Developing an Altman's Z-score-based model to support organisational resilience

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Dissertation accepted in fulfilment of the requirements for the degree Master of Commerce in Management Accountancy at the North-West University

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Graduation: June 2022

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ACKNOWLEDGEMENTS

My deepest appreciation to my supervisor, Prof. Sanlie Middelberg, and co-supervisor, Prof. Pieter Buys. Thank you for your guidance, support and motivation throughout the study process. I have learned so much from you!

To Rentia Mynhardt, thank you for your motivation, language review and input.

To my mother, Ilandi, thank you for nurturing a love of reading in me. Thank you for the library sessions, lunch boxes and sacrifices. Thank you for being my mom!

To my sister, Lienke. Never forget how wildly capable you are. I am your biggest supporter.

To my father, Pieter. Thank you for your motivation and support; from the high jump track to the brainstorming sessions in Mugg & Bean. Thank you for always being there. This study would not have been possible without you.

I would like to dedicate this dissertation to my family. Thank you for believing in me. I wouldn't be who I am today if it weren't for you.

ABSTRACT

The adverse consequences of the COVID-19 pandemic were the driving force behind the study. It emphasised the saying "*Survival of the fittest*" and the importance of having resilience to survive disruptive events. The primary objective of this study was to develop a decision-support model based on Altman's Z-score to gauge organisational resilience concerns in anticipation of possible disruptive events.

Action design research (ADR) was utilised to develop a theory-ingrained artefact as a resilience decision-support model. A literature review and an empirical study were conducted, resulting in the design of a two-part artefact. Part A comprises a diagram that illustrates the process of analysing the resilience of a company. The Z-double prime of eight sampled companies with going concern problems, i.e. current liabilities exceeding current assets, was calculated and analysed. The Z-double prime of six out of the eight sampled companies indicated a high risk of failure in *the year* of the going concern problems. However, for four of the eight companies, the Z-double prime did not indicate a moderate or high risk of failure in the years *prior* to the going concern problems. Therefore, the prediction of possible business failure could not be based solely on the going concern principle and had to be validated. Part B of the artefact is in the form of an MS Excel document. It lists certain words to be counted in a company's integrated report. These words are divided into three levels of resilience. It includes resilient or resilience (level 1), readiness, response and recovery (level 2) and the elements of resilience (level 3). It was assumed that managers considered resilience or its accompanying elements if they mentioned it in their integrated reports. The artefact was founded on the stewardship theory, which argues that managers will strive to benefit the company rather than themselves. Therefore, the integrated reports were viewed as an honest reflection of management's value creation activities. The analysis of the integrated reports revealed that companies have minimal disclosures of resilience or the levels of resilience. Companies also tend to increase the references to resilience or its levels in the years they experience going concern problems. The study concluded that the integrated reporting framework should require companies to include references to their resilience in their integrated reports. These references should be divided between the readiness, response and recovery dimensions of resilience.

An adapted version of the artefact mentioned above was developed and presented as a resilience scoring system. The adapted version combines Part A and Part B of the original artefact.

Keywords: action design research (ADR), Altman's Z-Score, disruptive events, going concern, integrated reports, readiness, recovery, resilience, response, stewardship theory

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1 INTRODUCTION

> *"Even though we cannot compute the odds for threats like bioterrorism or a pandemic, it is important to have the right people worrying about them and taking steps to minimise their likelihood and potential impact … But bioterrorism and pandemics are the only threats I can foresee that could kill over a billion people." (Microsoft Corporation Chairman Bill Gates, 2011)*

The current COVID-19 pandemic is an excellent example of a disruptive event that had an impact on companies all over the world. It unleashed a worldwide economic disaster which shock waves continue to spread, still putting more lives at risk (World Bank, 2021). It is predicted that the global economy will shrink with 5,2% in 2021, which will be the biggest decline since World War II (World Bank, 2020). The pandemic emphasises the importance of risk management in companies (Culp, 2020), because companies need to be able to "bounce back" from any situation, by being resilient.

According to 2020 projections of the Poverty and Shared Prosperity Report, the pandemic could result in between 88 million and 115 million people falling back into extreme poverty (World Bank, 2020). Therefore, the weakened global economies and struggling companies are bound to have a negative impact on society and the global population, as illustrated below.

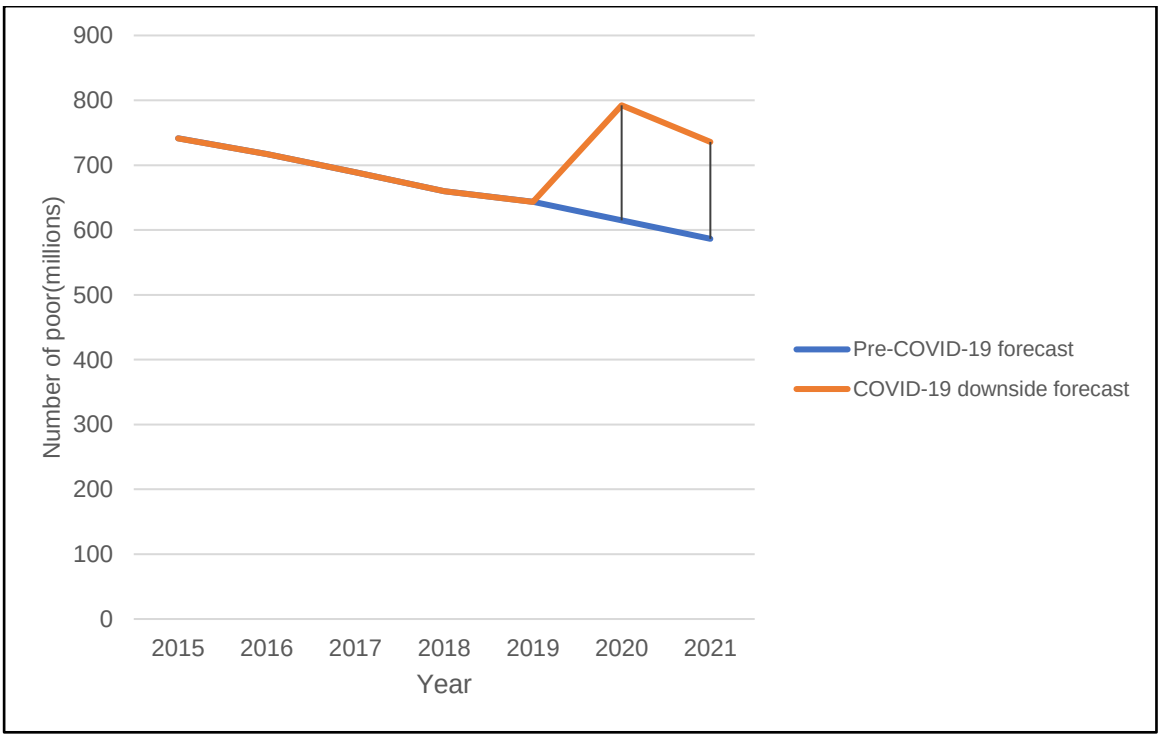

Figure 1-1: Forecasted impact of COVID-19 on the number of poor people

Source: World Bank (2020)

Figure 1-1 illustrates the forecasted increase in the number of people living in poverty, i.e. living on less than USD 1,90 per day, due to the COVID-19 pandemic. Per illustration, the World Bank

(2020) predicts that 735,7 million people will live in extreme poverty in 2021, which is an estimated 149,3 million more than the pre-COVID-19 forecast.

1.1 Background information

The following sections define the two key concepts fundamental to this study, namely disruptive events and resilience, with reference to the Sendai framework. The section also conceptualises the importance of resilience for companies, and it elaborates on the measurement of resilience, including the concept of 'Triple R' It provides background to the origin of the Altman Z-Score, the meaning of going concern and the stewardship theory.

1.1.1 Disruptive events

According to the Merriam-Webster online dictionary (2021), to "disrupt" means to cause disorder. The current COVID-19 pandemic may be seen as a global disruptive event. The risk of a pandemic, or another similar disaster, therefore, poses a worldwide threat. A "pandemic" can be defined as the worldwide spread of a new disease (WHO, 2011). According to the Merriam-Webster online dictionary (2021), a "pandemic" occurs over a widespread area, affecting a large part of the population, and "risk" is defined as something that could be harmful or result in injury. According to the Cambridge English Dictionary (2021) a "pandemic" is a disease that exists in almost an entire area or group of people. It can be noted from the definitions that a pandemic is a predominant illness that spreads over a large area and risk is the probability of an event occurring that will have a positive or negative impact on the company. The concept of "risk" is the combination of the probability of an event and its consequences (ISO, 2009). COVID-19 is not an isolated disruptive event, because there has been a number of pandemics and epidemics in the past. The most notable pandemic was the Bubonic Plague, which killed an estimated 50 million people worldwide (Johnson & Mueller, 2002). Other examples of pandemics and epidemics include the Black Death (a plague outbreak from the fourteenth century), the Spanish Flu of 1918, and the more recent outbreaks in the twenty-first century, including the 2002 outbreak of SARS and Ebola in 2013.

Disruptive events are not limited to pandemics. The well-known 9/11 attacks crashed the United States of America's (USA) stock market for four business days (Jackson, 2008). Another example of unprecedented circumstances is the Great Depression in 1930. It resulted from changes in trading patterns between countries after World War I (Temin, 1993). Therefore, a company's sustainability depends on its ability to adapt to change, because we live in a dynamic environment (Canavati *et al*., 2020).

1.1.2 Resilience

Gallopin (2006) describes enterprise resilience as a company's adaptive capacity and its ability to cope with, adapt to, and recover from a disruptive event. He states that, to adjust to potential risks and tolerate disruptions, companies must manage the complexity of their infrastructures. A key to being able to achieve this, and assessing the vulnerabilities embedded within the enterprise elements, is understanding the interrelationships and interdependencies between the company processes, information, and the supporting technologies within the company. Resilience-related actions can occur proactively, simultaneously, or as a response to something that has already occurred (Gallopin, 2006). Therefore, resilience becomes the ability to prevent disruptive events, the ability to prevent consequences of that disruptive event becoming worse, or the ability to recover from a disruptive event that has happened (Erol *et al*., 2010). The United States Agency for International Development (USAID, 2013) defines "resilience" as the ability of people, communities, countries and systems to mitigate, adapt to and recover from shocks and stressors in a manner that stimulates economic growth and reduces vulnerability. According to the Sendai Framework (UNISDR, 2015), resilience is the ability of a system, community or society to recover from the impact of a hazard in an efficient manner, by applying risk management procedures. Resilience is therefore the ability of a company to survive a disruptive event by having a timely and efficient response to the hazard.

The Sendai Framework was signed by the United Nations (UN) General Assembly after the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR). The objective of this framework is: "*The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."* The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the resilience of nations and communities to disasters. It is the result of stakeholder consultations and governmental negotiations, which were supported by the UN's Office for Disaster Risk Reduction (UNDRR) upon the request of the UN General Assembly. According to the Sendai Framework for disaster risk reduction (UNISDR, 2015), governments should direct their actions towards the following four priority areas:

- Priority 1: Gain knowledge of disaster risk.
- Priority 2: Managing disaster risk by improving risk governance.
- Priority 3: Ensure resilience by contributing towards disaster risk reduction.
- Priority 4: Prepare for disasters to ensure effective responses and the necessary recovery and rehabilitation take place.

Organisations that have developed capabilities such as indicated above are in possession of effective schemes to process information and may make efficient decisions in a timely manner (Canavati *et al*., 2020). Being resilient is beneficial, because in the context of environmental change or disaster management, resilient companies can maintain positive adjustments under challenging conditions, where they thrive and become better (Lengnick-Hall *et al*., 2011). According to the World Bank (2015), the risk of a disaster can result in economic losses even before a disaster strikes. Investing in disaster resilience, therefore, can yield a "triple dividend" by (1) avoiding losses when disasters strike; (2) unlocking development potential by stimulating innovation and bolstering economic activity in a context of reduced disaster-related background risk for investment; and (3) gaining the synergies of the social, environment and economic co-benefits of disaster risk management investments, even if a disaster does not happen for many years.

1.2 Measuring resilience

The next sections consider the three building blocks of resilience, i.e. readiness, response and recovery, and the potential use of Altman's Z-Score as a way to gauge such resilience.

1.2.1 The concept of 'Triple R'

To achieve the level of Priority 3 of the Sendai Framework, it is necessary to develop parameters to measure resilience (Dalziell & McManus, 2004; Sanchis & Poler, 2014). There are limitations in the methodologies applied in studies related to approaches for resilience measuring (Erol *et al*., 2010). Béné *et al*. (2016) argue that resilience comprises subjective elements rather than just tangible factors such as assets. Subjective measures relate to individual self-assessment of their own household or business capacities to handle future events (Maxwell *et al*., 2015). These measures have a component of uncertainty and will vary between companies. Another limitation will be resilience measures that utilise qualitative methods only (Demmer *et al*., 2011; Jackson & Stoel, 2011). As a consequence of these shortages in methods for measuring resilience, Erol *et al*. (2010) and Levine (2014) recommend the use of more mixed methods in order to develop a dynamic approach to measuring resilience. This study will analyse companies with going concern problems (refer to section 1.3.2) to develop a resilience-decision support model and possibly a resilience scoring system.

Ponomarov and Holcomb (2009) created a framework of measuring capabilities before and after disruptive events, while Chowdhury *et al*. (2013) expand thereon to include the aspects of readiness, response and recovery. The aspects are explained as follows:

- "Readiness" is the ability to use available resources to survive disruptive events (Han *et al*., 2020). Companies are "ready" for disruptive events when they are able to predict these events and prepare for it. Readiness will enable companies to prevent disruptive events from occurring or to lessen the negative impact on a company's performance (Chowdhury et al., 2013). The readiness dimension contains four capabilities: being aware of the situation, visibility, security and the ability to maintain excess capacity (Han et al., 2020). According to the Merriam-Webster online dictionary (2021), "awareness" is the knowledge that something exists, "visibility" is the capability of being seen and "security" is a state of being shielded from danger. "Excess" is defined as surpassing the usual and "capacity" is the ability to accommodate. Therefore, excess capacity allows a company to respond to a bigger demand than normal. It can be concluded that readiness requires knowledge of possible disruptions to shield a company from it by applying their excess resources.
- "Response" is the ability to quickly respond to disruptive events and gives a company the opportunity to gain market share (Chowdhury et al., 2013). This dimension contains the following capabilities: flexibility, agility, collaboration, and leadership (Han et al., 2020). According to the Merriam-Webster online dictionary (2021) "flexibility" is defined as being tractable, "agility" is the ability to respond quickly, and "collaboration" is the working together with others. Therefore, effective response requires teamwork to quickly adapt to disruptions.
- "Recovery" implies the speed in which a company returns to its original state (Han et al., 2020). The recovery dimension has three capabilities: knowledge management, contingency planning, and market position. A quick response and recovery are crucial for a company to be resilient. Therefore, recovery time is an important measure of resilience (Chowdhury et al., 2013). According to the Merriam-Webster online dictionary (2021), "contingency" is unpredictable and subject to change. "Market position" is the image that a company creates to differentiate them from their competitors and "knowledge management" is the use of knowledge to improve a company's performance (Oxford University Press, 2021). Therefore, a company should gain knowledge of their markets to create a reputation that will withstand disruptions.

1.2.2 Altman's Z-Score

According to Gerantonis *et al*. (2009), a well-known statistical model to predict business failure is the so-called Altman's Z-Score, developed in 1968 by Professor Edward Altman at Stern Business School. He examined twenty-two possible ratios and selected five that provided the best results when used in combination with each other (Gerantonis *et al*., 2009). The model combines five financial ratios to produce the Altman's Z-Score as follows (Erfani & Vasigh, 2018):

$$Z = 1,2X1 + 1,4X2 + 3,3X3 + 0,6X4 + 1,0X5$$

The model represents the following items:

- X1 = Working capital / Total assets: measures the ability of a company to meet its short-term obligations and thus a measurement of its ability to continue as a going concern.
- X2 = Retained earnings / Total assets: measurement of the likelihood of a company failing as a lower ratio implies that the company obtains funds by borrowing.
- X3 = Earnings before interest and tax / Total assets: measurement of the difference between a company's operational income and expenses. A higher ratio indicates that a company effectively applies its assets.
- X4 = Market value of equity / Total liabilities: measurement of a company's ability to use debt to increase their investments in assets (Anjum, 2012).
- X5 = Sales / Total assets: measurement of a company's asset optimisation as it is one of the most important drivers of a company's success.

The key objective of the Z-Score is to identify possible risk levels in terms of longer-term sustainability, as illustrated in Figure1-2.

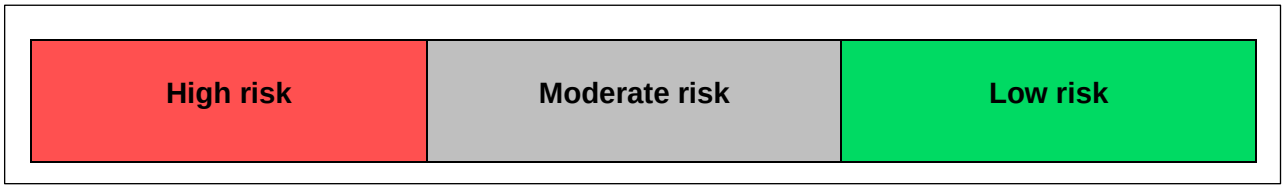

Figure 1-2: Z-Score areas of danger

Figure 1-2 illustrates the three categories of risk derived from Altman's Z-Score i.e. high risk, moderate risk and low risk. It will form the basis for the model. Altman's Z-Score consists of different versions, namely: the Z-Score, Z-Prime and Z-double prime.

The Z-Score has numerous uses, for instance the US Environmental Protection Agency (US EPA) applied a Z-Score evaluation to companies in potential environmentally damaging industries. They used the Z-Score results before and after compliance with regulations to determine the potential financial impact of compliant investments (Hauschild, 2013). Furthermore, creditors and money lenders are often key users of Z-Score information, while investors may use the Z-Score to evaluate a company's financial endurance in order to identify potential investments (Hauschild, 2013).

The Z-Score is a potential tool for determining business survivability (Hauschild, 2013). For 50 years, the model has been used to determine if a company is financially stable and the likelihood of them facing bankruptcy (Erfani & Vasigh, 2018). Previous studies concluded that the model is 90% accurate in predicting business failure one year before actual business failure, and 80% accurate two years in advance (Hauschild, 2013). It is often more useful than traditional financial analysis because it combines information from both business analysts and market perceptions that may influence the share price (Gerantonis *et al*., 2009). Therefore, the Z-Score may be one of the most accurate predictors of failing companies (Erfani & Vasigh, 2018). A key accounting concept used when evaluating whether a business is possibly facing financial difficulties, is the concept of "going concern" discussed in section 1.3.2 below.

1.3 Motivation of topic actuality

The actuality of the topic is discussed with reference to the potential impact of disruptive events, going concern and the stewardship theory.

1.3.1 Potential impact of disruptive events

As mentioned above, the outbreak of the COVID-19 pandemic provides an ideal example of a major disruptive event that had an unannounced emergence and a devastating impact on companies worldwide. The losses suffered by numerous companies placed emphasis on the statement "*Survival of the fittest"*. Companies without the ability to effectively respond to unanticipated disruptive events struggled to survive, which negatively impacted the global economy and individuals. A company's survival depends on its ability to adapt to change because we live in a dynamic environment (Canavati *et al*., 2020). The ability to adapt to change is a characteristic of a resilient company. As mentioned above, a well-known statistical model to predict business failure is Altman's Z-Score (Gerantonis *et al*., 2009). An interview between Edward Altman and Jeffrey Caso (an expert in the global management consulting firm, McKinsey's Washington office) was published. During the interview, Altman remarked that he found it interesting that McKinsey implemented the Z-Score to evaluate company performance before and after disruptive events (Caso, 2020). Therefore, the application of the Z-Score as a resilience prediction model might be possible.

1.3.2 Going concern

The International Standard on Auditing (ISA) 570 identifies a net current liabilities position (a situation where a company's current liabilities exceed their current assets) as an indicator of a company possibly experiencing going concern problems. That is because a company viewed as

a “going concern” can meet its obligations without selling its operational assets or restructuring its debt (IFAC, 2020). The Companies Act No. 71 of 2008 states that a company will satisfy the solvency and liquidity test if it appears that it will be able to pay off its short-term and long-term debts in the normal course of business for a period of twelve months after the date on which the test is considered. Therefore, to determine whether a company experiences financial difficulty, the solvency and liquidity test will be applied. The International Accounting Standard (IAS) 1, Presentation of Financial Statements, states in paragraph 26 that in assessing whether the going concern principle is appropriate, management should consider all available information about the future, for a minimum of twelve months from the end of the reporting period (IASB, 2020). However, a limitation of this study is that a company will be considered to experience financial distress based solely on the current liabilities exceeding the current assets (refer to section 5.7).

From the above, it can be concluded that companies with a history of financial sustainability issues will be identified by applying the solvency and liquidity test to their financial data for twelve-month periods.

1.3.3 Theoretical foundation: stewardship theory

As this study was done in an organisational context where managers need to ensure their companies’ survival, the stewardship theory will be used.

According to the Merriam-Webster online dictionary (2021), “stewardship” is the responsible management of something placed under a person’s supervision. Davis *et al*. (1997) describe the stewardship theory as circumstances in which managers are motivated to act in the best interests of their company’s stakeholders. In the stewardship theory, the model of man is based on an individual whose actions are ordered so that behaviour that is beneficial to the company is more valuable than individualistic behaviour (Davis *et al*., 1997). According to Pastoriza and Ariño (2008), the stewardship theory argues that managers will be motivated by obtaining the satisfaction of a job well done without the necessity to implement expensive motivators. The evidential factors in the stewardship theory are trust, engagement, collectivism and equal power distribution (Pastoriza & Ariño, 2008). Therefore, there is an agreement between management and stakeholders with managers striving to attain satisfaction from doing meaningful work (Pastoriza & Ariño, 2008).

The stewardship theory can be summarised as a theory in which managers aim to supervise companies to the latter’s benefit, rather than striving for personal rewards. The stewardship theory is applicable to this study because managers are viewed as stewards in creating a favourable environment to ensure the resilience of their companies.

1.4 Problem statement

As alluded to above, disruptive events could have an adverse impact on the continuity of a company's operations. The Altman's Z-score has numerous uses, especially for determining the likelihood of a company facing business failure. The study will consider the possibility of using Altman's Z-score as an initial indicator of business failure and then incorporating various resilience dimensions as a predictor of organisational resilience, especially in the advent of a significant disruptive event.

1.5 Research objectives

The research objectives are divided between the primary objective and supported by the secondary objectives.

1.5.1 Primary objective

The main objective is the development of a decision-support model, based on Altman's Z-Score, to gauge organisational resilience concerns in anticipation of potential disruptive events.

1.5.2 Secondary objectives

The secondary objectives are split between theoretical and empirical secondary objectives.

1.5.2.1 Theoretical secondary objectives:

The first secondary objective will consider the principles underlying Altman's Z-Score (including aspects around the going concern concept) and the resilience concept. This objective will form the basis of the empirical development of the model (Chapter 1 and Chapter 2).

1.5.2.2 Empirical secondary objectives:

The second secondary objective will utilise the theoretical foundation in developing the anticipated Altman's Z-Score-based decision-support model. In doing so, the sampled companies' resilience will be analysed using the identified resilience dimensions (Chapter 3 and Chapter 4).

1.5.3 Research methodology

The research methodology will consist of a literature review and an empirical study. The empirical study will be conducted in two phases that will be elaborated on in the data collection section (refer to section 1.7, page 11).

1.5.4 Method

ADR is a research paradigm that supports the creation of prescriptive design knowledge by evaluating ensemble artefacts in a business setting (Sein *et al*., 2011). The two building blocks of ADR are found in (1) action research (AR), which is a research method with the objective to develop scientific knowledge to solve real problems, and (2) design science research (DSR) which is an approach that aims to solve problems through research (Collatto *et al*., 2018). According to Bilandzic and Venable (2011), the purpose of ADR is the integration of key concepts from AR and DSR.

Characteristics of ADR methodology	Characteristics of this study
ADR process model continues to adapt to meet the challenges of a dynamic environment.	The processes were evaluated and adapted to meet the demands of the environment and to address the problem.
Aims to develop scientific knowledge whilst solving actual problems.	Disruptive events, poses an actual threat to communities, individuals and companies worldwide.
ADR is ideal for complicated environments.	The business environment is complicated because it reacts to external factors.

Table 1-1: Characteristics of ADR applied to this study

Source: Adapted from Sein *et al*. (2011)

The anticipated decision-support model will be the developed artefact. According to the Merriam-Webster Dictionary (2021), an “artefact” is a human-made object that is usually mass produced and inexpensive, while Sein *et al*. (2011) describe artefacts as ensembles created through continuous improvement. An artefact is therefore an object that is made by humans through an ongoing process. According to Sein *et al*. (2011), the ADR research method consists of four stages, namely:

- Stage 1: Problem formulation
- Stage 2: Building, intervention and evaluation
- Stage 3: Reflection and learning
- Stage 4: Formalisation of learning

1.6 Population and sampling

The population consists of companies with publicly available (published) financial statements. The companies for the sample will be selected if their current liabilities exceed their current assets. Therefore, the sampled companies will be JSE-listed companies with going concern (as defined in section 1.2.2) issues. Companies that might satisfy this criteria will be identified based on a list of worst performing shares on the JSE's website, as well as companies in the news with a history of losses. The current liabilities and current assets of these companies will be calculated to determine if their current liabilities exceed the current assets. Eisenhardt (1989) advises researchers to include four to ten cases in a study. He explained that less than 4 cases will not be persuasive to the reader while more than 10 cases could be difficult to handle. Therefore, the sample will consist of a minimum of seven companies, which is in the middle of the recommended range, with going concern problems.

1.7 Data collection and analysis

Data will be collected by extracting the necessary financial information from the financial statements of the sampled companies, i.e. companies with a going concern problem. The necessary financial information will be the items that Altman's Z-score consists of. To ensure consistency of financial data, data will be obtained from the IRESS (Identification of Requirements for Enterprise Social Software) database. Data from the sampled companies' integrated reports will be analysed with ATLAS.ti (version 9) software. ATLAS.ti is a software programme capable of analysing a large volume of qualitative data in the form of graphics, audio, video or text (Friese, 2021).

Data analysis will be conducted in two phases. Phase 1 will consist of the calculation of the Z-Score for the five years preceding the going concern problems, by using the extracted financial data.

Phase 2 will entail the compilation of a spreadsheet (from literature) to determine the essential elements of a resilient company. The elements will be divided between the readiness, response and recovery dimensions of resilience. The spreadsheet will be used as a measuring instrument to assess resilience using the integrated reports of the sampled companies identified in phase one. ATLAS.ti software will be used to count the references to the elements of resilience in the integrated reports.

1.8 Contribution of the study

McKinsey acknowledges the importance of a resilient company and they conducted a study to distinguish a resilient company from a non-resilient company (Levy *et al*., 2020). They used the Z-Score to compare the performance of companies before and after disruptive events (Levy *et al*., 2020), which implies that the Z-Score could possibly be implemented as a resilience prediction model (refer to section 1.3.1). This study will contribute by exploring and concluding on the possibility. It could enable companies to apply Altman's Z-Score (as discussed in section 1.2.2) in combination with the dimensions of resilience (as discussed in section 1.2.1) to predict their resilience.

1.9 Ethical considerations

The study will only consider publicly available information as published in the companies' financial statements and will not create a negative image of certain companies by identifying them. Therefore, companies will be presented in random order. The study applied for and received ethical clearance from the North-West University. The study has received the appropriate ethics certificate and number (NWU-00882-21-A4) and has been included as Appendix D.

1.10 Permission and informed consent

Financial data are publicly available and therefore consent is not required.

1.11 Chapter overview

This study will be divided into six chapters.

Chapter 1: Introduction

The first chapter introduces the research topic, provides the background of the research and presents the research problem. It sets the objective and describes the methodology that will be applied in the study.

Chapter 2: Altman's Z-Score and resilience

The aim of this chapter is to review the existing literature on Altman's Z-Score, disruptive events, resilience and the stewardship theory. It will describe the readiness, response and recovery dimensions of resilience and conceptualise the going concern principle from literature. It aims to

evaluate possible methods to measure the resilience of companies by reviewing literature of integrated reporting.

Chapter 3: Research design and methodology

This chapter focuses on the research design and method followed and how it supports the motivation. It discusses the ADR process with the aim to develop the artefact, namely the resilience decision-support model.

Chapter 4: Presenting the developed Altman's Z-score-based decision-support model

This chapter will present Phases 1 and 2 of the empirical study. It entails determining the Altman's Z-Score of the sampled companies by using the relevant financial data found in its published financial statements. It further aims to analyse the companies' resilience using the identified resilience elements to present the developed Altman's Z-score-based decision-support model.

Chapter 5: Discussion and recommendations

This chapter provides a summarised overview of the study, methodology and outcomes. A conclusion and recommendations for future research are provided based on the literature and empirical study. It discusses the reflection and learning stage of the ADR process.

The next chapter will review the literature around the Altman's Z-Score and resilience.

CHAPTER 2

2 ALTMAN'S Z-SCORE AND RESILIENCE

The previous chapter presented an introduction to the study. This chapter will provide a review of the relevant literature.

2.1 Introduction

The aim of this chapter is to address the first secondary objective as set in Chapter 1 (section 1.6.2.1), which is to consider the principles underlying Altman's Z-Score, aspects around the going concern concept and the resilience concept.

The chapter will provide a brief overview of disruptive events and their negative consequences on companies, communities and individuals. Together with Chapter 1, this will encompass the first stage of the ADR method, i.e. this will create the setting to demarcate the necessity of a resilience prediction model. It will be followed by a discussion on the stewardship theory, Altman's Z-score and the readiness, response and recovery dimensions of resilience. Integrated reporting will be discussed as it was used in the analysis of the readiness, response and recovery dimensions.

An overview of this chapter is provided in Figure 2-1.

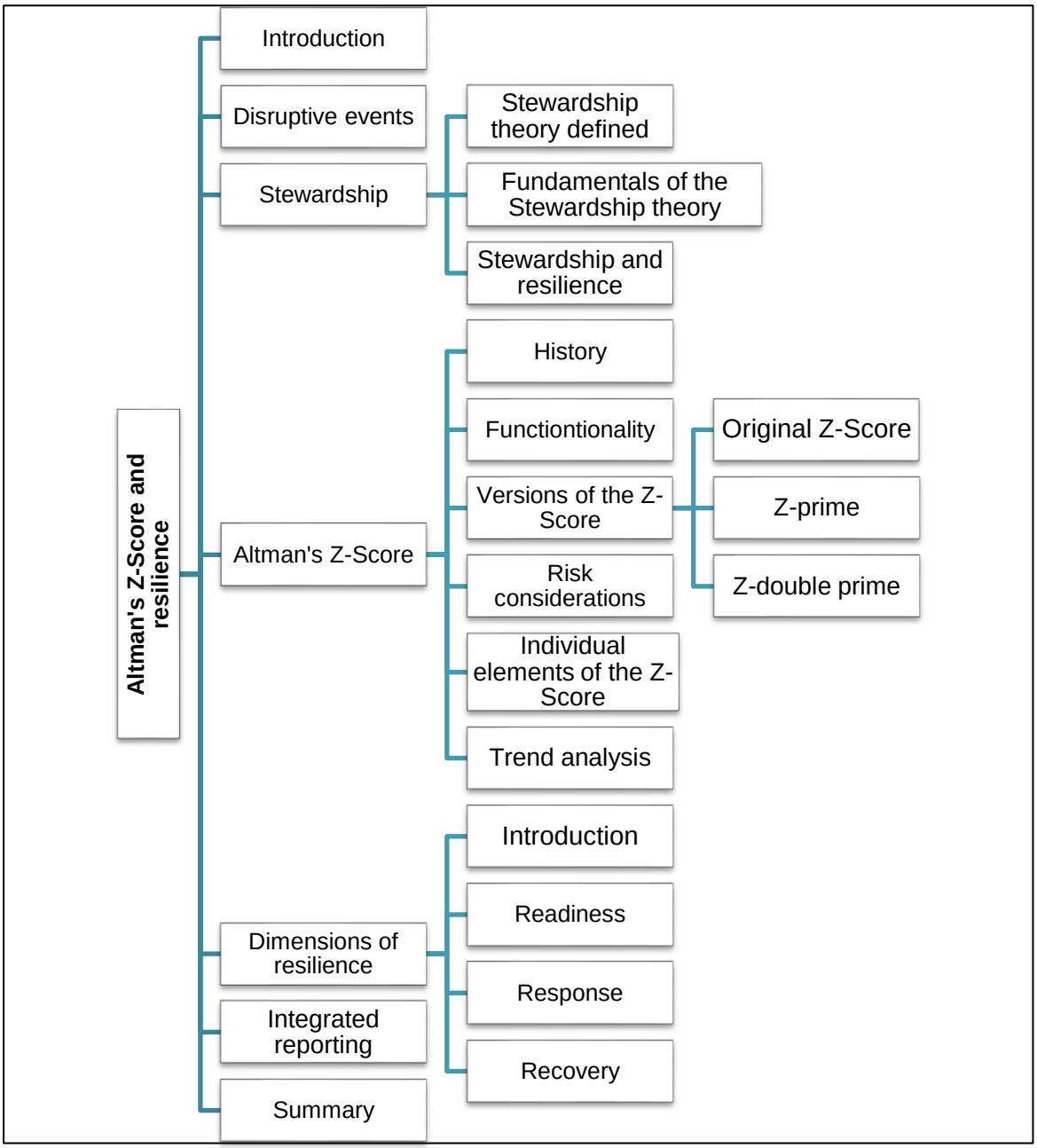

Figure 2-1: Chapter overview

2.2 Disruptive events

Although the current COVID-19 pandemic is seen as a major disruptive event, it is not an isolated example. Wildfires can also be regarded as a disruptive event. Paradise Ridge, a Northern California winery, was heavily impacted by the 2017 wildfires (McDermaid & Newton, 2020). Similarly, Australia's 2019/2020 bushfire season was the fifth deadliest in their history, while an increase in the frequency of wildfires has also been reported (Canavati *et al*., 2020). This statement is supported by 2020's occurrence of four out of the five largest fires in California since

2003 (Canavati *et al*., 2020). Disasters can be divided into natural disasters and man-made or technological disasters. Natural disasters include tsunamis, droughts and diseases, whilst man-made or technological disasters include chemical spills, civil unrest or cyber-attacks (IEDC, 2021). This increase of disruptive events indicates that industries' survival is dependent on their reactions to future disruptions (Canavati *et al*., 2020). Therefore, the impact of COVID-19 will vary between different producers, depending on their ability to adapt to change.

Disruptive events, of all kinds, can have destructive consequences. As mentioned above, Paradise Ridge, the Northern California winery, was exposed to a previous devastating event, the 2017 Tubbs wildfire. This event ravaged Santa Rosa in mere hours and burnt the winery to the ground. The fire destroyed 11 of their 13 structures and caused a loss of approximately USD 15 000 000. After two years of repairing the damage caused by the wildfire, the COVID-19 pandemic struck (McDermaid & Newton, 2020). Paradise Ridge Winery's Co-Owner and Vice President, Rene Byck, realised that their survival depended on taking action and turning this disaster into opportunity, i.e. being resilient. He subsequently discovered methods (changing their marketing strategy) to apply resilience and adapt to the "new normal" (McDermaid & Newton, 2020).The frequency of change increased over the past years and change can cause disruptions in a company's operations (Rick, 2017). Therefore, disruptive events such as pandemics and other disasters should be expected (Mario, 2020). Managers should focus on resilience and sustainability for companies, the society and individuals.

The following paragraphs describe the adverse impact of the current COVID-19 pandemic on different industries. It emphasises the expectation that companies with resilient characteristics are expected to be better equipped to survive financial difficulty than others. Some of the industries that have been affected are discussed below as illustration of the adverse consequences of the pandemic.

Hospitality industry

Severe travel restrictions placed the hospitality industry under extreme pressure. Therefore, many companies in this industry may not survive the lockdown that forbade travelling for leisure. The Bureau for Economic Research's (a research institute in Stellenbosch, South Africa) fourth-quarter survey of "other services" (restaurants, accommodation, transport, real estate and business services) showed that the percentage of hotels and restaurants that reported job losses grew every quarter in 2020. A net 14% reported a decline in employment in quarter one, and reports of declines increased to 60% in quarter two. Quarter three had reports of declines by 67% and quarter four ended with 83%, the highest percentage of reported declines (Bisseker, 2021). However, the Tourism Recovery Report of South Africa states that tourism, which includes

hospitality, is resilient and can recover from a disaster (Tralac, 2020). This can be attributed to this industry having the necessary features for recovery, such as investments with a high return, diverse markets, consumers and products (Tralac, 2020).

Financial services industry

Mr Menon, managing director of the Monetary Authority of Singapore, stated that Singapore's finance sector functioned with little COVID-19 disruption, because of their resilience and ability to adjust (Olano, 2020). According to Lesetja Kganyago, Reserve Bank governor, South Africa's financial sector demonstrates resilience in this unpredictable time (Donnelly, 2020). Therefore, it may seem as if companies in the financial industry generated satisfactory results, despite challenges they faced. According to Sanlam's (South African JSE-listed financial services company) interim results of 2020, the company remained resilient during the challenging times of COVID-19, as reflected in their underlying operational performance during the six months to 30 June 2020 and a healthy solvency position throughout the period. Their new business volumes increased by 40% and investment business inflows increased by 64%. The company claims that their resilience is founded on the quality of their client and other stakeholder relationships, as well as skilled employees (Sanlam, 2021).

Consumer goods industry

The consumer goods industry, in specific the alcoholic beverages industry, is an important creator of employment opportunities at different levels, from vineyard labourers to key players involved in the tourist industry (SAWIS, 2015). Job opportunities were lost in only weeks and food producers struggled with disruptions (Mario, 2020). COVID-19 restrictions led to business closure and had an impact on 1,6 billion workers in the informal sector (Mario, 2020).

The South African wine industry was still struggling to recover after the first ban on alcohol sales, when a second ban was implemented from 12 July 2020 until 17 August 2020 (Shaw, 2021). The first ban, from 27 March 2020 until 1 June 2020, resulted in a loss of more than R8 billion in direct sales (Shaw, 2021). It threatened 27 000 jobs which increases the poverty levels of the most vulnerable in the community (Vinpro, 2021). The third ban from mid-December until February increased the sustainability issues that companies in the industry experienced (Shaw, 2021). Wine producers, therefore, faced extreme uncertainty with the restrictions on alcohol sales changing regularly.

Byck's response to the COVID-19 pandemic and ability to adapt to change is the ideal example of the effective use of the stewardship theory.

2.3 Stewardship

According to the Merriam-Webster online dictionary (2021), “stewardship” is the management of resources in a person’s care. The stewardship theory will form the theoretical basis of the study.

2.3.1 Stewardship theory defined

The stewardship theory, as Snippert *et al*. (2015) explain, is based on a relationship that is developed between the managers (principals) and their employees (stewards). Snippert *et al*. (2015) elaborate on this relationship, stating that trust and collective involvement are essential to achieve goal alignment. L’Huillier (2014) emphasises the above by stating that a company that cultivates trust and delegates to employees is essential when a stewardship approach is being followed.

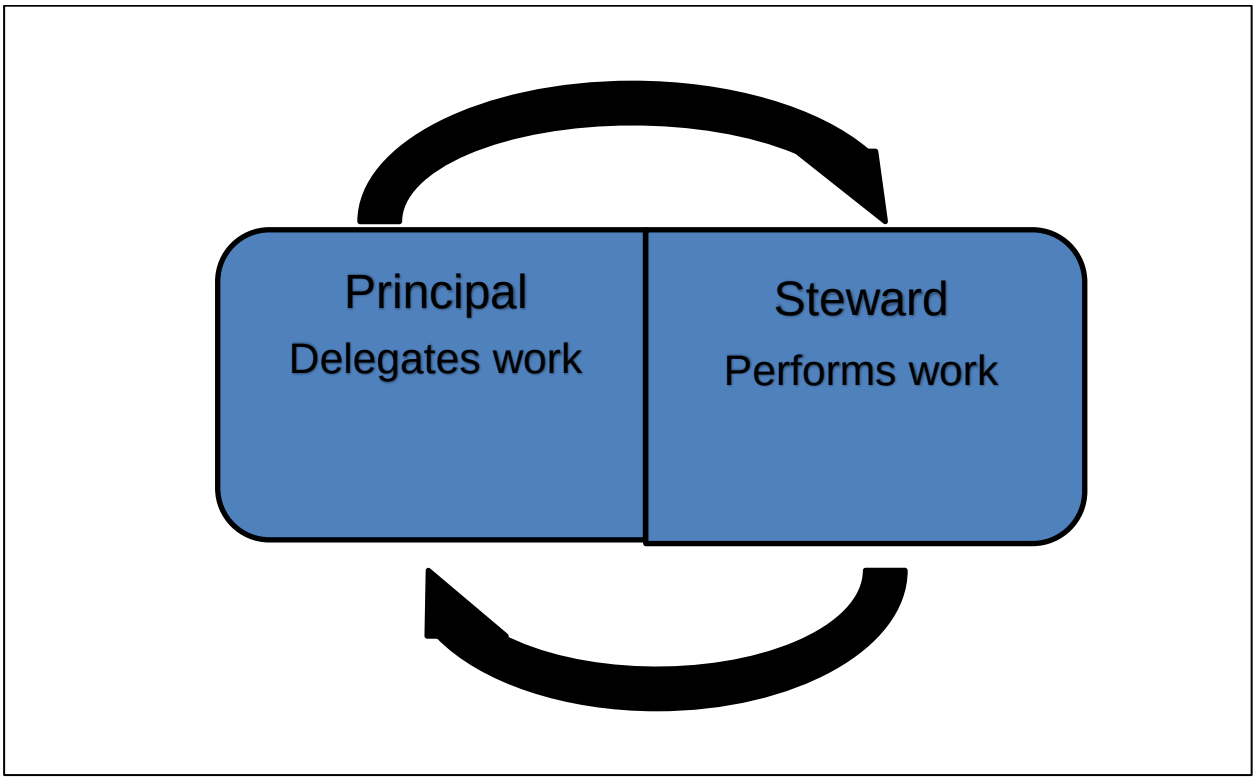

Figure 2-2: The stewardship theory with the actions of the principal and agent

Source: Slyke (2006)

Figure 2-2 illustrates the relationship between the principal and the steward in the stewardship theory. It shows that the principal delegates the work while the steward performs the work. The actions of the principal and steward work towards achieving the same goal.

2.3.2 Fundamentals of the stewardship theory

The primary argument of the stewardship theory is the achievement of mutual goals through the implementation of trust and the involvement of management (Slyke, 2006). According to Snippert *et al*. (2015), a company will gain the following benefits by implementing a stewardship approach. Stewardship will firstly lead to the alignment of goals because it stresses the importance of pro-organisational behaviour. Secondly, stewardship creates an environment built on trust, by allocating responsibility and ensuring autonomy. Thirdly, stewardship places little emphasis on legal contracts and will create a coalesced culture. Stewardship lastly aids the measurement of the completion of tasks by creating a consistent model of governance in companies.

According to Slyke (2006), the stewardship theory is based on the following theoretical principles:

- Assigning risk to the steward.
- Monitoring stewards by implementing frequent feedback and reporting.
- Viewing positive contributions to reputation as an intrinsic reward.
- Reward systems.

Becoming a trusted partner can be viewed as an intrinsic reward by stewards and will align their interests with the company's goals (Slyke, 2006). Therefore, trust is an essential component of the stewardship theory that needs to be cultivated over time. A steward can be trusted if they share similar goals to the principal. Trust involves a level of risk, because the actions of one party can have a detrimental effect on the success of another (Slyke, 2006).

The stewardship theory can be applied by (Slyke, 2006):

- using good reputation as an incentive to achieve goal alignment;
- removing self-serving behaviour; and
- ensuring balance in the processing of information.

The initial introduction of the stewardship theory can be costly as collective decision making and problem solving are time-consuming. However, both Snippert *et al*. (2015) and L'Huillier (2014) argue that the stewardship theory will lead to participants taking the responsibility to reach the desired results. Therefore, this approach may lead to lower transaction costs in the future as stewards and principals manage their mutual goals.

2.3.3 Stewardship and resilience

According to the Sendai Framework (UNISDR, 2015), a company can recover from a disaster by implementing a risk management process (refer to section 1.1.2). Employees have an in-depth view of certain risks as it forms part of their daily operations. Therefore, managers need to trust employees with their input regarding their observations of disaster risk in the company. The stewardship theory is applicable to this study because stewards and principals should align their goals to promote a resilient company. A resilient company can adjust to challenging circumstances (Lengnick-Hall *et al*., 2011). Therefore, the achievement of a resilient company will provide intrinsic rewards to managers because it improves a company's chances of surviving disruptive events.

L'Huillier (2014) mentions that methods should be in place to aid managers in attaining objectives, because trying to control them will lead to demotivation. Therefore, managers should have the ability to implement a method to predict the likelihood of sustainability issues threatening the achievement of their objectives. The stewardship theory requires managers to act without self-serving bias to benefit the company (Slyke, 2006). According to Altman (Caso, 2020), managers need help in reflecting on their past choices that led to current circumstances. Therefore, he advises companies to implement objective models to support managers' decision making in times of crisis (Caso, 2020). Altman's Z-Score is a model used to predict the likelihood of a company's failure and, therefore, sustainability issues (Gerantonis *et al*., 2009). Companies should apply their knowledge of the Z-Score to reach a company's goals in uncertain times by being flexible with their operations (Levy *et al*., 2020).

2.4 Altman's Z-Score

This section will present the history of the Altman Z-Score, the functionality thereof, the different versions of the Z-Score, the individual elements of the Z-Score and trend analysis.

2.4.1 History

Altman's Z-score is a crucial application to estimate the survivability of a company (Hauschild, 2013). Altman developed the Z-Score in 1968. The Z-Score has been used for 50 years to determine the likelihood of a company's failure (Erfani & Vasigh, 2018).

The model represents the following items (as listed in Chapter 1, section 1.2.2):

- X1 = Working capital / Total assets

- X2 = Retained earnings / Total assets
- X3 = Earnings before interest and tax / Total assets
- X4 = Market value of equity / Total liabilities
- X5 = Sales / Total assets

Altman's reasoning behind this development was the decline in the application of ratio analysis of companies, as statistical analysis became the sought-after method (Altman, 1968). Altman (1968) mentioned that the argument against ratio analysis is that it can be a negative reflection of a company's actual performance. A negative financial ratio should not immediately lead to an unfavourable view of a company, as a combination of positive and negative ratios can yield satisfactory results (Altman, 1968).

2.4.2 Functionality

In an interview between Edward Altman and Jeffrey Caso (an expert in the global management consulting firm McKinsey's Washington office), Altman stated that he used the Z-Score in December 2008 to advise the USA House Finance Committee against bailing out General Motors and Chrysler (GMC). At the onset of the financial crisis, Altman's testimony stated that GMC was heading for bankruptcy, which was proven correct six months later (Caso, 2020).

According to Hauschild (2013), the model is 90% accurate in predicting business failure one year before actual failure and 80% accurate two years in advance (refer to section 2.4.4). Glautier and Underdown (2001) conclude that Altman's Z-Score was 95% successful in the prediction of failure of their sampled companies and 72% successful in the prediction two years in advance. However, the Z-Score's application is not limited to the prediction of business failure but can also be used to manage the risks of an existing business (Hauschild, 2013). Altman's Z-Score is a valuable tool for start-up companies that need financial assistance and can be applied in the evaluation of mergers. The uses of Altman's Z-Score extend to setting goals for budgets and evaluating a company's sustainability for growth (Hauschild, 2013). The Z-Score can also be used by banks to determine whether a loan should be granted, thereby decreasing the cost of an excessive creditworthiness check (Altman, 1968).

Vuran (2009) argues that the implementation of prediction models is firstly useful to principals as a preliminary warning of financial distress, and secondly it contributes towards the analysis of a company's prospects by financial institutions. The results of the Z-Score can be an indication of the misappropriation of assets (Glautier & Underdown, 2001) and it can be used by financial institutions to protect their investments (Muller *et al*., 2009). An unsatisfactory Z-Score can act as

a warning signal to managers that corrective action needs to be taken to avoid failure (Glautier & Underdown, 2001). If failure is unavoidable this action by management can provide benefits such as a decrease in bankruptcy costs and the protection of shareholders (Gharaibeh *et al*., 2013). The aim of this study is to develop a model to act as a warning signal of possible business failure. This signal will enable managers to proactively react to signs of distress.

According to Hauschild (2013), the Z-Score is relevant, because it combines five important measures of a company's performance:

1. Profitability
2. Liquidity
3. Efficiency
4. Productivity
5. Leverage

It can, therefore, be concluded that the functionality of Altman's Z-Score extends beyond the mere prediction of a company's failure.

2.4.3 Versions of the Z-Score

The Z-Score has been adapted and developed over the years.

2.4.3.1 Original Z-Score

The Z-Score was mainly used to predict the potential for failure of manufacturing companies. Interpretation of the results obtained from the Z-Score model are as follows (Gerantonis *et al.*, 2009):

- $Z < 1{,}81$: Indicates a high risk of short-term failure.
- $Z > 2{,}99$: Indicates a low risk of failure.
- $1{,}81 < Z < 2{,}99$: Indicates a grey area and shows a company potentially at risk.

Since its original version, Altman created revised versions of the prediction model, because the original model was criticised to be ineffective for privately-held companies.

2.4.3.2 Z-Prime

Altman developed the Z-Prime in 1983, specifically for privately-held manufacturing companies (Hauschild, 2013). The Z-Prime was developed to allow managers to calculate the Z-Score of

their private companies in a scientifically-proven manner (Heine, 2000). This was done because it is more difficult to determine the market value of private companies as opposed to public companies (Valentiam Group, 2020). For this reason, the book value of the equity-to-debt ratio is used when calculating the Z-Prime for privately-held companies. On the other hand, when calculating the original Z-Score of publicly-traded companies, the equity-to-debt ratio is calculated using market values (Hauschild, 2013). The Z-Prime was developed by decreasing the Z-Score's coefficient of X4 (Market value of equity / Total liabilities) from 0,6 to 0,42 because it has less of an impact on the revised Z-Score (Heine, 2000). The Z-Prime is thus based on the original Z-Score.

2.4.3.3 Z-double prime

The Z-double prime revealed a need for a Z-Score applicable to non-manufacturing companies, since the Z-Score was only applicable to manufacturing companies. Therefore, Altman adapted the Z-Score to the Z-double prime in 1995 (Cao, 2016). This score is useful to companies where alternative means of financing are implemented by different companies (Heine, 2000). This model excludes the coefficient of X5 (sales over total assets), which represents the asset turnover ratio. The asset turnover ratio is easily influenced by the industry in which it operates, because industries have different asset bases and sales volumes (Dikov, 2020). Therefore, the goal of the Z-double prime was the development of a more versatile model for different industries (Cao, 2016).

Table 2-1: Versions of the Z-Score

Version of Score[1]	Applicable business	Model
Z-Score	Manufacturing companies	(X1*1,2) + (X2*1,4) + (X3*3,3) + (X4*0,6) + (X5*1,0)
Z-Prime (Z' Score)	Private industrial companies	(X1*0,717) + (X2*0,847) + (X3*3,107) + (X4*0,42) + (X5*0,998)
Z-double prime (Z'' Score)	Non-manufacturing and service companies	(X1*6,56) + (X2*3,26) + (X3*6,72) + (X4*1,05)

Source: Hauschild (2013)

Table 2-1 summarises the models for the different versions of the Z-Score. Altman adapted and developed the original Z-Score over the years to make it applicable to different types of businesses, because he discovered that non-manufacturing companies might have a higher Z-Score than manufacturing companies (Cao, 2016). According to Altman, the original Z-Score was built for manufacturing companies. Therefore, the revised Z-prime and Z-double prime scores were developed for companies in different industrial sectors (Rotblut, 2016).

Cao (2016) argues that the cut-off rating for the Z-Score needs to be revised over time, because lower profitability leads to a decrease in the Z-Score. According to Altman, modern companies, compared to companies in previous years, are exposed to greater risk because of an increase in global competition (Cao, 2016). Increased global competition could threaten the sustainability of companies if it leads to a decrease in their profits (Khakwani *et al*., 2018). Therefore, globalisation poses unique challenges that increases the risk that companies currently face.

2.4.4 Risk considerations

Companies are exposed to systematic and unsystematic risk. Systematic risk has an impact on the entire market and cannot be diversified (Hsu & Jang, 2008; Marshall, 2015), because it is not within management's control (Skalpe, 2003). Therefore, systematic risk is a risk inherent to a

[1] Altman developed a fourth business failure predictor, ZETA®, in 1977. The ZETA® is claimed to be an accurate prediction of a company's failure five years in advance. However, the formula's access is restricted, as it belongs exclusively to subscribers of ZETA Services, Inc. (Heine, 2000).

certain market that cannot be avoided. In contrast, unsystematic risk is related to a specific company (Marshall, 2015). It is unique to individual companies, because it relates to operational and financial decisions made by managers (Hsu & Jang, 2008). According to Skalpe (2003), unsystematic risk is a result of operational leverage and can be used to evaluate a company's performance. Therefore, unsystematic risk is a risk that can be influenced by managerial decisions.

It can be concluded that companies are exposed to various risks depending on the industry in which they operate. It supports Altman's statement that the Z-Score needs to be adapted for a specific industry or market, as well as the environment in which it operates (Cao, 2016).

Altman advises non-manufacturing companies to implement the Z-double prime (Cao, 2016). A study conducted by Hayes *et al*. (2010) reveal that the Z-double prime accurately predicted possible financial distress for Blockbusters two years in advance, as they received a going concern warning in April 2009. In contrast, Netflix obtained a score that falls into the safe zone and did not file for bankruptcy. The study concluded that the Z-double prime is a successful predictor of financial distress in companies because it accurately identified eight out of nine companies with financial distress (Hayes *et al*., 2010). Therefore, it was found that the Z-double prime provided more accurate results than Altman's Z-Score.

Table 2-2: Interpretation of the results of the versions of the Z-Score

	High risk	**Moderate risk**	**Low risk**
Z-Score	< 1,81	>=1,81 < 2,99	> = 2,99
Z-Prime (Z' Score)	< 1,23	>=1,23 < 2,9	>= 2,9
Z-double prime (Z'' Score)	< 1,1	>=1,1 < 2,6	>= 2,6

Source: Hauschild (2013)

Table 2-2 illustrates the interpretation of the different versions of the Z-Score. It can be concluded that a Z-Score of less than 1,81 indicates a high risk of short-term failure and a Z-Score greater than, or equal to 2,99, indicates a low risk of failure. A company with a Z-Prime Score of less than 1,23 has a high risk of short-term failure and a Z-Prime Score greater than, or equal to 2,9 has a

low risk of failure. The last version of Altman's Z-Score, the Z-double prime, was used in this study. It represents a high risk of failure if less than 1,1 and a low risk if equal to, or greater than 2,6.

2.4.5 Individual elements of the Z-Score

According to Altman (1968), the development of the Z-Score was based on the selection of 33 bankrupt companies and 33 non-bankrupt companies. He mentions that it requires the selection of key financial indicators and the allocation of a weight to each indicator (Altman, 1968).

Mahama (2015) argues the importance of these elements in providing essential financial information. He classifies the elements of Altman's Z-Score as measurements of key financial indicators:

- X1: Measurement of liquidity (readily convertible into a determinable cash value).
- X2 and X3: Measurement of profitability (yielding positive returns).
- X4: Measurement of leverage (applying credit to improve speculation abilities).
- X5: Measurement of *efficiency* (gaining desired outcomes).

From the above it can be derived that Altman's Z-Score is functional, because it provides information around key financial indicators such as liquidity, profitability, leverage and efficiency.

According to Hauschild (2013), each element of the Z-Score should be evaluated separately to determine if it contributes to satisfactory results. This will ensure that management takes corrective actions to limit the detrimental consequences of elements that negatively impact the total value of the Z-Score. For example, turnaround strategies by managers to improve deteriorating EBIT over total assets (X3), may improve the company's performance. This improvement may lead to an increase in the other contributing elements of the Z-Score (Hauschild, 2013). Therefore Hauschild (2013) notes that the elements of the Z-Score are interrelated, because an improvement in a single element will have a positive effect on the remaining elements.

A company at low risk could have items that could negatively impact them if left unaddressed (Hauschild, 2013). According to Hauschild (2013), if X1 (which is working capital over total assets) is negative, management needs to address this immediately. A negative working capital ratio indicates financial problems because current assets are less than current liabilities, i.e. going concern problems. Altman believes that companies should aim to achieve a balance between the

individual elements of the Z-Score by improving the performance of the different metrics (Caso, 2020). Therefore, items of the model should be considered individually as well as collectively.

2.4.6 Trend analysis

Data for the Z-Score is obtained from the statement of profit and loss and other comprehensive income and statement of financial position at a point in time. It should be taken into consideration that the results of Altman's Z-Score will be distorted if the financial data used as an input is a misrepresentation of actual financial results (Erfani & Vasigh, 2018). According to Hauschild (2013) data of a minimum of three periods need to be used to identify a trend. A negative result in a single year is not cause for concern, but a pattern of losses over three years should indicate to management that extreme intervention is required. A history of losses can negatively impact stakeholders' perceptions of a company. It can be concluded that trend analysis is necessary in the evaluation of the Z-Score (Hauschild, 2013).

Trend analysis consists of historical analysis and industry analysis. The historical data of the company should be compared to the historical data of the industry to determine if it seems realistic. Historical analysis consists of the comparison of the company's financial data of prior years to identify a pattern. This pattern can then be used to predict if the company's financial performance will possibly improve, worsen, or remain constant in the future (Rulandari & Sudrajat, 2017).

Historical analysis should be done for a minimum of three years using financial data (Rulandari & Sudrajat, 2017). Altman mentions that companies with a Z-Score showing a downward trend in 2018, 2019 and 2020 might indicate a vulnerable financial position even before the pandemic hit (Caso, 2020). Therefore, similar behaviour of three years will be seen as a trend.

The trend analysis of the Z-Score over several years may indicate the dimensions of resilience over a period of time. Therefore, this study calculated the Z-double prime for Company A to Company G from 2015 to 2020. The Z-double prime was calculated from 2014 to 2018 for Company H, as it was delisted in 2020 (refer section 4.4.2).

2.5 Dimensions of resilience

The dimensions of resilience will be introduced, followed by a discussion of the concepts of readiness, response and recovery.

2.5.1 Introduction

Dalziell and McManus (2004) acknowledge that companies are complex and dynamic. Therefore, measuring resilience cannot be achieved by only identifying the correlation between the cause and effect of disruptive events. As a basis to measuring resilience, it is important to consider the company in terms of the properties of their systems, such as (Dalziell & McManus, 2004):

- determining the system's purpose and defining the system's boundaries;
- identification of the different components or elements that are essential to the system's achievement of its purpose;
- analysis of the relationships between these different components to understand how they work together; and
- review of the system's interaction with its environment, by determining how it influences the environment and how the environment causes change.

When applying the above with reference to disruptive events, a company's purpose will be the survival of the disruptive event by being resilient. Readiness, response and recovery are the dimensions that need to be present to achieve resilience (Chowdhury *et al*., 2013). These dimensions have an interdependent relationship, because an improvement in the readiness dimension can result in an appropriate response and recovery to the event (Kolodny-Goetz *et al*., 2021).

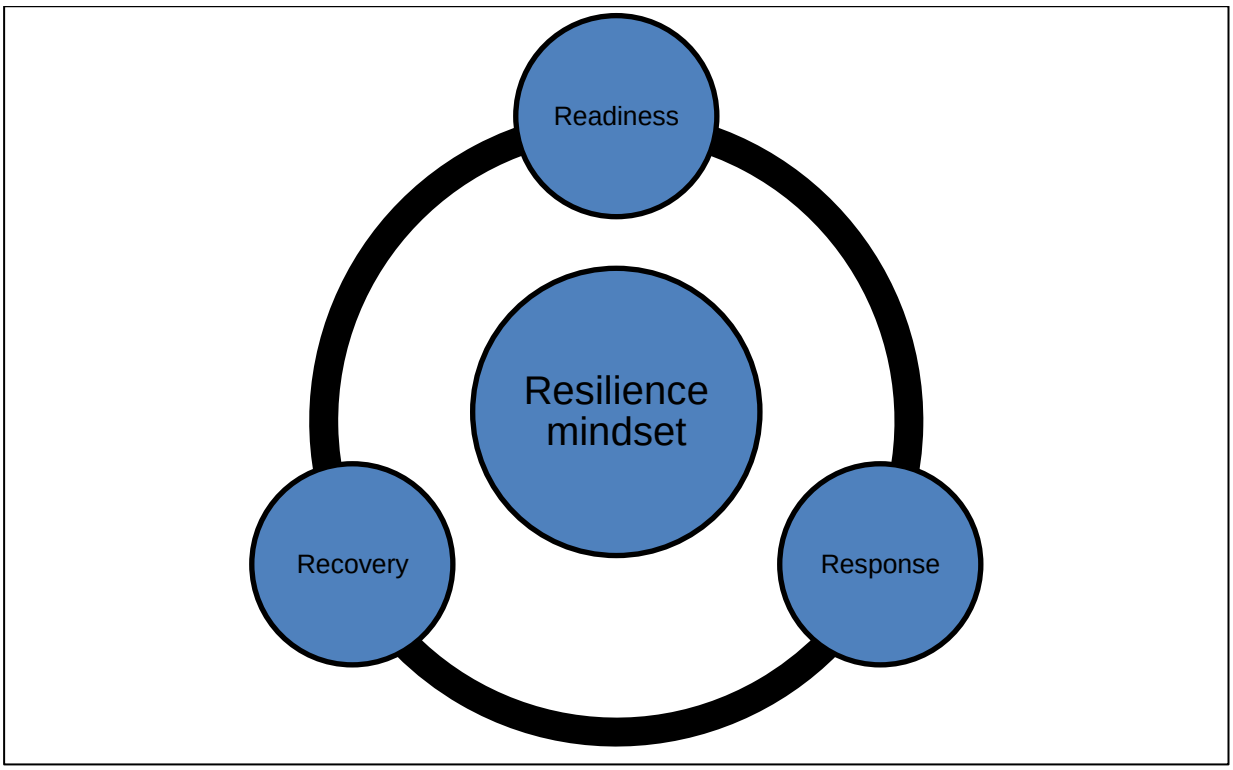

Figure 2-3: The resilience mindset

Source: Adapted from Su *et al*. (2021)

Figure 2-3 illustrates the interrelationship between the dimensions of resilience that is the result of a resilience mindset. The figure emphasises the importance of having a resilience mindset, to effectively mitigate and recover from potential disruptive events.

Companies operate in a dynamic business environment that will have an impact on their operations (Erol *et al*., 2010). The evaluation of the readiness, response and recovery dimensions by management may increase a company's ability to respond to change (Kolodny-Goetz *et al*., 2021). An event that causes a company to make changes in its operations can be seen as a disruptive event (Rick, 2017). The management of disruptive events, such as disasters, can be divided into a pre-disaster phase and a post-disaster phase. Managers are shifting their focus to the survivability of their companies with resilience in the pre-disaster phase (Sahebjamnia *et al*., 2015).

2.5.2 Readiness

Managers need to prepare in anticipation of disruptive events to enable them to deploy resources to survive disasters (Sahebjamnia *et al*., 2015). Plans that can be successfully implemented can vary for the same disruptive event, therefore the available resources need to be taken into

consideration (Sahebjamnia *et al*., 2015). According to the Merriam-Webster online dictionary (2021), “readiness” is a state of preparation. Therefore, the readiness dimension fits the description of the pre-disaster phase.

The number of resources allocated can have a direct impact on the decrease in a company’s operational performance and the time it takes to recover (Su *et al*., 2021). Ownership of assets is another contributing factor to the readiness dimension of resilience because a company that owns assets does not have the outflow of rent and the assets can be utilised as security for obtaining a loan (Dahlhamer & Tierney, 1998). Therefore, companies with a shortage of resources are not prepared to overcome disruptive events.

Knowledge of a company’s readiness will help companies to return to their original state after a disruptive event. Management’s assessment of a company’s readiness in the advent of a major disruptive event may guide them in the implementation of strategies to survive disruptive events (Kolodny-Goetz *et al*., 2021). Companies that have experienced prior disasters are more prepared to handle a disruptive event, because managers have implemented strategies to overcome the impact of previous disasters (Dahlhamer & Tierney, 1998). The experience gained by managers acting as stewards will enable them to aid their company in surviving unforeseen circumstances. However, the assessment of a company’s readiness is a continuous process, because their level of readiness will vary over time (Domlyn & Wandersman, 2019).

2.5.3 Response

A company should respond to change, because the business environment is dynamic (Dalziell & McManus, 2004). According to the Merriam-Webster online dictionary (2021), “response” is the reaction to a specific input. Therefore, a company’s response to a disruptive event entails the application of the resources accumulated in the readiness dimension to avert the adverse consequences of a disaster. Managers should use their knowledge to apply these resources in a new or existing market (Dalziell & McManus, 2004). A successful response to a disruptive event will take minimal time (Erol *et al*., 2010). According to Arabi *et al.* (2021), a company should be flexible and able to increase their performance in minimal time. The response can occur automatically or as a formal process with communication between the principals and stewards (Dalziell & McManus, 2004). The type of response will be dependent on the planning implemented in preparing for the event. Therefore, the post-disaster response and pre-disaster readiness dimensions are interrelated.

2.5.4 Recovery

A company should recover from disruptive events by minimising the long-term impact (Ivanov *et al*., 2017). According to the Merriam-Webster online dictionary (2021), “recovery” is the act of overcoming a problem, especially after an economic downturn. A company’s ability to adapt to change is an important indicator of resilience, but it cannot be evaluated in isolation. When sufficient time passes companies will be able to adapt to change, but some companies will have a faster reaction time than others (Erol *et al*., 2010). Therefore, recovery time is an important measure of the resilience of a company.

Recovery time can be measured as the time between the start and stop points of disruptive events (Erol *et al*., 2010). The start point depends on the nature of the disruption and whether the disruption has a direct or indirect effect on the company. Therefore, the start point of the disruption could either be when the disruptive event takes place or when the event disrupts the company. In some instances, both can happen at the same time (Erol *et al*., 2010).

The stop point depends on the definition of the recovered state. The recovered state could either be the company’s original state, before the disruptive event took place, or a minimum state, which is lower than the original state (Erol *et al*., 2010). A company should not become stagnant. A sustainable company should recover to a “new normal” after a disruptive event (Dalziell & McManus, 2004). Therefore, desired recovery will be a company that applied the dimensions of resilience to achieve improved post-disaster operations.

A company’s recovery can be measured with reference to their financial performance before the disaster occurs, because recovery is dependent on income (Dahlhamer & Tierney, 1998). A company with a history of satisfactory financial results will have cash resources to utilise in times of economic adversity. Another indicator of expected recovery is the impact of disruptions on the continuity of a company’s operations. A company with enough skilled employees will be better equipped to handle disruptions, because their continuity will not be compromised (Dahlhamer & Tierney, 1998).

Dalziell and McManus (2004) describe the measurement of resilience as a requirement to be a resilient company. They identify the development of simple methods that companies can use to evaluate their resilience as a main element of this measurement scheme. In this study, the analysis of the integrated reports of the sampled companies were a supplement to the calculation of their Z-double prime scores to evaluate their resilience.

2.6 Integrated reporting

An integrated report communicates how a company's strategy, performance and prospects support value creation (Integrated Reporting, 2021). Integrated reporting is an opportunity to provide richer communication to address the needs of stakeholders (Simnett & Huggins, 2015). According to the Merriam-Webster online dictionary (2021), "integrated" means to form part of a bigger unit and a "report" is defined as a verbal or written description of something. Therefore, an integrated report is an all-inclusive written report that provides information to stakeholders. The objectives of integrated reports are to (Integrated Reporting, 2021):

- highlight the factors that could have a material impact on a company's value creation over time;
- promote stewardship for financial, human and natural resources; and
- support actions that aim to create value over the short and long term.

The integrated report is essential, because its main objective is to explain to stakeholders how a company manages value creation over time. According to a recent study in March 2019, South Africa has the best integrated reporting worldwide explaining value creation over time (Eccles *et al*., 2019). Companies in the Netherlands and Germany are placed second and third. The authors evaluated companies' integrated reporting based on the integrated reporting's content elements, such as outlook, risk and opportunities (Eccles *et al*., 2019).

Resilience can be seen as improved risk management (Pettit *et al*., 2019). Therefore, risk relates to resilience. Hope *et al.* (2016), however, argue that the disclosure of risk factors is not sufficient as it is not adapted according to the individual risks. Therefore, the disclosures in integrated reporting can still be improved (refer to section 5.5).

A company's outlook is another element disclosed in their integrated reports. It is evaluated based on a company's exposure to changes in the external environment and its ability to handle it. The discussion on outlook determines how changes in the external environment could derail the achievement of strategic objectives (Eccles *et al*., 2019). Gallopin (2006) describes enterprise resilience as a company's ability to recover from potential risks and disruptions (refer to section 1.1.2). Therefore, both outlook and risk relate to resilience, even though there is no specific requirements of resilience disclosures, it can be argued that a company's disclosure of their outlook and risk could be viewed as an indirect disclosure of their resilience. However, disclosures of a company's outlook and risk, without reference to the dimensions of resilience (refer to section 1.2.1) will only be the "*tip of the iceberg"* of the considerations for a resilient company. The

integrated reporting framework does require discussions on the impact of a company's activities on six capitals, namely (Integrated Reporting, 2021):

- financial (funds obtained through financing or investments);
- manufactured (physical objects, such as buildings or equipment);
- intellectual (knowledge-based intangibles, such as patents);
- human (the competence and innovation of people);
- social and relationship (stakeholder relationships and shared values); and
- natural (environmental resources, such as water or land).

Integrated reporting helps management to determine how inputs form part of the process of value creation. It motivates managers to accept responsibility for their actions and to provide honest information (Friese, 2021).

The Association of Chartered Certified Accountants (ACCA) investigated the disclosures of integrated thinking in integrated reports. Companies mentioned that integrated reporting improves their processes and contributed positively to organisational resilience (ACCA, 2021). The report mentions that integrated reporting shows improvement, however, it is still not part of the management process (ACCA, 2021).

2.7 Summary

The aim of this chapter was to address the first secondary objective as set in Chapter 1 (section 1.6.2.1), which is to consider the principles underlying Altman's Z-Score (including aspects around the going concern concept) and the resilience concept.

The chapter explored the stewardship theory and the history and function of Altman's Z-Score. It investigated the readiness, response and recovery dimensions of resilience. The chapter described the importance of integrated reporting and identified the gap in the requirement of resilience disclosures, which has become more important in the uncertain times of COVID-19.

The COVID-19 pandemic, as a disruptive event, had a devastating impact on industries worldwide and it is not an isolated occurrence, i.e. companies should expect and be prepared for a disruptive event. Managers should, therefore, implement methods to ensure that principals and stewards share a shared goal of being a resilient company. It was noted that it is necessary to analyse the elements of Altman's Z-Score individually as well as collectively to reach a conclusion regarding the financial performance of companies.

The chapter elaborated on the readiness, response and recovery dimensions of resilience. The readiness dimension is dependent on a company having the necessary resources to survive a disruptive event. The response dimension is the utilisation of these resources to respond to a disruptive event. Lastly, the recovery dimension is concerned with the time that a company needs to return to its original state or a minimum state. It can be noted that the dimensions of resilience are interrelated and therefore each dimension should be evaluated separately and collectively by management. This study will evaluate the dimensions of resilience separately (refer figure 3-5) by identifying elements applicable to the specific dimension. It will conclude on the resilience of a company after the collective consideration of these dimensions that is considered to form the "building blocks" of resilience.

The chapter concluded with a discussion on integrated reporting because it will be used in the analysis of the qualitative information of the companies.

The next chapter will address the research design and methodology by elaborating on the ADR process to address the second secondary research objective, as stated in Chapter 1 (section 1.6.2.2). The chapter will apply the stages and principles of the ADR process to this study.

CHAPTER 3

3 RESEARCH DESIGN AND METHODOLOGY

The previous chapter provided background to the study by elaborating on the literature review.

3.1 Introduction

The aim of this chapter is to formulate a research methodology to be adopted to address the second secondary research objective, as stated in Chapter 1 (section 1.6.2.2). This chapter focuses on the research design and methodology followed and how it supports the motivation. It will discuss the purpose and characteristics of research. The research methodology will be broken down into research philosophy and research approach and the research strategy will be discussed. The research design will be presented based on the stages and principles of the ADR process. The data collection and analysis stage, including the use of ATLAS.ti, will be discussed. Chapter 3 in combination with Chapter 4 will address the second secondary objective.

An overview of this chapter is provided in Figure 3-1.

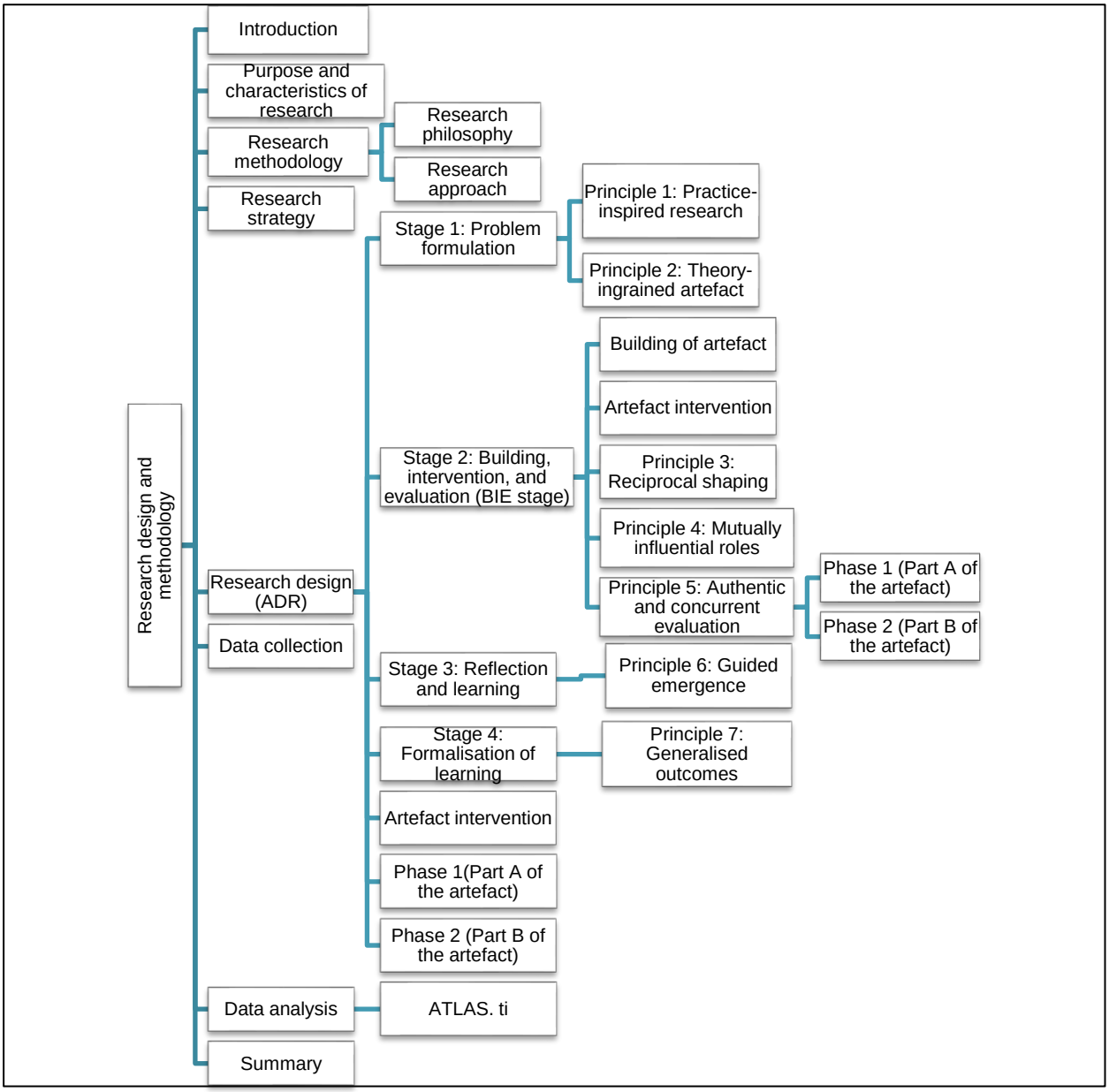

Figure 3-1: Chapter overview

This chapter firstly discusses the purpose and characteristics of research. It is followed by a discussion of the research methodology based on the six elements of the honeycomb methodology. The research methodology will consist of a literature review and an empirical study. The chapter will elaborate on the empirical study that will be conducted in two phases. It describes the research strategy and design. The chapter concludes by adopting a quantitative and qualitative approach and applying ADR as the research method suitable for this study. The data collection and analysis processes are performed in the next chapter, Chapter 4.

3.2 Purpose and characteristics of research

Walliman (2011) defines research as the application of methods to prove facts. Research is the continuous observation of a process from different perspectives to arrive at a conclusion (Singh, 2006). According to the Merriam-Webster online dictionary (2021), “research” is a meticulous search for information on a specific subject.

Singh (2006) notes the following from his analysis of research definitions:

- Research collects new information in an objective manner.
- Research quantitatively sorts collected data.
- Research records the procedures followed to arrive at an appropriate conclusion.
- Conclusions reflect the results obtained and may be unpopular.

According to Singh (2006), there are five main characteristics of research:

1. Research looks to the future and should be an innovative process.
2. Research employs speculative reasoning.
3. The motivation behind research should be the desire for improvement.
4. Research is a balance between philosophy and logical thinking.
5. Facts cannot be researched in isolation but should be evaluated as part of a complex process.

Walliman (2011) expands on the above by listing the applications of research. Research can be applied to: (1) compare contrasting ideas to identify the differences; (2) classify items in categories; (3) examine items to identify a correlation; and (4) predict an occurrence by assuming that an existing correlation can be extrapolated into the future. Therefore, research is a scientific process to obtain new information in solving a research problem.

The next section will describe the research methodology.

3.3 Research methodology

The discussion of the research methodology will be based on the honeycomb methodology as presented in Figure 3-2.

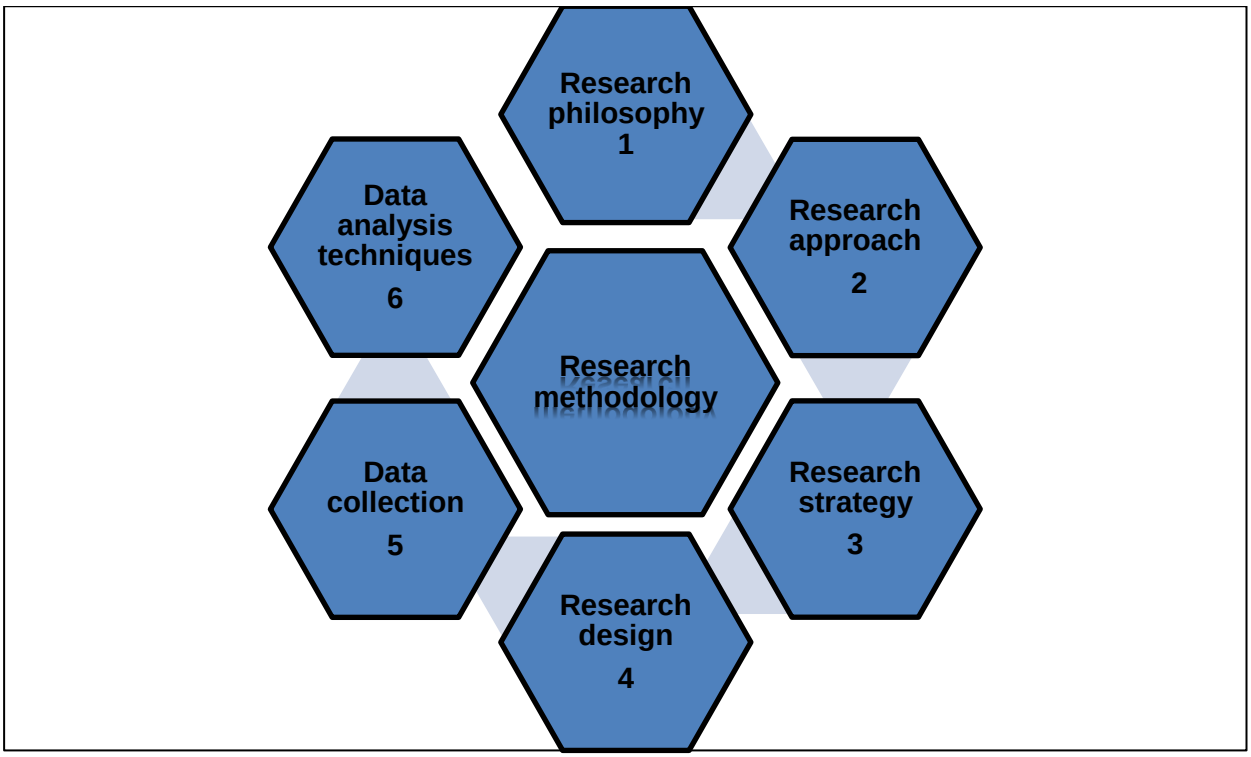

Figure 3-2: The honeycomb of research methodology

Source: Wilson (2014)

Figure 3-2 illustrates that the honeycomb of research methodology consists of six main elements: research philosophy, research approach, research strategy, research design, data collection and data analysis techniques. These elements function to form the research methodology. The honeycomb model will form the basis of the discussion of the six main elements of the research methodology.

3.3.1 Research philosophy

Research philosophy is the first element of the honeycomb model (Figure 3-2). Research philosophy is the development of knowledge in a certain domain. It involves assumptions that are shaped by a person's values and beliefs (Saunders *et al*., 2019).

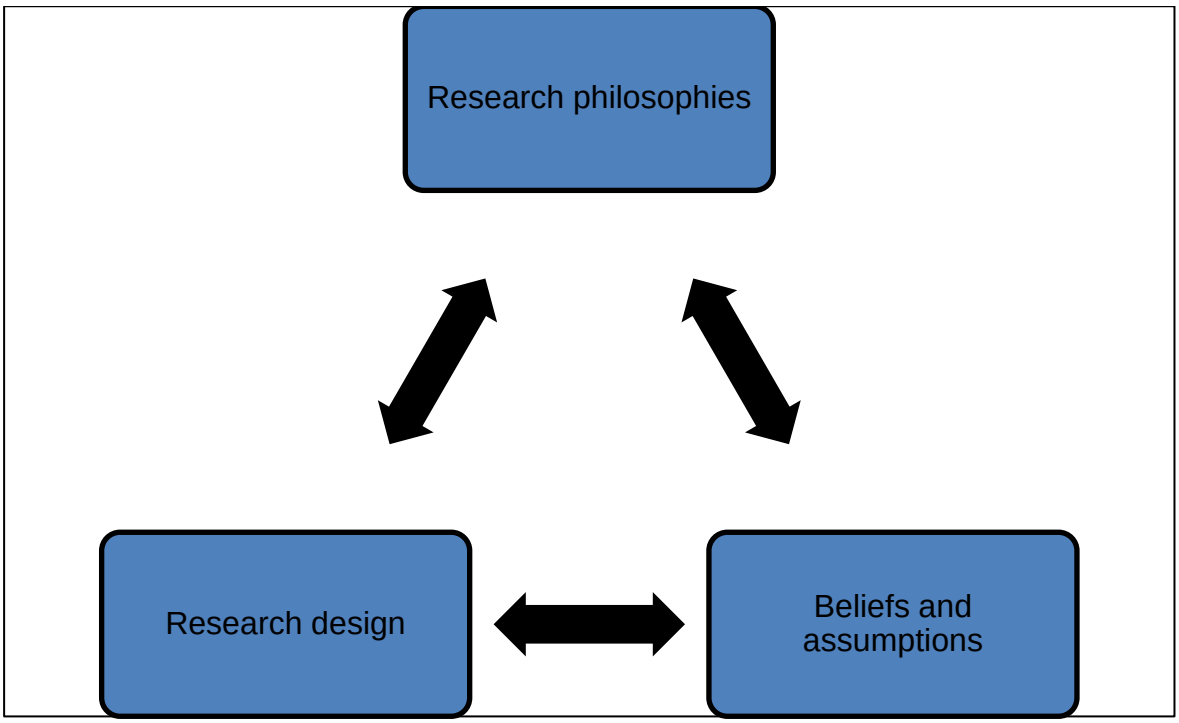

Figure 3-3: Research philosophy

Source: Saunders *et al*. (2019)

Figure 3-3 emphasises the importance of the research philosophy in the research process as it influences the research design and methodology (Saunders *et al*., 2019). The philosophy is shaped by a researcher's beliefs and assumptions, such as ontology and epistemology.

Ontological assumptions are made about reality that will form the opinion of the research subject (Saunders *et al*., 2019). Ontology can be an objective view of the researcher or be influenced by circumstances that shapes reality (De Villiers & Fouché, 2015). Therefore, ontology will depend on a researcher's interpretation of occurrences. The object of this study is companies with going concern problems. Therefore, ontology will shape the way in which the companies' performance will be evaluated. Within the concept of ontology, it is possible to define further research paradigms. The main research paradigms are positivism, pragmatism and interpretivism. Positivism views knowledge as an object, while a pragmatist's research is based on the research problem (Wilson, 2014). De Villiers and Fouché (2015) concur that a positivist applies research in an objective manner to clarify certain events.

Interpretivists on the other hand argue that knowledge is subjective and formed by a researcher's experiences (McChesney & Aldridge, 2019). They aim to create a setting for researchers to analyse circumstances as experienced by participants, or in this case, managers (McChesney & Aldridge, 2019). A researcher's values and beliefs will influence their analysis of data (Ryan,

2018). According to Wilson (2014), interpretivism views knowledge as a subjective idea. They aim to gain an understanding of people's actions and reasoning by observing their behaviour (De Villiers & Fouché, 2015). This study will focus on the subjective beliefs of the researcher in developing an Altman's Z-Score-based model to support organisational resilience. Therefore, the research is nested in interpretivism.

Epistemology entails decisions about the acceptability of knowledge (Saunders *et al*., 2019). Epistemology determines the researcher's perspective of knowledge. It can be based on observations made by conducting experiments or a complex process subject to interpretation (De Villiers & Fouché, 2015). The study will comprise the analysis of data from the integrated reports of companies. Therefore, epistemological assumptions will be made in deciding whether the data can be considered as valid. These epistemological assumptions made can be either objective or subjective. Objectivism is concerned with the analysis of data that can be measured and the existing data is not shaped by the researcher's personal values and beliefs (Bryman, 2008). In contrast, subjectivism is based on the perspectives of the researcher as they continually evaluate the research experience (Bryman, 2008). The researcher will be involved in the analysis of the data, and the interpretation of the results will be influenced by her values and beliefs. Therefore, this study will be subjective in nature.

3.3.2 Research approach

Research approach is the second element of the honeycomb model (Figure 3-1). According to Wilson (2014), the research approach can be deductive or inductive. Young *et al*. (2020) affirm that a deductive approach investigates a theory to accept or reject it. It aims to prove a hypothesis from a selected theory (Martelli & Greener, 2018). Therefore, a deductive approach is a structured approach that results in a conclusion on a selected hypothesis.

In contrast, an inductive approach aims to develop a theory by collecting and examining data (Wilson, 2014) and requires a researcher's involvement in finding a solution to a real problem (Creswell, 2014). This approach analyses observations to draw a conclusion (Walliman, 2011). An inductive researcher can implement statistical methods or observations to generate a theory (Young *et al*., 2020). An inductive approach will develop theory from research by starting with the focus of the study (Martelli & Greener, 2018). The latter in this study is the development of a resilience decision-support model in anticipation of potential disruptive events. Therefore, an inductive viewpoint will be applicable to this study. Young *et al*. (2020) further argue that an intricate research strategy will disconnect quantitative research from a deductive approach, and qualitative research from an inductive approach (Young *et al*., 2020).

3.4 Research strategy

Research strategy is the third element of the honeycomb model (Figure 3-1). The three main research strategies are qualitative, quantitative and a mixed-method approach (Creswell, 2014).

Quantitative research is the extraction of precise and numerical data to analyse it (Johnson & Onwuegbuzie, 2004). According to the Merriam-Webster online dictionary (2021), “quantitative” can be determined in numbers. The aim of the analysis of the numerical data is to test a hypothesis (Creswell, 2014). The results derived from testing the sample group will be extrapolated to a larger group (Maree & Pietersen, 2007). Therefore, quantitative research is the analysis of data by using measurable amounts.

In contrast, qualitative research responds to stakeholders’ needs by exploring why a phenomenon occurs (Johnson & Onwuegbuzie, 2004). According to Creswell (2014), the objective of qualitative research is to investigate actual problems by following an analytical strategy. Qualitative research aims to describe events from the perspective of the participant (Jamali, 2018). Babbie and Mouton (2008) strengthen this argument, claiming that qualitative research enables the researcher to understand the environment examined by exploring relevant knowledge. Creswell (2014) mentions that qualitative research includes the collection of data by analysing documents (reports or financial statements) or by observing the behaviour of participants. Therefore, qualitative research solves problems by investigating existent occurrences. It can be concluded that quantitative research is numerically quantifiable, while qualitative research requires the researcher to ask probing questions.

The final approach, mixed methods, endeavours to integrate the qualitative and quantitative approaches to simultaneously gain the advantages of both methods and eliminate the disadvantages (Bahari, 2010). A mixed-methods approach is the collection of data with qualitative and quantitative methods (De Villiers & Fouché, 2015). This approach is superior to a single method because it allows the triangulation of information (McChesney & Aldridge, 2019). Therefore, a mixed-methods approach is beneficial because it enables the researcher to reap the benefits of either qualitative or quantitative research whilst eliminating the weaknesses.

This study will be conducted in two phases. Phase 1 will be quantitative in nature as it will numerically analyse financial data by calculating the Z-Score of the selected companies. Phase 2 will be qualitative in nature and will entail the compilation of a spreadsheet (from literature) to determine the essential elements of a resilient company. The elements will be divided between the readiness, response and recovery dimensions of resilience. The spreadsheet will be used as a measuring instrument to assess resilience using the integrated reports of the sampled

companies. This application will investigate the survivability of companies which is an actual problem and, therefore, a qualitative approach will be followed.

3.5 Research design

The fourth element of the honeycomb method is the research design (Figure 3-1). This study will use the ADR method to address the research problem. ADR is an integration between action research (AR) and design science research (DSR) (Collatto *et al*., 2018).

AR is a research method that requires the collaboration between a researcher and a person that will benefit from the research process, such as the manager of the company. It aims to simultaneously find a solution to an issue whilst researching it (Bilandzic & Venable, 2011). AR is therefore a participatory research method that integrates actions and solutions (Collatto *et al*., 2018).

DSR is a research method that aims to solve problems (Collatto *et al*., 2018). The researcher develops an artefact and examines the theoretical contribution of this artefact (Collatto *et al*., 2018). The researcher and project participants can adapt the artefact over the research lifecycle (Haj-Bolouri *et al*., 2017).

Both AR and DSR aim to reach the same objective of solving a problem, but they implement varying procedures to reach this goal. However, the similarities between these methods made it possible to combine it into a new method, namely ADR. This will enable the researcher to benefit from the principle of designing an artefact in DSR and the reflection and learning phase from AR (Collatto *et al*., 2018).

ADR is a research philosophy with the objective to gain prescriptive design knowledge by examining ensemble artefacts in an organisational setting (Sein *et al*., 2011). According to Sein *et al*. (2011), a key requirement of the ADR methodology is that it should be designed and developed as a process integrated with the environment in which it will operate. According to Peffers *et al*. (2018), a solution to the new problem could be found by designing a practical solution. ADR addresses the following (Sein *et al*., 2011):

- Dealing with a problematic situation in an organisation with intervention.
- Developing an artefact to find a solution to the problematic situation.

The ADR method consists of four stages and seven principles to address an organisational problem and is illustrated in Figure 3-4 (Sein *et al*., 2011).

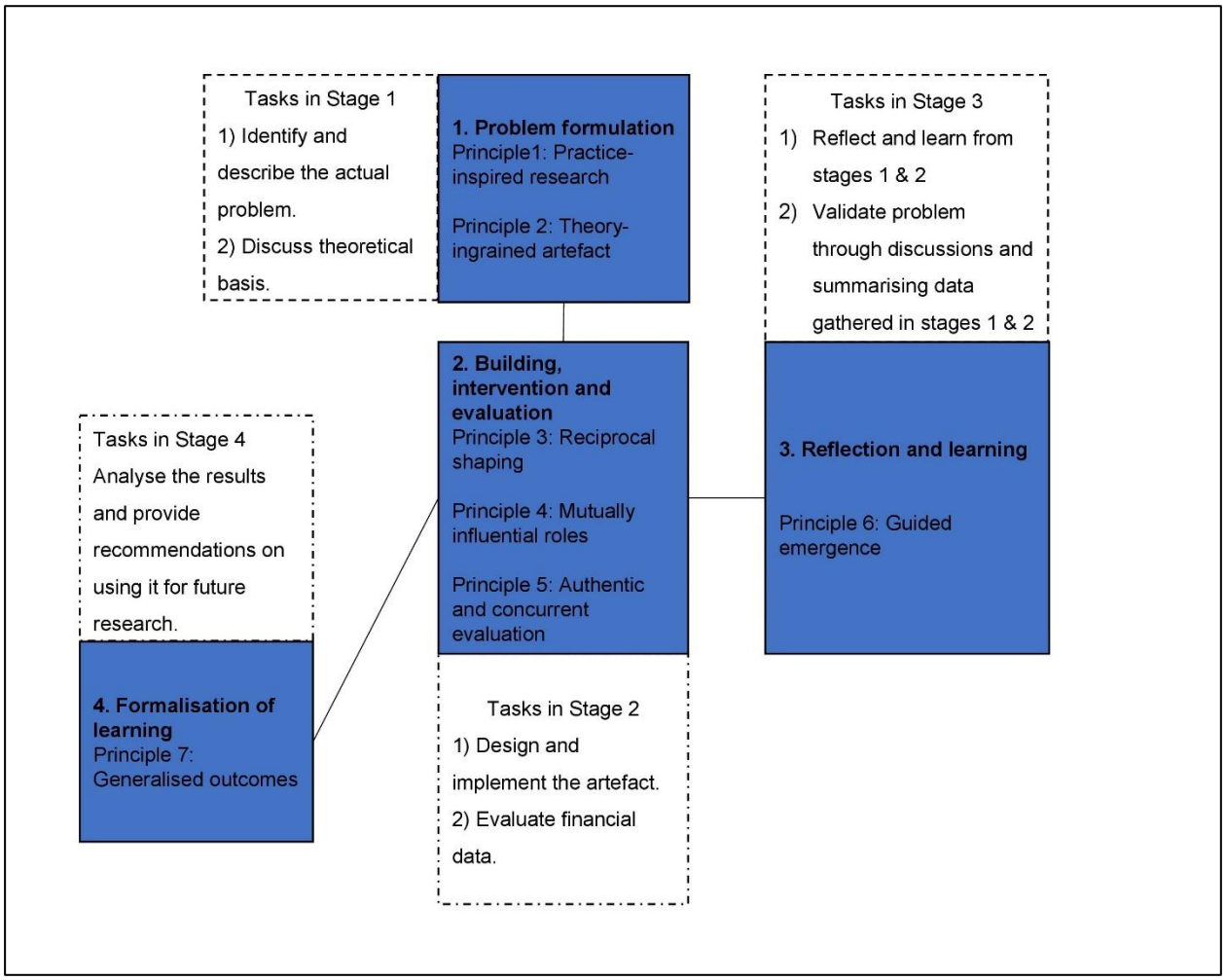

Figure 3-4: ADR method: Stages and principles

Source: Adapted from Sein *et al.* (2011)

Figure 3-4 illustrates the stages and principles used in the ADR method. The model includes the tasks of the stages applicable to this study.

3.5.1 Stage 1: Problem formulation

The first stage investigates an existing or anticipated problem whilst adhering to Principle 1.

3.5.1.1 Principle 1: Practice-inspired research

ADR is based on actual, real-life problems observed during research. ADR entails identifying a problem by firstly considering the needs of the company and the research participants. Secondly, ADR considers whether the identified problem should be investigated as an element of a broader group of problems (Haj-Bolouri *et al*., 2017). According to Peffers *et al*. (2018), the identified problem could be unaddressed or addressed with undesirable solutions. Therefore, problem

identification requires knowledge of problems and the effectiveness of their current solutions. Elaborating on the value to be gained from finding the solution to a specific problem will motivate the participants (Peffers *et al*., 2018). Table 3-1 presents the contribution of the literature review in identifying the research problem.

Table 3-1: Contribution of literature review in problem identification

Section	Literature review	Contribution to problem identification
2.2	Disruptive events	Described the adverse consequences of disruptive events and indicated the necessity of a possible predictor of financial distress.
2.3.3	Stewardship and resilience	Emphasised the importance of management applying the stewardship theory during the risk management process to ensure a resilient company.
2.4.2	Altman's Z-Score	Supports the effectiveness of Altman's Z-Score as predictor of possible business failure by investigating its numerous uses.
2.5.4	Risk considerations	Companies are exposed to different risks and therefore the Z-Score should be adapted for the environment in which it operates.
2.7	Integrated reporting	The integrated reporting framework does not require specific resilience disclosures.

Table 3-1 presents the results from the literature review discussed in Chapter 2 with the aim of linking it to the problem formulation stage in the ADR process. Within this study, the problem addressed is the possibility of using Altman's Z-Score as an initial indicator of business failure and then incorporating various resilience dimensions as a predictor of organisational resilience, especially in the advent of a significant disruptive event (as discussed in the problem statement in Chapter 1, section 1.5). The first principle is therefore adhered to.

3.5.1.2 Principle 2: Theory-ingrained artefact

The ADR process is used to design an artefact as a solution to the identified problem. The problem is contextualised and investigated using a sound theoretical foundation. Knowledge of theory could bring forth a solution to the problem (Peffers *et al*., 2018).

This study is nested in the stewardship theory as discussed in Chapter 2 (section 2.3). Snippert *et al*. (2015) explain that it is based on a relationship that is developed between the managers (principals) and their employees (stewards). The stewardship theory argues that an individual whose actions are beneficial to the company is more valuable than individualistic behaviour (Davis *et al*., 1997). Management that sacrifices their personal time to implement the developed Z-Score-based model will improve the knowledge of the resilience of the company. Thus, the second principle is also followed in this study.

3.5.2 Stage 2: Building, intervention and evaluation (BIE stage)

The second stage of ADR builds on the formulated problem and theory-ingrained artefact used in the previous stage. From Figure 3-4 it is evident that this stage, the building (B), intervention (I) and evaluation (E) stage, comprises the third, fourth and fifth principle. The building and evaluation of the artefact will be discussed in Chapters 4 and 5. However, intervention will be limited since this is a model designed to use publicly available financial information. The implementation of this model in practice falls outside the scope of this study.

Building of artefact

The objective of building the artefact is to find a solution to an actual problem (Sein *et al*., 2011). Table 3-2 aims to link the literature review with the role it played in creating a solution. The relevant literature review is identified by indicating the appropriate section in Chapter 2.

Table 3-2: Contributions of the literature review in addressing the problem identified

Section	Literature review	Role in solution creation
2.3	The stewardship theory is a relationship built on trust between managers and employees.	Managers should be involved with the application of a model to support organisational resilience.
2.4	Altman's Z-Score has been used for 50 years to predict possible business failure.	Altman's Z-Score will be relied on as an effective tool to predict possible business failure.
2.4.2	Altman finds McKinsey's implementation of resilience interesting.	It shows the potential of integrating Altman's Z-Score with resilience to predict possible business failure.
2.5.6	A pattern of losses over three years indicates that immediate action is required.	Trend analysis of the Z-score will be implemented for the identification of possible company failure.
2.5	The readiness, response and recovery dimensions are necessary for resilience.	These dimensions should form part of the resilience decision-support model.

Table 3-2 summarises the results from the literature review that were applied to find a possible solution to the identified problem. These results were applied during the design of the artefact.

The artefact created to address the problem is a Z-Score-based model consisting of two parts. Part A is a diagram (Figure 3-5) that illustrates the process to support organisational resilience.

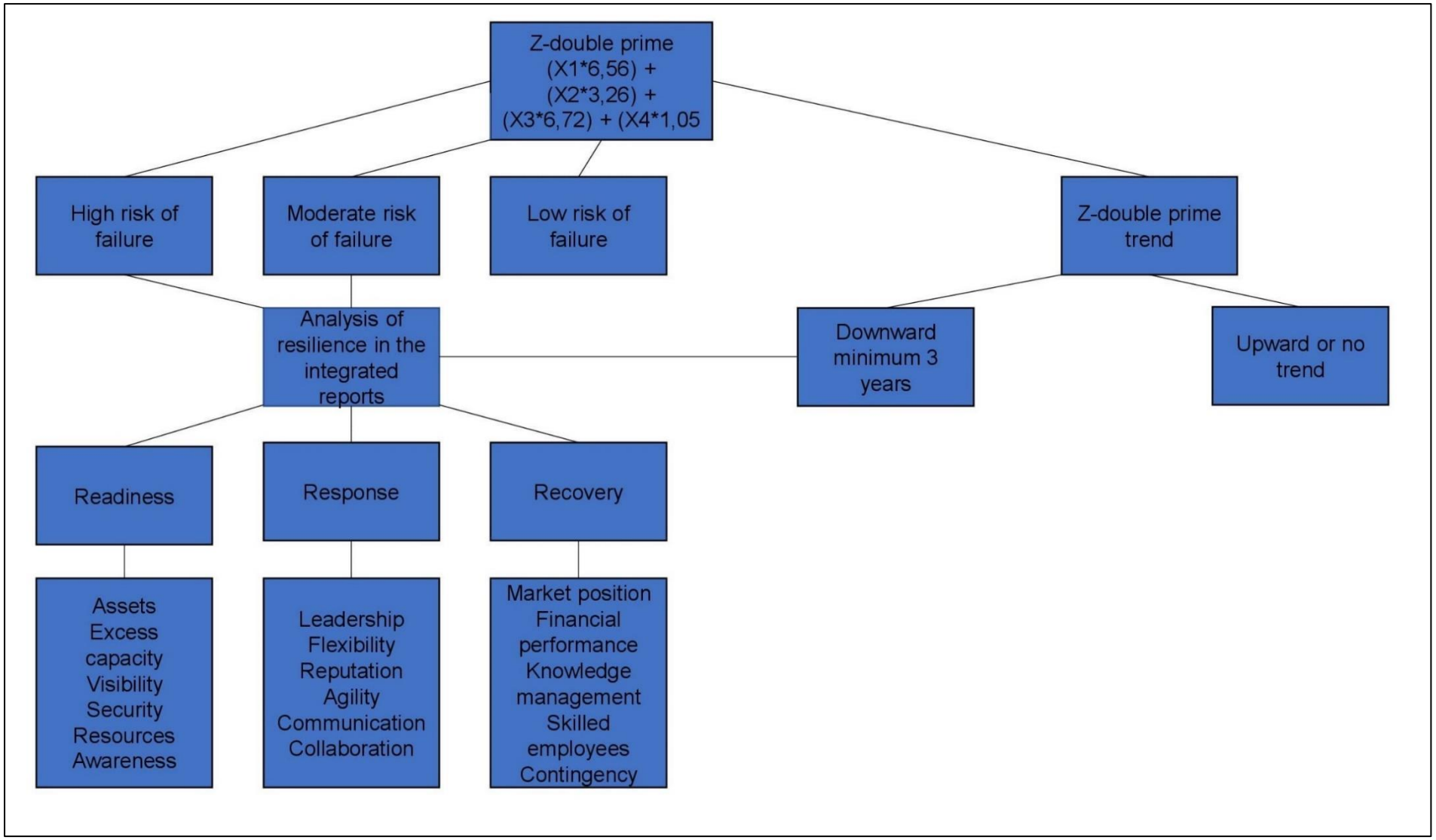

Figure 3-5: Artefact

The developed artefact, presented as a decision-support model, is illustrated in Figure 3-5. The application of the artefact will be discussed under Principle 5. Part B is a MS Excel document. Table 3-3 shows an example of the Excel document used for the historical data evaluation (also refer to Annexure 2).

Table 3-3: Template used for historical data evaluation

	Frequency of words
Level 1	
Resilience or resilient	
Level 2	
Readiness	
Response	
Recovery	
Total	
Level 3	
Readiness elements (R1)	
Assets	
Resources	
Excess capacity	
Visibility	
Security	
Awareness	
Total (R1)	
Response elements (R2)	
Leadership	
Flexibility	
Reputation	
Agility	
Communication	
Collaboration	
Total (R2)	
Recovery elements (R3)	
Market position	
Financial performance	
Knowledge management	
Skilled employees	
Contingency	
Total (R3)	
Level 3 Total R1+R2+R3	

Table 3-3 illustrates Part B of the artefact with Part A illustrated in Figure 3-5. Part B, the MS Excel document, consists of three levels of resilience. Level 1 counts the frequency of the words "resilient" or "resilience" in the integrated report of the relevant company that is reviewed. Level 2 counts the frequency of the words "readiness", "response" and "recovery". Level 3 counts the words relating to the individual elements of the readiness (R1), response (R2) and recovery (R3) dimensions as indicated in the Table above. These words were identified in the literature review and will be elaborated on in Chapter 4. Column 1 indicates the words counted and column 2 indicates the frequency of the words in the integrated reports. The analysis was conducted by using the Word list function of ATLAS.ti (refer section 3.7.1) to find references to certain words in the integrated reports.

The elements relating to resilience were identified based on the literature review and defined in Chapter 1 (section 1.2.1), as well as Chapter 4 (section 4.4.).

Readiness	Response	Recovery
•Assets (Dahlhamer & Tierney, 1998) •Excess capacity (Han *et al*., 2020) •Visibility (Han *et al*., 2020) •Security (Han *et al*., 2020) •Resources (Sahebjamnia *et al*., 2015) •Awareness (Han *et al*., 2020)	•Leadership (Han *et al*., 2020) •Flexibility (Han *et al*., 2020) •Reputation (Dean, 2004) •Agility (Han *et al*., 2020) •Communication (Dalziell & McManus, 2004) •Collaboration (Han *et al*., 2020)	•Market position (Han *et al*., 2020) •Financial performance (Dahlhamer & Tierney, 1998) •Knowledge management (Han *et al*., 2020) •Skilled employees (Dahlhamer & Tierney, 1998) •Contingency (Han *et al*., 2020)

Figure 3-6: Elements of resilience

Figure 3-6 indicates the elements of resilience of readiness, response and recovery. All these items support an environment in which managers can trust employees (stewardship), whilst also implementing a model to predict the resilience of a company. The integrated reports of the sampled companies were analysed in search of these elements.

References to certain words will be viewed as a consideration by management, because they should utilise integrated thinking in the compilation of their integrated reports (refer section 2.6). Integrated thinking requires management to have knowledge of their company's strategy and operations and leads to the identification of possible risks (La Torre *et al*., 2019). La Torre *et al*. (2019) describe managers with integrated thinking as "work bees" that perform various roles

through their lifetime. The “work bees” execute activities to protect the colony and in turn survive. This is similar to the stewardship theory (refer section 1.3.3) that requires managers and employees to work together towards a common goal. Therefore, managers apply their knowledge of their company’s operations in the compilation of their integrated reports.

Integrated reporting motivates managers to react, because it acts as a method of managing and improving a company’s performance (refer to section 2.6). It requires managers to use integrated thinking to give their opinion on how a combination of capitals drive their company’s value (Deloitte, 2015).

The developed artefact was used for the analysis of the historical data.

Artefact intervention

The artefact described above (Part A and Part B) was used in the historical data analysis. The assumptions applied in the data analysis, based on literature, include the following:

- The Z-Score is effective in predicting possible financial distress.
- Management effectively implements the stewardship theory, which requires them to act in a manner that benefits the company rather than the individual (Chapter 1, section 1.3). Therefore, trust can be placed on the disclosures in the integrated report.
- The effective communication of integrated thinking can only be achieved by understanding the different parts of the company and how it works together towards a common purpose (ACCA, 2021). Therefore, the integrated reporting forces management to focus on their companies’ operations. The disclosure of certain words in the integrated report will indicate that management is aware of the element and considers it as part of their integrated thinking.

3.5.2.1 Principle 3: Reciprocal shaping

Principle 3 elaborates on the joint use of the artefact and the organisational context, as the artefact is developed through the continuous interaction between the researcher and the organisational representative/s. According to Pastoriza and Ariño (2008), this interaction is the result of a relationship built on trust. Synergy between the parties, i.e. the researcher and the organisational representative/s, is necessary to analyse the resilience of the company. Since this is a model based on publicly available information, this principle falls outside the study’s scope (as discussed above).

Resilience is a key requirement for the survival of companies, especially those with sustainability issues. The artefact is developed to support the resilience of companies and can be integrated with the environment in which it operates to evaluate it. Therefore, Principle 3 can be applied with further research.

3.5.2.2 Principle 4: Mutually influential roles

This principle emphasises the importance of mutual learning between project participants.

Principle 4 can be followed by using the stewardship theory to develop the artefact and equip the organisational managers with knowledge to improve their measurement of resilience. According to Pastoriza and Ariño (2008), principals (as described in section 2.3) need to allocate significant time to interact with project participants and build trust. Mutual trust will lead to improved interaction through communication and learning. Principals should communicate the problem and its importance, as well as the reason for the artefact's design to project participants (Peffers *et a*l., 2018). This communication could be achieved through information sessions and training workshops where principals explain the concept of resilience to project participants. A limitation of this study is that there will not be interaction with project participants and therefore Principle 4 falls outside the scope of this study.

3.5.2.3 Principle 5: Authentic and concurrent evaluation

This principle points to the fact that evaluation cannot be viewed as a separate stage, but should be an ongoing process. Therefore, evaluation is a continuous process that is not viewed in isolation.

The evaluation of the financial data and integrated reports (the "E" in Stage 2) was divided into two phases.

Phase 1 (Part A of the artefact)

Phase 1 focused on the calculation and interpretation of the Z-double prime.

- Phase 1, firstly, entailed the calculation of the Z-double prime and the interpretation of the results. As shown in Table 2-2 (section 2.5.4), a Z-double prime below 1,1 indicates a high risk of failure and a Z-double prime above 2,6 indicates a low risk of failure. A Z-double prime between 1,1 and 2,6 indicates a moderate risk of failure.
- A company with a high or moderate risk of failure required further analysis of its resilience using the company's integrated reports.

- A company with a low risk of failure (Z-double prime above 2,6) was analysed to determine if the Z-double prime had a downward trend for a minimum of 3 prior years.
- If the company's results did not have a trend or the trend was upwards, no further analysis was conducted. However, the downward trend resulted in the analysis of the integrated reports together with the high or moderate risk of failure companies.

Phase 2 (Part B of the artefact)

Phase 2 evaluated the resilience of the company, based on the dimensions of resilience, i.e. readiness, response and recovery. ATLAS.ti (version 9) software was utilised to analyse the integrated reports of the sampled companies. ATLAS.ti is a software programme capable of analysing a large volume of qualitative data in the form of graphics, audio, video or text (Chapter 1 section 1.7, Chapter 2 section 3.7.1).

The following process was followed to analyse the qualitative data in the integrated reports using ATLAS.ti. The commands referred to below refers to the functions in ATLAS.ti.

- A new ATLAS.ti "project" was created for each of the sampled companies.
- The integrated reports of the sampled companies were downloaded from each company's website and uploaded as primary documents into ATLAS.ti to analyse the documents.
- An existing "stop-and-go" list (Appendix A) was exported from ATLAS.ti to use as a template for creating a stop-and-go list applicable to this study.
- The words "resilience", "resilient", "readiness", "response" and "recovery", as well as the words from Table 4-2 were listed in the stop-and-go list.
- The option "create word list", as discussed in Chapter 2 (section 2.6.5), was selected in ATLAS.ti and the newly created stop-and-go list was imported from Excel.
- The listed words should be included in the search and therefore "go list" was selected.
- The option "ignore case" was selected to "communicate" to ATLAS.ti to not count words separately depending on upper and lower case.
- The option "show inflected forms" was deactivated. Inflected forms include the plural forms of nouns and past tense of verbs. Therefore, the list included the basic form of the words and its plural form.
- The word list indicating the word counts was exported to Excel.

- The same process was followed to create a word cloud as a visual representation of the words used in the word list. Examples of these word counts are presented in Chapter 4 and included as appendixes (Appendix C).

The companies were evaluated based on three resilience levels, as illustrated in Table 3-3.

The results of the evaluation of the financial data and the integrated reports will be discussed in Chapter 4.

3.5.3 Stage 3: Reflection and learning

This stage involves the application of the created solution to bigger problems. It is an ongoing process and runs parallel with the first two stages. The reflection and learning stage will be discussed in Chapter 5 (section 5.4).

3.5.3.1 Principle 6: Guided emergence

This stage emphasises that the ensemble artefact will reflect not only the preliminary design created by the researcher but will be shaped by the ongoing organisational use. As mentioned above, the organisational use falls outside the scope of this study.

3.5.4 Stage 4: Formalisation of learning

The objective of this stage is to formalise the learning. The organisational outcomes can be characterised as design principles that contributed to the initial design.

3.5.4.1 Principle 7: Generalised outcomes

The result of ADR represents a solution to a specific problem. Figure 3-6 reflects the process the researcher followed in the study to reach a possible solution to the specified problem.

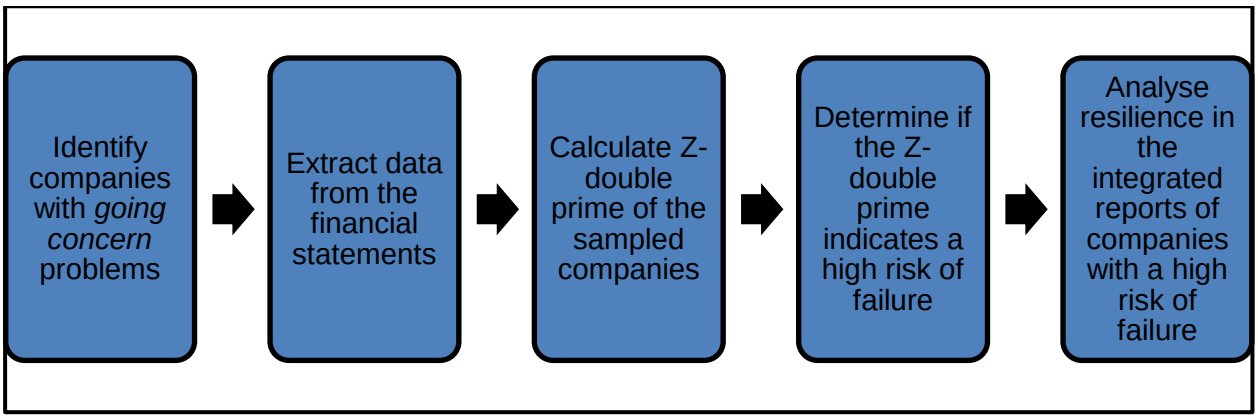

Figure 3-7: Process of the study

The study implemented the above process, as described under the applicable stages, to collect data and analyse the results.

3.6 Data collection

Data collection is the fifth element of the honeycomb model (Figure 3-2). This study will collect data by extracting the necessary financial information from the integrated reports of the selected companies.

The necessary financial information will be the items that Altman's Z-Score consists of, namely:

- Working capital
- Retained earnings
- Earnings before interest and tax
- Market value of equity
- Total liabilities
- Sales
- Total assets

To ensure consistency of financial data, data will be obtained from the IRESS database. It is software that connects to global data vendors to provide current market information (IRESS, 2021).

3.7 Data analysis

Data will be analysed in two phases as discussed under research approach in Chapter 3 (section 3.4). Phase 1 will determine the Z-Score of the sampled companies and be quantitative in nature. Phase 2 will implement a mixed-methods approach but will be mainly qualitative in nature. It will evaluate the resilience of the company, based on the dimensions of resilience. ATLAS.ti (version 9) software will be utilised to analyse the integrated reports of the sampled companies.

3.7.1 ATLAS.ti

ATLAS.ti is a software programme capable of analysing a large volume of qualitative data in the form of graphics, audio, video or text (Chapter 1, section 1.7). ATLAS.ti allows users to analyse narrative information through coding and subsequently to create word lists and word clouds for documents, quotations and codes. A word list is a feature of ATLAS.ti that enables the users to quantitatively analyse documents by creating a list of the amount of word counts. The list can be exported to Excel (Friese, 2021). Word clouds allow the graphic presentation of text data by displaying words used the most in a bigger and bolder font. The cloud can be exported as an image (Friese, 2021). A stop-and-go list can be created that lists words that should either be included or excluded from the list or cloud (Friese, 2021). ATLAS.ti will therefore be able to analyse the qualitative data found in the integrated reports of companies by applying the word count function.

The word count will be a form of content analysis, i.e. conceptual analysis. Conceptual analysis involves the counting of concepts in qualitative data to determine the frequency (Colombia University, 2019).

By comparing the word counts of the sampled companies, the aim is to identify which companies' managers are more aware of resilience. The results obtained will be assumed to apply to an entire population.

3.8 Summary

The aim of this chapter was to elaborate on the ADR process based on extant literature. The chapter explored the purpose of research and the theoretical underpinnings of the research philosophy. It investigated the research methodology by examining the various elements of the honeycomb model.

This study will be nested in an inductive epistemological viewpoint, implementing a mixed-methods research approach. In addition, the chapter elaborated on the ADR research process. It

described the origin of ADR as the integration of the AR and DSR research processes to benefit from both methods. It detailed the application of the ADR process to this study, with reference to the four stages and seven principles of a complete ADR cycle. The stages and principles were applied to this study.

The chapter presented Part A and Part B of the designed artefact. Part A was presented as a resilience decision-support model based on Altman's Z-Score. Part B of the artefact was presented as a MS Excel document that will be applied in the evaluation of the integrated reports of the companies. The document consisted of three levels of resilience that will be evaluated with the application of the "word count" function of ATLAS.ti.

Lastly, the chapter mentioned the data collection and analysis techniques, including ATLAS.ti, that was utilised to arrive at the results presented in Chapter 4.

Chapter 4 will discuss Phases 1 and 2 of the empirical study by using the relevant financial data found in its published financial statements. It further aims to analyse the companies' integrated reports using the identified resilience elements to assist in reaching the second secondary objective, as stated in Chapter 1 (section 1.6.2.2).

CHAPTER 4

4 PRESENTING THE DEVELOPED ALTMAN'S Z-SCORE-BASED DECISION SUPPORT MODEL

The previous chapter described the research design and methodology of this study.

4.1 Introduction

The aim of this chapter is to support Chapter 3 in addressing the second secondary objective, as stated in Chapter 1 (section 1.6.2.2). The second secondary objective will utilise the theoretical foundation in developing the anticipated Altman's Z-Score-based decision-support model. In doing so, the sampled companies' Z-double prime will be calculated, and their resilience will be analysed using the identified resilience elements. The chapter will create the background by discussing Altman's Z-Score elements and going concern considerations. The Z-double prime of the sampled companies will be calculated, and the findings summarised. The chapter will elaborate on additional elements that support resilience. These elements will form part of the evaluation of the integrated reports. Some of the results from the integrated reports will be discussed and presented in word clouds. Finally, the main findings will be presented.

The flow of the chapter is shown in Figure 4-1.

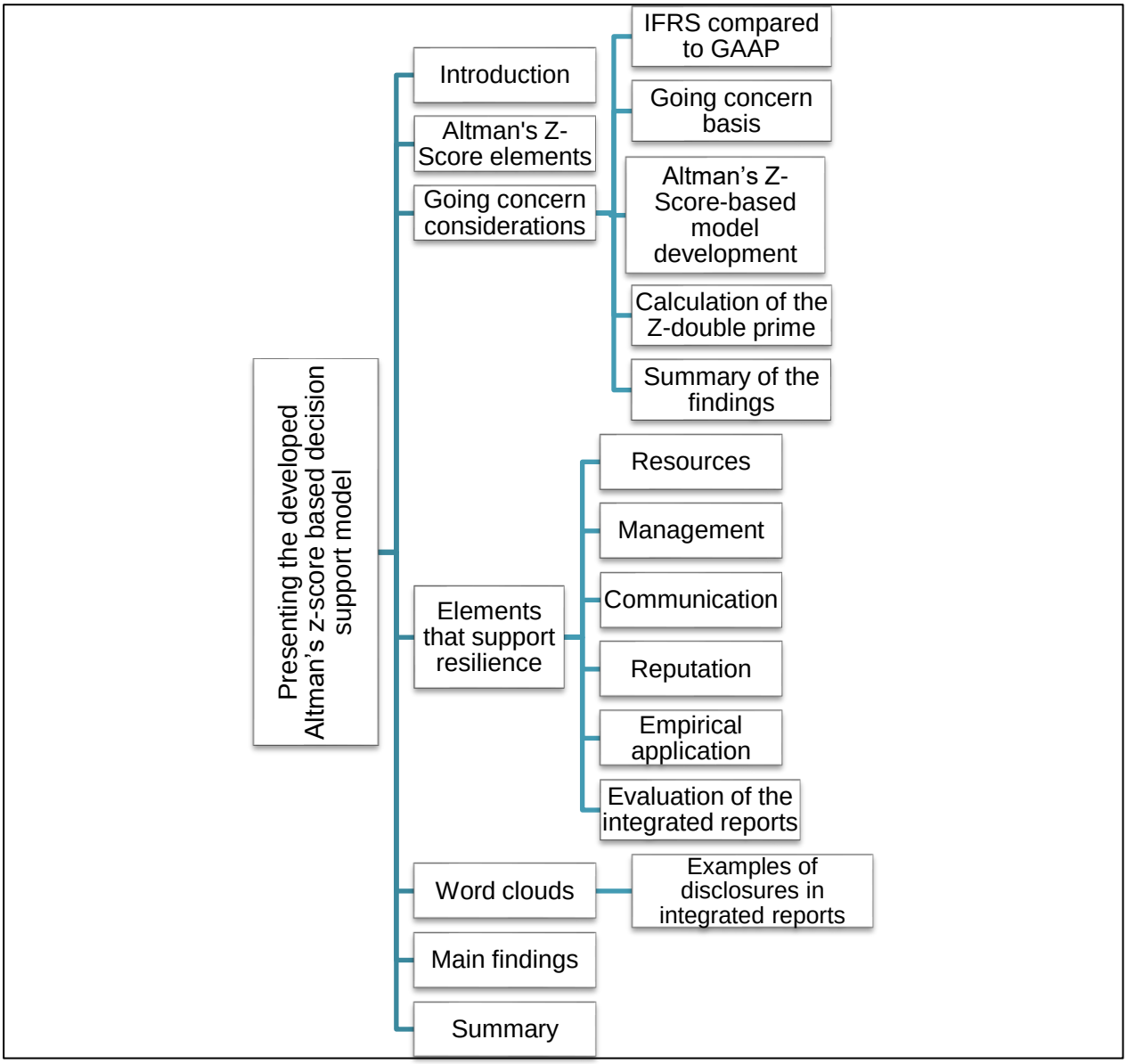

Figure 4-1: Chapter overview

4.2 Altman's Z-Score elements

Before the empirical phase can be presented, it is important to review the five elements of the Z-score that are indicators of a company's financial performance: retained earnings, EBIT, market value of equity, revenue and working capital (Sarpong, 2021). Individual elements of the Z-Score should be evaluated separately to determine if it contributes to satisfactory results, as discussed in section 2.4. Each of these individual elements are discussed below:

- Retained earnings are the profits that remain after a company pays out dividends (Sarpong, 2021). According to the Merriam-Webster online dictionary (2021), "retain" refers to hold in possession, while "earnings" are the remaining revenue after deducting

expenses. Retained earnings are an indicator of a company's future growth prospects (Goh et al., 2021). Therefore, retained earnings are profits that a company holds back for future growth.

- EBIT refers to earnings before interest and taxes and is a measurement of profitability (Schoenen et al., 2016). EBIT can be used to measure a company's profit (Restianti & Agustina, 2018) and is therefore an important predictor of financial distress in companies (Sarpong, 2021). A lower EBIT implies that a company may face business failure if they cannot meet their obligations. EBIT improves the accuracy of comparing earnings of different periods and between various countries, because it excludes varying tax rates and interest rates (Goh et al., 2021). Therefore, EBIT indicates if a company's earnings exceed their unavoidable expenses, such as interest and tax.
- Market value of equity is calculated as a company's share priced multiplied by the issued shares, referred to as market capitalisation (Goh et al., 2021; Oswald, 2021). According to the Merriam-Webster online dictionary (2021), "market value" is the price at which buyers and sellers are willing to conduct business. Therefore, market value of equity is the price that market participants are willing to pay for a company's share. According to Oswald (2021), smaller companies are riskier, because they would have less access to available resources, which larger listed companies would have. Size can therefore contribute to a company experiencing going concern problems.
- Sales is the gross amount earned from daily operations before deducting expenses (Chauhan, 2013). According to the Merriam-Webster online dictionary (2021), "sales" refer to value gained by giving something up through selling. Sales is an indication of management's ability to compete in the market (Heine, 2000). Therefore, sales are income earned or generated through a company's operational activities.
- Working capital is current assets minus current liabilities (Goh et al., 2021). According to the Merriam-Webster online dictionary (2021), "working capital" is capital that a company can utilise during normal operations. Therefore, working capital indicates a company's ability to meet their short-term obligations. As discussed in section 1.3.2, a negative working capital, i.e. current liabilities exceeding current assets could also be an indicator of a company possibly experiencing going concern problems (IFAC, 2020).

Therefore, the five elements of the Z-Score may highlight underlying issues that could impact a company's ability to continue as a *going concern*.

4.3 Going concern considerations

The empirical study starts with the identification of companies with going concern problems, as illustrated in Figure 4-1. *Going concern* is described by numerous standard setters including the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB).

4.3.1 IFRS compared to GAAP

Financial statements are prepared in accordance with the applicable financial reporting framework. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) are the two main accounting frameworks used worldwide. US law requires companies with publicly available financial information to comply with GAAP principles. IFRS is implemented by South Africa and 165 other jurisdictions, such as Australia and the United Kingdom (Matos, 2021). The main difference is that GAAP is based on rules, compared to IFRS which is based on principles (IFRS Foundation, 2021). IFRS standards are required for public South African companies and GAAP is permitted if a company's main listing is outside South Africa (IFRS Foundation, 2021). A comparison between IFRS and GAAP (Table 4-1) will clarify the application of the going concern principle to financial statements.

Table 4-1: IFRS and GAAP on the going concern principle

IFRS	GAAP
Financial statements are prepared on the going concern basis unless management plans to cease operations.	Financial statements are presented on the going concern basis until management has no other alternative than liquidation.
IFRS requires a company to disclose the basis of preparation of financial statements, if the going concern basis is not used.	GAAP provides specific guidance on the liquidation basis of accounting, if the going concern basis is not applicable.
Management should present certain disclosures if there is material uncertainty about a company's ability to continue as a going concern.	Disclosures are required when there is substantial doubt about a company's ability to continue as a going concern.
The period of assessment is a minimum of one year from the date of the statement of financial position.	The assessment period is within one year after the financial statements are issued or are available to be issued.

Source: Adapted from FASB (2014)

From Table 4-1: IFRS and GAAP on the going concern principle it can be concluded that there are similarities between the IFRS and GAAP's presentation requirements for the going concern principle. However, the main difference is that IFRS requires disclosure when there is *material uncertainty* about a company's going concern ability, whilst GAAP refers to *substantial doubt* about a company's ability to continue as a going concern. Therefore, the disclosure requirements relating to going concern (a key concept of this study) depends on the accounting standards applied and are subjective.

4.3.2 Going concern basis

Moore *et al*. (2006) strengthen this argument, stating that a conflict of interest with the client may result in an auditor unintentionally issuing an erroneous going concern opinion because of bias. Many decades ago, Brown (1989) stated that auditors are not in a better position than others to make a judgement on the prospects of the client. Bellovary *et al*. (2006) posit that auditors' opinions provide insufficient information on the financial statements and their evaluation of the going concern principle should be removed. Therefore, auditors' going concern opinion is not sufficient to determine the survivability of a company and other aspects should be considered. This study aimed to, in part, address this shortcoming by considering the resilience of a company.

The nature of the going concern principle can be viewed from an economic, applied and legal perspective (Savova, 2021).

Table 4-2: Aspects of going concern

Economic	Applied	Legal
Indicates how much a company can grow their capital investment.	The performance of a company's operations.	Company's ability to survive for a period.

Source: Savova (2021)

Table 4-2 describes the economic, legal and applied aspect of the going concern principle. The economic aspect refers to the capital invested in a company by its shareholders, whilst the applied aspect refers to the continuous business activities performed by individual companies. The legal aspect refers to the company's ability to survive for a period that will require resilience. As the main objective of this study is the development of a decision-support model based on Altman's Z-Score to gauge organisational resilience concerns in anticipation of potential disruptive events, the focus will mainly be on the legal aspect of the going concern principle.

The going concern principle is especially relevant in the uncertain times of COVID-19 (Savova, 2021). The COVID-19 pandemic is a test of a company's ability to recover from a crisis, pointing to the resilience of a company. An auditor issues a going concern opinion if they are unsure whether a company will be able to meet their financial obligations in the next financial year (Savova, 2021). An auditor will adjust his opinion and include a paragraph with the heading *Material uncertainty related to going concern* or express an adverse opinion in his auditor's report (IFAC, 2020). The "Big 4" accounting firms increased the percentage of going concern opinions they issued in 2020, compared to previous years (Oswald, 2021). The "Big 4" – Ernst & Young (EY), PricewaterhouseCoopers (PwC), KPMG and Deloitte – are auditing firms that dominate the accounting industry (CFA, 2021). Similarly, the likelihood of auditors issuing a going concern opinion increased after the global financial crisis (Carson *et al*., 2013). The latter refers to the crisis that stretched from 2007 to 2008 that was caused by the crash of the US housing market (Oswald, 2021). The collapse of the housing market is another example (other than COVID-19) of a disruptive event, as it led to an economic downturn and several companies experiencing going concern problems. Therefore, disruptive events have a direct impact on the going concern opinion of auditors.

Carson *et al*. (2013) sampled data of 88 359 companies from 2000 to 2010. The authors obtained the data from Audit Analytics – a company that appoints researchers to obtain and analyse data (Audit Analytics, 2021). The aim of this study was to evaluate the accuracy of going concern opinions by implementing a framework that analysed the outcomes of such opinions. The findings revealed that 60% of companies that were issued with going concern opinions faced business failure before their next audit (Carson *et al*., 2013). It can therefore be argued that a company with going concern problems may face business failure. In contrast to this research, Mareque *et al*. (2017) conclude that more than half of the companies that went bankrupt in 2010 had no mention of going concern problems. These authors considered the financial crisis in Spain in 2008 by analysing reports from 2007 to 2010. The sample consisted of 2 935 audit reports of unlisted Spanish companies. The aim of the study was to evaluate the impact of the financial crisis on the audit reports issued by auditors (Mareque *et al*., 2017). Therefore, the prediction of possible business failure cannot depend on the going concern opinion issued by auditors.

4.3.3 Altman's Z-Score-based model development

In the present empirical study, companies with going concern problems were selected where the current liabilities exceed the current assets. Companies with going concern problems were identified (current liabilities exceeding current assets) and their Z-double prime for the five years preceding the going concern problems were calculated. The first eight companies identified were selected. Eisenhardt (1989), concluded that studies on between 4 to 10 cases would be effective (refer to section 1.6). The application of the process described in section 1.6, revealed 8 companies that satisfied the criteria. The amount of eight was between 4 to 10 cases as recommended by Eisenhardt (1989) and therefore a sufficient amount.

The Z-double prime will be used because, firstly, it, accurately identified eight out of nine companies with financial distress (Hayes et al., 2010). Secondly, the use of the Z-double prime by *non-manufacturing* companies is specifically advised by Altman, as discussed in Chapter 4 (section 4.1).

Calculation of the Z-double prime

The sampled companies' financial information required to calculate their Z-double prime was obtained from the IRESS database. The Z-double prime of the companies were calculated and the results were graphically illustrated. The year that the company experienced a going concern problem is indicated with a red dot on the graph line. The graphs are presented from the most recent year (for example 2020) to the preceding four or five years (for example 2015) to illustrate

the sequential process followed, i.e. the identification of the going concern problem in 2020 or 2019 or 2018, followed by the analysis of the Z-double prime for the four or five preceding years.

The calculation of the Z-double prime and the discussion of the results of Company A to Company H are shown below.

Table 4-3: Z-double prime of Company A to Company H

	2020	2019	2018	2017	2016	2015	2014
A	-2,59	-3,56	3,60	4,50	3,40	4,07	-
B	2,70	-2,50	7,01	6,64	7,21	9,75	-
C	-4,16	-3,48	6,14	8,47	9,28	11,62	-
D	-1,19	-0,88	-1,65	-2,90	0,00	-0,07	-
E	-1,77	0,56	0,74	1,85	2,63	2,16	-
F	2,96	2,93	4,86	4,60	7,66	5,49	-
G	-2,53	-3,19	1,93	3,71	3,85	2,98	-
H	Delisted	Business rescue	-0,23	4,99	4,83	5,09	6,20

Table 4-3 summarises the results of the Z-double prime for Companies A to H. The red blocks represent a high risk of failure, yellow blocks represent a moderate risk of failure, and the green blocks represent a low risk of failure, as shown in Chapter 2 (Table 2-2).

The detailed calculations and interpretations of the companies' Z-double prime are reflected below:

Company A

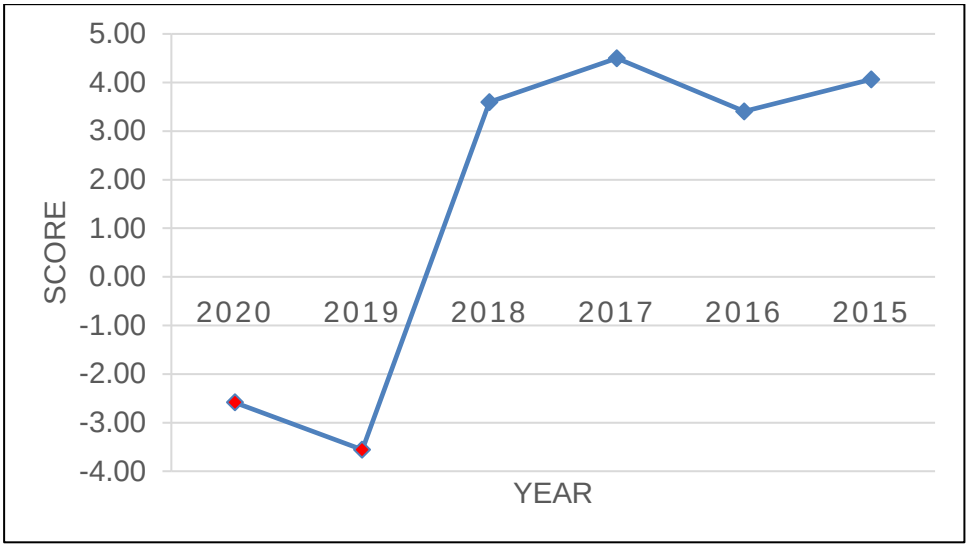

Figure 4-2: Z-double prime Company A

Company A was identified based on its going concern problem in 2020, i.e. a negative working capital of R7 702 000 000. This amount was calculated from the 2020 financial statements, by subtracting the current assets of R8 290 000 000 from the current liabilities of R15 992 000 000. Figure 4-2 shows that the Z-double prime has a downward trend from 2015 to 2020.

Table 4-4: Z-double prime of Company A

	2020	**2019**	**2018**	**2017**	**2016**	**2015**
X1	-2,85	-3,47	1,11	1,43	0,64	0,80
X2	-0,50	-0,80	1,17	1,29	1,44	1,48
X3	0,74	0,56	0,46	0,58	0,40	0,54
X4	0,02	0,16	0,85	1,20	0,92	1,24
Z-double prime	**-2,59**	**-3,56**	**3,60**	**4,50**	**3,40**	**4,07**

Table 4-4 indicates the results and inputs of the Z-double prime of Company A. As discussed in Chapter 2 (section 2.4.4), a Z-double prime above 2,6 indicates a low risk of failure. Therefore, based on the Z-double prime, Company A has a low risk of failure from 2015 to 2018, but this changed in 2019 (-3,56) and 2020 (-2,59).

Table 4-5: Z-double prime and going concern (R' 000) correlation of Company A

Z-double prime	-2,59	-3,56	3,60	4,50	3,40	4,07
Going concern	-7 702 000	-7 727 000	4 803 000	5 951 000	2 942 000	3 203 000

The company experienced a going concern problem in 2019 and 2020, as their current liabilities exceeded their current assets (reflected in Table 4-5). Therefore, the Z-double prime indicates a high risk of failure in the years with the going concern problems. However, the Z-double prime did not predict it in advance.

Company B

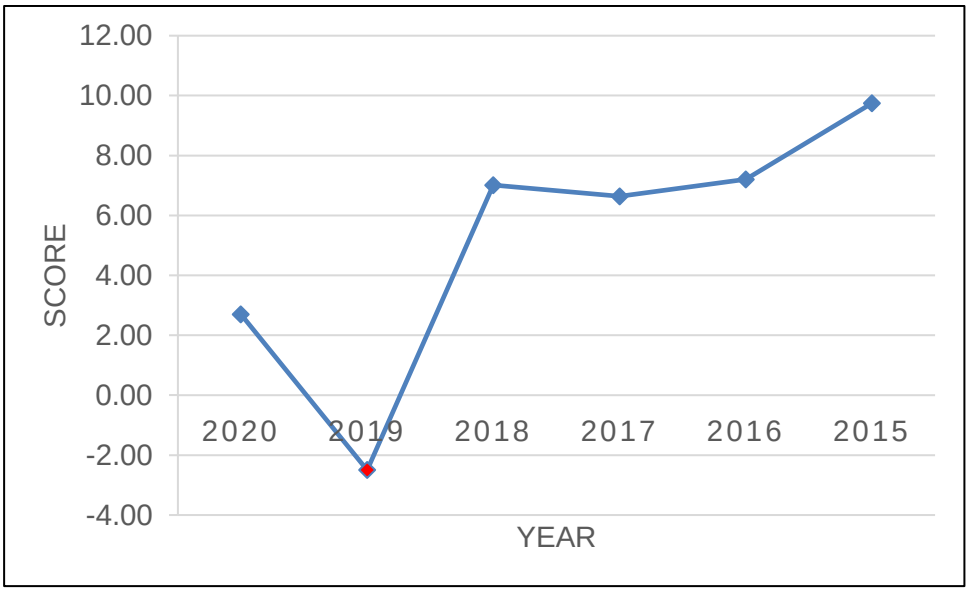

Figure 4-3: Z-double prime of Company B

Company B was identified based on its going concern problem in 2019, i.e. a negative working capital of R379 769 000. Figure 4-3 illustrates that the Z-double prime has a downward trend from 2015 to 2019.

Table 4-6: Z-double prime of Company B

	2020	2019	2018	2017	2016	2015
X1	2,17	-0,28	1,79	1,44	1,28	2,27
X2	0,59	0,72	3,58	3,12	2,73	3,73
X3	-0,11	-3,21	1,04	0,94	0,93	1,53
X4	0,04	0,27	0,59	1,14	2,26	2,21
Z- double prime	**2,70**	**-2,50**	**7,01**	**6,64**	**7,21**	**9,75**

Table 4-6 shows the calculation of the Z-double prime of Company B. A Z-double prime above 2,6 indicates a low risk of failure, as discussed in Chapter 2 (section 2.4.4). Company B has a low risk of failure, except for 2019 with a negative Z-double prime of 2,5.

Table 4-7: Z-double prime and going concern (R' 000) correlation of Company B

Z-double prime	2,70	-2,50	7,01	6,64	7,21	9,75
Going concern	2 167 317	-379 769	1 652 975	1 181 899	530 615	551 775

Company B experienced going concern problems in 2019, as their current liabilities exceeded their current assets by R379 769 000. Therefore, the Z-double prime indicated a risk of failure in the year (2019) of the going concern problems. However, the Z-double prime did not predict it in advance (reflected in Table 4-7).

Company C

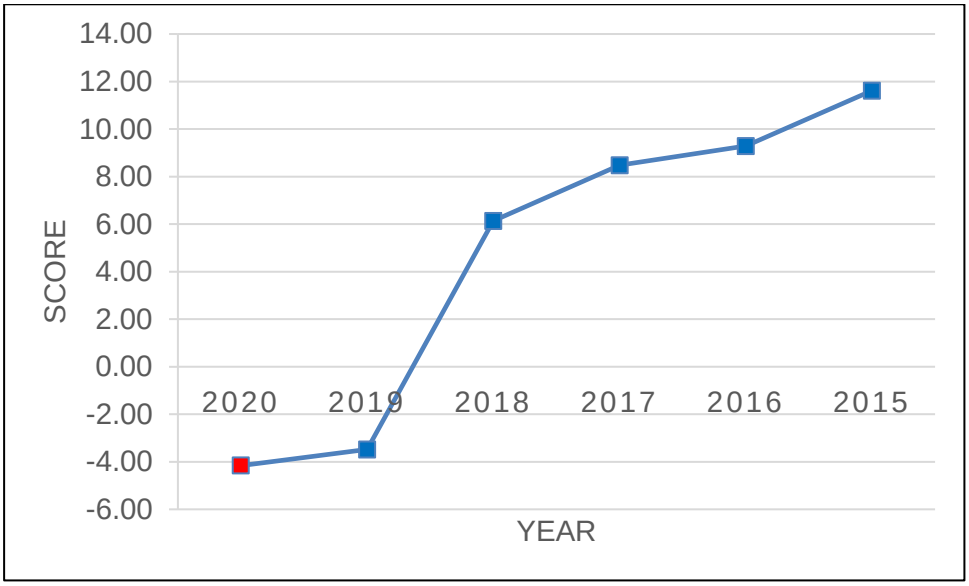

Figure 4-4: Z-double prime of Company C

Company C was identified based on its going concern problem in 2020, i.e. a negative working capital of R2 388 329 000. Figure 4-4 illustrates that the Z-double prime has a downward trend from 2015 to 2020.

Table 4-8: Z-double prime of Company C

	2020	**2019**	**2018**	**2017**	**2016**	**2015**
X1	-2,55	0,05	2,21	2,38	2,13	2,10
X2	0,27	0,83	2,51	2,60	2,67	2,32
X3	-2,02	-4,82	0,70	1,40	1,49	1,57
X4	0,13	0,46	0,72	2,08	3,00	5,62
Z-double prime	**-4,16**	**-3,48**	**6,14**	**8,47**	**9,28**	**11,62**

Table 4-8 shows the calculation of the Z-double prime of Company C. A Z-double prime above 2,6 indicates a low risk of failure, as discussed in Chapter 2 (section 2.4.4). Company C has a high risk of failure, specifically in 2019. The company scored a negative Z-double prime of 3,48 in that year and therefore predicted the failure in 2020 one year in advance. However, the Z-double prime for the preceding years (2015 to 2018) is above 2,6 and indicates a low risk of failure.

Table 4-9: Z-double prime and going concern (R' 000) correlation of Company C

Z-double prime	-4,16	-3,48	6,14	8,47	9,28	11,62
Going concern	-2 388 329	56 395	3 546 680	3 869 880	2 614 574	1 726 215

Company C experienced going concern problems in 2020, as their current liabilities exceeded their current assets by R2 388 329 000. Therefore, the Z-double prime indicated a risk of failure in the year (2020) of the going concern problems (reflected in Table 4-9). It also indicated a high risk of failure in 2019. Therefore, to reiterate, the Z-double prime predicted failure one before the going concern problems. These results support the argument of the literature reviewed in Chapter 2 (section 2.4.2 which concluded that the Z-double prime has a high success rate as an accurate predictor of a company's possible financial distress a year before business failure.

Company D

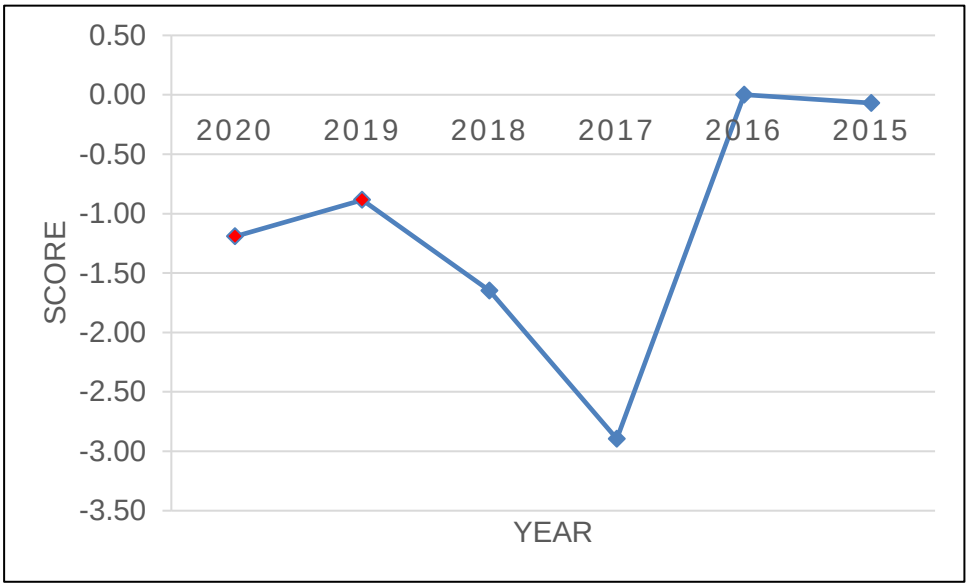

Figure 4-5: Z-double prime of Company D

Company D was identified based on its going concern problem in 2020, i.e. a negative working capital of R951 000 000 and R281 000 000 in 2019. Figure 4-5 illustrates that the Z-double prime has a downward trend from 2015 to 2017, followed by an upward trend from 2017.

Table 4-10: Z-double prime of Company D

	2020	**2019**	**2018**	**2017**	**2016**	**2015**
X1	-0,54	-0,15	0,10	0,30	1,51	1,33
X2	-0,52	-0,66	-0,56	-1,16	-1,79	-1,58
X3	-0,19	-0,14	-1,19	-2,24	0,14	-0,02
X4	0,06	0,06	0,01	0,20	0,13	0,20
Z-double prime	**-1,19**	**-0,88**	**-1,65**	**-2,90**	**0,00**	**-0,07**

Table 4-10 shows the calculation of the Z-double prime of Company D. A Z-double prime below 1,1 indicates a high risk of failure, as discussed in Chapter 2 (section 2.4.4). Company D has a high risk of failure from 2015 to 2020, as the Z-double prime is negative.

Table 4-11: Z-double prime and going concern (R' 000) correlation of Company D

Z-double prime	-1,19	-0,88	-1,65	-2,90	0,00	-0,07
Going concern	-951 000	-281 000	231 000	776 000	5 672 000	5 443 000

Company D experienced a going concern problem in 2019 and 2020, as their current liabilities exceeded their current assets (reflected in Table 4-11). The Z-double prime indicates a high risk of failure from 2015 to 2020. Therefore, the Z-double prime indicates a high risk of failure in the years with the going concern problems. The Z-double prime predicted possible failure more than three years in advance, which was a prediction of the going concern problem longer than the one to two years as discussed in Chapter 2 (section 2.4.4).

Company E

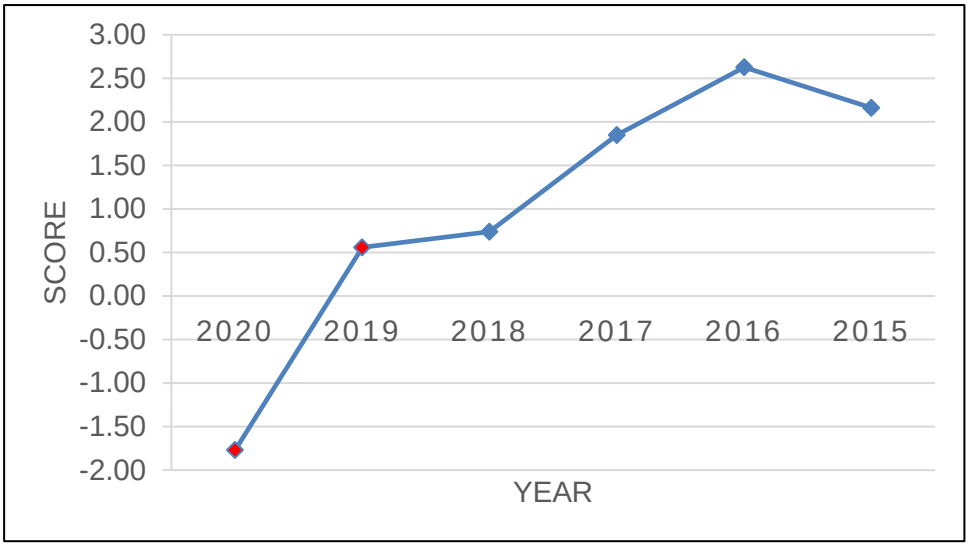

Figure 4-6: Z-double prime of Company E

Company E was identified based on its going concern problem in 2020, i.e. a negative working capital of R998 321 000 and R300 732 000 in 2019. Figure 4-6 illustrates that the Z-double prime has a downward trend from 2015 to 2020.

Table 4-12: Z-double prime of Company E

	2020	**2019**	**2018**	**2017**	**2016**	**2015**
X1	-1,05	-0,33	0,12	0,32	0,34	0,02
X2	0,38	0,95	1,03	1,45	1,61	1,48
X3	-1,11	-0,18	-0,51	-0,13	0,50	0,43
X4	0,01	0,11	0,10	0,21	0,17	0,23
Z-double prime	**-1,77**	**0,56**	**0,74**	**1,85**	**2,63**	**2,16**

Table 4-12 shows the calculation of the Z-double prime of Company E. A Z-double prime below 1,1 indicates a high risk of failure, as discussed in Chapter 2 (section 2.4.4). Therefore, Company E has a high risk of failure from 2018 to 2020.

Table 4-13: Z-double prime and going concern (R' 000) correlation of Company E

Z-double prime	-1,77	0,56	0,74	1,85	2,63	2,16
Going concern	-998 321	-300 732	109 129	265 247	274 479	19 743

Company E experienced going concern problems in 2020 and 2019 as is evident from Table 4-13. Therefore, the Z-double prime indicated a risk of failure in the years 2019 and 2020 of the

going concern problems. It also indicated a high risk of failure in 2018. Therefore, the Z-double prime predicted going concern problems, as defined by this study, one year in advance.

Company F

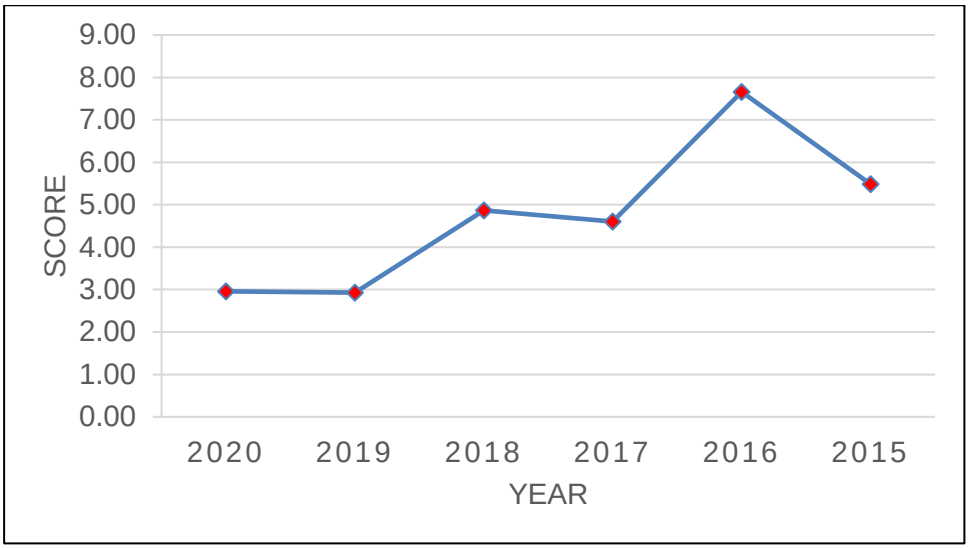

Figure 4-7: Z-double prime of Company F

Company F was identified based on its going concern problem in 2020, i.e. a negative working capital of R1 431 900 000. Figure 4-7 illustrates that the Z-double prime first had an upward trend between 2015 and 2016, but then started with a downward trend from 2016 onwards.

Table 4-14: Z-double prime of Company F

	2020	**2019**	**2018**	**2017**	**2016**	**2015**
X1	-1,56	-1,32	-1,22	-2,18	-1,41	-1,64
X2	2,08	1,85	2,26	2,33	2,68	2,47
X3	0,98	0,99	1,08	1,08	1,27	1,02
X4	1,46	1,41	2,74	3,37	5,12	3,64
Z-double prime	**2,96**	**2,93**	**4,86**	**4,60**	**7,66**	**5,49**

Table 4-14 shows the calculation of the Z-double prime of Company F. A Z-double prime above 2,6 indicates a low risk of failure, as discussed in Chapter 2 (section 2.4.4). Therefore, Company F has a low risk of failure from 2015 to 2020.

Table 4-15: Z-double prime and going concern (R' 000) correlation of Company F

Z-double prime	2,96	2,93	4,86	4,60	7,66	5,49
Going concern	-1 431 900	-1 206 300	-841 700	-1 320 800	-693 300	-740 600

Company F experienced going concern problems from 2015 to 2020, as their current liabilities exceeded their current assets. However, the Z-double prime indicated a low risk of failure for every year since 2015. This discrepancy between going concern problems and the Z-double prime may affirm that there is no direct correlation between companies experiencing going concern problems and the prediction characteristic of the Z-double prime.

Company G

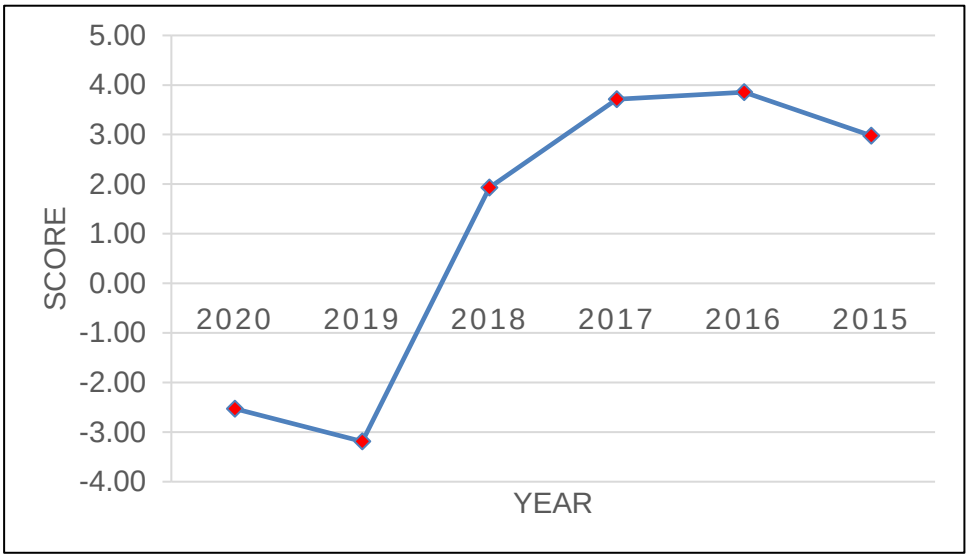

Figure 4-8: Z-double prime of Company G

Company G was identified based on its going concern problem in 2020, i.e. a negative working capital of R9 830 525 000, although it had going concern problems from 2015 to 2020, similar to Company F. Figure 4-8 illustrates that the Z-double prime has a downward trend from 2016 to 2019. There was a slight upward trend between 2015 and 2016. Between 2019 and 2020 the Z-double prime improved.

Table 4-16: Z-double prime of Company G

	2020	2019	2018	2017	2016	2015
X1	-4,78	-4,22	-1,74	-1,34	-0,32	-0,77
X2	1,68	2,35	3,20	3,52	2,68	2,58
X3	0,54	-1,35	-0,05	0,84	0,87	0,38
X4	0,03	0,04	0,52	0,69	0,62	0,78
Z-double prime	**-2,53**	**-3,19**	**1,93**	**3,71**	**3,85**	**2,98**

Table 4-16 shows the calculation of the Z-double prime of Company G. A Z-double prime below 1,1 indicates a high risk of failure, as discussed in Chapter 2 (section 2.4.4). Company G has a high risk of failure in 2019 with a negative Z-double prime of 2,53.

Table 4-17: Z-double prime and going concern (R' 000) correlation of Company G

Z-double prime	-2,53	-3,19	1,93	3,71	3,85	2,98
Going concern	-9 830 525	-10 243 163	-5 635 392	-4 475 285	-907 220	-1 755 738

Company G experienced going concern problems from 2015 to 2020, as their current liabilities exceeded their current assets. Therefore, the Z-double prime indicated a risk of failure in the years 2019 and 2020 of the going concern problems. It also indicated a moderate risk of failure in 2018 of 1,93. However, Company G experienced going concern problems since 2015 which the Z-double prime did not to predict in advance.

Company H

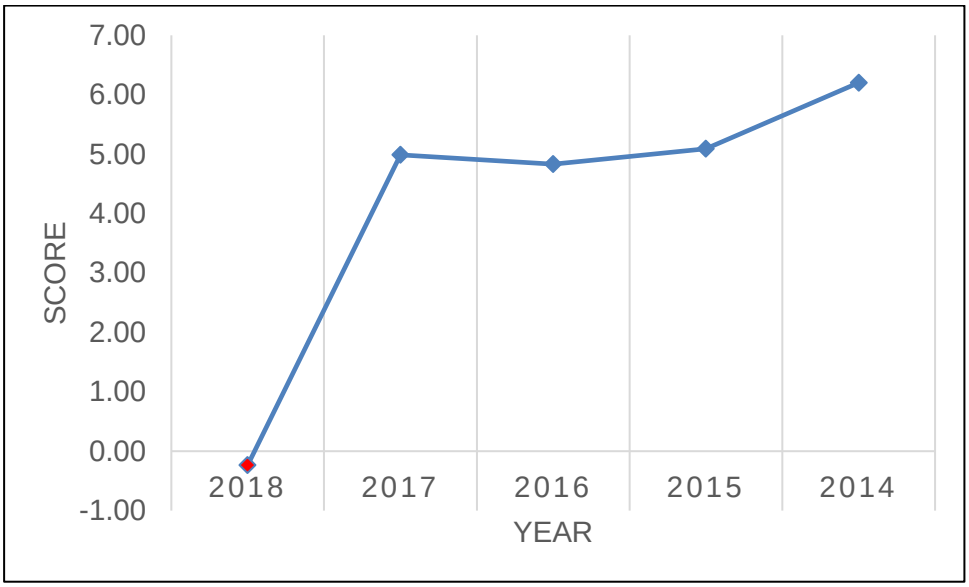

Figure 4-9: Z-double prime of Company H

Company H was identified based on its going concern problem in 2020, i.e. a negative working capital of R1 036 515 000 in 2018. Company H was analysed based on the financial data from 2014 to 2018, as they were in business rescue since March 2019 (refer section 4.4.2). Figure 4-9 illustrates that the Z-double prime has a downward trend from 2014.

Table 4-18: Z-double prime of Company H

	2018	2017	2016	2015	2014
X1	-1,06	0,62	0,70	0,97	0,82
X2	1,36	1,75	1,64	1,40	1,29
X3	-0,73	-0,28	0,23	0,12	0,21
X4	0,19	2,90	2,27	2,60	3,88
Z-double prime	**-0,23**	**4,99**	**4,83**	**5,09**	**6,20**

Table 4-18 shows the calculation of the Z-double prime of Company H. A Z-double prime below 1,1 indicates a high risk of failure, as discussed in Chapter 2 (section 2.4.4). Company H has a high risk of failure in 2018 with a negative Z-double prime of 0,23.

Table 4-19: Z-double prime and going concern (R' 000) correlation of Company H

Z-double prime	-0,23	4,99	4,83	5,09	6,20
Going concern	-1 036 515	717 845	1 113 859	1 516 800	1 234 819

Company H experienced going concern problems in 2018, as their current liabilities exceeded their current assets. The Z-double prime indicated a high risk of failure in 2018 which was the year of the going concern problem. However, the Z-double prime did not predict it in advance.

4.4 Summary of the findings

The results of the Z-double prime calculations of Companies A to H presented in section 4.3.3 above, can be summarised as follows:

- In six out of the eight cases (75%), the Z-double prime indicates a high risk of failure in the year of the going concern problems.
- A downward trend leads to a Z-double prime score that indicates financial distress.
- The Z-double prime indicated a high risk of failure one year before the going concern problems for Company C and E. It indicated a moderate risk of failure for Company G one year before the going concern problems. The Z-double prime of Company D indicated a high risk of failure four years before the going concern problem in 2019.
- The Z-double prime did not indicate a high or moderate risk of failure before the going concern problems of four out of the eight companies. Therefore, the Z-double prime

predicted the going concern problems of 50% of the sampled companies at least one year in advance. It can be concluded that the effectiveness of the Z-double prime in predicting the going concern problems varied.

However, as discussed in Chapter 3 (section 3.5), the Z-Score will be assumed to be effective in predicting financial distress and possible company business failure. Therefore, it will be concluded that the going concern principle in isolation is not an accurate indication of financial distress and possible business failure. Additional factors pertaining to the survivability of a company should therefore be considered, such as the resilience of the companies, to validate the going concern problems.

The consideration of the elements of resilience by management of companies with going concern problems will be analysed further by referring to the integrated reports of the sampled companies selected as described in Chapter 1 (section 1.6). The reason for using the integrated reports is supported by De Villiers *et al*. (2017) who argue that the global financial crisis in 2008 emphasised the need for improved integration between financial and non-financial disclosures, as many blamed traditional reporting limitations for the losses suffered. This led to an increase in integrated reporting by companies, which aims to provide shareholders with non-financial information (Frias-Aceituno *et al*., 2014) in the form of qualitative information (De Villiers *et al*., 2017). The integrated reports will be analysed to identify elements of resilience.

4.5 Elements that support resilience

Based on the literature review, the following elements were identified to support the resilience of a company: resources, management, communication and reputation. These elements were allocated to the dimensions of resilience, i.e. readiness, response and recovery (refer figure 3-6).

Resources

A surplus capacity of resources will enable a company to respond more effectively to fluctuating demand (Christopher & Peck, 2004). In addition, planning the optimal allocation of resources is necessary to continue the company's activities during a crisis (Sahebjamnia *et al*., 2015). According to Seville (2006), a resilient company is aware of the resources to their disposal and can employ innovative people, i.e. human capital, to mobilise resources in an efficient manner to handle a crisis. Therefore, a company is dependent on its human capital to act under pressure and implement readiness and response principles during a crisis (Seville, 2006). The experience of management forms part of human capital (IIRC, 2021).

Management

The resilience of a company is influenced by the resilience of their management. Managers need to be committed to share in the responsibility of the resilience of the company (Bell, 2019) Resilience will require an all-inclusive management approach that will be influenced by the person responsible for the outcome (Bell, 2019). Therefore, the effective implementation of the stewardship theory is necessary for resilience. Managers need to obtain strategic knowledge. Strategic knowledge is knowledge of the external and internal environment, including trends that might have an impact on operations. Knowledge about the external environment can be gained through a PEST (political, economic, social and technological) analysis (Christopher & Peck, 2004).

Support from the stakeholders is essential for the company to recover from a crisis. Therefore, effective management is crucial for the transition between the response and recovery phase, as discussed in Chapter 2 (section 2.5). The transition phase will likely result in a change in management styles (Seville, 2006). Therefore, resilience is a continuous process that needs to be managed over time (Lengnick-Hall *et al*., 2011). Managers need to communicate effectively with employees to improve resilience (Gover & Duxbury, 2018).

Communication

The creation of a communication channel between stakeholders supports resilience (Buzzanell, 2010) because it reduces uncertainty (Christopher & Peck, 2004). Vos *et al*. (2017) support the argument that communication can impact the development of resilience in times of crisis. Communication is necessary to align the company's vision and goals because resilience cannot be achieved when working in isolation. It requires the integration of different departments to work together towards a common goal (Seville, 2006). Communication will result in collaboration and visibility. Collaborative planning will require the sharing of information on market trends and visibility will require stakeholders to alert managers of possible disruptions (Christopher & Peck, 2004). This information will enable managers to improve their *readiness* in anticipation of possible disruptive events which will in turn enhance the company's resilience.

Effective communication will require the breakdown of "silos" between parties to ensure the free flow of information (Christopher & Peck, 2004). Therefore, communication is essential for the resilience of a company (Gover & Duxbury, 2018). However, managers fear bad publicity and will rather keep resilience planning private to keep their reputation intact. This will negatively prevent collaboration between managers and employees to manage resilience (Seville, 2006). Therefore,

the implementation of the integrated reporting requirements to promote transparency is an essential building block for a resilient company (IIRC, 2021).

Reputation

Managers need to communicate with stakeholders to define the disruptive event and highlight it as a unique occurrence to prevent extreme reputational damage (Koronis & Ponis, 2012). Adequate disclosure in the integrated report is therefore necessary to enhance trust in the company. Managers need to implement stewardship by taking accountability for their actions and disclosing the impact of such actions on stakeholders (IIRC, 2021). According to Dean (2004), a company's reputation will have a direct impact on their ability to respond to a crisis, because a company will lose favour from stakeholders if they act in a socially irresponsible manner. A company with an appropriate response will apply their resources in a manner that will create trust and protect stakeholders' pre-crisis view of the company (Koronis & Ponis, 2012).

During a crisis, consumers will be less likely to believe unfavourable information of a firm with a good reputation. Consumers that are committed to a company will not have an attitude change towards a company based on negative publicity (Dean, 2004). Therefore, a company that is transparent with their stakeholders by opening communication channels during a crisis will suffer less reputational damage.

In line with this notion to enhance transparency, the integrated reporting framework requires the inclusion of certain information, namely (Integrated Reporting, 2021):

- information on a company's strategy;
- the connection between the elements that create value;
- information on a company's relationship with their stakeholders and how they respond to their individual needs;
- information on materiality;
- information should be concise;
- information should be reliable and free from material error; and
- information should be comparable to prior years and to other companies in the industry.

4.5.1 Empirical application

Currently the integrated reporting framework does not set benchmarks or provide guidelines for this type of information highlighted above. Another weakness in the requirements of the integrated reporting framework is that it does not prescribe specific disclosures of key performance indicators (Integrated Reporting, 2021), which can be used to measure the resilience of a company (Seville, 2006). Therefore, there are certain limitations in the existing integrated reporting framework. The results of the present study hope to make recommendations to address such limitations in an integrated report by identifying information a company can publish to communicate its efforts to improve or move towards becoming more resilient.

The elements relating to resilience were identified based on the literature review (refer to figure 3-6).

4.5.2 Evaluation of integrated reports

The integrated reports were evaluated by utilising the evaluation template as discussed and presented in Table 3-3. The historical results will be used as the empirical basis on which the artefact will be built. It will validate the proposition in Chapter 3 (section 3.5) that a more frequent word count in the respective integrated report implies a more resilient company. The results will be incorporated into the resilient scoring system (refer to figure 5-2).

A summary of the comparison between the companies' evaluation of their integrated reports is presented in Table 4-20.

Table 4-20: Results from integrated reports

Sampled companies	A	B	C	D	E	F	G	H
Resilience	35	16	53	20	1	31	14	0
Level 1 Total	**35**	**16**	**53**	**20**	**1**	**31**	**14**	**0**
Placed	2	5	1	4	7	3	6	8
Readiness	4	1	5	5	1	17	0	4
Response	48	18	38	61	17	55	39	14
Recovery	39	6	41	37	40	40	32	23
Level 2 Total	**91**	**25**	**84**	**103**	**58**	**112**	**71**	**41**
Placed	3	8	4	2	6	1	5	7
R1	615	379	1 700	778	454	1 146	1 060	281
R2	316	107	402	387	251	453	219	28
R3	0	2	2	0	7	8	0	2
Level 3 Total	**931**	**488**	**2 104**	**1 165**	**712**	**1 607**	**1 279**	**311**
Placed	5	7	1	4	6	2	3	8
Grand Total	**1 057**	**588**	**2 241**	**1 288**	**771**	**1 750**	**1 364**	**352**
Placed	**5**	**7**	**1**	**4**	**6**	**2**	**3**	**8**

Table 4-20 summarises a comparison of the results from the evaluation of the integrated reports of Companies A to H. The total of level 1 shows the number of references to the words “resilient” or “resilience”. The total of level 2 shows the number of references to the words “readiness”, “response” and “recovery”. The total of level 3 shows the cumulative references to the elements of resilience, as represented by the individual words. The combinations were placed in a position from 1 to 8 depending on the frequency of references to the identified words.

Company H was placed last with a grand total of 352 references, while Company C was placed first with 2 241 references. Company F had 112 references to the dimensions of resilience (level 2) and Company B only had 25 references. Company C had the most references to the elements of resilience (2 104 references) and Company G had the least references (311 references). Company G had no references to resilience. Company C had the most references (53 references). The number of references were counted over a combined 6-year period which stretched from 2015 to 2020 for Company A to Company G and from 2014 to 2018 for Company H (refer Annexure B). The periods covered are different, because Company H was in business rescue from March 2019 followed by a delisting on 15 June 2020 after 46 years on the JSE (Anderson, 2020). It can be concluded that companies made minimal reference to resilience in their integrated reports.

The ATLAS.ti results on the findings of Table 4-20 can be presented as word clouds.

4.6 Word clouds

The following figures visually present the findings of level 1, level 2 and level 3 of Table 4-20 in the form of a word cloud. The detailed results (other than those presented below), relating to the results obtained from the individual companies, can be viewed in Appendix C. The word clouds of the two companies that were placed best overall (Company C and Company F) and the word cloud of the company that was placed last (Company H) will be presented below.

Figure 4-10: Word cloud of Company C

Figure 4-10 is a graphic representation of the total column of Table 4-20. It can be noted that the word “assets” was the most popular. Assets were identified as a word supporting the readiness element of resilience (see Figure 3-6). Assets improve a company’s readiness, because it can be used as collateral to apply for a loan during financial difficulty (refer to section 2.5.2).

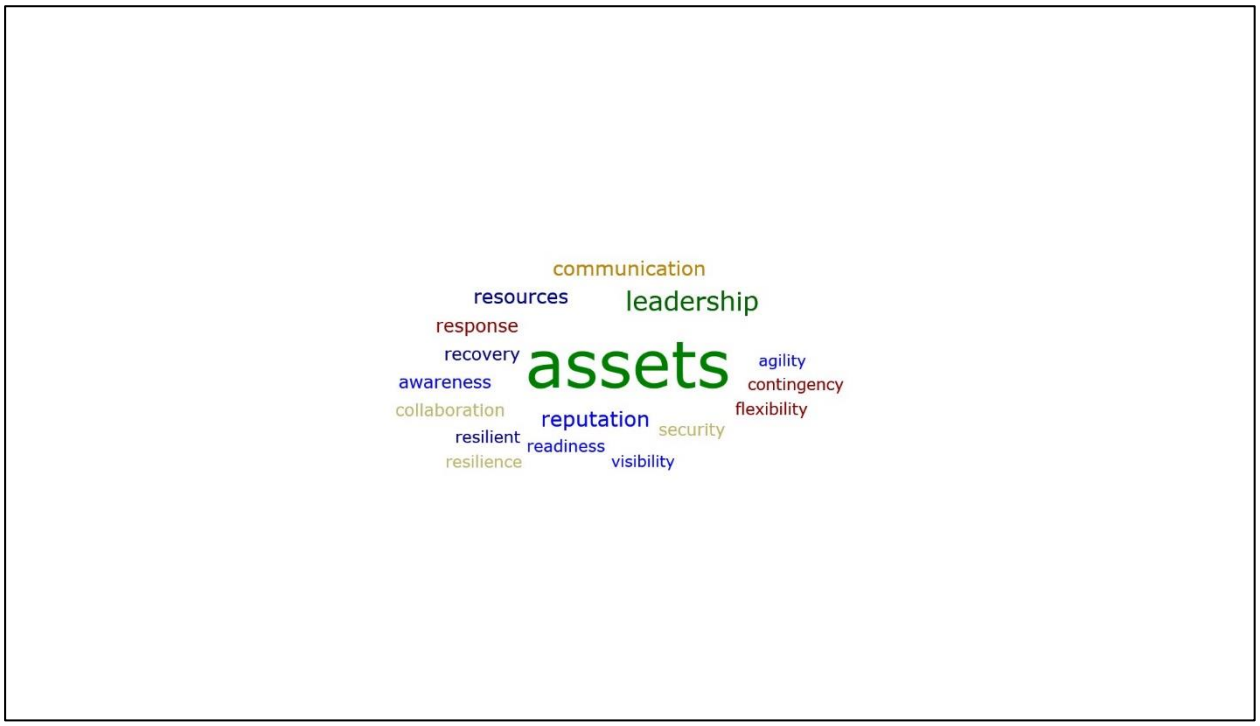

Figure 4-11: Word cloud of Company F

Figure 4-11 is a graphic representation of the total column of Table 4-18. Similar to the findings of Company C, it was evident that the word “assets” was the most popular. As mentioned above, assets allude to the readiness element of resilience. A company that owns assets does not have a compulsory rent outflow. Therefore, this “cost saving” can cover other expenses during difficult financial times (refer to section 2.5.2).

Figure 4-12: Word cloud of Company H

Figure 4-12 is a graphic representation of the total column of Table 4-20. Interestingly, although Company H was the company placed last, it also used the word “assets” the most in its integrated reports, although the company made no reference to “resilient” or “resilience” in its integrated reports.

4.6.1 Examples of disclosures in integrated reports

The following direct quotations are examples of disclosures from the integrated reports of the companies placed first and second with the total word counts, from level 1, level 2 and level 3 (Table 4-18):

Company C

Below are the quotations from Company C’s integrated report.

> *“Our core iOCO business has stabilised and proven its **resilience** through the disruption caused by COVID-19.” (2020)*
>
> *“The business as a whole held up incredibly well, which is a testament both to its **resilience**, innovativeness and robust standing, and to the hard work, sacrifice and creativity of our staff.” (2020)*
>
> *“Due to the **flexibility** and strength of the business, and because we have a wide customer and service base, we’ve reached a point where we’ve been able to create optionality for ourselves.” (2020)*

*"[Company C's] **response** to the COVID-19 pandemic provides an excellent case study of the depth of intellectual property across the Group that enables the rapid development and implementation of innovative and sustainable technology solutions." (2020)*

*"The [Company C] Courageous **Leadership** initiative was introduced in 2019 and stemmed from the need to instil a new and sustainable ethos within Company C." (2020)*

*"Risk **awareness** campaigns and training through the Organisation." (2020)*

It can be noted that Company C views itself as resilient because it was able to effectively respond to the COVID-19 pandemic and survive it. Company C includes resilience and sustainability as one of its seven governance pillars. Instead of simply stating they are resilient, Company C provides reasons to support its argument as to "why" it is resilient. Therefore, management is aware of the resilience of the company.

Company F

The direct quotations below are from Company F's integrated reports.

*"[Company F] continues to build **resilience** across its organisation despite the significant uncertainty and additional volatility created by the health and economic crises experienced during the last quarter of the 2020 financial year." (2020)*

*"Both businesses have proved **resilient** post the lockdown from both a revenue and profitability perspective and are delivering according to the strategic plan and budget." (2020)*

*"[Company F] responded immediately to the COVID-19 crisis by implementing a **response** plan across all operations in consultation with customers." (2020)*

*"All projects remain operational with COVID-19 **response** measures in place." (2020)*

*"[Company F's] ability to develop sound client relationships and work in remote and difficult locations throughout Africa has earned it a strong **reputation** in its selected markets." (2020)*

It can be noted that Company F was able to implement a quick response to the COVID-19 crisis to continue with their business activities. Management is involved with the implementation of the response plan because they evaluate whether the company yields financial results in line with their strategy. Therefore, management considers resilience as part of their planning to survive disruptive events.

4.7 Main findings

The main findings of the empirical study can be summarised as follows:

- The references to the readiness, response and recovery dimensions (level 2) do not align with the references to the individual elements that it consists of (level 3).
- The reporting on the recovery dimension of resilience (level 2), as well as its elements (level 3) is minimal. There is a need for an increase in the reporting on recovery, as it is a continuous process that forms part of resilience.
- Company H was placed second last in level 2 and last in level 1 and 3. They had no reference to resilience and was delisted in June 2020. This can indicate that resilience reporting is essential for a company's survival.
- It was found that companies increase the references to resilience in the year of the going concern problems (see Appendix B). However, the plans to be resilient should then already be in place, because time is an important determinant of the resilience of a company (section 2.5.4). Therefore, companies should be pro-active in their resilience disclosures instead of reactive.
- It was also found that companies also increase their references to recovery in the year that going concern is a problem, but the implementation of recovery measures is not a short-term process. Managers may underestimate the risk of a disruptive event and not react until they feel the impact. However, if managers apply the Z-Score they can respond earlier (Caso, 2020).

4.8 Summary

The aim of this chapter was to address the second secondary objective to utilise the theoretical foundation in developing the anticipated Altman's Z-Score-based decision-support model. In doing so, the sampled companies' resilience was analysed using the identified resilience elements.

The chapter mentioned that the prediction of a company's survival cannot be based solely on the going concern opinion issued by auditors, because the accuracy of the prediction in previous studies varied. The Z-double prime of the sampled companies was calculated, and the results interpreted. The Z-double prime indicated a high risk of failure for six out of the eight companies in the year of the going concern problems. It was found that a downward trend in the Z-double prime could signal possible problems.

It was concluded that the Z-double prime is not effective in predicting the going concern problem, and therefore the going concern principle should be validated with resilience. The integrated reports were analysed using the evaluation template presented in Chapter 3. The word count function of ATLAS.ti was used to count the company's references to "resilient" or "resilience" (level 1), and number of references to the words "readiness", "response" and "recovery" (level 2). The function was lastly used to count the cumulative references to the elements of resilience, as represented by the individual words (level 3). The total of level 1, level 2 and level 3 of the word counts of the companies were compared. A summary of the results is reflected in Table 4-18.

Resources, management, communication and reputation were discussed as elements that support the resilience of companies. These were allocated to the dimensions of resilience, i.e. readiness, response and recovery. The evaluation of the integrated reports of the sampled companies found that companies have minimal disclosure of resilience in their integrated reports. An increase in the references to the word "resilience" in the year of the going concern problems was noted. However, companies should have planned in preparation of possible disruptive events to react quickly.

The results of the the word clouds of the two companies placed best overall (Company C and Company F) and the word cloud of the company placed last (Company H) were presented visually in the form of word clouds. Company H that obtained the lowest score for their resilience disclosures was delisted in June 2020 that emphasised the importance of resilience disclosures for companies.

Direct quotations from the integrated reports of Company C and Company F were provided as an example of resilience disclosures. These companies mention that they showed resilience during COVID-19 and support this argument with their practical application of resilient actions.

Chapter 5 will analyse the results obtained and provide recommendations for further research and integrated reporting disclosures. It will refer to the limitations of the study and provide recommendations to adapt the artefact to develop a resilience scoring system.

CHAPTER 5

5 DISCUSSIONS AND RECOMMENDATIONS

The previous chapter described the empirical application of this study and the findings from the Z-double prime score.

5.1 Introduction

The aim of this chapter is to conclude and provide recommendations based on the literature and empirical study.

The flow of this chapter is shown in Figure 5-1.

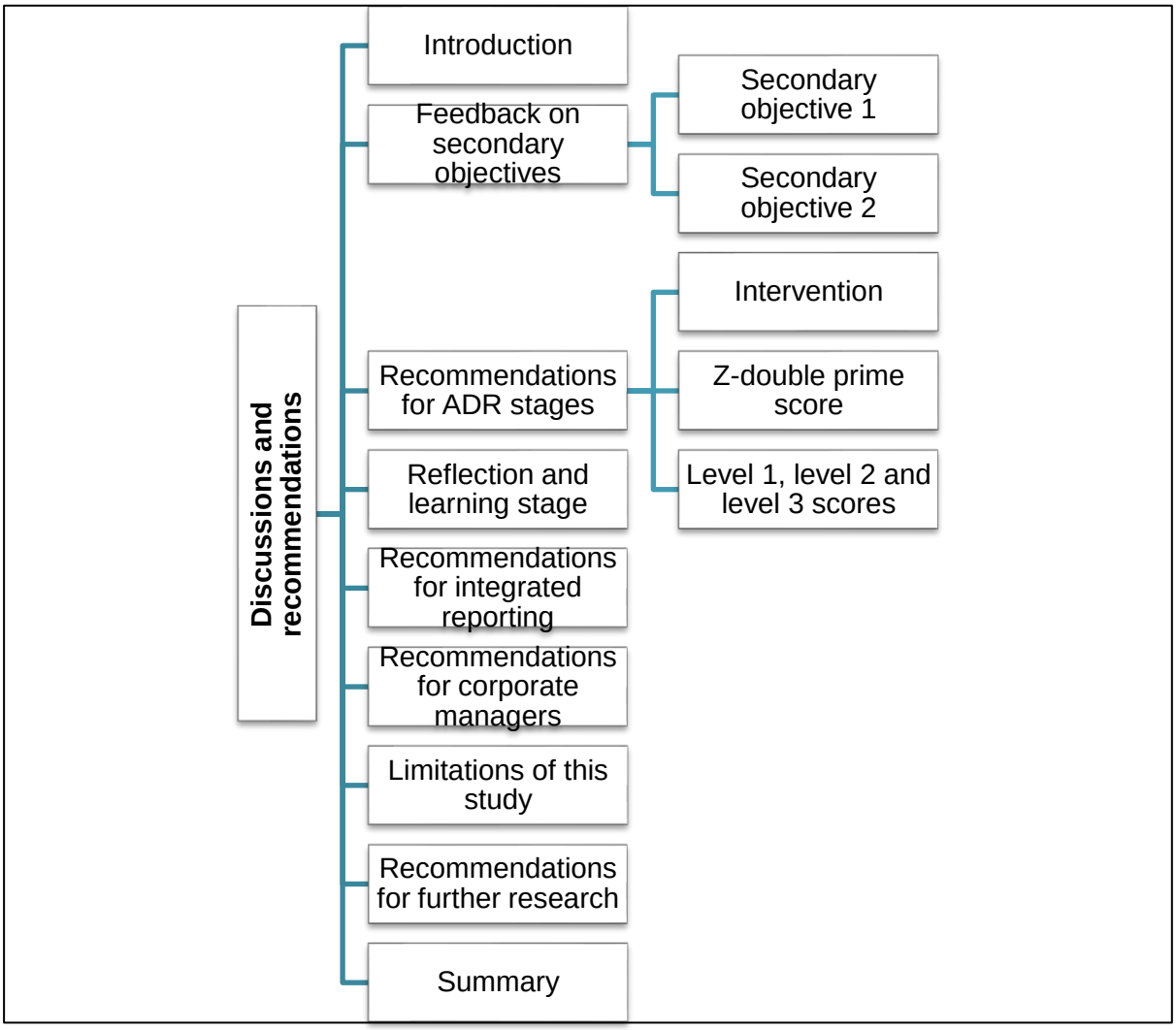

Figure 5-1: Chapter overview

This chapter will start with a discussion on how each secondary objective was addressed. It will provide recommendations on the ADR stages, in the context of the Z-double prime score and the three levels of resilience. The fourth ADR stage – reflection and learning – of the ADR process will be addressed. The chapter will provide recommendations for integrated reporting disclosures and recommendations on the practical application of the developed model by managers. The chapter will conclude by identifying the limitations of the study and the identification of areas of possible further research.

5.2 Feedback on secondary objectives

The secondary objectives supported the main objective of the development of a decision-support model, based on Altman's Z-Score, to gauge organisational resilience concerns in anticipation of potential disruptive events. The study successfully addressed the secondary objectives as stipulated below.

5.2.1 Secondary objective 1

The first secondary objective will consider the principles underlying Altman's Z-Score (including aspects around the going concern concept) and the resilience concept. This objective will form the basis of the empirical development of the model.

In Chapter 2 the history, functionality, individual elements and versions of Altman's Z-Score were investigated. It was determined that Altman's Z-Score has been used to predict possible business failure and to manage the risks of a company.

The various resilience dimensions were described. These dimensions were deemed to be necessary for the survival of companies, because of the uncertainty of the consequences of adverse events. The dimensions were identified as the readiness, response and recovery dimensions of resilience that are dependent on one another.

Readiness was described as the availability of adequate resources to respond to disruptive events. Managers should have knowledge of these resources to respond to events. Response was described as the ability to implement resources to respond to disruptive events. It was concluded that skilled employees will improve a company's ability to adequately respond to events. It was stated that a company with a faster response will be more likely to survive and recover from a disruptive event. Recovery was defined as the ability of a company to return to a pre-disaster state which could be determined with reference to a company's financial performance.

It was concluded that the readiness, response and recovery dimensions should continuously be evaluated by management.

5.2.2 Secondary objective 2

The second secondary objective will utilise the theoretical foundation in developing the anticipated Altman's Z-Score-based decision-support model. In doing so, the sampled companies' resilience will be analysed using the identified resilience dimensions.

In Chapter 4 the Z-double prime scores were presented that was calculated using data that was extracted from the sampled companies' financial statements with the use of the IRESS database. The developed artefact (Part A and Part B) was applied to evaluate the resilience of the companies. Part A was applied to calculate the Z-double prime of the companies and Part B was applied to evaluate the integrated reports for resilience elements. The main findings of the analysis of the resilience in the integrated reports of the sampled companies are summarised below:

- Companies have limited disclosures on resilience and the elements that it consists of.
- Companies do not perform well in all three levels because they do not mention the elements that their resilience consist of, or they do not link these elements to the dimensions of resilience.
- Companies increase their disclosure of resilience and these elements in the year of the going concern problems, but there should be existing plans of action to pre-empt disruptive events.
- Company H was in business rescue since March 2020, followed by a delisting on 15 June 2020 (Anderson, 2020). It had no references to resilience in their integrated reports. The company's demise supports the argument in favour of the importance of resilience disclosures for a company's survival.

Therefore, a recommendation is that managers need to increase the disclosures on the resilience of their company, which will be elaborated on the discussion on recommendations below.

5.3 Recommendations for ADR stages

The study was conducted in two phases. Phase 1 was the calculation and interpretation of the Z-double prime of the sampled companies and Phase 2 was the evaluation of their integrated reports. The results lead to the development of an artefact that consists of two parts. As discussed

in Chapter 3 (section 3.5), Part A is a diagram that illustrates the process to support organisational resilience and Part B is a MS Excel document used for the historical data evaluation.

Intervention

Part B, the MS Excel document, of the artefact could be adapted to allow managers to implement it in an organisational context and calculate and allocate a resilience score to a company. Therefore, the intervention part of stage 2 of the ADR process could be applied. The adapted artefact (presented in Table 5-1) will replace Part A and Part B of the original artefact (refer to section 3.5). The results of the application of the artefact can be evaluated to determine the effectiveness thereof and can be used to identify areas for possible improvement. The adapted artefact is illustrated below.

Table 5-1: Adapted artefact

	Points	Weighting	Resilience scoring system
Z-double prime		X3	
High risk <1,1	1		
OR			
Moderate risk >=1,1<2,6	2		
OR			
Low risk, downward trend >=2,6	1		
OR			
Low risk, upward or no trend >=2,6	3		
Z-double prime Score (Z)			
	Company's frequency of words	Industry benchmarking for frequency of words	Resilience scoring system
Level 1			
Resilience or resilient			
Level 2			
Readiness			
Response			
Recovery			
Total			
Level 3			

Readiness elements (R1)			
Assets			
Resources			
Excess capacity			
Visibility			
Security			
Awareness			
Total (R1)			
Response elements (R2)			
Leadership			
Flexibility			
Reputation			
Agility			
Communication			
Collaboration			
Total (R2)			
Recovery elements (R3)			
Market position			
Financial performance			
Knowledge management			
Skilled employees			
Contingency			
Total (R3)			
Level 3 Total R1+R2+R3			
Total Resilience Score (Level 1 + Level 2 + Level 3)			

Table 5-1 reflects the adapted artefact. It can be noted that the artefact was expanded to include the Z-double prime in row 1. Column 3 relating to industry benchmarking and Column 4 relating to the resilience scoring system were also added. Some explanatory notes relating to the adapted artefact:

- A Z-double prime that indicates a high risk of failure will be scored a 1, a moderate risk of failure will be scored a 2, while a low risk of failure will be analysed further, as discussed in Part A of the original artefact. A company with a low risk of failure will be analysed to determine if the Z-double prime had a downward trend for a minimum of three prior years. A downward trend of a minimum of three years indicates a high risk of failure (section 2.4.6) and will be scored a 1. However, an upward trend or no trend will be scored a 3. Therefore, a lower score indicates a lower resilience. The total score will be multiplied by 3 to ensure equal weighting to the resilience components.

- Managers should apply their knowledge of the Z-Score to reach the company's goals in uncertain times by being flexible with their operations (Levy *et al*., 2020). In line with this, managers should consider the Z-double prime during uncertain times, and it will also form part of the resilience scoring system (refer Table 5-2).
- It can be concluded that the analysis of the Z-Score is essential during disruptive events. Therefore, the Z-double prime will be multiplied by 3 to increase its weighting in relation to the resilience scores of the levels of resilience. The part of the scoring system that relates to resilience comprises three levels. Therefore, a weighting of 3 was used for the Z-double prime to compensate for the uneven weighting and elevate the importance of the Z-double prime score. However, the multiplication by 3 is merely suggested and can be decided by the management of a company.

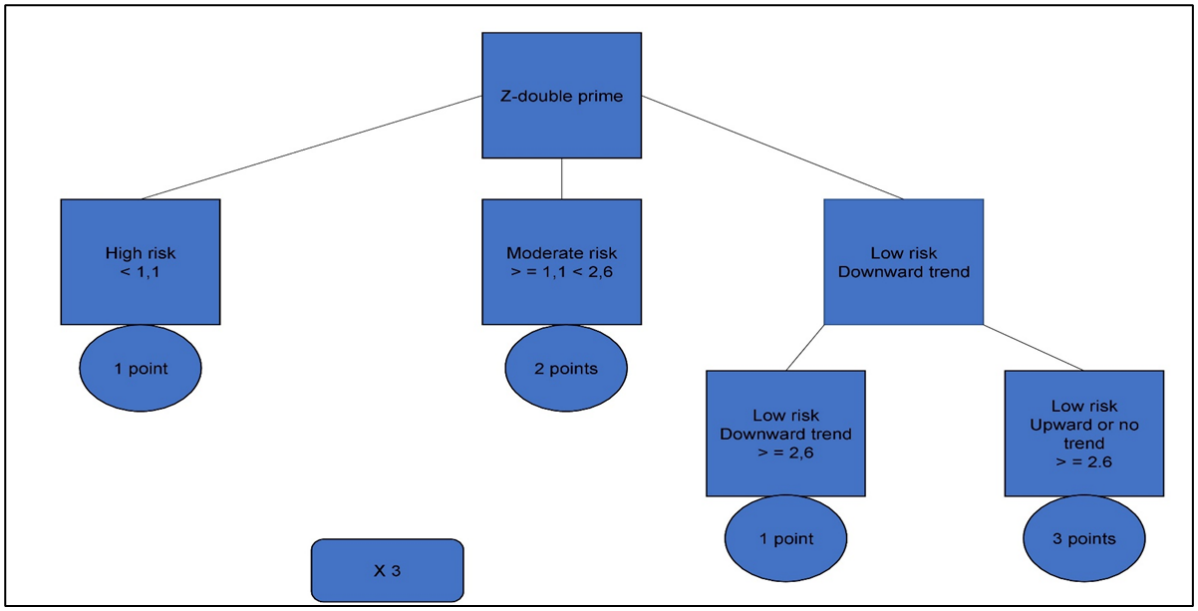

Figure 5-2: Scoring system for Z-double prime

- Figure 5-2 illustrates the points allocated to Altman's Z-double prime. The squares represent the risk of failure (high, moderate or low), obtained from the Z-double prime and the number in the circle represents the points allocated to the Z-double prime score. The total points will be multiplied by 3 to ensure equal weighting to the scoring system of the levels.
- The artefact consists of three levels of resilience as shown in Table 5-1. Level 1 counts the frequency of the words "resilient" or "resilience". Level 2 counts the frequency of the words "readiness", "response" and "recovery". Level 3 counts the words relating to the individual elements of the readiness, response and recovery dimensions.

- Industry benchmarking is more effective than historical analysis (refer section 2.4.6). Therefore, managers should compare their strategy with the strategies of their more resilient competitors to develop resilience (Levy *et al*., 2020). The application of the artefact will firstly require managers to obtain word counts from other companies in the industry to implement peer-benchmarking. Word counts will be a form of conceptual analysis, as discussed in Chapter 3 (section 3.7). It is agreed that if management refers to certain words in the integrated report it was considered by them (artefact creation, Chapter 3). Therefore, a word count is an effective benchmark for the resilience scoring system. Industry benchmarking with word counts (as reflected in Table 5-1, column 3) will be considered as the scoring system of the levels of resilience. The Z-double prime will not be evaluated with word counts, because the existing benchmarking system of the Z-double prime, created by Edward Altman, will be applied.

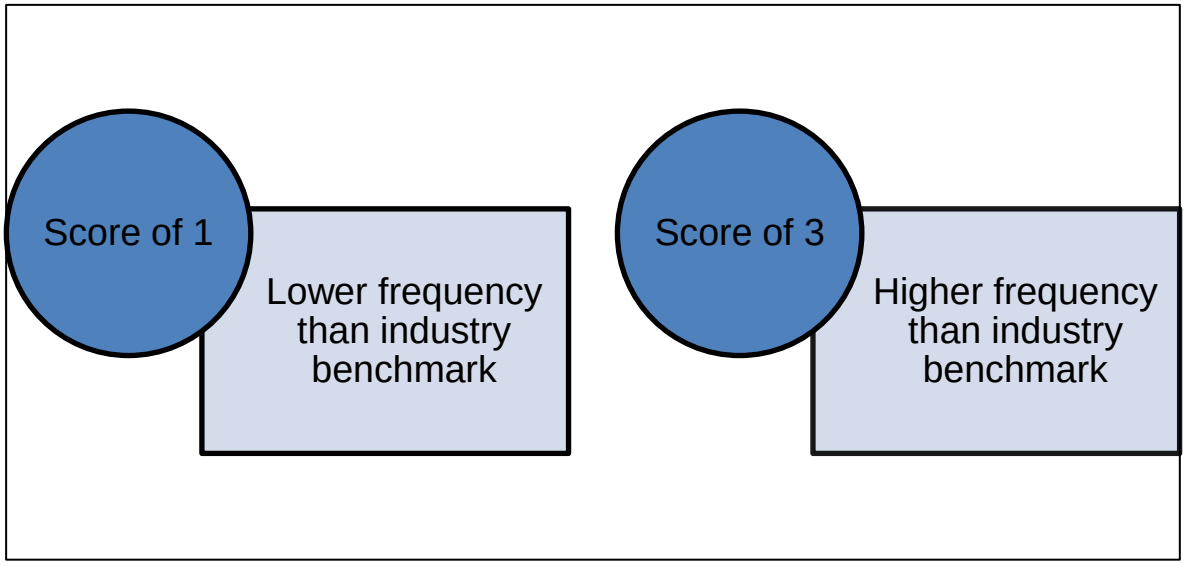

Figure 5-3: Scoring system for level 1 to 3

- Figure 5-3 illustrates the scoring system applied to level 1, level 2 and level 3. A lower frequency of words compared to the industry will score a 1, while a higher frequency will score a 3.
- The frequency of words will be compared to the frequency of the competitors. If a company obtains a higher frequency, they will be scored with a 3 and a lower frequency will be scored with a 1. The score of the Z-double prime and the three resilience levels will be added to get a total resilience score out of 18. Table 5-2 shows a breakdown of this total.

Table 5-2: Perfect Z-Score

Z-double prime and levels of resilience	Score	Weighting	Score after weighting
Z-double prime	3	X 3	9
Level 1	3		3
Level 2	3		3
Level 3	3		3
Total			**18**

Table 5-2 shows that a company with a perfect resilience score will obtain 3 points for the Z-Score, as well as a score of 3 for each resilience level. The Z-double prime will be multiplied by 3, to ensure equal weighting, as discussed under the explanatory notes above. The sum of these items will give a total resilience score of 18.

The scores obtained with the application of the above figures will be added together to obtain a total resilience score, as shown in Figure 5-4.

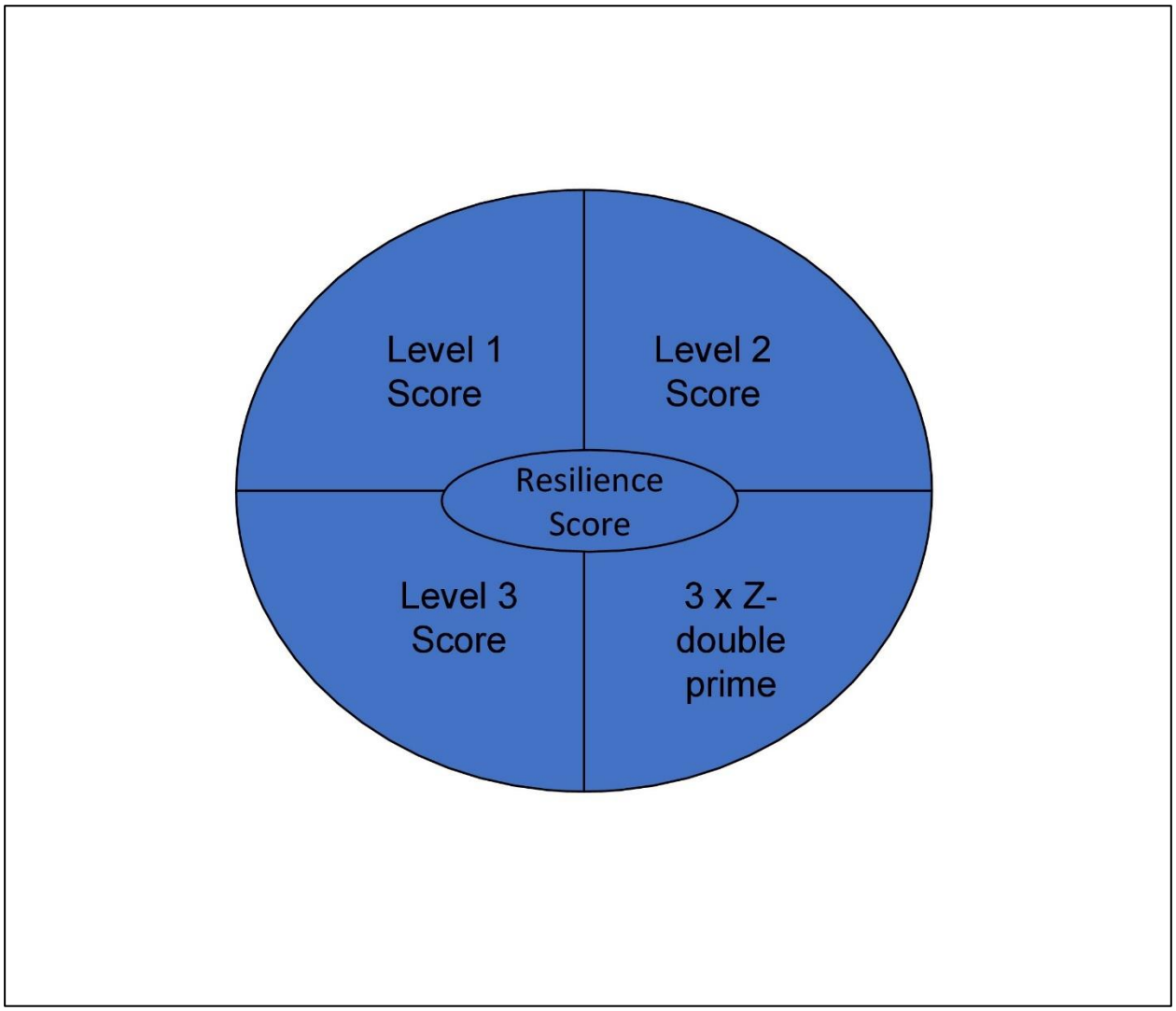

Figure 5-4: Total resilience score

Figure 5-4 illustrates the application of the resilience score system. The resilience score consists of the sum of the level 1, 2 and level 3 scores, as well as three times the Z-double prime score.

For the purpose of illustrating the total resilience score of a fictitious company, Company β, is considered. It is assumed that the managers of Company β obtained the frequency of words from the integrated reports of Company β, as well as their competitors in the industry. They used these results of the other companies to decide on the industry benchmarking for the resilience scoring system.

Z-double prime score

The following will discuss the application of the Z-double prime score:

- Assuming Company β has a Z-double prime of 0,5, according to Chapter 2, this will be classified as a high risk of failure according to Altman's Z-Score (section 2.4.4). As reflected in Figure 5-2 the points allocated according to the resilience scoring system will be 1. Therefore, a lower score indicates a lower resilience.
- These points for the Z-double prime score will be multiplied by 3 to obtain a total of 3. It is multiplied by 3, because the Z-double prime score is important and should be weighted in equal proportion to the level 1, level 2 and level 3 scores, as discussed under reasons for inclusion.

Level 1, level 2 and level 3 scores

The scores allocated to level 1, level 2 and level 3 (refer to table 5-1) of resilience will be elaborated on below:

- The comparison of Company β to the industry benchmark, for the frequency of words, revealed that Company β had more references (10 vs 8) to the words "resilience" or "resilient" (level 1). As discussed in Chapter 3 (artefact creation), a company with more references than the industry, is considered to be more resilient. Therefore, Company β was assumed to be more resilient than its competitors and they scored a 3.
- The comparison of Company β to the industry benchmark, for the frequency of words, revealed that Company β had less references (5 vs 7) to readiness, response and recovery (level 2). Therefore, Company β scored a 1 (Figure 5-3).
- The comparison of Company β to the industry benchmark, for the frequency of words, revealed that Company β had more references (12 vs 10) to the words "readiness", "response" and "recovery" elements (level 3). Therefore, Company β scored a 3.
- The points for the Z-double prime and the scores of the levels will be added together to obtain a total resilience score of 10 out of 18.

Table 5-3 will practically illustrate the above scenario.

Table 5-3: Fictitious example of Company ß's resilience score

	Points	Weighting	Resilience scoring system
Z-double prime			
High risk <1,1	1	X3	3
Z-double prime score			
	Company β Frequency of words	Industry benchmarking for frequency of words	Resilience scoring system
Level 1	10	8	3 (higher frequency)
Level 2	5	7	1 (lower frequency)
Level 3	12	10	3 (higher frequency)
Total resilience score (Level 1 + Level 2+ Level 3)			10

Table 5-3 is a summarised application of the artefact using a fictitious company's data. The sum of the 1 point of the Z-double prime score, multiplied by 3, and the scores of level 1, level 2 and level 3 will result in a total resilience score of 10.

Note: the scores used in the scoring system is subjective and can be improved by applying the artefact to more companies.

5.4 Reflection and learning stage of the ADR process

Reflection and learning comprise stage 3 of the ADR process, as discussed in Chapter 3 (section 3.5). Table 5-4 will discuss the reflection and learning stage in the form of feedback provided by the researcher on certain discussion points. The discussion points are based on the problem formulated and the feedback is based on the results from the empirical application.

Table 5-4: Findings from empirical application validating the problem formulated

Discussion point	Feedback
Can Altman's Z-Score be applied as an initial indicator of possible company failure?	Yes, the Z-double prime accurately predicted going concern problems, as defined by this study, for four out of the eight companies. Yes, companies that experienced going concern problems had a declining trend in the Z-double prime for a minimum of three years.
Can various resilience elements be incorporated as a predictor of organisational resilience?	Yes, companies' resilience was evaluated based on their resilience elements by analysing their integrated reports.

5.5 Recommendations for integrated reporting

As derived from the International Integrated Reporting Framework (2021), reporting on resilience is not a requirement of integrated reporting. Based on the evaluation of the sampled companies' integrated reports, the reporting on resilience and the elements of resilience were found to be lacking (Table 4-20).

Therefore, guidelines need to be put in place to offer support to companies in not only the reporting of, but also enhancing the resilience of a company.

These guidelines should be expanded to include Altman's Z-Score, as well as the various dimensions of resilience. Knowledge of which dimension of resilience is lacking will enable a company to implement performance measures to improve their resilience.

Therefore, the inclusion of the evaluation of reporting on resilience in the integrated report is recommended. Reporting on resilience should be broken down in the dimensions of the readiness, response and recovery dimensions, with applicable headings. The dimensions should be analysed according to the elements of the dimensions as listed in Figure 3-6 (Chapter 3). The application of the developed artefact will enable managers to gain insight into their companies' resilience and report on it. This inclusion will ensure transparency to the shareholders about essential information on corporate resilience.

5.6 Recommendations for corporate managers

As discussed in section 1.3.3, managers are the stewards that can drive the success of their companies by ensuring a favourable environment for resilience. The implementation of this model can assist managers in stewarding resilience in their companies.

- Managers should discuss the results of this model with their employees. This collaboration will aid managers in building a relationship of trust with their employees, which is a factor of the stewardship theory (refer to section 1.3.3).
- Managers should disclose this information to shareholders to show their commitment to the company's success.
- The application of the model to companies that are showing satisfactory results will be useful to managers. The information provided by the model can be evaluated to determine what the driving force is behind the company's success and managers can continue doing it in the future.
- Managers of companies that are doing well can implement the model in decision-making processes. Their resilience score can help them to decide between applying surplus funds to pursue new opportunities or rather saving it for a "*rainy day*".

5.7 Limitations of this study

The limitations can be addressed in further research and are discussed below:

- A limitation of this study is that the auditors' considerations on other factors pertaining to the going concern principle were excluded. Therefore, a company was considered to experience financial distress based solely on the current liabilities exceeding the current assets.
- The sample size of the companies selected can be viewed as small when compared to the number of JSE-listed companies.
- The identified companies are listed on the JSE Limited and therefore required to adhere to listing and reporting requirements. Companies that are dual-listed may have other reporting requirements to adhere to.
- There was no interaction with participants from practice in designing the model.
- The companies' references were not considered in the context of the integrated reports.
- The study evaluated companies with going concern problems with no comparison to companies that did not have these problems.

5.8 Recommendations for further research

Future research can address the limitations of the study and expand on the designed framework. Recommendations for further research include:

- Refer to the auditors' report to determine their considerations on the going concern principle.
- Increase the sample of companies evaluated by also including companies that did not experience going concern problems.
- Extend the sample of companies evaluated to companies listed on alternative stock exchanges and evaluate their reporting requirements.
- Collaboration with managers in practice to determine their view on the elements of resilience.
- Evaluate the references to determine whether it is in relation to resilience and if it is positive or negative.
- Use companies without going concern problems as a control group to compare companies with going concern problems to.

5.9 Summary

The chapter concluded that the secondary objectives of the study were achieved. It adapted Part A and Part B of the original artefact into a new artefact that can be applied as a resilience scoring system.

The study was conducted in two phases. Part A of the artefact was applied in Phase 1, i.e. the calculation and interpretation of the Z-double prime. Part B was applied in Phase 2 of the study, i.e. the evaluation of the integrated reports. The adapted artefact (refer Table 5-1) will firstly allocate points to a company based on their Z-double prime score. Secondly, the artefact will use industry benchmarking to compare a company's word counts of their resilience disclosures to the word counts of their peers. A score will be allocated to the company based on this comparison.

The chapter provided recommendations for compulsory inclusions in the integrated reporting framework. These inclusions should include disclosures of the resilience of a company, the dimensions, as well as the elements of resilience. Recommendations for managers to practically apply this model, even in times of financial prosperity, were elaborated on.

The chapter concluded with a discussion on the limitations of the study and recommendations for further research.

The primary objective of this study was the development of a decision-support model, based on Altman's Z-Score, to gauge organisational resilience concerns in anticipation of potential disruptive events. The objective was achieved by the development of an artefact that aids managers in gaining an understanding of the resilience of their respective companies.

In addition to developing a resilience decision-support model, a stewardship relationship between management and the employees of the company was also established. The implementation of the proposed model will make it possible for management and employees to work together towards the goal of managing the resilience of the company. Therefore, the primary objective was achieved.

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APPENDIX A: STOP AND GO LIST

Name	**Stop List**		**Comment**
Resilience	no		
Word or Regex	**Enabled**	**Regex**	**Comment**
(\d+) (((. |,) \d+) +)?	no	yes	Excludes numbers of any length (including e notation 0.234e25)
\b(\w) \b	no	yes	Excludes words consisting of a single character
_+	no	yes	Excludes strings of underscores
-+	no	yes	Excludes strings of hyphens of arbitrary size
assets	yes	no	
resources	yes	no	
excess capacity	yes	no	
visibility	yes	no	
security	yes	no	
awareness	yes	no	
leadership	yes	no	
flexibility	yes	no	
reputation	yes	no	
agility	yes	no	
communication	yes	no	
collaboration	yes	no	
market position	yes	no	
financial performance	yes	no	
knowledge management	yes	no	
skilled employees	yes	no	
contingency	yes	no	
resilient	yes	no	
resilience	yes	no	
readiness	yes	no	
response	yes	no	
recovery	yes	no	

APPENDIX B: HISTORICAL DATA EVALUATION

Company A

	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	7	4	5	4	0	0	20
Resilient	2	1	3	7	1	1	15
Total	**9**	**5**	**8**	**11**	**1**	**1**	**35**
Level 2							
Readiness	0	0	0	1	2	1	4
Response	16	5	13	5	7	2	48
Recovery	12	3	8	8	5	3	39
Total	**28**	**8**	**21**	**14**	**14**	**6**	**91**
Level 3							
Readiness elements (R1)							
Assets	44	17	72	71	68	66	338
Awareness	3	2	4	3	8	9	29
Resources	22	14	28	26	29	29	148
Security	12	4	21	25	17	10	89
Visibility	2	0	2	2	2	3	11
Total (R1)	**83**	**37**	**127**	**127**	**124**	**117**	**615**
Response elements (R2)							
Collaboration	1	0	9	5	5	5	25
Communication	17	6	9	10	10	7	59
Flexibility	1	0	2	1	2	3	9
Leadership	20	17	53	38	43	28	199
Agility	2	0	1	0	0	0	3
Reputation	6	3	4	3	2	3	21
Total (R2)	**47**	**26**	**78**	**57**	**62**	**46**	**316**
Recovery elements (R3)							
Total (R3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Level 3 Total (R1+R2+R3)	**130**	**63**	**205**	**184**	**186**	**163**	**931**
Grand Total (Level 1+2+3)	**167**	**76**	**234**	**209**	**201**	**170**	**1057**

Company B

	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	1	0	0	0	0	0	1
Resilient	2	1	1	4	4	3	15
Total	**3**	**1**	**1**	**4**	**4**	**3**	**16**
Level 2							
Readiness	0	0	0	1	0	0	1
Response	14	2	1	0	0	1	18
Recovery	2	1	1	1	0	1	6
Total	**16**	**3**	**2**	**2**	**0**	**2**	**25**
Level 3							
Readiness elements (R1)							
Assets	35	108	39	36	29	38	285
Awareness	5	5	3	3	1	1	18
Resources	10	12	9	11	5	3	50
Security	8	7	5	5	0	1	26
Total (R1)	**58**	**132**	**56**	**55**	**35**	**43**	**379**
Response elements (R2)							
Collaboration	4	0	0	0	2	1	7
Communication	6	1	3	0	1	0	11
Flexibility	6	0	0	0	0	1	7
Leadership	34	10	9	6	15	4	78
Reputation	0	0	0	1	1	2	4
Total (R2)	**50**	**11**	**12**	**7**	**19**	**8**	**107**
Recovery elements (R3)							
Contingency	0	2	0	0	0	0	2
Total (R3)	**0**	**2**	**0**	**0**	**0**	**0**	**2**
Level 3 Total (R1+R2+R3)	**108**	**145**	**68**	**62**	**54**	**51**	**488**
Grand Total (Level 1+2+3)	**127**	**149**	**71**	**68**	**58**	**56**	**529**

Company C

Word	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	13	13	2	4	1	3	36
Resilient	6	2	4	4	0	1	17
Total	**19**	**15**	**6**	**8**	**1**	**4**	**53**
Level 2							
Readiness	1	3	0	0	0	1	5
Response	20	4	5	5	2	2	38
Recovery	11	15	3	4	4	4	41
Total	**32**	**22**	**8**	**9**	**6**	**7**	**84**
Level 3							
Readiness elements (R1)							
Assets	342	302	182	170	179	184	1359
Awareness	5	1	3	2	1	1	13
Resources	27	29	21	24	22	21	144
Security	42	24	27	31	29	25	178
Visibility	3	1	1	1	0	0	6
Total (R1)	**419**	**357**	**234**	**228**	**231**	**231**	**1700**
Response elements (R2)							
Collaboration	12	8	2	3	1	0	26
Communication	15	15	10	10	12	12	74
Agility	1	0	0	2	2	2	7
Flexibility	6	0	0	1	1	2	10
Leadership	75	106	22	22	10	9	244
Reputation	13	19	2	2	3	2	41
Total (R2)	**122**	**148**	**36**	**40**	**29**	**27**	**402**
Response elements (R3)							
Contingency	1	1	0	0	0	0	2
Total (R3)	**1**	**1**	**0**	**0**	**0**	**0**	**2**
Level 3 Total (R1+R2+R3)	**542**	**506**	**270**	**268**	**260**	**258**	**2104**
Grand Total (Level 1+2+3)	**593**	**543**	**284**	**285**	**267**	**269**	**2241**

Company D

Word	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	2	0	1	0		2	6
Resilient	2	0	0	1		2	14
Total	**4**	**0**	**1**	**1**	**10**	**4**	**20**
Level 2							
Readiness	0	0	0	2	2	1	5
Response	17	10	6	8	9	11	61
Recovery	3	4	2	10	8	10	37
Total	**20**	**14**	**8**	**20**	**19**	**22**	**103**
Level 3							
Readiness elements (R1)							
Assets	43	172	119	81	69	86	570
Awareness	5	8	4	5	6	5	33
Resources	16	21	25	30	23	15	130
Security	2	1	4	12	9	3	31
Visibility	3	5	1	2	0	3	14
Total (R1)	**69**	**207**	**153**	**130**	**107**	**112**	**778**
Response elements (R2)							
Collaboration	3	1	1	1	1	0	7
Communication	3	3	17	13	14	21	71
Flexibility	2	1	1	2	5	0	11
Leadership	37	29	26	39	47	57	235
Reputation	10	12	9	10	10	12	68
Total (R2)	**55**	**46**	**54**	**65**	**77**	**90**	**392**
Recovery elements (R3)	0	0	0	0	0	0	0
Total (R3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Level 3 Total (R1+R2+R3)	**124**	**253**	**207**	**195**	**184**	**202**	**1170**
Grand Total (Level 1+2+3)	**148**	**267**	**216**	**216**	**213**	**228**	**1293**

Company E

Word	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	0	0	0	1	0	0	1
Total	**0**	**0**	**0**	**1**	**0**	**0**	**1**
Level 2							
Readiness	1	0	0	0	0	0	1
Response	8	2	1	1	1	4	17
Recovery	8	5	4	5	8	10	40
Total	**17**	**7**	**5**	**6**	**9**	**14**	**58**
Level 3							
Readiness elements (R1)							
Assets	29	43	29	29	29	44	203
Awareness	12	5	5	5	6	8	41
Resources	31	31	33	28	26	45	194
Security	2	2	3	3	3	2	15
Visibility	1	0	0	0	0	0	1
Total (R1)	**75**	**81**	**70**	**65**	**64**	**99**	**454**
Response elements (R2)							
Collaboration	2	1	3	2	7	2	17
Communication	21	14	11	14	12	16	88
Flexibility	3	3	3	4	2	0	15
Leadership	20	19	19	12	11	23	104
Reputation	5	4	3	5	5	5	27
Total (R2)	**51**	**41**	**39**	**37**	**37**	**46**	**251**
Recovery elements (R3)							
Contingency	2	1	1	1	1	1	7
Total (R3)	**2**	**1**	**1**	**1**	**1**	**1**	**7**
Level 3 Total (R1+R2+R3)	**128**	**123**	**110**	**103**	**102**	**146**	**712**
Grand Total (Level 1+2+3)	**145**	**130**	**115**	**110**	**111**	**160**	**771**

Company F

Word	2020	2019	2018	2017	2016	2015	Total
Level 1							
Resilience	7	3	1	1	2	1	15
Resilient	10	2	1	1	1	1	16
Total	**17**	**5**	**2**	**2**	**3**	**2**	**31**
Level 2							
Readiness	7	2	3	2	2	1	17
Response	27	7	8	3	2	8	55
Recovery	12	9	9	4	3	3	40
Total	**46**	**18**	**20**	**9**	**7**	**12**	**112**
Level 3							
Readiness elements (R1)							
Assets	190	187	190	139	143	148	997
Awareness	20	1	10	3	0	5	39
Resources	22	19	14	7	7	13	82
Security	11	3	7	2	2	2	27
Visibility	0	0	1	0	0	0	1
Total (R1)	**243**	**210**	**222**	**151**	**152**	**168**	**1146**
Response elements (R2)							
Collaboration	5	3	9	4	9	1	31
Agility	3	0	0	0	0	0	3
Communication	29	5	24	17	8	8	91
Flexibility	5	0	1	0	0	4	10
Leadership	69	46	40	17	17	18	207
Reputation	23	17	27	17	14	13	111
Total (R2)	**134**	**71**	**101**	**55**	**48**	**44**	**453**
Recovery elements (R3)							
Contingency	1	2	1	1	2	1	8
Total (R3)	**1**	**2**	**1**	**1**	**2**	**1**	**8**
Level 3 Total (R1+R2+R3)	**378**	**283**	**324**	**207**	**202**	**213**	**1607**
Grand Total (Level 1+2+3)	**441**	**306**	**346**	**218**	**212**	**227**	**1750**

Company G

Word	2020	2019	2018	2017	2016-part 1	2016-part 2	2015	Total
Level 1								
Resilience	1	1	1	1	0	0	1	5
Resilient	1	1	1	1	1	1	3	9
Total	**2**	**2**	**2**	**2**	**1**	**1**	**4**	**14**
Level 2								
Readiness	0	0	0	0	0	0	0	0
Response	18	6	8	2	3	0	2	39
Recovery	10	13	4	4	0	0	1	32
Total	**28**	**19**	**12**	**6**	**3**	**0**	**3**	**71**
Level 3								
Readiness elements (R1)								
Assets	159	163	143	143	19	125	134	886
Awareness	3	3	3	3	1	0	2	15
Resources	23	25	17	10	4	3	7	89
Security	9	16	16	10	3	3	8	65
Visibility	1	1	1	1	1	0	0	5
Total (R1)	**195**	**208**	**180**	**167**	**28**	**131**	**151**	**1060**
Response elements (R2)								
Collaboration	4	3	2	1	0	0	0	10
Communication	19	20	19	17	2	2	4	83
Flexibility	2	3	2	0	0	1	0	8
Leadership	6	7	11	25	34	0	11	94
Reputation	2	2	3	3	7	0	7	24
Total (R2)	**33**	**35**	**37**	**46**	**43**	**3**	**22**	**219**
Recovery elements (R3)								
Total (R3)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Level 3 Total (R1+R2+R3)	**228**	**243**	**217**	**213**	**71**	**134**	**173**	**1279**
Grand Total (Level 1+2+3)	**258**	**264**	**231**	**221**	**75**	**135**	**180**	**1364**

Company H

Word	2018	2017	2016	2015	2014	Total
Level 1						
Resilience	0	0	0	0	0	0
Total	0	0	0	0	0	0
Level 2						
Readiness	0	0	2	2	0	4
Response	5	3	4	2	0	14
Recovery	6	4	7	6	0	23
Total	**11**	**7**	**13**	**10**	**0**	**41**
Level 3						
Readiness elements (R1)						
Assets	36	57	32	39	17	181
Awareness	0	1	1	3	0	5
Resources	15	22	26	28	1	92
Visibility	0	1	0	2	0	3
Total (R1)	**51**	**81**	**59**	**72**	**18**	**281**
Response elements (R2)						
Collaboration	0	2	1	2	0	5
Communication	3	2	2	6	0	13
Flexibility	0	2	0	0	0	2
Leadership	7	6	12	18	0	43
Reputation	4	1	2	3	0	10
Total (R2)	**14**	**13**	**17**	**29**	**0**	**73**
Recovery elements (R3)						
Contingency	0	0	0	1	0	1
Total (R3)	**0**	**0**	**0**	**1**	**0**	**1**
Level 3 Total (R1+R2+R3)	**65**	**94**	**76**	**102**	**18**	**355**
Grand Total (Level 1+2+3)	**76**	**101**	**89**	**112**	**18**	**396**

APPENDIX C: WORD CLOUDS

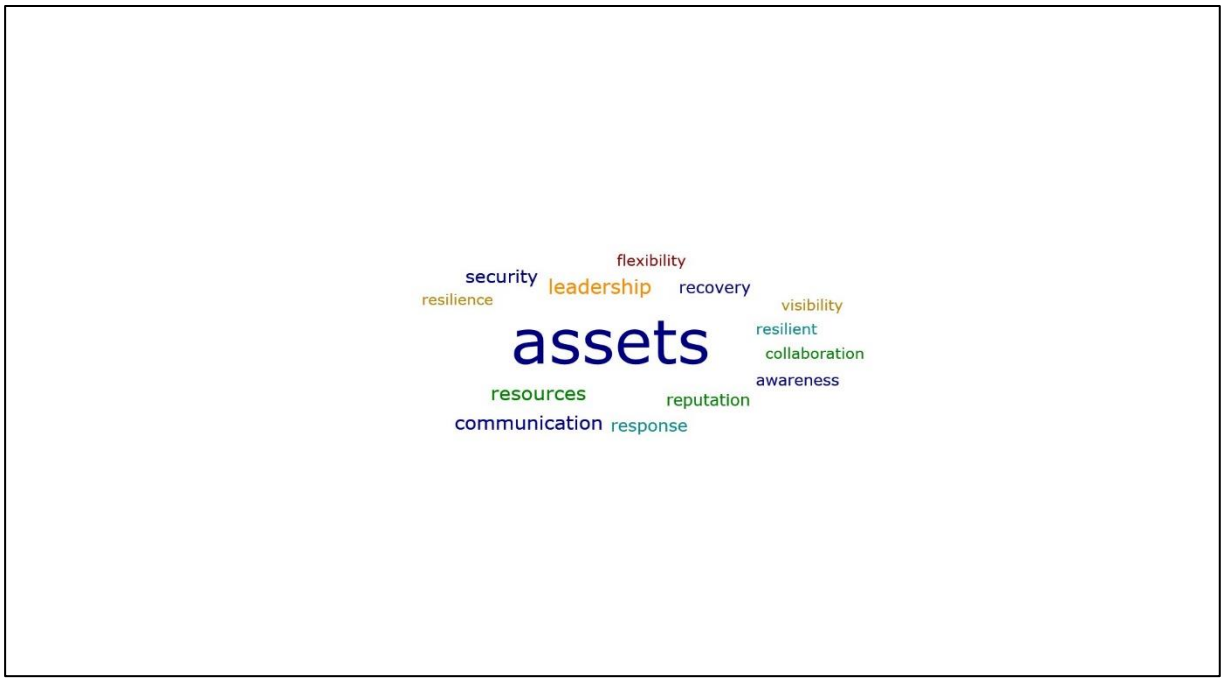
Company A

Company B

Company D

Company E

Company G


flexibility
security
leadership
recovery
resilience
visibility
resilient
assets
collaboration
awareness
resources
reputation
communication
response

APPENDIX D: ETHICS CERTIFICATE

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Economic and Management Sciences Research
Ethics Committee (EMS-REC)

27 July 2021

Prof S Middelberg and Prof P Buys
Per e-mail
Dear Prof Middelberg and Prof Buys,

EMS-REC FEEDBACK: 25062021 – Round Robin
Student: Pretorius, M (28423607)(NWU-00882-21-A4)
Applicants: Prof S Middelberg and Prof P Buys – MCom in Management Accountancy

Your ethics application on, ***Developing an Altman's Z-Score based model to support organisational resilience,*** which served via Round Robin, refers.

Outcome:

Approved as a minimal risk study. A number **NWU-00882-21-A4** is given for one year of ethics clearance.

Please note that the ethics approval of this application is subject to the Covid-19 protocols.

Kind regards,

Mark Rathbone

Prof Mark Rathbone
Chairperson: Economic and Management Sciences Research Ethics Committee (EMS-REC)

APPENDIX E: LANGUAGE CERTIFICATE

RENTIA MYNHARDT

BCom (UNISA)

SA Translators' Institute (SATI)
Membership number: 1002605
PO Box 6986, FLAMWOOD 2572
Cellphone: 082 7717 566 * E-mail: rmynhardt@vodamail.co.za

Reference number: MP1
Date: 2021/11/15

To whom it may concern,

LANGUAGE EDITING

This letter serves as proof that the following document was submitted for language editing in November 2021:

Author:	M Pretorius
Document type:	Dissertation: Master of Commerce in Management Accountancy (MCom)
Title:	*DEVELOPING AN ALTMAN'S Z-SCORE-BASED MODEL TO SUPPORT ORGANISATIONAL RESILIENCE*

I applied all reasonable effort to identify errors and made recommendations about spelling, grammar, style and punctuation.

I attempted to be consistent regarding language usage and presentation.

The bibliography was also checked and corrections were made where necessary.

I confirmed the content as far as possible, but cannot be held responsible for this as all facts could not be confirmed. This remains the responsibility of the author.

Thank you very much.

Kind regards.

Rentia Mynhardt