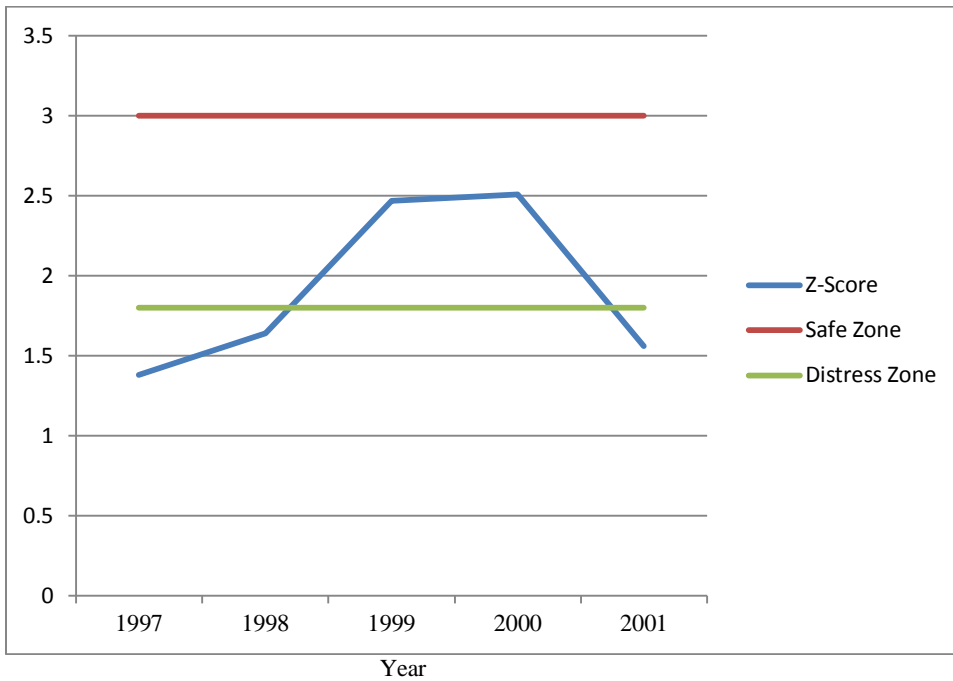
Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.


**Appendix 7: Pustylnick's Modified Altman**

|  | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|
| X1(Shareholders' Equity ÷ Total Assets × 1.2) | 0.288 | 0.288 | 0.344 | 0.210 | 0.351 |
| X2(Retained earnings ÷ Total Assets × .014) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| X3(EBIT ÷ Total Assets x .033) | 0.001 | 0.002 | 0.002 | 0.001 | 0.001 |
| X4(Market Value of Equity ÷ Total Debt × .006) | 0.003 | 0.003 | 0.009 | 0.007 | 0.007 |
| X5(Revenue ÷ Total Assets × .999) | 0.899 | 1.069 | 1.199 | 1.538 | 0.749 |
|  |  |  |  |  |  |
| **Modified Z-Score =** | **1.251** | **1.424** | **1.625** | **1.799** | **1.179** |
| $(1.2*X_1) +$ |  |  |  |  |  |
| $(1.4*X_2) +$ |  |  |  |  |  |
| $(3.3*X_3) +$ |  |  |  |  |  |
| $(.6*X_4) +$ |  |  |  |  |  |
| $(1.0*X_5)$ |  |  |  |  |  |

Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.

Appendix 8: Pustylnick's Modified Altman



Year
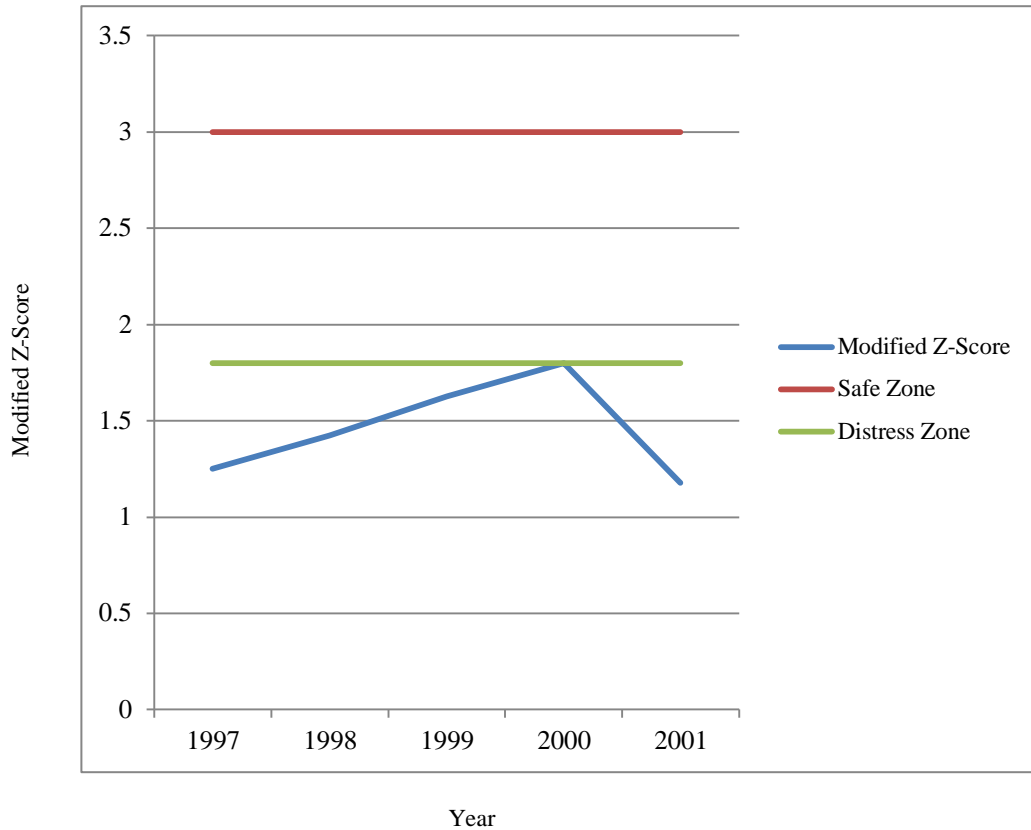
Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.

Appendix 9: Beneish Model Ratios

| INDEX | RATIOS | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|
| Days sales In Receivables Index | $\dfrac{\dfrac{\text{Accounts Receivables}_t}{\text{Sales}_t}}{\dfrac{\text{Accounts Receivables}_{t-1}}{\text{Sales}_{t-1}}}$ | 0.625 | 0.148 | 0.956 | 1.376 | 1.487 |
| Gross Margin Index | $\dfrac{\dfrac{\text{Sales}_{t-1} - \text{Cost of Sales}_{t-1}}{\text{Sales}_{t-1}}}{\dfrac{\text{Sales}_t - \text{Cost of Sales}_t}{\text{Sales}_t}}$ | 70.175 | 0.0168 | 2.205 | 1.232 | 1.401 |
| Asset Quality Index | $\dfrac{1 - \dfrac{\text{Current Assets}_t + \text{Net Fixed Assets}_t}{\text{Total Assets}_t}}{1 - \dfrac{\text{Current Assets}_{t-1} + \text{Net Fixed Assets}_{t-1}}{\text{Total Assets}_{t-1}}}$ | 1.308 | 1.363 | 1.314 | 1.471 | 1.479 |
| Sales Growth Index | $\dfrac{\text{Sales}_t}{\text{Sales}_{t-1}}$ | 1.526 | 1.542 | 1.283 | 2.513 | 0.497 |
| Total Accruals to Total Assets Index | *(Δworking capital-Δcash-Δc.t.p-dep.&amort.)/(total assets)*  Note. c.t.p is current taxes payable  Dep. &amort. is depreciation and amortisation | 0.190 | 0.187 | 0.135 | 0.053 | 0.048 |

Data Source: U.S SEC Edgar Database for company 10K Annual Financial Reports.

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## AUTHOR

Caesar K. Simpson, BA (Hons), MBA, ACCA,

Swiss Management Centre (SMC) University, *simpsonck@yahoo.com or* caesar.simpson@student.swissmc.ch