BANKRUPTCY PREDICTIVE ANALYTICS AND THE DOCTRINE OF GOING CONCERN: A STUDY OF QUOTED MANUFACTURING FIRMS IN NIGERIA

By

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ABSTRACT

The paper focused on bankruptcy predictive analytics and the doctrine of going concern with focus on the quoted manufacturing firms in Nigeria. The study reveals the issues of bankruptcy and factors that lead to bankruptcy within an organisation with emphasis on the provisions of Altman's Z-score for predicting bankruptcy within the manufacturing sector. In Nigeria, some organisations, most especially manufacturing companies have been caught in the web of bankruptcy and they are no longer in operation, some were lucky to be bailed, others have left the country abruptly. This study carried out a bankruptcy predictive analytics using Altman's Z-score to predict imminent bankruptcy among the quoted manufacturing firms operating in Nigeria. A quantitative research approach was adopted and data were collected using a secondary source of data from the financial reports of the firms from 2018 to 2022. A total of 38 manufacturing companies are quoted on the Nigerian Exchange Group (NGX) of which a sample size of 15 of the companies were examined with the use of a judgemental sampling technique. The result revealed that 4 of the manufacturing firms constituting 26.7% of the companies examined are within the safe zone, 7 of them constituting 46.6% are within the gray zone, while the remaining 4 constituting 26.7% of the total companies show imminent sign of bankruptcy. It is recommended that the companies within the bankruptcy zone should reduce their level of debts, the liquidity of the firms should be efficiently utilized for profitable projects, and the study suggests that a bankruptcy prediction test report should be encouraged as a part of going concern reporting.

Keywords: Bankruptcy, Model, Profitability, Quoted Manufacturing Firms, Solvency, Z-Score

1. INTRODUCTION

Organisations are regarded as artificial persons created by the provisions of the court, to transact businesses and relate with individuals and corporate entities within a specific location and beyond its place of establishment. Likewise, its creation can be brought to an end by the court that created it due to some factors such as bankruptcy (Oyati, 2012; Renne, 2021, Becchetti & Sierra, 2003). According to Warner (1977) cited in Uchenna and Okelue (2012), the abnormal or unethical behaviour of some organisations remain one of the contributory factors why organisations fail. The dearth in the number of manufacturing companies operating in Nigeria is on the increase with the rising cost of equipment and the threats posed by the big or foreign organisations that have access to cheap labour and machine to produce in foreign countries and then dump in the country at the detriment of the local manufacturers. The rising cost of exchange rate and the rising cost of man and material resources have continued to constitute huge challenges to the continued survival of the manufacturing companies in Nigeria coupled with government policies and management's decisions and the rising cost of inflation, thereby leading to the inability of the manufacturing companies to be able to meet their financial obligations.

Bankruptcy remains a very crucial issue and a global phenomenon in the business world, most especially within the manufacturing companies operating across the globe (Kasgari, Salehnezhad & Ebadi, 2013); while Nigeria is not an exception (Opara, Okere & Opara, 2014). The manufacturing companies have been responsible for the transformation of raw materials into finished goods for the use of the consumers, thereby translating into the creation of utility for the consumers and wealth from the goods sold with the use of machines, human efforts and equipment (Ogundipe, 2022). Since the wealth of nations are not equitably distributed, there is a need for organisations or countries to demand for products from other countries that have them in order to meet the demands of their people and also help a country with a comparative production advantage derive foreign exchange from the sales of goods produced.

The manufacturing sector according to Sasu (2023) have been contributing tremendously to the GDP of the Nigerian economy and for the second quarter of 2023, the food, beverage, and the tobacco companies that are part of the manufacturing sector accounted for 4.5% of the GDP in 2023. In terms of job creation and human capital development, the manufacturing sector has continued to be involved in the engagement of the human factor of production in the creation of products required by the final consumers. Before the oil boom that occurred in the early 1970s, the manufacturing sector contributed about 10% to the economy of Nigeria while the advent of the oil discovery has continued to be the reason for the decline in the sector's contribution to the country's GDP (National Bureau of Statistics, 2013).

The issue of bankruptcy has been a main subject of discourse among academics and there are various literatures centred on this subject as it is a main subject of concern most organisations are saddled with. In the words of Muminovic (2013), Babatunde, Akeju and Malomo (2017), the anticipation of a potential bankruptcy in a firm has always been a subject of high interest as it remains one of the basic tasks of financial analysts. The use of Altman's Z-score bankruptcy prediction model comes to mind in predicting a likelihood of organisations going bankrupt if it refuses to pass the test as presented in the model. Although, the Altman's Z-score prediction model first surfaced in 1968 with its shortcomings as it was only suitable to predicting manufacturing

firms based on the regression model which highlights just five financial components. For its applicability in other sectors, Altman improved on the model which brought about the Altman's revised Z-score model with four financial components in 1993 as its applicability to other sectors became necessary. This study focused on applying the Altman's Z-score model to predict bankruptcy of firms in the manufacturing sector in Nigeria and to also highlight its efficiency in predicting likely bankruptcy with focus on five years from 2018-2022 time series. The study focused on closing the vacuum that exists in other areas of research as most studies focus on banking firms with little or no focus on the manufacturing companies in Nigeria.

The study highlights the effectiveness of the Altman's revised Z-score model in predicting bankruptcy in the Nigerian manufacturing sector. Altman's Z-score was first adopted in 1968 on a sample of sixty-six manufacturing companies. He further classified the companies into bankrupt and non-bankrupt companies as well as on a hold-out of fifty companies operating in the United States of America. The financial data was gathered with the aid of the annual reports of the companies that were available on Moody's Standard & Poor's industrial manual. The research was conducted to predict the financial health of the manufacturing firms operating in the United States of America and the likelihood of the firms filing for bankruptcy at the time. Based on the test conducted on the sixty-six firms operating in the United States, the Altman's Z-test proved to be hundred percent accurate as the firms within the distressed/bankruptcy zone did eventually became bankrupt within a year and those that had a score higher than 2.99 remained financially solvent (Altman, 2018). This study postulates that most of the manufacturing companies quoted on the NGX that are tested are not within the safe zone, most of them do not fall within the gray zone and also most of them do not fall within the bankruptcy zone based on Altman's bankruptcy predictive metrics also known as the Z-score.

2. LITERATURE REVIEW

The Concept of Going Concern

Organisations are artificial beings that are created by the provisions of the law to continue to operate within a given territory in agreement with the laws that govern the countries where they are domiciled. These organisations can continue to exist into the future even at the demise of the owner. Its book of account must align with the going-concern concept in accounting. According to the International Standard on Auditing (2016), the financial statements must be prepared on the basis that the entity will continue its operations into the foreseeable future.

The going concern is basically a concept that assumes that a given reporting entity will definitely continue to operate into the future, and that it will also be able to realize its assets and discharge its financial obligations in the normal course of its day-to-day operations. This means that organisations can continue to exist without the presence of their owners. This further gives room for stewardship management as a result of the separation of the owners of the business from the management. The International Financial Reporting Standards (2021) emphasized that the concept of going concern involves an entity whose operations are profitable with no liquidity problems and there is no doubt as to its ability to continue to operate into the future. Therefore, an organisation's inability to meet its obligations and also cover its cost of operation may trigger bankruptcy or discontinuation of the business at the expense of its shareholders. The International Accounting Standard (IAS) also emphasizes on the concept of going concern which is a factor that the

management of an organisation must put into consideration in its financial disclosure in relation with profitability as well as liquidity (International Financial Reporting Standards, 2021).

Bankruptcy and Insolvency

According to Halliday (2022), the concept of bankruptcy in its right form is the legal status of an individual or a corporate entity that is unable to meet or repay the debts being owed to others. Also, according to the Black's Law Dictionary as cited by Scott (2021) "bankruptcy is a statutory procedure by which a debtor obtains financial relief and undergoes a judicially supervised reorganisation or liquidation of the debtor's assets for the benefit of creditors." Insolvency according to Shi and Li (2019), occurs when an organisation is basically incapable to meet its current financial obligations. In the words of Onakoya and Olotu (2017), "the term bankruptcy originates from the mixture of 'bancus and ruptus', Latin words for "bench or table" and "broken" respectively." The word bankruptcy connotes "insolvency" as it indicates the inability of an individual or organisation to meet his or her debt obligations. Though, the provision of the law does not see all insolvent individuals as being bankrupt. This debt obligation arises from having to meet some of the needs of the organisations such as the acquisition of the various assets, payment of administrative costs, settlement of litigations, payment to the relevant authorities, exploration of other areas of businesses, information and technological costs, overhead costs. Bankruptcy as a concept simply means financial unsoundness (Becchetti & Sierra, 2003). It is a process of law that terminates the existence of a company due to its inability to meet its financial obligation, therefore, creating a chain of disability as it affects other companies linked to it (Ioana, 2022).

Bankruptcy Predictive Test

A bankruptcy prediction test is basically a test conducted by an organisation's financial expert in predicting the financial solvency of an organisation in coming operational years. It affirms the financial strength of an organisation within a time frame and provides measures or steps to be taken in reducing possible occurrence of dissolution of an organisation. According to Arno, Mulier, Baeck and Demeester (2022), bankruptcy prediction tests are quite useful in various real-world case scenarios, and also various research contributions have focused on it based on various structured and unstructured data. It is also believed that a bankruptcy prediction test requires the use of financial ratios as indicators (Takahashi, Taques & Basso, 2018).

The bankruptcy prediction test makes use of the profitability and the liquidity ratios of financial data contained in the financial reports of the companies being observed, it also includes various weight parameters to achieve a proper test based on the various types of industries that the organisation being examined is operating. Financial insolvency occurs when the organisation's liabilities are far greater in value compared to the value of the assets of the same organisation (Altman & Hotchkiss, 2006 in Shi & Li, 2019). The profitability ratios as used by Altman are retained earnings to total assets, earnings before interest and taxes to total assets and sales to total assets. Liquidity on the other hand is indicated by the use of the working capital to the total assets and for investment ratio, the book value of equity to the total liabilities was also adopted.

Bankruptcy and the Provisions of the Law

Bankruptcy in the words of Karamzadeh (2013) is a legal status of an insolvent person or a corporate entity, that is, the one who cannot repay the debts he is owing to creditors. It is imposed

by the courts through an order which is often initiated by the debtor. This according to Gitman (1996) cited in Karamzadeh (2013), occurs when the amount of an organisation's debts are higher than the value of its existing assets. Also, to guide or protect the creditors from the debtors, various bankruptcy Acts were promulgated in different countries most of which confers the right to the creditors to the assets of the organisation or individual owners before the other stakeholders in the business. The order according to the bankruptcy Acts is an order of a court made under any law that provides for or authorises the appointment of a receiver or a receiver-manager.

According to the Nigerian bankruptcy and insolvency Act (2015), bankrupt means:

> *A person who has made an assignment or against whom a receiving order has been made under section 5(10). This individual known as the bankrupt owes obligations to individuals or organisations that have helped in funding his business. The Act further emphasized that "a debtor includes an insolvent person and any person who, at the time an act of bankruptcy was committed by him, resided or carried on business in Nigeria and, where the context requires, includes a bankrupt."*

The bankruptcy Act of the various countries distinguished between a bankrupt and an insolvent person as not similar, while an insolvent person under the law is not a bankrupt, meanwhile a bankrupt person can be an insolvent person.

It has become a norm for businesses to thrive on borrowed funds. These borrowed funds are being used for the day-to-day running of the businesses and they can be raised from individuals and corporate entities. The funds borrowed are required to be repaid back, both the principal and the interest element depending on the agreed period of time. This agreement is quite fundamental in order to avoid litigation in a competent court of law. Since it is expected of the borrower to pay back the borrowed funds at the stipulated time. "When an individual applies for credit or borrows money, he or she enters some kind of written or oral agreement. If there is no repayment, the debtor breaks a contract that is considered fundamental in every economy" (Gratzer & Stiefel, 2008). Bankruptcy is not limited to an individual likewise a bankrupt person can be an organisation that is finding it quite difficult to meet its debt obligation at the expense of the shareholders' funds. Individuals, corporate entities and states according to Kalu and Agaezichi (2017) incur debts that they are unable to pay, these comes with many reasons such as poor management of the borrowed funds, unwise use of the credit granted, as well as unforeseen difficulties.

Bankruptcy erupts from huge borrowing and unprofessional management of the funds so borrowed. This borrowing is at the expense of the shareholders who are the owners of the business. It is mandated under the law to settle-off the creditors before others in a case of bankruptcy. The balance left is shared by other stakeholders within the organisation after settling all legal expenses associated with the appointment of a receiver by the court.

Manufacturing Companies and their Contribution to the Growth and Development of Nigeria

Nigeria is a country richly blessed with human and material resources and it has continued to witness the advent of organisations big and small that are involved in the production or manufacturing of essential commodities for local and foreign use. Since human resources are not

equitably distributed, there is a need to create an enabling environment for production in order to ensure that goods not readily available can be produced through the setting-up of manufacturing firms.

According to Agbo, Akighir and Ipuele (2020) manufacturing businesses make up 32 of the 170 companies traded on the Nigerian Exchange Group in line with the data provided by the NGX. This indicates that 19% of the Nigerian Exchange's activities are accounted for by the manufacturing company. Fast-forward to 2024, there are currently 154 companies quoted on the Nigerian Stock Exchange of which 38 are manufacturing companies based on the information available on the Nigerian Exchange Group (2024) website. This is an indication that about 25% of the total number of the companies quoted on NGX are manufacturing companies. Comparing the data provided by Agbo *et al*. (2020), there is an increase in the number of manufacturing companies from 32 to 38 while the total number of companies quoted on the exchange market has reduced from 170 to 154. Therefore, the role of the manufacturing companies in the Nigerian economy cannot be under-estimated as it has continued to be a formidable sector that has continued to ensure that raw materials are being converted into finished products.

Despite the importance of the manufacturing firms' contribution to growth within Nigeria, evidence has shown its inherent capabilities has not been highly tapped for the development of the country's economy. It has also been affirmed that the performance of the manufacturing sector in Nigeria has been quiet weak over some years based on statistics available compared to other sectors (Onodje & Farayibi, 2020).

Manufacturing Companies in Nigeria and their Challenges

Manufacturing companies operating in Nigeria are faced with so many challenges ranging from the inability to be able to access huge finance for business to produce. The Nigerian manufacturing sector consists of both local and foreign companies that are involved in the production of various items that are industrial and consumer goods. According to Oyati (2012), the manufacturing sector remains a great hub to a vibrant Nigerian economy and to remain relevant and compete with its foreign counterpart, it must be able to harness its raw materials and also transform them into finished products through the engagement of human as well as other agents of production.

Based on the assertions above, the availability of raw material, finance and also human capital are of great importance to the continued survival of the manufacturing sector in Nigeria. Setting up a manufacturing company entails compliance with industrial standard and having the management resources to be able to achieve huge productivity over time. Onyebuchi and Nwaeke (2020) remark that the management of an organisation depends on the effectiveness and the efficiency of the human managers who have the required professionalism and skill to ensure productivity. Ayandele & Akpan (2015) also affirmed that for a manufacturing firm to survive or succeed, it has to ensure that it has the financial resources that are necessary for its operation as well as the moral support of top management. Over the years, manufacturing companies have been getting off the scene of production in Nigeria, some of those manufacturing firms that we are used to knowing are no longer operating in the Nigerian market such as Unilever, Procter and Gamble, Dunlop Tyres, and GlaxoSmithKline (GSK).

Olatunji (2018) examined the challenges faced by the Ajaokuta steel mill which was a foresight to construct Africa's largest steel manufacturing plant in Nigeria which is a Sub-Saharan part of Africa started in the year 1958. This was Nigeria's first of its kind steel plant, it was designed to

ensure smooth processing of inputs into the major steel plant on its own, ensure smooth conversion of ore as well as solid metals to a liquid iron as well as pig iron transformed into liquid steel. The Ajaokuta steel was commissioned between 1970 and 1985 but it was uncompleted till date. The Ajaokuta steel project was marred by the lack of funding and politics due to frequent changes in government and some of those in power see the project as unrealistic or not feasible (Unuigboje, 2018). Despite the huge contribution of the manufacturing sector to the growth of the Nigerian economy, the Nigerian government is yet to ensure that one of its huge project; the Ajaokuta Steel Mill is yet to see the light of production of steels. Today, the Ajaokuta steel manufacturing mill still remains as it is without being able to function and serve its purpose. According to the Budget Office of the Federation of Nigeria (2017), the Ajaokuta Steel Project was conceived to be the bedrock of industrialization in Nigeria. As an integrated steel, plant, it was expected that the project will lay the foundation of Nigeria's industrial drive. "However, since 1979 to date, the project has not led to the production of liquid steel. Indeed, despite gulping billions of dollars, the project has been mired in high stake politics, monumental corruption and lack of progress" Danga (2020). This further re-affirms the brazen corruption present within the Nigerian system as a factor necessitating the lack of growth and productivity of the manufacturing sector in Nigeria.

The political landscape remains a very great issue with the manufacturing sector due to the political nature portrayed within Nigeria. Having a political affiliation may have its effect on the continued operation of the manufacturing firms. Since owners may be subjected to antagonism for belonging to a given opponent party. Abolo (2017), confirmed that more than 270 manufacturing firms closed their shops in 2016 alone as a result of low or no patronage in Nigeria as well as beyond. The Ajaokuta steel manufacturing company is yet to see the light of the day while foreign made products have continued to dominate our local markets. This means that the manufacturing sector should be seen as an institution that brings people together to help solve complex problems within our society through the creation of jobs as well as the production of goods and services for human consumption. The continuous neglect of the sector will definitely alter production, increase the demand for foreign products and also have a negative effect on the power of the exchange rate compared to that of foreign countries.

Also, the Nigerian textile manufacturing companies in the 60s and 70s were highly active until it was later neglected and underfunded by the government as it was mostly concerned with the exploration of discovered crude oil while some sectors like the manufacturing and the agricultural sector suffered. Odey, Saliu, Achukwu and Olashina (2018) argue that the problems faced by the textile industry includes, poor economic policies, smuggling of textile products, the global recession as well as the perception of the people in regards to using made-in Nigeria goods. Also, they affirmed that one cannot leave the problem of financing behind while loans to finance business are not readily available. According to Renne (2021), four of the largest textile mills in Kaduna state, Nigeria closed their operations from the year 2002 to the year 2005. One of the textile manufacturing company that closed its operation as at the time was Kaduna Textiles Limited. It was a sad event as many of the workers were laid-off, operations stopped while those that were laid-off were sent-off without pay.

The Nigerian textile manufacturing company had its fair share of the issues and challenges that faced manufacturing companies in Nigeria despite being one of the promising sectors operating in the country as at the time. The sudden closure of the company had its effect on the internal generated revenue from this company on the part of the government as well as that of others that were similarly affected as at the period. It moved from being the highest employer of labour of

over one million individuals (Owen, Ogunleye & Orekoya, 2016) to nothing eventually. There are arguments that the preferences of Nigerians to import textile materials from overseas also contributed highly to the end of the textile manufacturing sector in Nigeria (Odey *et al*., 2018). According to Nwabueze (2009), the textile industry in Nigeria in 2007 was over 50 years from the year 1997, while the sector was bedevilled by structural instability as it was tended towards a total collapse. The iron and steel manufacturing company sited at Ajaokuta is yet to see the light of the day. This is a huge project for the Nigerian economy in making huge revenue from the manufacturing of steel.

Theoretical Framework

The theoretical framework of this study is built on three theories of sustainability, agency and asymmetry of information which are depicted on the diagram below:

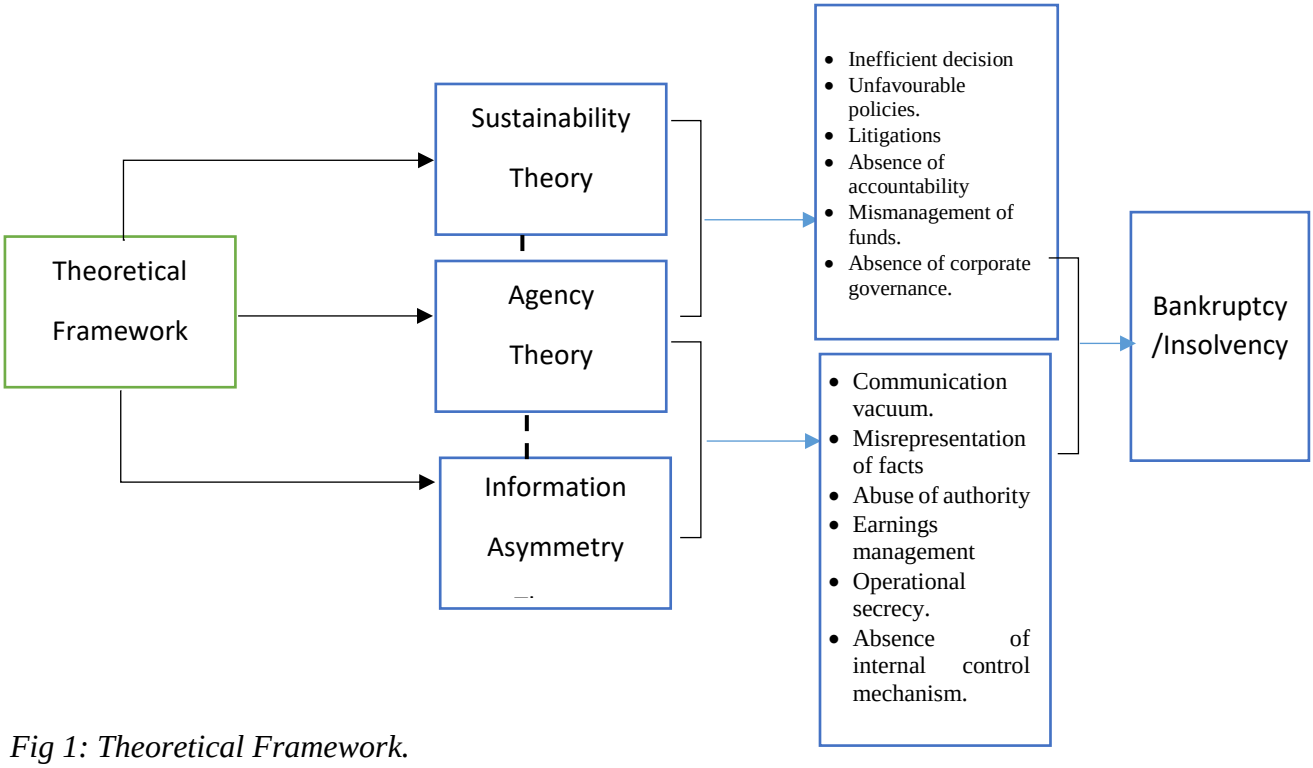

Fig 1: Theoretical Framework.

Source: Authors' Design (2024)

Sustainability Theory

The word sustainability is a word that is common with various disciplines, most especially with the environmental field and consequently with the field of management and social sciences. Sustaining a business entails ensuring that compliance with standards and ethics are entrenched within the organisation and proper records are kept for the sake of accountability. It also focuses

on sustaining the environment through the direct and indirect participation of an organisation based on its activities and how it affects the environment. According to Christensen (2012) sustainability theories were regarded to as an attempt to put more priority as well as integrate social responses to both environmental as well as cultural problems. It emphasizes on the sustenance of both natural as well as financial capital. Also, the idea behind sustainability came into public view or attention after a 1972 report which was titled "limit to growth" which was issued by an international think tank club in Rome. It further gained prominence as a result of the 1987 report which was of the World Commission on Environment and Development titled "our common future" which was also often called "the Bruntland Report" which was taken from the former Norwagean Prime Minister Gro Harlem Brundtland (Christensen, 2012).

For an organisation to continue to exist into the foreseeable future, there is a need for the organisation to be structured sustainably in terms of its operations and structure and the type of individuals that constitute the part of the organisation's management. The management of an organisation can make or mar it based on the decisions taken. Companies have been ordered to close down based on their operations contributing to environmental hazards or the actions of their managers being unethical, thereby plunging the companies into the abyss of bankruptcy. According to Harrington (2016), it is having the capacity to maintain as well as to improve the state and availability of materials that are desirable and also conditions over a given long period of time. It emphasizes on ensuring that different aspect of the natural as well as social conditions and the status of the natural resources are met. Therefore, there is a need on the part of the management to make meaningful decisions, avoid unfavourable policies, avoid litigation, ensure accountability on the part of the employees and key officers, and adhere strictly to the code of corporate governance. Amos and Uniamikogbo (2016) affirmed that sustainability based on the Brundtland report as a type of development meets the desire or needs of the current or present generations without compromising the ability of the coming future generations to meet their desires or needs.

Agency Theory

The agency theory is a theory that has continued to evolve in the world of academic research. It explains the relationship that exists between the principal and the agent in ensuring that the operations of an organisation is properly handled in the best interest of the owners. Bendickson, Muldoon, Liguori and Davis (2016) asserted that "principal-agent relationships should reflect efficient organisation of information and risk bearing costs. Various researchers have affirmed that the main idea behind the principal-agent theory is that the principal out of his engagement requires the duties of the agent, also the busy schedule of the principal may not allow him to monitor the activities of the agent. Panda and Leepsa (2017) also attested that the theory of agency revolves around the problems and issues that are attached to agency as well as their solutions. The agency problems have evolved over the years, one which is based on trust and professionalism in delivering on the job. The agent can make or mar the activities of an organisation and his contribution cannot be undermined in the continued operation of the organisation.

In regards to the bankruptcy of organisations, an agent's poor decision may have a negative effect on the operations of an organisation if due care is not taking. The agent is in the position of stewardship to protect the interest of his principal most especially in relation to the financial investment of the principal and the goodwill attached to the principal's business. The manufacturing sector most especially in Nigeria is not spared either and most businesses have

failed due to lack of trust as well as other unethical practices exhibited by those in the position of stewardship within the organisations. Eisenhardt (1989), remarked that "agency theory is concerned with resolving two problems that can occur in agency relationships. The first is the agency problem that arises when (a) the desires or goals of the principal and agent conflict and (b) it is difficult or expensive for the principal to verify what the agent is actually doing. Based on the postulation of Eisenhardt (1989), there is a need for the organisations to put in place stringent measures to check the activities of the agents as well as the internal control process within the organisation.

Information Asymmetry Theory

The information asymmetry theory since its introduction by notable economists George Akerlof, Michael Spence, and Joseph Stiglitz in the 1970s, has grown to be a fundamental concept in the study of a wide range of social and economic events and it was later formalized in 2001 (Matagu, 2018). It asserts that disparities in the information that is frequently available to various parties during transactions cause imbalances in risk assessment, decision-making, and resource allocation within organisations. In the used automobile market in particular, Akerlof's ground-breaking study "The Market for Lemons" (1970) shed light on how information asymmetry causes adverse selection, where low-quality products predominate because consumers are unable to differentiate them apart from high-quality ones. The harmful consequences of knowledge asymmetry on market efficiency and welfare were highlighted by this seminal study.

According to Omar, Sell and Rover (2017), information asymmetry hinders the relationship that exists between the principal and his agent and there is a need for business compliance to ensure that information asymmetry is addressed and implemented within the organisation so as to ensure that it achieves its stated goals. Basically, the idea highlights the importance of responsibility, transparency, and disclosure within an organisation in reducing the knowledge imbalance between shareholders and management due to the separation of ownership from management that exists within a corporate entity, with significant ramifications for corporate governance practices. Nyon (2018) explains that some people in a given transaction have more information at hand compared to other parties within the same transaction circle and this give those with more information more power compared to the others in a given transaction. According to Upaa and Iorlaha (2023), research has shown that information asymmetry can result in a cost of capital increase for companies. Also, in line with sustainability disclosure, information asymmetry can manifest when companies fail to provide comprehensive and accurate Environmental Social and Governance (ESG) information, leaving investors with incomplete or inaccurate data. The efficacy of regulatory measures, like mandatory disclosure laws and corporate governance changes, in lowering agency costs and enhancing business performance is investigated in this field of study. The issue of transparency remains a factor that affects an organisation and sometimes lead to bankruptcy of such firms most especially when the resources of the organisations are not fully utilized and information are not properly disseminated for effective and efficient use of the organisation.

Empirical Review of Literature

Gratzer and Stiefel (2008) opined that the bankruptcy system aims to achieve equality among creditors in questions of loss upon the debtor's insolvency. Their study examined various bankruptcy and insolvency laws across various countries in Europe and the United States by identifying patterns in the laws using a qualitative research approach to analyse the various

changes within the laws. They observed that bankruptcy laws are influenced by tradition, economic and political views as well as the influence of religion. These legal influences have shaped how a bankrupt person is perceived within the society and the privileges he tends to forfeit. Gratzer and Stiefel (2008), further emphasized that for long periods, debtors were subjected to severe treatment. Insolvency was often equalled to theft from creditors who usually had the right to the debtor's property and body. The death penalty, servitude, debtors' prison and stigmatizing penalties were still in existence well after the middle ages. Despite the position of the law and the steps taken to sanitize the system, more organisations continue to fail and top on the list is the manufacturing sector. This was buttressed by Onigbinde (2021) who emphasized that the bankrupt individual losses some benefits or rights within the society in accordance with the law and some of such benefits he losses is his right to vote and be voted for or involvement in business for a given period as ordered by the court. Onigbinde (2021) adopted a comparative and qualitative research approach in his study of Nigerian insolvency laws with that of the international community like that of the United Kingdom and that of the United States with focus on the provisions of the law in the stated countries compared to the provisions of the Companies and Allied Matters Act of 2020. The position of the law is to safeguard the interest of the creditors who are the debenture holders of one form of loan stock or the other in the bankrupt organisation, which puts them at an advantage over the preference or the ordinary shareholders.

Halliday (2022) in his study focused on corporate insolvency by adopting a qualitative approach through the examination of the position of the law in addressing issues associated with insolvency. He examined the legal framework and the position of the various regulatory institutions on insolvency such as the Companies and Allied Matters Act (CAMA) 2020, Asset Management Corporation of Nigeria Act (AMCON), Banks and Other Financial Institutions Act (BOFIA), Investment and Security Act, Nigerian Deposit Insurance Corporation Act etc. A differentiation was made in regards to the use of bankruptcy and insolvency interchangeably as the former involves individuals and the latter corporate entities.

The inability of the organisations to prepare a bankruptcy prediction report makes the organisations unaware of the impending doom that is about to befall them. This and other reasons associated with sustaining an organisation have spurred various researchers to conduct research on bankruptcy predictive tests. Egbunike and Ibeanuka (2015) focused their study on the prediction of corporate bankruptcy, and the ways to prevent the allocation of resources from further being channelled into falling or failing businesses by adopting a quantitative research approach with the adoption of financial profitability ratios on the financial reports of some selected financial institutions operating in Nigeria. The manufacturing sector in Nigeria is not spared of corporate failures. Adekola and Adeyemi (2017) observed that the impact of manufacturing companies in the growth and development of Nigeria is high and has continued to be positive based on their study carried out from 1980 to 2015 as an increase in the output of the manufacturing companies resulted in economic growth. With the growing rate of the country's population, there is a need to ensure that the burgeoning demand of the people is met and one of the ways by which this can be met is with the increased focus on production. The encouragement of investors is quite essential to float organisations but setting-up a manufacturing firm may involve huge capital.

Ioana (2022) adopted a quantitative research approach by examining various financial indicators of different companies and its impact on bankruptcy threat by carrying-out a multiple regression analysis on the data collected. The findings of the study revealed that the financial indicators are

good predictors of bankruptcy. These financial indicators are a composition of the Altman's test such as the profitability ratios, the liquidity as well as the solvency ratios respectively.

Abolo (2017) affirmed that the manufacturing sector is a sector which provides one of the greatest opportunity for the positive transformation of the economy of Nigeria. It is a way for reducing unemployment as well as the creation of economic wealth as well as sustainable economic development. The importance of the manufacturing sector spurred Altman (2018) to carry out research on the sector in the US in 1967 before further development on the model for the US financial market. The Z-score multi-variate model have proven to be quite effective over time in predicting bankruptcy within the manufacturing sector. The Altman 1967 model adopted a quantitative research approach by surveying a sample of sixty-six manufacturing firms out of which thirty-three of the predicted firms that show sign of bankruptcy eventually filed for bankruptcy.

Shi and Li (2019) adopted a systematic literature review with the aid of Scopus database to identify important international academic research papers in relation to bankruptcy prediction models for corporate organisations and their findings revealed that bankruptcy prediction within the corporate world remains a field of growing concern due to the significant number of studies recorded after the global financial crisis of 2018. The study also revealed that the two most used model in bankruptcy prediction are logistic regression and neural network models.

Babatunde, Akeju and Malomo (2017) investigated the effectiveness of Altman's Z-score in the prediction of bankruptcy of manufacturing companies that are quoted on NGX. The study adopted a sample size of 10 quoted manufacturing firms for the financial year of 2015 by adopting a quantitative research approach. The research findings revealed that the Z-score was a very efficient and important tool that can be used to identify companies with performance that is deteriorating in Nigeria. Al-Manaseer and Al-Oshaibat (2018) in their empirical findings supported the observations of Babatunde, Akeju and Malomo (2017), the authors adopted a multiple linear regression analytical method by analyzing financial reports of insurance companies quoted on Amman Stock Exchange (ASE) from 2011 to 2016. Their findings revealed that the Z-score model has a high power of prediction and it remains a valuable instrument for the financial statement users.

Uchenna and Okelue (2012) on their part adopted the use of multi discriminant analysis model which consists of financial ratios for predicting bankruptcy. Data for a five year period were gathered for eleven manufacturing firms operating in Nigeria. Their findings revealed that the use of financial ratios and the Z-score in assessing the financial health of manufacturing companies operating in Nigeria are great tools and they serve as warning signals for impending failure in businesses.

3. RESEARCH METHODS

Research Design

The study employed quantitative research design. According to Simister and James (2020), quantitative research approach deals with the use of quantitative data which is basically expressed in numbers (e.g. prices, proportions, units and ratios). It involves the use of statistical data methods such as the use of averages, regression analysis as well as correlations with the use of numeric indicators. The use of quantitative research is interpretative in nature as it tends to interpret a given set of numerical data gathered from a secondary source. Bryman (2011) and Daniel (2016) explain

that quantitative research places much emphasis on numbers as well as on figures in the process of the collection and the analysis of data and it is seen as being "scientific in nature."

Population and Sample Size

The Population is the composition of variables that share the same characteristics (Khotari, 2004), it is regarded as a larger set (Igwenagu, 2016) from which a random selection is done. The population of the study consists of all manufacturing companies quoted on the Nigerian Exchange Group (NGX, 2024). A total of 38 manufacturing companies divided into industrial and consumer goods of which 13 are into the manufacturing of industrial goods, 21 are into the manufacturing of ultimate consumer goods while 4 are conglomerates.

Table 1: Manufacturers of Industrial Goods

Industrial Goods	Date Incorporated	Industrial Goods	Date Incorporated
Austin Laz & Co. Plc	July 13, 1982	GREIF Nigeria Plc	January 20,1940
Berger Paints Plc	Sept. 1, 1959	Lafarge Africa Plc	February 24, 1959
Beta Glass Plc	June 2, 1974	Meyer Plc	May 20, 1960
BUA Cement Plc	May 30, 2014	Notore Chemical Ind. Plc	November 30, 2005
CAP Plc	Sept. 21, 1965	Premier Paints Plc	August 24, 1982
Cutix Plc	Nov. 4, 1982	Tripple Gee and Co. Plc	April 14, 1980
Dangote Cement plc	Nov. 4, 1992	-	-

Source: Nigerian Exchange Group, 2024

Table 2: Manufacturers of Consumer Goods

Consumer Goods	Date Incorporated	Consumer Goods	Date Incorporated
BUA Foods Plc	April 13, 2005	Int. Breweries Plc	December 22, 1971
Cadbury Nigeria Plc	January 9, 1965	McNichols Plc	April 26, 2004
Champion Breweries Plc	July 31, 1974	Multi-Trex Integrated Foods Plc	October 30, 1999
Dangote Sugar Refinery Plc	January 4, 2005	Nig. Flour Mills Plc	October 29, 1971
DN Tyre & Rubber Plc	October 21, 1961	Nascon Allied Industries Plc	April 30, 1973
Flour Mills Nig. Plc	September 29, 1960	Nestle Nigeria Plc	September 25, 1969
Golden Guinea Breweries	September 26, 1962	Nigerian Breweries Plc	November 16, 1946
Guinness Nigeria Plc	April 29, 1950	Nigerian Enamelware Plc	May 21, 1960
Honeywell Flour Mill Plc	July 9, 1985	PZ Cussons Nigeria Plc	April 12, 1948

Unilever Nig. Plc	November 4, 1923	Union Dicon Salt Plc	November 12, 1991
Vitafoam Nig. Plc	April 8, 1962	-	-

Source: Nigerian Exchange Group, 2024

Table 3: Conglomerates

Conglomerates	Date Incorporated	Conglomerates	Date Incorporated
John Holt Plc	August 28, 1961	SCOA Nigeria Plc	June 24, 1969
Chellarams Plc	August 13, 1947	UACN Plc	April 22, 1931

Source: Nigerian Exchange Group, 2024

Sampling on the other hand is referred to as an important tool used in research due to the fact that the population ~~which is~~ of interest consists of ~~various~~ individuals that may not all be included as participants in the study (Majid, 2018). This study focuses on a finite population size, which is the number of manufacturing companies that are operating and quoted on the Nigerian Exchange Group. As provided on the NGX website, there are 38 manufacturing companies quoted on the stock exchange market in Nigeria which shows a finite number of the population. A sample size of 15 companies was adopted out of the population size of 38 quoted companies based on their balance sheet size, the year of operation and the availability of their financial reports.

This study adopted the use of judgemental sampling technique which is a non-probability sampling technique that allows a researcher to gather samples based on his or her best of judgement for timely delivery. When gathering preliminary data timeliness and affordability are the main goals of exploratory research or pilot studies, this approach is frequently utilized (Etikan, 2016). Judgmental sampling is a common option in research with limited resources or time restrictions because of its cost-effectiveness and appeal. It is also referred to as selective sampling as it involves the intentional selection of participants according to predetermined traits or standards that support the goals of the study. To select participants who are most likely to offer rich and pertinent data for the study, researchers employ their judgments (Palinkas, Horwitz, Green, Wisdon, Duan & Hogwood, 2015).

Procedure for Data Collection

The secondary data source involves the collection of data from a third-party and not directly from the respondents as in the case with a primary source of data collection. Collecting data remains a significant stage of the research process as the test, interpretation as well as the research findings depend upon the data collected. Data were collected from the financial reports of the manufacturing firms quoted on the NGX financial reports from 2018 to 2022.

Validity and Reliability

With respect to validity of the data and test, Sajjan (2016) investigated the application and use of the Altman's Z-score in the prediction of bankruptcy in some selected firms operating in India for a 5-year period from 2011 to 2015 respectively. The result showed that the Altman's Z-test is reliable in the prediction of corporate failure in India. The data used were retrieved from the published financial records of incorporated manufacturing firms quoted on the Nigerian Exchange

Group and their data have been proven to be valid over time through the independent opinion of the statutory auditors.

Method of Data Analysis

The paper adopted the use of both descriptive and inferential statistics through the use of the Edward Altman (2000) Z-score which is in a linear regression model form stating the dependent and independent variables of which the figures arrived at are based on various financial ratios (profitability, liquidity and solvency ratios) that was introduced into the model as depicted below:

$Z= 1.2X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 0.99 X_5$

Where:

X_1= Working capital divided by the total assets
X_2= Retained earnings divided by the total assets
X_3= Earnings before interest and taxes divided by the total assets
X_4 = Book value of equity divided by the total liabilities.
X_5 = Sales Divided by Total Assets
Note: 1.2, 1.4, 3.3, 0.6 and 0.99 are the weights or intercepts attached to the variables as provided by Altman (2000).

4. DATA PRESENTATION AND ANALYSIS

Presentation of Demographic Data and Descriptive Analysis for the Quoted Manufacturing Firms

The data were extracted from the annual financial report of the quoted manufacturing firms on the Nigerian Exchange Group (NGX) from a period of 2018-2022. The study was conducted on 15 companies out of a total number of 38 companies quoted.

Table 4: No of Years in Operation

Years	***Frequency***	***Percentage***
0-20yrs	3	20
21-40yrs	1	6.6
41-50yrs	4	26.7
50-60yrs	3	20
60yrs+	4	26.7

Source: Nigerian Exchange Group (2024)

The table above depicts the number of years the quoted manufacturing firms have been in operation. Most of the manufacturing firms constituting 26.7% operating in Nigeria have been in operation for more than 41 to 50 years as well as above 60 years.

Table 5: Total Balance Sheet Size of the Manufacturing Companies

Size	***Frequency***	***Percentage***
N100million-N1billion	1	6.7
N1billion –N100billion	6	40
N101billion-N500billion	3	20
N501billion-N1trillion	3	20

N1trillion +	2	12.3

Source: Authors' Computation (2024)

The table above shows that 6.7% of the manufacturing firms have a balance sheet size of between N100million to N1billion, 40% of the manufacturing firms examined have a balance sheet size of between N1billion to N100billion, 20% of them have a balance sheet size of between N101billion to N500billion, 20% of the manufacturing firms have between a balance sheet size of N501billion to N1trillion while 12.3% have a balance sheet size of N1trillion. This shows that most of the manufacturing firms have between N1billion to N100billion. The balance sheet size is the value of the manufacturing company's total asset which is also equal to the total liabilities plus the book value of equity.

Table 6: Descriptive Analysis of the Altman's Z-score computed for Quoted Manufacturing Firms on the Nigerian Exchange Group from 2018-2022.

	mean	***sd***	***var***
Austin Laz	14.93	2.92	8.52
Berger Paints	2.63	0.45	0.20
Beta Glass	6.56	1.81	3.29
Cutix Plc	3.87	0.49	0.24
Dangote Cement	3.18	0.55	0.31
Greif	0.44	5.72	32.67
Notore chemical	(0.13)	0.16	0.03
Tripple Gee	1.69	0.62	0.38
McNichols	2.28	0.27	0.07
International Breweries	0.08	0.29	0.08
Flour Mills Nigeria Plc	2.03	0.19	0.04
Cadbury Nigeria Plc	2.15	0.50	0.25
Lafarge Cement Plc	2.56	0.95	0.91
DN Meyer Paints	2.27	1.49	2.21
Dangote Sugar Plc	2.82	0.76	0.58

Source: Authors' computation (2024)

The statistical Table 6 depicts the mean, standard deviation and variance computation for the Altman's test computed for the companies being examined for this study. The result was generated from the Altman's Z-score test conducted for all the 15 companies being examined. Austin Laz company has the highest mean value of 14.93 which is far greater than the Altman's test metric for risk zone classification. The result of Austin Laz can be affirmed to be as a result of the company's small balance sheet size compared to that of others as well as its total liabilities which are quite small compared to that of others being examined.

Inferential Statistical Analysis

Table 7: Altman's Z-Score Test for the Quoted Manufacturing Firms on NGX from 2018-2022

Firms	2018	2019	2020	2021	2022
Austin Laz	10.39	17.87	16.40	16.15	13.84
Berger Paints	2.22	2.12	2.75	2.95	3.13
Beta Glass	3.34	7.31	7.49	7.61	7.07
Cutix Plc	4.45	4.32	3.47	3.36	3.77
Dangote Cement	4.08	3.32	2.99	2.69	2.82
Greif	0.22	(8.98)	5.10	0.96	4.90
Notore chemical	(0.36)	(0.04)	0.04	(0.23)	(0.07)
Tripple Gee	2.04	2.18	1.93	1.67	0.63
McNichols	2.03	2.17	2.05	2.54	2.59
International Breweries	0.37	(0.37)	0.06	0.04	0.28
Flour Mills Nigeria	1.74	2.11	2.25	2.07	1.98
Cadbury Nigeria Plc	2.60	2.71	2.09	1.84	1.53
Lafarge Cement	1.00	2.53	2.68	3.56	3.01
DN Meyer Paints	0.95	0.69	4.05	2.18	3.46
Dangote Sugar	3.70	3.54	2.63	2.00	2.26

Source: Authors' computation (2024)

Table 7 shows the Altman Z-score computation result for the 15 manufacturing companies observed with the aid of the data gathered from the financial reports of the quoted manufacturing companies on the Nigerian Exchange Group. From the result above, Austin Laz has the highest Z-score result during the five years' period compared to other companies for the five year period as computed above thereby surpassing the 2.99 threshold as posited by Altman. The company with the least result is Notore Chemical which was unable to stay within the gray zone.

Test of Hypotheses

Table 8: Hypotheses Tests Result

	Mean Z-Score	Result	Decision	Hypothesis
Austin Laz	14.93	>2.99	Safe Zone	1
Beta Glass	6.56	>2.99	Safe Zone	1
Cutix Plc	3.87	>2.99	Safe Zone	1
Dangote Cement	3.18	>2.99	Safe Zone	1
Berger Paints	2.63	<2.99	Gray Zone	2
McNichols	2.28	<2.99	Gray Zone	2
Flour Mills Nigeria	2.03	<2.99	Gray Zone	2
Cadbury Nigeria Plc	2.15	<2.99	Gray Zone	2
Lafarge Cement	2.56	<2.99	Gray Zone	2
DN Meyer Paints	2.27	<2.99	Gray Zone	2
Dangote Sugar	2.82	<2.99	Gray Zone	2
Greif	0.44	<1.81	Distress	3
Notore chemical	(0.13)	<1.81	Distress	3

Tripple Gee	1.69	<1.81	Distress	3
International Breweries	0.08	<1.81	Distress	3

Source: Author's computation using Altman's Z-score (2024)

Table 9: Decision Parameter

S/N	Result	Indication/Decision
1	Z-score > 2.99	Safe Zone-Low Risk
2	1.81 < Z < 2.99	Gray Zone-Moderate Risk
3	Z< 1.81	Distress/Bankruptcy Zone-High Risk

Source: Authors' design based on Altman's Z-score (2024)

The tables 8 and 9 above depict the Altman's Z-score result and the decision parameter table in respect of the bankruptcy prediction zones. It was deduced that most of the companies (7 manufacturing companies) fall within the gray zone which is an indication that care has to be taken by those companies so as not to witness signs of impending bankruptcy. The gray zone is the mid-point between the safe zone and the bankruptcy zone. The result of the hypotheses tested are summarized on the table below:

Table 10: Summary of Companies Bankruptcy Prediction Status

S/N	Safe Zone	Gray Zone	Distress Zone	Total
Number of Companies	4	7	4	15
Percentage	26.7	46.6	26.7	100

Source: Authors' Computation (2024)

From Table 10, it can be deduced that 4 of the companies examined by the study are within the safe zone which is an indication that there are no possible sign of distress. Out of the total number of 15 companies, 7 of the companies constituting 46.6% of the total number of companies are within the gray zone. That is, they are neither within the safe zone nor the distress zone, while, 4 (26.7%) of the total number of companies examined are within the distress zone.

Summary of findings

Based on the Altman's Z-score test conducted to predict for possible bankruptcy, a Z-score greater than 2.99 translates to the manufacturing companies being solvent. Therefore, few (26.7%) of the manufacturing companies fall within the safe zone. Also, a score of 1.81 or lower than Z-score of 2.99 translates to the manufacturing company being within the gray zone based on the test conducted. The validity of the Altman's model in predicting for bankruptcy was supported by Al-Manaseer and Al-Oshaibat (2018), Sajjan (2016), Babatunde, Akeju and Malomo (2017) and Altman (2000). Therefore, most of the companies fall within the gray zone. A Z-score that is less than 1.81 translates to the manufacturing companies being bankrupt. Therefore, few of the quoted manufacturing companies fall within the bankruptcy zone.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the use of the Altman's Z-score to predict imminent signs of bankruptcy within quoted manufacturing firms operating in Nigeria using financial data from 2018 to 2022. The study adopted a linear regression model containing all the financial ratios adopted by Altman in his study for the analysis in predicting bankruptcy within the manufacturing sector. The Z-scores

analysis results revealed the examined manufacturing firms that fall within the three zones (safe, gray and bankruptcy) which are the metrics for reaching an informed conclusion. The Z-score revealed that four of the manufacturing companies fall within the safe zone, seven fall within the gray zone and the remaining four companies examined fall within the bankruptcy zone. The four companies that fall within the bankruptcy zone have a computed Z-score which is lower than 1.81 and an increasing rate of liability for the five years being examined.

Also, from the findings made in the study using the Altman's Z-score carried out on the quoted manufacturing firms operating in Nigeria, it can be deduced that the Altman's test is efficient in carrying out bankruptcy predictive test within the manufacturing sector as it does reflect the level of risks associated with the companies being examined and their various test zones in terms of low profitability compared to rising cost of operation, high level of borrowing and cost of financing the debts, rising level of current liabilities compared to the organisations' current assets. Based on the test conducted, some of the smaller companies in terms of balance sheet size tend to show no or low sign of distress compared to the big ones due to their low liabilities, and consistency in operation. The firms within the safety zone have lower value of liabilities compared to those within the "gray" and "distress" zones respectively. The number of manufacturing firms quoted on the Nigerian exchange group have continued to decline due to various economic factors such as inflation, unfavourable government policies and rising cost of operations.

Therefore, the study recommends that the quoted manufacturing firms within the distress and gray zones should ensure that the current assets are properly utilized for profitable production or expansion into other markets, the debts incurred in terms of liabilities which comprise of both current and long-term liabilities should be reduced as a result of huge cost of financing the debts. Also, the manufacturing firms within the distress and gray zones should ensure that idle cash are properly channeled into further production of goods needed by the consumers as its non-effective usage will have a negative impact on the firms. Therefore, the manufacturing firms should check the rising level of liabilities incurred in their statement of financial position and un-utilized cash should be put to gainful use. In addition, the study recommends that the manufacturing firms should prepare bankruptcy predictive report to test for imminent signs of bankruptcy so as to be prepared for financial distress that may arise.

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