THE IMPLEMENTATION OF CREDIT SCORING AS A RISK MANAGEMENT TOOL

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Dissertation submitted in partial fulfillment of the requirements for the degree of Master of Business Administration of the Potchefstroomse Universiteit vir Christelike Hoër Onderwys

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November 2001

Potchefstroom

ABSTRACT

BURGER, MARIA **2001**

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Consumer lending is a natural niche for community banks, offering opportunities to expand customer relationships and diversify risks. Both small and large community-based institutions are turning their attention to growing these lines of business.

Accompanied by the growth in consumer debt, however, is the reality of consumer bankruptcies and delinquencies.

As a result, lending organizations are pressured to find the best methods to estimate risk as accurately as possible in the credit granting process. If risk is estimated poorly, the entire enterprise can fail either because of excessive default or lack of business. If you can estimate risk better than your competitor can, his business is in danger, since you are able to offer better terms to more people than he can.

The challenge facing any lending organization then, is to try to manage the credit losses in this high volume consumer lending business in order to improve pricing margins.

Turning a profit in the credit industry rests on many factors beyond the loan agreement. Long-term profitability can be affected by the credit grantor's ability to close deals quickly at the point-of-sale, to accurately determine applicant creditworthiness, and to assess various stages of risk throughout the course of the agreement.

As elusive as these capabilities may seem, some credit grantors are already performing these activities economically with the aid of new technologies. The capacity to instantly access credit bureau report information and assess creditworthiness in seconds, rather than hours, is a reality reaping dividends for credit grantors representing a wide variety of industries.

One of these technologies widely used in consumer lending today is credit scoring. Credit scoring is a tool designed to give credit management the ability to measure risk and to take the action best suited to each risk that is identified.

Through a simple, single transaction, patrons of this burgeoning technology have gained instantaneous access to numerous consumer and credit information databases, as well as the ability to score applications consistently, without bias, and according to their own specific lending strategies. Additional technologies have also emerged which are extending these capabilities to mobile professionals, as well as allowing online users to instantly verify applicant information and identify fraud.

The technique involves awarding points to answers given to questions listed on an application form. Questions cover such areas as:

- Marital status and dependants;
- Age;
- Number of years at present address;
- Nature of property occupied – whether it is owned or rented;
- Occupation;
- Length of time with employer;
- Previous credit history.

Each question will carry a maximum possible score that will be higher for important questions such as occupation and previous credit history, and lower for questions such as age and marital status. The score awarded to each answer will vary. For example, if the question asks for the number of years at present address, ten points might be awarded for each year, up to a maximum of, say, 200, in the same way certain occupations will be awarded higher marks than others. The score will determine whether an account may be opened. If the score is above a certain number, the account may be opened and vice versa, if the score is below a certain point, the applicant will not be accorded an account.

The technique of credit scoring can be used for all routine applications where some exercise of judgment would formerly have been needed. It is commonly in use for the opening of current accounts, for car finance, issuing credit cards, personal loans and more recently for mortgage lending and small business applications.

Good resources on the topic are however, scarce and there does not seem to be any published information in South Africa on credit scoring. The primary objective of the study was to try and prove that by using credit scoring the decision to grant or not to grant credit can be more scientifically based in order to reduce risk in lending, and for management to have better control over the granting of credit.

In order to test the effectiveness of credit scoring as a risk management tool, Absa bank is used as a benchmark, being one of South Africa's largest financial institutions. Absa, realizing the need to improve on systems and procedures in the credit granting process in order to remain competitive, appointed specialist consultants, the Experian Group (UK) during 1993, to perform a feasibility study. Questions were designed from the results of the study where certain inherent problems were identified within the credit management environment at Absa. These questions based on the problems identified by Experian, form the basis of the Empirical study.

The position before and after the implementation of credit scoring at Absa is compared using various research methodologies such as Pareto analysis, Statistical analysis and interviews. To obtain the general viewpoint of bankers countrywide on the topic 'Credit scoring as a risk management tool', a questionnaire was designed that was distributed amongst Absa personnel and various other registered banks in South Africa for completion.

The results emanating from the Empirical study and the Literature study prove that although a scoring model is not perfect and does have its drawbacks, it is effective as a risk measurement tool. A large number of benefits can accrue to an organization following the successful implementation of a well-designed credit scoring system. Using credit scoring, competitive advantages could well be attained through efficient service and improved turnaround times.

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1.1 INTRODUCTION

In this study I will attempt to evaluate the effect of credit scoring as a risk management tool in the credit industry and particularly in the banking world.

Credit risk models are important today because they provide the decision maker with insight or knowledge that would not otherwise be readily apparent or that could be marshaled only at prohibitive cost. In a marketplace where margins are fast disappearing and the pressure to lower costs is unrelenting, models give their users a competitive edge. In any large financial institution that has a wide variety of exposures, operates in many geographic regions, and has a large and varied workforce, quantitative models can inject a useful degree of objectivity.

Credit risk models have been built for large corporate, commercial and industrial loans, commercial real estate loans, small business loans, residential first mortgages, home equity and consumer loans, loans to financial institutions, and loans to sovereign governments.
Experience shows that the market penetration of credit models varies with the size of the borrower. Consumer sector lending was the first to use credit risk models in decision-making. The use of these models has spread to large corporate, upper middle market, and residential real estate lending. In these sectors, the models provide key inputs for credit approval and review. Recently such credit models have been applied to small business lending. Today, lower-middle market and private borrowers and commercial real estate are the sectors with the smallest use (or potential for use) of credit models (Caouette *et al,* 1998:106).

Originally introduced in the 1950's, credit scoring is now widely used for consumer lending, especially credit cards, and is becoming more commonly used in mortgage lending. Scoring for the small business applicant, however, is relatively new due to the complexity involved in developing an accurate method of scoring as business loans typically differ substantially across borrowers (Mester, 1997:28).

Briefly defined, credit scoring is a best estimate of risk (of non-repayment of capital and interest), determined through analysis of the relevant importance of items on a credit application. Applicant information is assigned a score weight that is then added to form a score. The higher the score, the lower the credit risks (Zmiewski & Foster, 1996:42).

Characteristics that are consistent with eventual bad payment behaviour develop credit-scoring models. If, for example, the presence of public record information were a good predictor of eventual slow payment, it would be given a weight or a score. All such characteristics are evaluated and assigned a weight. The advantage of a credit-scoring model is that it always looks at the same characteristics the same way. It doesn't have bad days, or deal with persistent sales people.

It is assumed that the concept behind credit scoring is that borrowers are expected, as a group, to behave more or less as they did in the past. As there are no absolute criteria that determine future satisfactory or unsatisfactory credit performance, all that remains is to try to associate a new case with cases seen in the past. Credit scoring measures an applicant's propensity or probability to repay the loan.

Consumers who seek a home mortgage, auto loan, or credit card are assigned a credit score. A credit score measures the relative degree of risk of delinquency or default that a borrower represents to a creditor, or lender. The score, also called a "risk score," is based on information in the borrower's credit report and also on information about how other borrowers with similar information have repaid their bills.

Creditors may use their own credit scoring model, different scoring models for different types of credit, or a generic model developed by a credit scoring company. Many different credit-scoring models are used; Fair Isaac Co., a credit scoring company in San Rafael, California, has developed the most widely used models (Consumers Union, 1998).

Before implementing credit scoring it is important for any organization to examine the industry. Factors to consider include whether the organization is in a very competitive industry where quick turnaround is essential to maintain a competitive advantage. It is also very important to understand what the scoring model is predicting and how the model was developed before considering incorporating credit scoring into the firms credit policy. The commercial Intelliscore model developed by Experian, for example, is predicting the probability that an applicant will pay more than 90 days late in the next six months. Determining the threshold for risk is the starting point, whether 90 days is an acceptable level of risk differs from industry to industry and depends on the business.

Figure 1 shows an example of what a credit-scoring table might look like (Koch & MacDonald, 2000:725).

FIGURE 1 – Example of a Credit Application Scoring Table

Category	Characteristics/Weights					
Job stability	Less than 1 year **5**	One to two years **20**	Two to four years **50**	Longer than four years **70**	Unemployed **5**	Retired **70**
Residence	Own or Buying **40**	Rent **15**	Own outright **50**	No answer **15**		
Residence Stability	Less than 1 year **5**	One to two years **15**	Two to four years **35**	Longer than four years **50**	No answer **0**	
Age of Applicant	Younger than 50 yrs **5**	Older than 50 yrs **25**	No answer **0**			
Annual Gross Income	Less than $10,000 **5**	$10,000-$20,000 **15**	$20,000-$40,000 **30**	$40,000-$60,000 **45**	More than $60,000 **60**	
Monthly Debt Payment / Monthly Net Income	More than 40% **0**	30-40% **5**	20-30% **20**	10-20% **35**	Less than 10% **50**	
Banking Relationship Cheq./Sav.	None **0**	Cheque account **30**	Savings account **30**	Cheq. & Sav. **50**	No answer **0**	
Major Credit Cards	None **0**	One or more **30**	No answer **0**			
Credit History	Any derogatory within seven yrs. **-10**		No record **0**		Met obliged payments **30**	

NOTE: Minimum score for credit approval for this specific scorecard is 200; score for judgmental evaluation, 150 to 195; score for automatic credit denial is less than 150 (Koch & MacDonald, 2000:725).

A glossary of terms for reference purposes is provided as an attachment to the study identified as Annexure A.

1.2 HISTORICAL BACKGROUND OF CREDIT SCORING

Henry Wells, a statistician who worked for Aldens Inc. and Spiegel Inc. in the United States of America, in the late 1930s and early 1940s, was the first to use statistical methods to evaluate a credit applicant's repayment potential. He devised a point scoring system for new mail-order time payment applications.
Applying mathematical and statistical models to the credit granting decision gained recognition when David Durand of the National Bureau of economic Research in New York published his 1941 study entitled Risk Elements in Consumer Installment Financing. He was the first to use discriminate analysis to measure credit risk. Several other individuals developed scoring methodologies during the 1950's but it was not until Fair, Isaac and Company entered the field that it began to become a significant factor in the credit industry (Mularz, 1987:50).

The first task of these early developers, after devising the basic methodology that they were to use in building their scoring tables, was to gain the acceptance of the credit community. This was not a simple task, since traditional methods were deeply entrenched. (Traditional credit analysis is described in chapter 1 under the heading; Mythology and Traditional credit analysis. In chapter 2 an overview of the credit models presently used for consumer lending and their areas of application is described under the heading; Situation analysis of present techniques). The difficulty of assaulting the bastions of tradition was considerable; they did not succumb to the first approach. However, while there are still sceptics, the vast majority of credit in the United States is now granted by processes involving credit scoring to one degree or another (Mularz, 1987:50).

The growth of the use of credit scoring has been a component of the change in American business brought about by increased awareness of the value of scientific analyses of problems of all sorts, not only those associated with credit. As a result, management have become increasingly aware that technical methods must be evaluated carefully and that traditional methods will have to accept the challenge of new ideas and, if these new ideas prove to be more effective than the methods of the past, those past methods must disappear.
Management has also become aware that competition is a broad term. Enterprises compete not only with pricing and variety and quality of merchandise, but in the manner in which they operate their businesses.
Operations that are conducted more intelligently and with the use of sharper tools will drive to the wall those that disdain sharp tools and thoughtful practice.

According to Lewis (1994:22) much of the initial effort in the process of introducing credit scoring was directed towards finance companies. This was because there were a lot of them and the problems of management and control were particularly acute in that area, in the view of the developers of scoring systems. The finance company world appeared to be a fertile field. Fertile or not, it was not a simple field to enter.
The finance companies had well entrenched operations and recognized no pressing need for change. However, slowly but surely these companies began to consider the ideas of scoring and to adopt them, at least as a component of the credit decision process.

Not far behind the finance companies were the retailers. Credit cards were not as common in the 1960's as they are today, but even then oil companies issued large numbers of cards. The major credit cards of today, Visa and Master Card, did not come into prominence until the early 1970's. The wholesale granting of credit cards led, as could be expected, to very large losses by some of the issuers. These losses motivated credit grantors to look into credit scoring.

Other credit grantors followed along. Airlines began to use scoring in the issuance of their travel cards. Automobile financing companies entered the field in 1979. By the end of the 1970's credit scoring of applications for credit was a fully established process and almost all major credit grantors and many smaller ones employed it.

Early in the development of scoring questions arose to which there were no answers at the time. One was: How long does a scoring system last and how can we tell when to replace it?
A scoring system should be replaced when its performance degrades to a degree that, if replaced by a new system with performance equal to that of the original system at the time of its installation, the replacement will be profitable. In many cases, since there is now more data available, the replacement scorecard will perform even better than the original (Lewis, 1994:22).

A second question that arose as far back as the 1960s was: In the case of revolving credit, where an account remains open for an extended period, and where the information given on the application loses its pertinence as time passes, how is that account's continued credit performance to be predicted? This question was answered by the development of what is called "Behaviour Scoring." (Lewis, 1994:22). Behaviour scoring is discussed in detail in chapter 3 under the heading; Research Methodologies and analysis and interpretation of results – Results to question 1.

Behaviour scoring is a risk estimator similar to credit scoring but uses for its development data on the actual behaviour of credit account holders (that is, the way in which the individual has used his credit, how much he has used, what, if any, delinquency history does he show, and any other information available on the individual) rather than the information available on the original application. While behaviour scoring is not yet as widely used as credit scoring, it is probable that it will become the dominant scoring procedure in the coming years (Lewis, 1994:22).

1.3 CREDIT RISK IN BANKING

Introduction

Any profit-maximizing business, including banking, confronts macroeconomic risks (for example, the effects of recession) and microeconomic risks (for example, new competitive threats). Breakdowns in technology, commercial failure of a supplier or customer, political interference, or a natural disaster, are additional potential risks all firms must face.

Hefferman (1996:163) refers to a bank's core product as ' intermediation', that is, to intermediate between those with a surplus liquidity, who make deposits, and those with a deficit of liquidity, who borrow from the bank. The payments system facilitates the intermediary role of banks. For banks, the core business is managing the risks arising from on-and off-balance sheet business. Hefferman (1996:163) also describes the 'business of banking' very briefly; 'the fact is that bankers are in the business of managing risk. Pure and simple that is the business of banking' (Hefferman, 1996:163).

As banks become more complex organizations, offering fee-based financial services and relatively new financial instruments, financial risks other than credit risk have been unbundled and made more transparent, for example, Foreign Exchange Risk, which under flexible exchange rates, any net short or long open position in a given currency will expose the bank to foreign exchange risk, a special type of market risk.
Credit risk in banking will however be the focus of this study with the aim to determine the effectiveness of credit scoring as a risk management tool.

According to Cade (1997:20) credit risk is the risk that has historically proved to be the most lethal hazard of all, in every continent. Briefly defined, Credit risk is the risk of loss to the bank through default by an obligator (Cade, 1997:20).

1.3.1 Mythology and Traditional credit analysis

Traditionally, banks have managed credit risk almost exclusively by adopting procedures for credit analysis- the process of inquiry prior to making the decision to lend. Credit analysis focuses on two distinct but interrelated issues: the borrower's *willingness* and *ability* to repay a loan. Analyzing willingness to pay is, essentially, a matter of investigating the borrower's character. Analyzing the ability to pay is a matter of investigating the borrower's economic prospects.
Research into a borrower's character may begin with an exploration of the individual's position in society and of the mores of the society itself. Is the person a member of the establishment? A radical? Does the society generally consider it important that people repay their debts? A banker might interview a prospective borrower and others who know the individual well to glean as much information as possible about the person's moral fiber.

Evaluating the *ability* of an individual or corporation to pay is a different process. Bankers typically start by looking at macro issues and then working their way down to specifics. What are the prospects for the economy as a whole? Is it heading into a period of prosperity or recession? What is the outlook for the borrower's industry? Is it expanding? Mature? Dying? What about the borrower's business? Is it thriving? Overextended? Losing, or gaining share? Is the borrower well organized in its affairs?

According to Edwards (1997:342) both forms of analysis require information, and, generally speaking, the more information available and the greater its accuracy and timeliness, the better the lending decision will be. While both types of inquiry are critical to credit analysis, the economic issues are, on balance, the more important of the two. Historically, more money had been lost because borrowers were unable to pay than because they were unwilling to do so.

In addition to developing techniques for credit analysis, bankers also learned how to manage their risk through such mitigation techniques as down payments and collateral that increases the likelihood of repayment. A borrower who is faced with the loss of a home, farm, factory, or car is highly motivated to make payments in full and on time (Edwards, 1997:342).

Every profession develops its own mythology over the years, and the credit industry is no exception. The idea of creditworthiness is only one of the many aspects of that mythology. Most of the mythology of credit has grown up out of the experience of the many diverse people who have been involved in the industry. For example, Lewis (1994:4) does not agree with the traditional credit analysis described by Edwards (1997:342), referring to it as a myth. Lewis (1994:4) believes that credit that is extended only to those with the willingness and ability to pay is a popular myth. He believes that ability to pay is a weak reed to lean on. Lewis interprets 'ability to pay' to mean that there is sufficient income to pay the obligation. His argument is that even if the applicant has other debts, and even if those debts exceed his current income, it does not mean that he will not pay a new obligation. Of course, it does not mean that he will, either.

According to Lewis (1994:4) 'Willingness to pay' is even weaker. He poses the question, "Has anyone ever had an applicant who asked for credit and stated that he was *unwilling* to pay it?" The author cannot argue this statement as it seems doubtful that any credit grantor has had the experience where an applicant has admitted to not being willing to pay. Willingness is usually measured by looking at credit reports to establish whether previous obligations were met. If all obligations were met when due, it would not be unreasonable to expect a new one to be paid. If all previous debts on the other hand were defaulted, it is again not unreasonable to hesitate to extend any further credit to the applicant.

1.3.2 Motivation for change

The replacement of a methodology that has served its purpose for centuries is not a trivial matter; the motivation must be compelling. Even when the motivation is strong, it is not necessarily the case that the transition from an earlier methodology to a new one will be simple or that it will be accepted without a struggle by the parties involved (Lewis, 1994:10).

Motivation for change from the traditional judgmental procedures for making credit decisions with scoring is discussed in more detail in Chapter 2, Literature Study. Absa realizing that in order to remain competitive, existing systems and procedures used for the granting of credit would have to be reviewed implemented credit scoring in 1995 (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:6).

Absa bank was chosen as a benchmark for this study, strictly because it is one of South Africa's largest financial institutions, and not for any other reason. Technology advancements, or any other elements, of the various banks in South Africa were not taken into consideration when the benchmark was decided on. In Chapter 3 of the study, Empirical Study and Results Evaluation, Absa staff opinion on credit scoring is compared to the opinion of staff of several other banks in South Africa to obtain an overall opinion on the topic 'Credit Scoring as a Risk Management Tool', from bankers countrywide.

1.3.2.1 Background information: Absa bank

Absa, realizing the need to improve on systems and procedures in order to remain competitive, appointed specialist consultants, the Experian Group (UK) during 1993, to perform a feasibility study. The aim was to evaluate and recommend changes to the Bank's credit management procedures and systems for the consumer credit market. The primary focus following the results of the study will be the consumer clients of the Commercial Banks, as the benefit that will be gained from changes will be greater in this sector (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:6).

1.3.2.2 Results of the feasibility study conducted by Experian in 1993:

The results revealed that the ABSA credit management environment has certain inherent problems: (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:7).

- The bank's criteria for lending to consumers are mainly the same as the criteria used for lending to businesses. Balance sheets and security are requirements for some of the most basic consumer lending decisions. The consequence of this is costly, time consuming and impacts on client service;

- Decision making is totally manual and the bank does not have a system that is capable of assisting with or making the simplest of credit decisions;

- Systems prompt credit staff, and decision making is reactive and mandate driven;

- A manual environment, with weak decision support systems, has resulted in a process with little effective control as to whether the correct decision has been taken;

- Strategies and action are not always determined by the risk inherent in the relationship with a client;

- There are too many functions carried out by branch staff which could be automated to allow the staff to focus on areas that require more attention;

- The existing systems tend to concentrate on the delivery of up to date account information, but there is very little emphasis on, or availability of, historical account information.

These problems identified by Experian within the Absa credit system is what inspired the author to undertake this topic to compare processes and procedures within the credit department before and after the implementation of credit scoring at Absa.

It can be expected that the problems identified within the Absa credit granting system and procedures are somewhat generic and similar in nature to those of other financial institutions in the banking world, considering that the products offered by banks are similar in nature and traditional lending has evolved in credit departments over the years. Later on in the study in Chapter 3, Empirical Study and Results Evaluation, the opinion of various bankers is obtained via a questionnaire, which was distributed to various banks in South Africa. The same questionnaire was distributed amongst Absa staff countrywide and a comparison is made which will prove whether the problems identified by the Experian group within the credit granting process at Absa are similar in nature to those of other banks in South Africa.

1.4 THE PROBLEM RESEARCHED

According to Lamb (2000:20) consumer lending is a natural niche for community banks, offering opportunities to expand customer relationships. A typical example is the Citizens National Bank in the United States, which is a $400 million bank. In 1990, when Milton McGee took over as president and chief executive officer of the Citizens National Bank, the institution faced some critical challenges. Growth had stagnated, mainly because the bank's loan-to-deposit ratio hovered around 25 percent.

Now, more than 10 years later, Citizens National Bank has doubled in size and its loan-to-deposit ratio has more than doubled. Chief executive officer, McGee, says that a key factor for the growth has been the bank's energetic consumer lending strategy, as consumer loans comprise about a third of the bank's portfolio (Lamb, 2000:20).

Caouette et al (1998: 154) agrees that consumer debt has soared in recent years, but emphasizes that consumer bankruptcies and delinquencies have risen just as rapidly. The United States alone has seen record number of bankruptcies in the consumer sector.

According to Caouette et al (1998:154) consumer lending is a volume business in which credit losses are high, but it need not be so, as these losses can be managed, resulting in high pricing margins.

It can then be understood that by improving the management process of credit granting, losses due to non-repayment by lenders, can be reduced, which will result in increased profits for the lending organization. In order to try and minimize these losses, one needs to firstly determine what the problems are in the credit granting process.

According to Lewis (1994:7) the problem central to the granting of credit is the estimation of risk. If risk is estimated poorly, the entire enterprise can fail either because of excessive default or lack of business. If you can estimate risk better than your competitor can, his business is in danger, since you are able to offer better terms to more people than he can. **Credit scoring is a tool designed to give credit management the ability to measure risk and to take the action best suited to each risk that is identified** (Lewis, 1994:7).

Hefferman (1996:182) also acknowledges the importance of effectively managing credit risk. His opinion is that increases in credit risk will raise the marginal cost of debt and equity, which in turn increases the cost of funds for the bank. Credit officers are therefore required to follow some basic guidelines in formulating lending decisions. Techniques for credit risk management are well known because the banking sector has had a long history of experience in their area. Nonetheless, loan quality problems are an important cause of bank failure (Heffernan, 1996:182).

Before the invention of revolving credit, most credit was extended for relatively brief periods. Consequently, the decision to grant or not to grant credit, a decision made at the time an application was submitted, was regarded by many as the only credit decision. If fact, a number of credit decisions are made during the lifetime of an account, even one involving a short term.

Decisions made during credit lending:

The first decision, the one made at application time, remains of great importance. Credit scoring was originally developed to evaluate the risk presented by applicants, and this is still a major use of credit scoring systems.
In every one of the six credit decisions enumerated below, the central question is: 'what is the risk?' In every one of them, a properly constructed scoring system should provide the best estimate of the risk that is currently available and so can lead to the most profitable decision in each case.

1) **Credit limits.** Another set of decisions involves the credit limit itself. What limit is to be assigned to each newly accepted applicant, and under what conditions is that limit to be raised or lowered? All too frequently in the past, credit limits assigned at application time were quite low, and changes in assigned limits were made reluctantly and were, consequently rare.

2) **Risk (acceptable minimum level of risk).** Until scoring made it possible to assign a numerical measure of risk to each application for credit, management had no way of expressing a corporate policy such as: 'Accept only those applications whose risk is 13 to one or better'. As a result each individual credit evaluator decided for himself what level of risk the applicant presented and what level of risk the enterprise as a whole should tolerate.

3) **Collateral.** Traditionally a decision was made regarding collateral. In former times, many finance companies decided on a case-by-case basis whether collateral was required. Exactly what the criteria was for making that decision were not fully understood, and were usually not formal.

4) **Reviews.** In revolving credit accounts, the time comes when an account is to be considered for renewal. This is a decision to which scoring can be applied.

5) **Credit bureau.** Each time a credit decision comes up, the question is asked: Should a new credit bureau report be obtained? This is not always a simple matter. Credit reports are expensive, but failure to get one on a decision that later turn out to produce a collection account can cause other problems for the people involved. It is well worth the trouble to consider the manner in which the decision to get or not to get a credit report is made and to seek to improve it by the application of any tools that are available.

6) **Marketing.** Credit decisions are also often involved in the area of marketing, which is not usually considered a credit responsibility. In the past few years, many credit organizations have marketed various products through their billing systems.

Finance company marketing is largely directed toward the promotion of further loans and credit lines. Not only are such marketing mailings expensive but also these mailings constitute a credit decision since the service will be delivered and the corresponding credit extended, regardless of the previous performance or the probability of satisfactory payment of the buyer.

According to Lewis (1994:3) the system of using traditional credit analysis, however illogical, worked fairly well for a long time. One of the reasons for its success, however, was that the credit industry was very conservative in its view of the highest acceptable risk, and as a result it acted (unintentionally) to impede the growth of consumer credit.

After World War II, when pressure developed for greatly expanded consumer credit, it became important to measure risk more effectively than had been possible in the past. Credit scoring arrived on the scene at just the right time (Lewis, 1994:3).

The impression from the discussion of the study so far is that credit risk is taken, at least to some degree, by nearly all banks and lending institutions. There is a risk attached when credit of any form is extended, be it by way of a mortgage loan, overdraft facility or even when funds are granted for the purchase of a motor vehicle. It is understood that credit risk may lead to serious problems or even failure of an organization if excessive or poorly managed.

1.5 RESEARCH OBJECTIVES

Credit scoring was designed to provide a solution to tackle two seemingly conflicting objectives: increasing approval rates while reducing delinquencies and losses.

The first and main objective of this study will therefore be to try and prove that by using credit scoring as a risk management tool, the decision whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and for management to have better control over the granting of credit.

Secondly, the exact meaning of risk management must be established and research will be done to determine the tools used nowadays in risk management for consumer lending.

A complete study will then be undertaken to determine the benefits of replacing the traditional procedures for making credit decisions with a credit scoring system

Finally once the study has been completed, the objective is to provide information and suggestions to banks or any lending institution on any improvement that can be made within credit departments for credit lending as a result of findings, which emanate from this study.

1.6 RESEARCH METHODS

In order to meet the set objectives, a literature study will be done on the most recent literature available on risk management and any tools used in general for consumer lending.
An overview of previous research and any gaps, which still exist in the specific field of credit scoring, will be discussed.

The literature study will be followed by an empirical study. The empirical study is made up of two sections. Section one concentrates on the five questions, which were formulated from the problems identified by the Experian specialists in the credit management environment during their feasibility study performed at Absa during 1993.

Section two includes the views of various banks in South Africa on credit scoring. In order to determine the views and opinions of other bankers countrywide on the five questions formulated and their general view on credit scoring, a questionnaire was designed and distributed to all the registered banks of South Africa. The investment banks and merchant banks and any other banks not in the consumer lending business were excluded from the survey. The questionnaire will thus be sent to a total of eighteen registered banks of South Africa. This total includes Absa, as the same questionnaire will be distributed within Absa in order to obtain a uniform and fair representation of the views of bankers on credit scoring countrywide.

1.7 CONCLUSION

From the content of Chapter 1 it is understood that the core business of banks is not the taking of deposits and making loans but more the profitable management of risk. This is confirmed by Hempel & Simonson (1999:389) where they say, " successful bank lending is based not on making loans but on minimizing the risk in collecting them".

In addition, given the high stakes and intense competition in almost all industries, making intelligent business decisions is becoming more important than ever before. Information is thus a powerful business asset and the ability to harness the power of information to drive the decision-making processes is fundamental to any organizations success

It is accepted that with the granting of credit their is risk. It is therefore essential that risk be managed as far as possible to improve profits by reducing losses due to bad lending decisions. Credit scoring is a tool, which can be used to harness the power of information to develop statistical "models", or scorecards, that have become the core components of credit and fraud policies worldwide. Research will therefore be done in the following chapters in the literature study and empirical study to determine the benefits of using credit scoring as a risk management tool. Some recommendations will then be made based on the findings.

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

According to Hempel and Simonson (1999:505) the granting of all types of credit to consumers by banks has grown dramatically in the past 30 years. This type of credit now makes up over one-third of the average bank's loan portfolio. Installment credit is used mostly for the purchase of household durables and motor vehicles. Revolving credit, especially that associated with credit or debit cards, is increasingly used to purchase a wide variety of personal goods and services. Card- type transactions are valued by customers for their convenience as a virtual cash substitute as well as a source of credit.

Consumer credit risk management systems are applied to a wide range of consumer products, such as consumer installment credit, home mortgage loans, vehicle installment sales and leases. These systems employ a variety of techniques: human judgment, credit scoring, decision tree analysis, mathematical programming, expert systems and more recently, neural networks. Companies often use a hybrid of computer-based systems and judgmental systems, with the latter providing an override of the computer model where this is deemed appropriate. These innovations according to Caouette *et al,* (1998:102) were prompted by a number of secular forces, including the following:

- Deregulation, which has stimulated financial innovation and enabled new entrants to provide services. For example, deregulation drastically widened the range of products and services offered by banks. Most credit institutions diversified their operations out of their original business. New products are constantly introduced, such as derivatives and futures. Bessis (1998:4) refers to deregulation as the process that led to the disappearance of old existing regulations.
- The broadening of the credit markets to encompass new borrowing sectors, both domestically and internationally;
- A continuing shift from balance sheet lending to cash flow lending;
- An increase in off-balance-sheet risks;

- Shrinking margins on loans, which have forced banks to explore less costly ways of measuring and managing risk;
- Securitization, which has prompted the development of more efficient (and standardized) credit risk tools;
- Advances in finance theory, which has provided new ways of looking at risk.

Credit risk models are more in the nature of pioneering efforts to seek better solutions, rather than the culmination of the search. Some of the results of these efforts may fall away completely, but most will be incorporated into models that are yet to be constructed. In that sense, all of the models are bridges to the future.

The relationship between this study and previous work conducted on credit scoring as a risk management tool is explained below:

There does not seem to be any published sources from a South African perspective on the topic to be reviewed, so it is intended that this study add value by obtaining the opinion of various bankers in South Africa on credit scoring as a risk management tool. The literature study therefore concentrates mainly on the situation in the United States of America as the information available, which is limited on this specific topic, pertains mainly to the position in the U.S.A.

In chapter 4, Empirical Study and Results Evaluation, an estimate is given of the South African banks making use of credit scoring. The banks not making use of credit scoring were asked for input on any conscious decision for deciding against the use of credit scoring. The banks, which have implemented credit scoring based on questions from a questionnaire that was distributed, provide their views on a wide spectrum of topics, which was deemed necessary to determine the effectiveness of such a tool to determine risk.

This chapter outlines and compares previously conducted research on consumer credit risk management systems, specifically credit scoring and its effect as a risk management tool.

This chapter begins with a synopsis of Risk Management and then more specifically Credit Risk Management. The chapter then provides a description of techniques, which have evolved over the years moving on to the most recent tools used nowadays in consumer lending to measure credit risk. A brief description of their domain of application and the benefits and drawbacks associated with the implementation of such a tool for any organization is then discussed. The chapter will then give a brief overview of the motivation for change from the traditional judgmental procedure for making credit decisions to the implementation of credit scoring.

The advantages and disadvantages related to credit scoring based on the opinion of various authors under suitable headings is then debated. There is, however, limited theoretical literature on this topic and thus a scarcity of good sources for exposition.

2.2 RISK MANAGEMENT

2.2.1 Development of Risk Management in South Africa

Risk management started to develop in South Africa in the 1970s. Most of the broking houses including the Alexander Forbes, First Bowring and Glen Rand MIB were involved in this development, as were major industrial companies. The first known risk management statement to be signed by a company was in 1975, when Mike Rosholt, chairman of the then Barlow Rand Group, committed the group to a risk management programme (Valsamakis et al, 1999:8)

2.2.2 The dilemma of risk management

Risk tends to be quite complex. Can it then be managed? According to Carter (1997:19) there is much that can be done to manage risk. To manage something is to control it. Control is a word with very deterministic connotations. In the nebulous and probabilistic sphere of risk taking, the best that management can realistically attempt is to correctly foresee potential problems and influence them to minimize harm and maximize benefit. The first rule of risk management is to start working on the risks at the earliest possible opportunity. That is usually when the greatest impression can be made for the lowest cost (Carter, 1997:19).

Bessis (1998:23) also agrees that risk can be managed. The primary goal of risk management is to measure risk in order to monitor and control them. This capability serves several important functions. They include (Bessis, 1998:23):

- The implementation of strategy
- The development of competitive advantages
- The measure of capital adequacy and of solvency
- The aid to decision making
- The aid to pricing decisions
- The reporting and the control of risks
- The management of portfolios of transactions

The pointers above will now be explained in more detail, as they would be applied in a typical banking environment under the heading, The Role of Risk Management in Banking.

2.2.3 The Role of Risk Management in Banking

2.2.3.1 A Strategy Implementation tool

According to Bessis (1998:24) risk management provides banks with a better view of the future and ability to define the business strategy accordingly. Risks can appear 'theoretical' compared to the more practical realities such as business volume, margins and fees. Risks are possible and outcomes uncertain. Hence, there is a strong temptation to emphasize immediate goals and actions at the expense of future possible outcomes.
Today's risks are however, tomorrow's realities. Ignoring them amounts to leaving in the dark future possible losses. In the case of financial institutions, the uncertainty is too high to be replaced by some set of assumptions. Earnings are an outcome of constantly moving interest rates on other market parameters.
Without risk management, there would be no visibility on possible outcomes, and on the possible fluctuations of profitability, nor any way to control the uncertainty over expected earnings (Bessis, 1998:24).

2.2.3.2 Competitive Advantage and Pricing of Risk

Competitive advantage grows out of, and is sustained by, improvement, innovation and change (Hefferman, 1996:311).

Another fundamental reason for measuring risks is that they generate future costs that have to be valued in some way. Ignoring today's risks amounts to ignoring future losses, and giving up taking corrective action today to avoid them tomorrow. Today, future losses are only a possibility, but tomorrow they will turn into reality. Controlling future costs, as much as current costs, is a contribution to income, both present and future. This is why risk control is a key factor of profitability and competitive advantage.

Bessis (1998:24) states that risks such as costs should be charged to customers whenever the competition makes it feasible. This is why risk management is closely related to pricing decisions. The knowledge of risks is a necessary input to finding out the appropriate prices to be charged to customers. It is also the only tool that allows pricing differentiation across customers of varying risks. Without risk pricing, a bank does not anticipate the related costs in its price. It also discourages low-risk customers and attracts high-risk customers (Bessis, 1998:24).

2.2.3.3 Risk and Solvency

Briefly defined, solvency risk for a bank is the risk of ultimate financial failure of the bank through chronic inability to meet obligations (Cade, 1997:16). Banks have formal risk based capital requirements, which they have to comply with in order to avoid financial failure.

Despite the minimum capital requirement regulations that banks have to contend with, each institution according to Bessis (1998:26) has the capability, beyond the minimum requirements, to adjust the balance between risk and capital. Risk-based capital is that level of capital, which is derived from the evaluation of potential losses, and risk measures

2.2.3.4 Decision Making

Risk management could be seen as an even greater key factor of success if it developed up to the stage where it has an impact on decision-making.

Risk management includes the reporting and hedging of risks once decisions are made. But it should be more than that and should influence the decision-making process before decisions are made. The challenge is to capture risk upstream in the decision process, not downstream when decisions have been made and when risk already exists.

Institutions, which control their risks, have the ability to take informed decisions. Risk management techniques cannot however be a substitute for the decision-making process. According to Bessis (1998:27), risk taking is a judgmental process. It is simply not feasible to capture and measure all risk dimensions. Even though risks are measured, a decision still has to be made on the opportunity of a transaction, given its consistency with the commercial and financial policies of the bank. Risk management is not intended to model the entire decision-making process. It is intended to be a help to such a process (Bessis, 1998:27).]

2.2.3.5 Risk Reporting and Monitoring

Without risk measurement, it becomes unfeasible to compare the earning across products, customers or business units. It is easy to increase current margins by taking risks. A simple solution is to lend to high-risk customers whose default rates will be above average in the future. But this policy leads to an immediate increase in margins, followed by defaults in a second stage.

More prudent business units will maintain their margins over time. Hence only risk-reward profiles are relevant. Risk reporting should be integrated with the more traditional earnings reporting.

It could be argued that risk measurement discourages risk taking by making risks explicit. This is not so, and should actually be understood as the opposite. Risk monitoring can encourage risk-taking by providing explicit information on risks. With unknown risks, prudence will normally prevail and prevent risk-taking decisions even though profitability could be in line with risks. If the credit officers cannot show that expected margins and fees do cover risks the credit department will be reluctant to take those risks. Risk management does not discourage the risk-taking process. It provides the information useful to take known and calculated risks (Bessis, 1998:27).

2.2.3.6 Portfolio Risk Management

Many of the recent credit losses suffered by banks have resulted from excessive portfolio concentrations in particular sectors (Caouette *et al,* 1998:106). Bank's loans comprise a portfolio of loan types, geographical areas, and risk (Hempel and Simonson, 1999:398).

Portfolio management deals with the optimization of the risk-reward profile by altering the composition of a portfolio (Bessis, 1998:29). In the case of portfolio risk, the desired mix should be quantified: for example, short-term business loans, 20-30 percent; consumer loans, 40-50 percent; mortgage loans, 15-20 percent; term commercial loans, 10-15 percent. In practice, a desired percentage range of loans by type will prove to be more flexible. Portfolio mix expresses the diversification the bank seeks in its loan placements. Diversification reduces the portfolio risk associated with large concentrations of loans in a single category (Hempel and Simonson, 1999:398).

According to Koch and Scott MacDonald (2000:771), too often, particularly at small banks, loans are concentrated in one industry such as agriculture, energy, or real estate that reflects the specific economic conditions of the region. In these situations, the loan portfolio is not adequately diversified even when loans are not concentrated among single borrowers because its value will deteriorate if conditions adversely affect the industry in question.

Bessis (1998:29) states that although banks have always followed well-known diversification principles, the active management of banking portfolios is still limited. Cade (1997:104) agrees that any bank which has been in business for any length of time have gathered a portfolio of some kind, his question is whether the banks have the knowledge, the skills and the determination to manage it, as opposed to letting it manage them.

According to Cade (1997:104) many banks, if they were honest, would admit that they have some way to go to prove them equal to the task.

Hefferman, (1996:182) adds that the monitoring of portfolio risk will enable proactive management to influence the composition of the portfolio, appropriately tighten credit standards and the allocation of appropriate reserves. Consistently measuring portfolio risk over time allows credit mangers to manage aggregate risk within an acceptable range. Credit mangers can determine the aggregate level of risk an organization is willing to accept and set credit policy accordingly (Heffernan, 1996:182).

2.3 CREDIT RISK MANAGEMENT

According to Edmonds (1998:60) globalization of the world economy has added to the challenge of effective credit risk management. Global competition places increased pressure on an organization's ability to evaluate and control credit risk.

Credit risk management defined

According to Bessis (1998:27) credit risk management covers both the decision-making process, before the credit decision is made, and the follow-up of credit commitments, plus all monitoring and reporting processes. The decision-making process follows all the steps followed by a credit application, from the original account officer proposal to all credit officers who examine the credit application, or to a credit committee, which reviews the proposal.

The decision is based on the usual financial data, plus judgmental assessment of the market outlook, of the borrower, of the management and of the shareholders. The follow-up is done through periodic reviews of the bank's commitments by customer, industry and country. In addition, 'warning systems' signal the deterioration of the situation of the borrower before default whenever possible

Why is it important to manage credit risk?

Edmonds (1998:62) states that to manage credit risk effectively can substantially impact bottom-line performance. Business organizations have recognized that proactive management of credit can impact the bottom line in two significant ways, contribution to increased revenues and reduction of financing and delinquencies costs.

In addition, pricing that integrates credit terms with a company's products or services, makes it more attractive to the buyer. Rapid, effective and consistent risk analysis and setting appropriate maximum credit limits can win new customers, ensure optimum reorder points for existing customers and increase overall customer satisfaction.

2.4 SITUATION ANALYSIS OF PRESENT RISK QUALITY AND RATING TECHNIQUES

Organizations are faced with the problem of how to retain experts and their expert knowledge, in a society of competition and change. One potential response to this problem has been the advent of expert systems, which use information technology (IT) to acquire, retain, and utilize the knowledge of experts.

In this section an overview of the credit models used for consumer lending and their areas of application is discussed. The following are techniques, which have evolved over the years:

2.4.1 Judgmental systems

According to Hempel & Simonson (1999:486), the judgmental system of consumer credit analysis relies on the consumer loan officer's experience and insight when appraising a borrower's ability and willingness to repay. This evaluation is similar to the evaluation of a business loan at perhaps a lower level of sophistication. As in commercial lending, the consumer loan officer also must assess the applicant's character, use of funds, primary source of repayment, and any secondary or collateral sources of repayment.

In the judgmental method of credit analysis, character can be evaluated from the applicant's credit history and from the degree of dependability demonstrated through length and consistency of employment, length and type of residence, apparent sincerity, and other factors (Hempel & Simonson, 1999:486).

Judgmental systems are very common in lending industries and are used in South Africa and abroad. The rules used in making credit judgment are often home grown and are a function of an institution's credit culture. Figure 3 shows the criteria employed by a Japanese lender using a judgmental system (Caouette *et al,* 1998:157).

Figure 4 is another example of a judgmental credit approval system used by a U.S. finance company specializing in auto loans (Caouette *et al,* 1998:157).

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Figure 2 Credit Screening Criteria

Maximum debt to salary ratio of 60 percent

Must be 25 or older

Length of time on current job, minimum of 2 years

Type of industry in which employed, for example,

No show - business people

No taxi-drivers.

Figure 3 Judgmental Credit Approval Criteria

At least one year at current residence; phone number required; proof of residence required.

Three years of verifiable residence history on borderline cases.

At least one year in the current job.

Three years of verifiable residence history on borderline cases.

Length of employment requirement waived for recent college graduates.

Minimum of $1500 per month income, proof of income to be provided

Self-employed must provide copies of tax submissions.

Debt ratio of 50 percent based on auto payment, mortgage, insurance, current loans, and other fixed obligations.

Clean credit bureau rating.

Different credit screening approaches are applied when a loan is secured. Home equity line of credit lenders rely more on the appraised value of the home and the loan to value ratio and less on the attributes (including cash flow and job stability) of the credit applicant.

Caouette *et al*, (1998:106) state that sub prime lenders, such as finance companies lending to the used auto market, rely almost completely on the collateral. They make up for lower credit quality by adjusting the car price and relying on their ability to repossess the automobile in case of default. For instance, Arcadia, a U.S. auto finance lender, does not use credit-scoring models and relies entirely on judgment.

Nonetheless, in the vast majority of cases, consumer lending decisions are made by evaluating the applicant's creditworthiness as reflected in such characteristics as home ownership, income, job category, and credit history rather than by evaluating collateral (Caouette *et al*, 1998:106).

According to Caouette *et al,* (1998:106) the benefits of using a judgmental system include:

- Provides automation to the traditional risk assessment process.
- It allows the user to assign weighted values to key elements deemed essential to a sound credit decision process.
- One major advantage to this method is that it provides consistency to the account review process.

According to Caouette *et al,* (1998:106) the drawbacks associated with using a judgmental system include:

- Based upon the experience of those designing the model.
- Word based and essentially subjective without statistical validity.

2.4.2 Quantitative Credit Scoring Models

Credit risk models fall into two broad categories – credit approval (credit scoring) models and behavioural scoring models. The former are used in reaching a decision concerning whether to extend credit. Typically, they include such variables as shown in Figure 5 (Caouette *et al,* 1998:159).

Figure 4 Credit Scoring Variables and Impact on Score

Variable	Impact	
Rent or own residence	Own	= +
Years at current address	High	= +
Income per dependant	High	= +
Marital status (single, married, divorced, separated)	Married	= +
Occupation	Varies	
Credit bureau inquiries	Fewer	= +
Other credit cards	Yes	= +
Oil company credit cards owned	Yes	= +
Number of adverse remarks on credit history	Fewer	= +
Number of serious derogatory entries	Fewer	= +
Number of inquiries in past 6 months	Fewer	= +
Telephone number (yes or no)	Yes	= +
Years on current job	Higher	= +

Behavioural scoring models, by contrast, are used to improve the profitability of accounts by subjecting them to different treatments with regard to credit lines offered and collection methods used. These are based on a statistical analysis of account use and payment behaviour and include variables such as the following:

Simple Criteria

- Number of recent credit inquiries
- Worst credit reference from the bureau

Detailed Criteria

- Number of times 30,60, or 90 days past due in the last year
- Number of derogatory items
- Transaction volume
- Average line utilization

Most employed to generate so-called pre-approved lists use ingredients of both credit approval and behavioural scoring models, as well as data that has been reported to credit bureaus by lending institutions. Credit bureaus are information clearinghouses for participating member companies. In summary form, member companies report information on account activity to their bureau, which gathers these statistics and makes them available for a fee to any member requiring a credit profile on an individual. For example, credit bureaus provide lenders with charge-off/bankruptcy prediction indices that rely heavily on variables descriptive of past account activity (Caouette *et al*, 1998:106).

Benefits of using a credit-scoring model:

- Credit scoring procedures are more objective than judgmental evaluations (Koch & Scott MacDonald, 2000:722);
- Credit decisions can be made quickly (Koch & Scott MacDonald, 2000:722);
- Discrimination is largely eliminated due to the ruling of the Equal Credit Opportunity Act. (To ensure that credit will be available to any borrower who satisfies acceptable risk criteria, congress in the USA passed the Equal Credit Opportunity Act (ECOA) which makes it illegal for lenders to discriminate against potential borrowers because of race, religion, sex, marital status, age or national origin) (Koch & Scott MacDonald, 2000:722);

There does not seem to be any published information regarding the position in South African on credit scoring and any rulings associated with credit scoring. In chapter 4 of the study, Empirical Studies and Results Evaluation, various studies are performed to determine the effectiveness of credit scoring as a risk management tool. The opinions of various bankers in South Africa on credit scoring are obtained from the results of a questionnaire, which was distributed to a range of registered banks in South Africa.

Drawbacks associated with the use of a credit-scoring model:

- Credit scoring models must be statistically verified and continually updated, which can be expensive (Koch & Scott MacDonald, 2000:722).

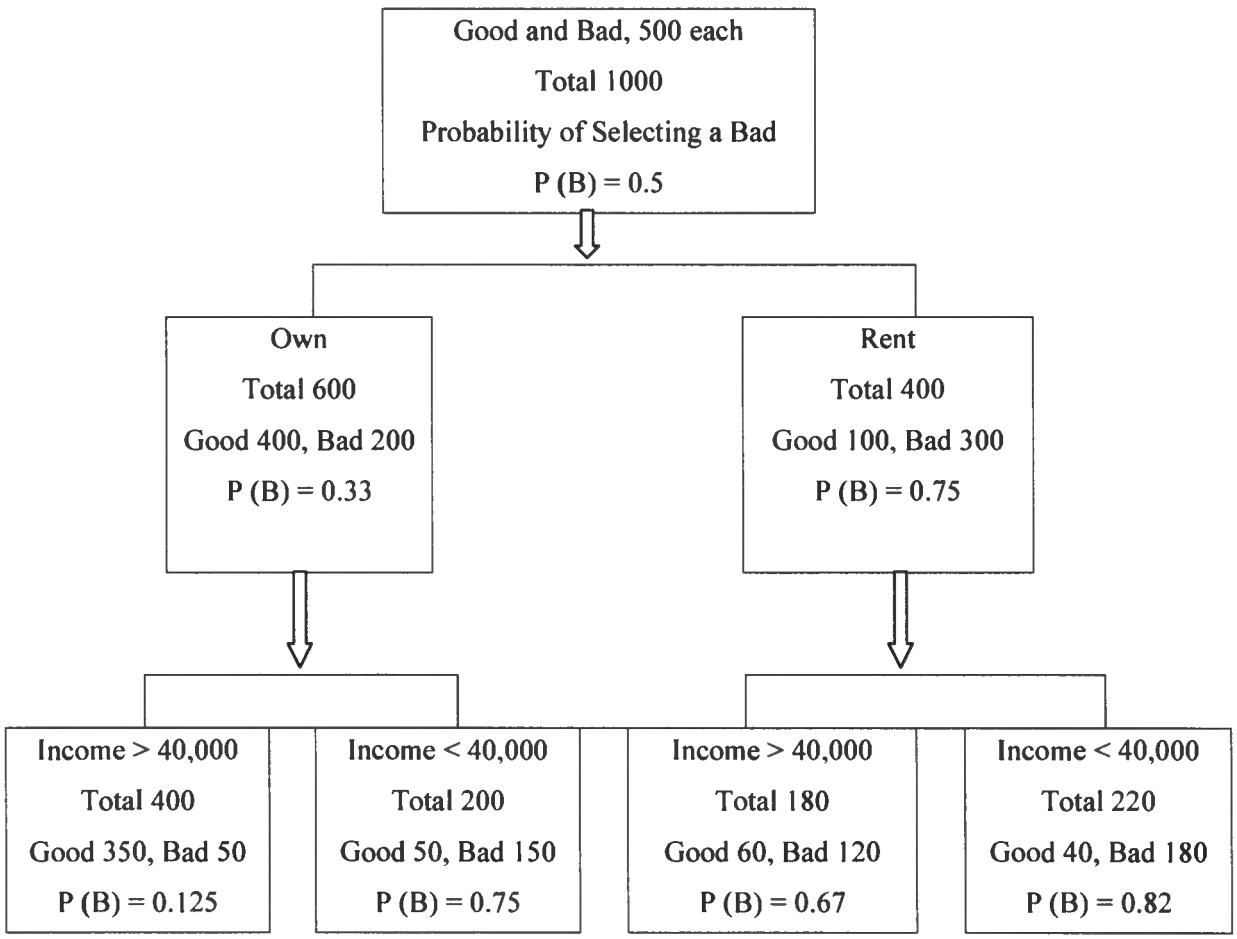
Benefits of using Behavioural Scoring include:

- Behavioural scoring is a statistical based scoring model that relies on multivariate correlation. It attempts to find common threads between problematic debtors and sound business (Wallis, 2001: 50);
- It examines all variables relevant to default or business failure using regression techniques and identifies a select set of key variables that point to the differences between marginal and sound business. It then weights the variables based on their importance to the outcome (Wallis, 2001: 50).

2.4.3 Decision Tree Models

The statistically developed credit-scoring model has a counterpart in operations research. In the decision tree approach, an applicant's attributes are partitioned off successively, from most important to least important. An applicant population may be divided into two main branches, say those who own their residence and those who rent. The owners may then be subdivided into different income levels, and each income level may be subdivided according to the number of years at the current address. The entire population is thus divided into mutually exclusive "buckets". The credit decision can then be made based on the probability of delinquency in each of the stages or buckets. This is graphically illustrated in Figure 6 for a two-variable system (own/rent and income level). In the example, as the tree branches are created, the probability (P) of selecting a bad (B), or a good account is moved away from 0.5 (a fifty-fifty chance) to a number closer to 0 or 1, thus increasing the likelihood of being correct (Caouette *et al*, 1998:164).

Figure 5 Credit Screening Decision Tree (Caouette *et al*, 1998:164)



Advantages to using decision tree analysis:

- The proponents of the decision tree approach claim that it deals more effectively with the interaction of variables than do credit scoring models (Caouette *et al*, 1998:164);
- Decision tree models can also generate a credit score even when some of the variables are missing (Caouette *et al*, 1998:164).

Decision tree analysis however, does have some drawbacks:

- Some of the lower level cells, for example, may have too few entries to provide credit managers with the level of comfort they get from the more common statistical models (Caouette *et al,* 1998:164);
- Decision trees do not work well for scheduling, planning, or synthesis problems (Riley, 1989:537);
- In general, decision trees will not work well for problems, which must generate solutions in addition to selecting them (Riley, 1989:537).

2.4.4 Expert Systems

The expert system, also widely referred to as 'knowledge-based systems' and 'rule based systems', are part of the wider families of 'decision support systems' and 'artificial intelligence'. Expert systems are one of the more established forms of modeling techniques incorporating rules and equations (Cade, 1997:120).

Jackson (1990:3) describes an expert system as a computer program that represents and reasons with knowledge of some specialist subject with a view to solving problems or giving advice.
Such a system may completely fulfill a function that normally requires human expertise, or it may play the role of an assistant to a human decision maker. The decision maker may be an expert in his or her own right, in which case the program may justify its existence by improving the decision maker's productivity. Alternatively, the human collaborator may be someone who is capable of attaining expert levels of performance given some technical assistance from the program. Expert systems attempt to codify the quantitative and qualitative knowledge of one or more experts (e.g. expert lenders) into a computer software package incorporating rules, policies, procedures, norms and advice for the user.

In the credit field, expert systems are mainly harnessed to processing advances, applications and reviews. The system advises and the user/sanctioner takes the final decision (e.g. to lend or not to lend; if need be, to defend and to reconcile with the recorded advise that he received).

Expert systems, as applied to credit assessment and grading, are best suited to the 'middle market' – characterized by medium size of customer, a fair amount of analytical complexity, and moderate volumes of applications (Jackson, 1990:3).

Advantages to using expert systems

Expert systems, in effect, clone human expertise and put it in a computer. Mallach (2000:452) describes the many benefits that expert systems provide, compared to asking human experts to carry out the same tasks as follows:

- They can solve problems more quickly than humans could, given the same data. It might take a moderately fast computer a minute or two to go through information that would take a person a few hours;
- Their output is consistent. They don't get tired, impatient, or angry. This can help standardize multi-individual decision making;
- They can be replicated as needed with minimal lead-time and at moderate cost. Human experts often need years of training and experience. They then retire or quit;
- They don't cost money when they're not being used. People expect a regular pay cheque;
- They can free up human experts to do other tasks, such as concentrating on the few problems that really require their high level of expertise;
- They don't mind working in locations that people find inconvenient or hazardous, or taking on repeated tasks that people find boring;
- The system is updated every time a new application is processed. Its "bench-marks" are thus updated continuously.

Additional benefits:

- **Stores information**. A well-furnished system provides a backcloth of industry data, credit policies with the bank, portfolio priorities and 'no go areas'. It is an invaluable storehouse of credit portfolio information (Cade, 1997:121);
- **Expert systems reinforce 'best practice' and help reduce volatility in the portfolio**. For many banks they will also offer the most practical means of implementing credit grading over a large part of the commercial lending book (Cade, 1997:121);
- **Increased availability**. Expertise is available on any suitable computer hardware. In a very real sense, an expert system is the mass production of expertise (Riley. 1989:5);
- **Explanation.** The expert system can explicitly explain in detail the reasoning that led to a conclusion. A human may be too tired, unwilling or unable to do this all the time (Riley. 1989:5).

The drawbacks to expert systems as described by Riley (1989:5) include:

- Dehumanizing and absence of intuition in problem solving and innovation.
- Difficulty in adapting to a constantly changing environment.
- Significant capital investment to install and maintain.
- Often confined to a very narrow domain and may have difficulty coping with broad interdisciplinary knowledge decisions.

Other drawbacks of expert systems:

- They are brittle at their limits. People recognize when they are reaching their limits and respond appropriately. Expert systems don't. They simply follow their rules and may recommend inappropriate actions, often without recognizing that they have done so. It can be said that there performance "falls off a cliff" at their limits rather than degrading gradually (Mallach, 2000:452).

2.4.5 Neural Network Models

It is accepted wisdom within the industry that a scorecard needs a complete redevelopment abed on fresh sampling every few years to keep abreast of economic and demographic changes; otherwise predictive accuracy starts to deteriorate. Cade (1997:123) believes that the use of neural network technology can help to obviate the need of these overhauls.

Neural network technology has recently been applied to credit scoring models. Neural networks are artificial intelligence systems that are designed to crudely mimic human thought processes and methods of learning. Neural network algorithms are a set of inputs (in this case the variables used in the credit application) that are mathematically transformed through a transfer function to generate an output (in this case a prediction of whether an applicant will be a performing credit or a charge-off). During the learning or graining phase, the weights are modified to reduce the difference between the desired output (correct prediction) and the actual output (generated prediction).

Richeson et al. (1996:34) report classification accuracy of 78 percent for performing accounts, and 70 percent for non - performing accounts. Although the results are encouraging, it is by no means clear that models based on neural networks will be acceptable from a regulatory standpoint because it is very difficult to explain the predictions in terms of the inputs.

Regulators view a credit analyst's qualitative judgment as an acceptable basis for a credit decision, but they still expect that a machine-based credit decision will satisfy the standard of tractability, that is, the ability to explain which variables produced an adverse credit decision. For this reason, neural networks are more useful in the back end of credit management (post approval processes such as credit review, line increases, collection strategies, etc.) rather than in the front end (credit granting).

Neural networks have been applied in behavioural scoring systems and fraud detection models. In these situations, the accuracy of the result obtained is the primary criterion, rather than the theory behind the method. It is more important to detect fraud with acceptable accuracy than to be able to explain what variables were considered and how they were used.

Advantages to using a neural network system include:

- A neural computer has the capacity to learn from experience and put into practice what it has learned. This means that a neural system's decision-support is non-subjective and, because of its rapid analysis capabilities, it can detect relationships between variables hidden deep within data (Mallach, 2000:452).
- It is not static and is constantly adjusting to changes, such as routine business and economic cycles that may have a positive or adverse effect on the outcome. The basis for this type of model is a series of algorithms that are constantly and automatically being refined and updated as time moves forward and information pertinent to the model is gathered and incorporated into the model parameters (Wallis, 2001: 50).

2.5 TECHNOLOGY

Technology is dramatically changing the role of systems and tools in the financial services industry. Computers, mass data storage and electronic data capture are all commonplace. However, the technology to analyze this mass of data and provide decision-support is still based upon conventional statistical techniques and the programming of fixed rules and equations.

According to Ryman-Tubb (2000:39) the technology of gathering data has far exceeded the technology to analyze it. A company can store millions of customer records with ease. To analyze them takes enormous effort and time requiring expert knowledge of both the data and analysis tools.

The mathematics for statistical prediction and modeling techniques has become even more complex, demanding considerable computing power, expertise and a lengthy development time for problems with more than a few input variables. Furthermore, statistical modeling approaches get into difficulties when there are a high number of complex non-linear interactions among input variables. This can lead to short cuts being taken. A database with 60 variables is typically cut down to only 20 because by statistical methods it would take too long to analyze all 60. Decision trees, expert systems and neural computing are just three of the advanced credit scoring methods already in use (Ryman-Tubb, 2000:39).

2.6 DOMAIN OF APPLICATION

Sargent (2001:56) describes the typical two distinct application points for credit scoring – new customer screening and ongoing or periodic customer reviews. In both cases, scoring rules can be developed to assist in determining the relationship between the company and the customer.

Section 2.4 of this chapter covered the various credit models used for consumer lending. According to Caoutte et al (1998:105) these credit models are applied in a variety of domains which are described below:

- *Credit approval.* Models are used by themselves or in conjunction with a judgmental override system for approving credit in the consumer lending business. The use of such models has expanded to include small business lending and first mortgage loan approvals. They are generally not used in approving large corporate loans, but they may be one of the inputs to a decision.
- *Credit rating determination.* Credit risk models are used in deriving "shadow" bond ratings for unrated securities and commercial loans. These ratings in turn influence portfolio limits and other lending limits used by the institution. In some instances, the credit rating predicted by the model is used within an institution to challenge the rating assigned by the traditional credit analysis process.
- *Credit pricing.* Credit risk models may be used to suggest the risk premiums that should be charged in view of the probability of loss and the size of the loss, given default. Using a mark-to-market model, an institution may evaluate the costs and benefits of holding a financial asset. Unexpected losses implied by a credit model may be used to set the capital charge in pricing.
- *Financial early warning.* Credit models are used to flag potential problems in the portfolio to facilitate early corrective action.
- *Common credit language.* Credit models may be used to select assets from a pool to construct a portfolio acceptable to investors or to achieve the minimum credit quality needed to obtain the desired credit rating. Underwriters may use such models for due diligence on the portfolio (such as a collateralized pool of commercial loans). Triggers for reserve levels may be tied to model performance.

- *Collection strategies.* Credit models may be used in deciding on the best collection or workout strategy to pursue. If, for example, a credit model indicates that a borrower is experiencing short-term liquidity problems rather than a decline in credit fundamentals, then an appropriate workout may be devised.

According to Sargent (2001:56), there is not necessarily one scoring model that fits all situations. Scoring models must however be flexible enough to take in to consideration differences between customer types and the availability of information. Most importantly, the rules, their possible answers, and the level of emphasis on those responses are usually different for every company, even companies in the same industry.

2.7 MOTIVATION FOR CHANGE

When the idea of replacing the traditional judgmental procedure for making decisions with scoring was first offered to the credit establishment it was not received with any conspicuous enthusiasm (Lewis, 1994:10).
Since the recommendation was coming from people with a background in mathematics, computers, and operational research, but definitely not credit experts, people in the credit field were more than a little hesitant.

What could these scientific types possibly know about the complicated business of credit that would give them the right to say they had developed a way of making credit decisions that was better than the traditional methods that had proven successful for so long?

The criticisms offered by the credit establishment were not without some merit. The old ways had worked for a long time and the suggestion that they be replaced by something that added some numbers was not looked on with favour. The number of factors considered by an experienced credit analyst, along with the years of experience of these analysts, led the credit establishment to feel that no numerical procedure could possibly compete.

Lewis (1994:11) confirms that this attitude still exists among many credit grantors, even some who have been using credit scoring successfully for years. However, despite the misgivings of many in the field, the pressure for the replacement of the traditional method has grown steadily over the past thirty years.

The pressures for change have come from various sources. Lewis (1994:11) feels that the most important of these is the plain fact that the traditional methods are less effective than their champions believe. He motivates this by saying that a judgmental process is, by its very definition, unexplainable. The exact process through which a credit analyst, however "expert" he may be, reaches a conclusion is impossible to put into words; that is what "judgmental" means. As a result, the only way that credit judgment can be taught is in the apprentice mode.

The apprentice sits at the feet of the master and tries to do things in the same way, with the master passing on to the student what experience he can verbalize. This is a costly process, and one cannot be undertaken when the volume of decisions is large and the masters do not have the time to teach the students. This is so true in practice and there are some credit decisions that cannot be reduced to a rule (Lewis 1994:11).

Many credit operations decline credit to any applicant who has a record of bankruptcy. Some elect to offer credit only to those with incomes over a certain level. Others require some minimum time at residence or employment. However, when these policy exclusions have been met, a decision must still be made, based on the available information, to grant or decline the requested credit. The number of factors is large.

Obviously, no one could possibly work out what decision is appropriate in each of such a vast number of cases. With traditional methods it is impossible for any individual to handle the immense diversity except in the most general of terms, which is why using the example of Lewis (1994:11), the apprentice can never exactly duplicate the decisions of his teacher. The student must learn what he can from the teacher and then apply what he has learned as best he can, trying as he goes to improve on his own performance.

Credit scoring, on the other hand, addresses exactly this diversity. Furthermore, it is fully explainable. All the factors that go into its construction are open to examination, all the methodology of computation can be reviewed, and the way that the enormous number of alternatives has been considered is available for one to see (Refer discussions in Section 2.4.2 of this chapter, Quantitative Credit Scoring Models).

Teaching about scoring does not require the apprentice mode, it can be done in a classroom style and questions can be answered in detail and with all the necessary supporting information based on accepted principles scientifically recorded.

The second motivation for replacing individual judgment with a numerical process stems from the fact that individual analysts are human and subject to that particularly human characteristic of inconsistent behaviour (Lewis, 1994:12).

Analysts have normal human feelings; on some days they feel better than on others, which may make them far tolerant of their fellows more on some days than usual. As a result, it is almost impossible for a human analyst to treat credit decisions in identical ways as time goes on. The application that is accepted on one day may easily be rejected on another. Inconsistency is not a desirable characteristic in credit operations, so its removal by a more consistent procedure is attractive.

Burgess (1996: 25-26) agrees that with manual decision-making, an applicant's creditworthiness can fluctuate according to those individuals' personal preferences. This could lead to inconsistent lending decisions from analyst to analyst or region-to-region and even applicant claims of bias.

A corollary to the problem of inconsistency is that different analysts have slightly different views about what forms a sound credit decision. No two analysts will deliver exactly the same results when examining any substantial body of decisions. This non-uniformity of decision is undesirable, since a credit operation is generally interested in consistent behaviour.

Obviously, a credit-scoring table does not produce inconsistent results. The same facts will produce the same every time (if accurately calculated), no matter who does it.

The inconsistency of individual judgment and the non-uniformity of decision among groups of credit analysts, undesirable enough on plain business grounds, is made even more serious by the laws and regulations of many jurisdictions regarding non-discrimination in credit. A rejected applicant, if he can find a similar (or even identical) application that has been accepted, presents a real legal hazard to any credit operation (Lewis, 1994:10). The application of a numerical system that reaches the same conclusion on the same facts every time has the value of consistency and would appear to avoid a specific legal hazard.

2. 8 ADVANTAGES OF CREDIT SCORING

From the above Section 2.7,Motivation for Change, it is clear that one of the biggest driving forces for replacing individual judgment with a numerical system stems from the fact that individual lenders are human and subject to that particularly human characteristic of inconsistent behaviour. Although it can be argued that consistency is not necessarily fair, Lewis (1994:13) confirms that a credit operation is generally interested in consistent behaviour.

Consistency and non-discrimination in lending is made even more serious by the laws and regulations of many jurisdictions regarding non-discrimination in credit. Credit scoring is a tool used nowadays to eliminate discriminatory practices in lending.

The advantages that a credit scoring system can provide any lending organization, based on the opinion of various authors, are discussed below.

2.8.1 Scoring is objective and consistent

As credit management becomes more developed, the need to eliminate subjective influences increases. Scoring models helps in this regard in that the scorecard criteria is the same for all applicants and thus avoiding any possible bias by a human credit grantor. A credit grantors' subjective judgment may influence credit decisions, but computers make decisions based only on facts reported on an application. For consumer credit, removing possible bias is important, especially in assuring that the credit granting organization is in legal compliance.

Bank regulators require that the factors in a scoring model have some fundamental relationship with creditworthiness. Even if a factor is not explicitly banned, if it has a disparate impact on a borrower of a certain race or gender or with respect to some other prohibited characteristic, the lender needs to show there is a business reason for using the factor and there is no equally effective way of making the credit decision that has less of a disparate impact (Mester, 1997:8)

A credit-scoring model makes it easier for a lender to document the business reason for using a factor that might have a disproportionately negative effect on certain groups of applicants protected by law from discrimination.

According to Caouette et al. (1998:166) credit scoring models are objective and consistent, which are desirable characteristics for any institution, and especially so for those lacking a strong credit culture. If properly designed, they can eliminate discriminatory practices in lending (Caouette et al. 1998:166).

Burgess (1996:25-26) agrees that since automatic decisions are programmed to reflect the lending institution's own credit risk policies and procedures, credit decisions are rendered rapidly and objectively. This alleviates the possibility of analyst bias or inconsistencies and allows credit lenders to customize their decision tools to meet the specific criteria of regional lending offices (Burgess, 1996:25-26).

Concerns from the author's point of view:

It can be argued that credit scoring is not entirely without bias. A typical example to substantiate the authors statement stems from the fact that a credit-scoring scorecard is developed based on data of the behaviour of prior customers. If for example these 'prior customers' are not demographically representative of the current base of loan applicants, a credit-scoring model might underestimate the likelihood of repayment by consumers whose demographics are not fully represented in the sample of prior customers upon which the scoring model was based.

2.8.2 Speeds up the decision making process

Consumer credit scoring models offer significant savings in the time required to make credit decisions, and with so many to make, this is invaluable. Also, by identifying the key variables, extraneous data can be eliminated, thereby making record keeping easier. For banks this means faster loan decisions and the ability to bid on loans of smaller amounts, because the cost of making the decision is so small (Parkinson & Ochs, 1998:22).

2.8.3 Reduces the cost of credit analysis

Credit scoring may well be a less expensive alternative than requests for full reports, such as credit bureau reports and calling for references. These reports are costly and can take a lot of time.

For example, Larry Gissible, treasurer of Fritzi California, a San Francisco-based manufacturer of medium priced women's apparel, has lowered the costs of his credit analysis by using an apparel credit scoring model for accounts requesting credit of $5,000 or less. If the score suggests the company is good for the requested credit limit, and the analyst confirms that the detail supports the score, the account gets approved.
"Because I can now see the data that supports the apparel score, I can use my own standards and judgment to evaluate it rather than paying for additional information from other third party sources" he notes (Brill, 1998:16).

Author's opinion:

Good credit managers in the banking world in South Africa seem to be scarce. It has been the authors' experience that banks can pay a large sum of money to employ a skilled, experienced credit manager. With credit scoring the rather simpler, smaller and more 'straight forward' application that does not require the advanced skill and experience of a credit manager can be approved by a credit scoring system. Instead of looking at every application, credit managers may only need to look at the exceptions.
There is a cost saving as scoring frees up credit managers to deal with other more technical and involved issues such as large business applications and collections (attempt to recover funds from accounts where there is concern regarding repayment ability).

2.8.4 Boosting revenue through increased volumes

It is said that past performance does not guarantee future results, but in the world of credit decisions, history often proves to be a reliable indicator. Credit scoring models that measure the likelihood of delinquent payments using actual payment history along with other financial and demographic statistics are familiar to most credit managers as useful tools for pre-qualifying sales prospects and making informed credit decisions. These days, however, credit professionals are discovering that the disciplined use of sophisticated credit scoring models can also create a significant bottom line impact by improving cash flow and collections.

By enabling faster credit decisions, scoring models can improve cash flow by bringing more business in the door, as proven by the experience of Steve Pucelik, credit manager of Great America Leasing, located in Cedar Rapids, Iowa. Great America provides leases on office machines and equipment through a nationwide network of 7,000 dealers. "Every transaction of $15,000 or less that scores above our cut-off becomes an automatic approval for us," Pucelik explains. Since implementing a leasing scoring model in May 1995, the group has analysed more than 3100 transactions and achieved an approval rate of 79 percent on those scored through the model. This approval rate was up six percent from a previous rate of 73 percent. Coupled with the fact that the group has reduced the number of personal guarantees they require from lessees, this has increased business.

Pucelik has analyzed account payment histories to check the validity of the credit sources. Of the transactions that have been approved, roughly 80% have moved to the funding stage, representing about $10 million in booked business. So far, they have only one past-due account in the portfolio. "The strength of our portfolio is primarily a function of our analysts' skills," Pucelik says, "but our use of the credit scoring is definitely a contributing factor." (Brill, 1998:16).

2.8.5 Monitoring existing accounts as well as prospects

While credit-scoring models serve to cut costs and increase revenues when making credit decisions on new customers, they can also add value when used to monitor existing accounts. Credit managers can review credit scores on smaller accounts annually to make sure that existing credit limits are still appropriate. If the credit score for a particular customer is borderline or low, the account will be 'flagged' for a quarterly or semi-annual review. This way a company can enforce its conservative credit policy.

Scoring software can also be used to create early warning systems that detect a drop in the creditworthiness of a lending institutions loan portfolio. This enables credit managers to keep track of correlations between credit scores and successful methods of intervention to keep people from defaulting on loans.

2.8.6 Prioritized collections

Using credit scores to monitor existing accounts can also improve cash flow by improving the collections process. On the collections side, credit scores have traditionally been viewed as purely a preventative measure; it stands to reason that better up-front credit decisions should reduce the number of delinquent accounts that must be turned over to third-party collectors.
However, if managers run credit scores on their existing base of delinquent accounts, they might also be able to determine how to structure their collection process to get a better return for their effort. A delinquent account with a high credit score for example, might suggest that a generally prompt-paying customer is experiencing temporary difficulty. Payment problems for accounts in this category are more likely to be resolved through direct contact. On the other hand, low credit scores on delinquent accounts may suggest more chronic problems.

For these cases, managers might decide to suspend credit, turn the account over to a collector sooner with the hope of achieving faster results, or cut the loss and write off the bad debt.

2.8.7 Financial and functional benefits

Burgess (1996:25-26) describes his view on the benefits of instant credit analysis and automatic decision-making as being both financial and functional.

First of all, initial system installation fees are comparable to many software program costs with additional fees only accruing on a transactional basis. In the long term, these fees are offset by the increased profits generated by the system. In fact, instant credit verification can have the favourable effect of increasing overall approval rates, while significantly lowering write-offs. A benefit, that flows directly to the bottom line.
Secondly, because credit evaluation systems and automatic decision tools so efficiently assess applicant creditworthiness, analysts are free to focus on the grey area between obvious acceptances and obvious declines. Consequently, due to the system's speed and accuracy, lending institutions can significantly increase application volumes without expanding the staff normally needed for the additional processing.

Finally, since automatic decisions are programmed to reflect the lending institution's own credit risk policies and procedures, credit decisions are rendered rapidly and objectively. This alleviates the possibility of analyst bias or inconsistencies and allows credit lenders to customize their decision tools to meet the specific criteria of regional lending offices (Burgess, 1996:25-26).

2.8.8 Improved Customer Service

According to Caouette et al. (1998:166) the installation of scoring models is relatively straightforward. The methodologies used to build these models are common and well understood, as are the approaches used to evaluate them. An institution is able to render better customer service by its ability to approve or deny a loan request speedily. This is an important factor in today's fast-paced world (Caouette et al. 1998:166).

2.8.9 Other Benefits

Credit scoring can be helpful where there is a decentralized process. If there are several people responsible for making credit decisions, credit scoring can help by allowing consistent parameters to be set. If several different people with different experience levels look at the same application, they may come up with different conclusions. Credit scoring helps to avoid this.

2.9 DISADVANTAGES OF CREDIT SCORING

Scoring models do have their inherent advantages but they are not perfect and do suffer from drawbacks. The disadvantages associated with the usage of credit scoring models are discussed below.

2.9.1 Scoring Models can have a significant impact on a given consumers ability to qualify

Not everyone agrees that the objectivity in scoring will benefit minorities or low-income individuals, who may for example, have had limited access to credit in the past. Mester (1997:9) argues that since these potential borrowers are not well represented in the loan data on which the scoring models have been built, the models are less accurate predictors of their loan performance (Mester, 1997:9).

Edmonds (1998:60-62) agrees that while scoring dramatically simplifies the credit analysis process, many organizations have come to realize that minor variations in scoring models can have a significant impact on a given consumers ability to qualify. As a result, many consumer groups have made credit scoring policies by banks and other financial service organizations a major point of scrutiny.
Thus, even with automated scoring systems, organizations may still need to rely on additional credit decision criteria if they are to be perceived as fair and consistent in the application of credit policy.

2.9.2 Human experts are still required to perform the routines that machines have not yet been taught.

Callahan (1998:18) expresses his concerns with utilizing a Credit History Scoring System. "The tendency for these systems to function under predictable (programmed) circumstances has demonstrated great success in a "perfect world" scenario; however, when significant, unpredictable circumstances enter the picture, human experts are required to return to the scene as consultants to perform the routines that the machines have not yet been taught" (Callahan, 1998:18).

2.9.3 Credit scoring models simply automate the prevalent credit practices of the bank.

Caouette et al. (1998:166) also acknowledges that credit-scoring models do suffer from some drawbacks. In most cases, they simply automate the prevalent credit practices of the bank. They do little, in other words, to eliminate an institution's historical screening biases. Furthermore, if the variables do not satisfy underlying assumptions, such as a multivariate normal distribution, the statistical validity of the models may be questionable. The statistical tests commonly used to whet these models are weak and may mislead the user into overestimation of their efficiency. Models are typically tested against a static criterion. For example, the approval rate for various cut-off scores is weighed against the corresponding bad rate. The problem with this approach is that approval is a one-time event, whereas charge-offs accumulate over a long period. Charge-offs do not all occur early in the credit cycle; in the contrary, experience suggests that the charge rate tends to hold steady over time (Caouette et al. 1998:166).

Author's opinion on the identified disadvantages of credit scoring:

The author acknowledges that the above areas of concern raised by various authors do carry water, as it is the author's experience that credit scoring can make lending rigid. Credit scoring systems do not make any exceptions.

There are certain issues such as retrenchment, which is a word very common in South Africa today, which is an unfortunate experience beyond the control of the borrower, which may have resulted in a temporary financial setback. The scoring system does not allow for an explanation by the borrower. What is positive though is that scorecards can be adjusted to accommodate certain adverse criteria. At Absa the scorecards are reviewed on a regular basis. The scorecards now make provision for old adverse detail and also the amount of the adverse is taken into consideration. For example, if the adverse detail is older than five years and smaller than five hundred rand, the scoring system will acknowledge the adverse but it will not prejudice the borrower regarding qualifying points.

2.10 SMALL BUSINESS LOANS

According to Mester (1997:4), in order to build a good scoring model, developers need sufficient historical data, which reflect loan performance in periods of both good and bad economic conditions. Volumes for small business loans are far less than for consumer lending, so there is far less information with which to build a credit scoring model (Mester, 1997:4).

The first banks to use scoring for small business loans were larger banks that had enough historical information to build a reliable model. One of these was BankAmerica, who built their credit-scoring model based on what the bank identified as 15,000 good and 15,000 bad loans with face values of up to $50,000 (Oppenheim, 1997:38).

According to Racine (1995:12) a survey reported in the *American Banker* in May 1995 with responses from 150 U.S. banks indicated that only 8 percent of banks with up to $5 billion in assets used scoring for small-business loans, while 23 percent of larger banks did. The smaller banks were less inclined to adopt scoring, citing small loan volumes. Fifty-five percent of banks with more than $5 billion in assets reported they planned to implement scoring in the next two years.

In a more recent survey of larger banks – the Federal Reserve's January 1997 Senior Loan Officer Opinion Survey on Bank Lending Practices – 70 percent of the respondents, that is, 38 banks indicated that they use credit scoring in their small-business lending, and 22 of these banks said that they usually or always do so (Racine, 1995:12).

Although credit scoring for small businesses is growing, the scoring systems accuracy, considering the complexity of a business, can be questioned. At First National Bank of Chicago it's been reported that about a quarter of the small-business loan applications rejected by credit scoring are approved after review, and an equal number of applications that pass the scoring model are rejected. First Union looks at credit scores as a supplement to more traditional analyses of businesses' financial statements (Hansell, 1995:1).

Callahan (1998:18) also has reservations. His argument is that the systems of an enterprise (integrating all operational activities of the organization) are developmentally inadequate for all facets of business applications.

2.11 LARGE COMMERCIAL LOANS

Despite its growing use for evaluating small-business lending, usually for loans under $100 000, credit scoring is not being used to evaluate larger commercial loans. A small business may be categorized as those with gross sales in the region of less than $ 5 million. Unlike larger businesses, the performance of a small business is closely related to the credit history of its owners (Caouette *et al,* 1998:106).

One question that is frequently asked is why are credit-scoring models so effective in consumer lending and not as effective in commercial lending? This question has three explanations: institutional, analytical, and economic. Institutionally, corporate lenders have adamantly maintained that corporate lending is a highly complex, multidimensional process requiring expert judgment that simply cannot be handled by quantitative models. Consumer lending, on the other hand have generally been more receptive to modeling approaches, perhaps because they have viewed their product in merchandising terms rather than in lending terms.

Analytically, it is somewhat easier to build consumer models because a fixed amount of information is provided on the credit application and a large statistical base of credit experience is available to test and refine credit models. The third reason is economic: losses in a consumer portfolio tend to be relatively large in number but small in size. Losses from a corporate portfolio are infrequent but much greater in size. Many believe that corporate defaults are less predictable and that reliance on a model may therefore be imprudent. Whatever the reasons, it is certainly true that quantitative credit risk models have not been accepted as widely in corporate lending as they have in consumer lending. But the trend toward greater acceptance has accelerated in recent years (Caouette *et al,* 1998:106).

2.12 CONCLUSION

Risk management has a number of potential benefits. But it does raise a number of conceptual and practical challenges. It is based on the ability to quantify risks. But uncertainty does not lend itself easily to such types of measures. This reason alone explains why the scope of risk management remained limited for a long time. Shifting from implicit and qualitative valuations of risk to explicit quantitative risk management techniques is a quantum leap. It implies a renewal of techniques and practices.

To make such a change feasible, a number of conditions have to be met. First, the definition of risk has to be improved so that risks can be tackled more efficiently. Second, the benefits of risks management have to become tangible enough to justify the shift.

The potential applications, and the use of risk management as a policy tool for the top management of banks are necessary to make the benefits more tangible. The capital adequacy regulations, with the related emphasis on internal models to value risks, provide such tangible benefits.
Credit risk models have not been accepted as widely in commercial lending as they have been in consumer lending. The main reason for this is due to the complexity involved when lending to a business.

Credit scoring for consumer lending is used for monitoring existing accounts, in the collection process, as well as for new prospects. Scoring is also intended to reduce the time needed in the loan approval process.

Implications of technological advances for the management of risk and for the prudential supervision of banks would mean that the banks credit cultures would have to change. Changes will be toward eliminating redundant practices, becoming more comfortable with portfolio management and achieving operational efficiencies at the transactional level.

Credit scoring addresses any diversity, inconsistency, non-uniformity of decisions and discriminatory practices, which may be experienced with traditional lending.

Although credit scoring has its inherent advantages, no model is perfect. Even a good scoring system won't predict with certainty any individuals' loan performance, but it should give a fairly accurate prediction of the likelihood that a loan applicant with certain characteristics will default. Some would argue that minor variations in scoring models could have a significant impact on a consumer's ability to qualify. Organizations still need to rely on additional credit decision criteria if scoring models are to be viewed as fair and consistent in the application of credit policy. It can thus be concluded that despite the advantages credit scoring models provide to the user, these systems cannot make lending decisions entirely independently; the "human touch" is still necessary if they are to be perceived as fair and equitable.

CHAPTER 3

EMPIRICAL STUDY AND RESULTS EVALUATION

3.1 INTRODUCTION

The problem central to the granting of credit is the estimation of risk. If risk is estimated poorly, the entire enterprise can fail either because of excessive default or lack of business. If you can estimate risk better than your competitor can, his business is in danger, since you are able to offer better terms to more people than he can (Lewis1994: 7).

Absa, realizing the need to improve on systems and procedures in order to remain competitive, appointed specialist consultants, the Experian Group (UK) during 1993, to perform a feasibility study. The aim was to evaluate and recommend changes to the Bank's credit management procedures and systems for the consumer credit market.

The problems identified by Experian within Absa's credit management environment are summarized below: (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:7).

- The bank's criteria for lending to consumers are mainly the same as the criteria used for lending to businesses;
- Decision-making is totally manual, reactive and driven by mandates with weak decision support systems;
- Strategies and action are not always determined by the risk inherent in the relationship with a client;
- There are too many functions carried out by branch staff which could be automated;
- The existing systems tend to concentrate on the delivery of up to date account information, with little emphasis on historical account information.

The empirical study is made up of two sections. The first section is based on five questions, which were designed as a result of the problems identified by Experian (Credit Management Feasibility Study, Experian, 1993, Simon Baum & Charles Taylor) within Absa's credit management environment, which are summarized above.

The results of the empirical study will determine whether the problems identified within Absa's credit management environment still exist or whether the implementation of credit scoring has provided a solution to the problems identified and hence, answered the objectives of this research. Any gaps or areas still requiring attention will be identified.

Once the problems within the Absa credit granting process has been addressed, the opinion of various bankers is obtained via a questionnaire distributed to various banks in South Africa, which makes up Section 2 of the Empirical Study. The same questionnaire was distributed amongst Absa staff countrywide and a comparison is made which will determine whether the problems identified by the Experian group within the credit granting process at Absa are similar in nature to those of other banks in South Africa.

3.2 RESEARCH METHODOLOGIES AND ANALYSIS AND INTERPRETATION OF RESULTS

Section 1 of this chapter focuses on Absa, which is the benchmark for the purpose of this study.
Section 1 is made up of five questions. The reasoning why each question is to be addressed and the research method used is explained directly following each question. The empirical result for each question is then presented, completed by the evaluation and interpretation of results for each question.

Section 2 comprises of the results of a questionnaire, which was distributed to 68 Absa branches countrywide and 18 various 'other' registered banks of South Africa to obtain a broader opinion on the topic 'Credit Scoring as a Risk Management Tool', from bankers countrywide. The 18 "other" banks are representative of the total banking industry for consumer lending in South Africa. The investment banks and merchant banks and any other banks not in the consumer lending business were excluded from the survey, as these banks would not require the use of a credit scoring system as they do not provide loans to customers. Credit scoring is used as a tool for lending.

A sample of the Questionnaire is included at the end of the study as Annexure B, for reference purposes.
In Section 2, the questionnaire is split in comprehensible parts showing firstly the question and answer results, followed by any additional facts and motivations by participants. Each question or group of questions is completed by the analysis and interpretation of results of the empirical study performed for each question.

The Absa results and the 'other' participating bank results are presented separately for comparison purposes. The analysis and interpretation of results however, addresses the results of all participating banks as a whole and any contradictory information or relational questions are identified and discussed.

SECTION 1

3.2.1 RESULTS TO QUESTION 1

QUESTION 1

Has the criteria for lending to consumers changed since the implementation of credit scoring at Absa?

1.2.1.1 Reasoning behind question to be addressed

The result of the feasibility study conducted by Experian in 1993 revealed that one of the problems in the Absa credit management environment was that the bank's criteria for lending to consumers are mainly the same as the criteria used for lending to businesses. Experian observed and brought to the attention of top management at Absa that statements of assets and liabilities and security are requirements for some of the most basic consumer lending decisions. The Experian staff felt that as a result the credit granting process is costly, time consuming and impacts negatively on client service.

1.2.1.2 Research method:

In order to see what has changed in the credit granting process for consumer lending within Absa, comparison analysis will be applied comparing criteria for lending to consumers before and after credit scoring was introduced at Absa using information and extracts from Absa's Credit Policy, Manual for Application Scoring, 2000.

1.2.1.3 Comparison analysis results: Criteria for lending to consumers before the implementation of credit scoring versus criteria for consumer lending after the implementation of credit scoring at Absa.

PREVIOUS POSITION:

The criteria for lending to consumers were mainly the same as the criteria used for lending to businesses. Balance sheets and security were requirements for some of the most basic consumer lending decisions.

This also applied when existing facilities were due for review. A requirement as per Absa's procedures manual was that all facilities were to be reviewed annually.

It has been the authors experience that even if the overdraft amount for an individual was as small as R1000 and full security was held, the following would be required to review the facility in order to extend it for a further year:

- Proof of income.
- Personal statement of assets and liabilities
- Income and expenditure
- Application form
- Credit bureau enquiries

SINCE THE APPLICATION OF CREDIT SCORING:

Whilst divisions of Absa such as the Bankfin vehicle finance division and Credit Card division has been using credit scoring in the decision making process for many years, implementation for consumers in the commercial bank took place in the following phases (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:16):

Phase 1 – Behavioural Scoring for consumers.

Behavioural Scoring for existing consumer clients was implemented in November 1995.

Phase 2.1 – Credit scoring for consumers.

Credit scoring of personal loans for consumer clients was implemented from February to July 1998.

Phase 2.2 – Credit scoring of cheque accounts for consumer clients was implemented during 1999.

Phase 2.3 – Credit scoring of mortgage loans for consumer clients was implemented in 2000.

The credit granting procedure for lending to consumer clients since the implementation of credit scoring at Absa is described in Absa's credit policy from where this extract was taken.

Steps followed by the credit scoring processing system when a client applies for a new cheque account or a loan in summary (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:14):

1. Completed client detail is captured onto the system by the sales consultant in the presence of the customer applying for a loan.
2. Client identification and earnings are verified.
3. Automatic links to Absa's internal credit systems will provide any additional client information where possible and determine whether a credit bureau enquiry is required and if so, information is drawn through from the relevant linking credit bureau.
4. The Absa system called the Strategy Execution Module will invoke the scorecards, determine the risk and apply credit policy rules and strategies.
5. The system will give a decision whether the application has been approved or declined or refer the application for further investigation, either by a branch official or a credit manager at the credit center.
6. The system will also determine whether any security is required if a client is applying for a loan. This will only be as a last resort as it is costly for the bank to maintain security documentation.

Where existing Absa cheque account holders apply for a new overdraft or an increase of overdraft facility, behaviour scoring is the system, which assists in decision-making.

Definition - Behaviour scoring

Behavioural scoring records the behaviour of client's accounts on a regular basis to highlight good and deteriorating relationships. Behaviour scoring is a risk estimator similar to credit application scoring but uses for its development data on the actual behaviour of credit account holders (that is, the way in which the individual has used his credit, how much he has used, what, if any, delinquency history does he show, and any other information available on the individual) rather than the information available on the original application (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:16).

Behavioural scoring uses the conduct of a client's accounts to predict whether a client will become "good" or "bad" (refer to section 3.2.3.5, for the definition of good/bad accounts).
Credit scoring and Behaviour scoring is currently applied only to consumer clients at Absa.

Definition – Consumer client

A consumer client (or individual) is a salaried person, a pensioner, a housewife or a person who has a combination of salary and income from a small business, or a farm where the salary is greater than the net income of the small business/farm (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:17).

Behaviour on the following products are scored to determine a risk grade for a client:

- Cheque accounts
- Credit cards
- Personal loans
- Credit lines
- Student loans
- Bankfin (motor financing) accounts
- Mortgage loans

The following products are also taken into account in the scoring process:

- Saving accounts
- Investment accounts
- Amounts paid in advance on home loans

A brief overview of how behavioural scoring is applied at Absa follows. Information is taken from Absa's credit policy, which is updated when changes are made, electronically from a central point (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:17).

Behaviour scoring is based on the conduct of a clients existing accounts to predict whether a client will become 'good" or "bad". Scorecards are thus built using behavioural data.

Behavioural scorecards contain a list of characteristics based on the performance of a client's various accounts and the points that are given for each performance characteristic will result in a score for each account.

Depending on the score assigned, the client's account will be allocated a risk grading ranging from one to five. One being very low risk up to five, which is very high risk, as illustrated in Figure 7 (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:17).

FIGURE 6 – Client Risk Grade Categories.

CLIENT RISK GRADE	LEVEL OF RISK
1	Very low risk
2	Low risk
3	Medium risk
4	High risk
5	Very high risk

Based on these risk categories, overdraft limits are granted or increased for existing cheque account holders at branch level without having to obtain proof of income or a personal statement of assets and liabilities from the customer.

Behaviour scoring is also used within Absa for the review of facilities based on the risk category in which the client has been categorized. For example, it is no longer necessary to provide any documentation from the clients side such as proof of income or personal statements of assets and liabilities to extend an existing overdraft for a further year if the risk grading for the client is categorized as either a one (very low risk), or a two (low risk) rating.

1.2.1.4 Conclusion

The criteria for lending to businesses remain the same. Absa does not currently make use of a scoring system for business applicants.

For consumer lending however, credit scoring is used for clients applying at Absa for any of the following products: a cheque account; credit card; mortgage loan; car finance, or a personal loan.

Although proof of income is obtained on application, focus is no longer on security when facilities are granted. The scoring system determines when security is necessary. Security is however, taken as an exception not as a rule.

Once an application has been accepted and an account opened or a loan granted, behavioural scoring comes into play.

Behaviour scoring has simplified the credit granting process for existing clients. The benefits of using a behaviour scoring system can be summarized as follows:

- Depending on a clients risk grade, financial information is no longer requested for new or increased overdraft facilities;
- Credit bureau enquiries are also no longer drawn on clients in a low risk category, which means a considerable cost saving for the bank;
- Behaviour scoring now allows staff at the credit division, based on the cheque account holders risk grading, to do the extension of facilities from a central point. This allows for improved client service and speedier decisions as the client no longer has to call at the branch yearly to provide the necessary financial information before the extension of the clients facilities would be reviewed, as was the practice in the past.

The drawbacks to using behavioural scoring are summarized below:

- Behavioural scoring can only be applied to an existing client base normally where the cheque account is six months and older;
- Based on historical account information only.

3.2.2 RESULTS TO QUESTION 2

QUESTION 2
Is decision making within Absa fully automated or is decision making still reactive and driven by mandates?

3.2.2.1 Reasoning behind question to be addressed

The feasibility study (Credit Management Feasibility Study, Experian, 1993, Simon Baum & Charles Taylor) further revealed that decision-making is totally manual and the bank does not have a system that is capable of assisting with or making the simplest of credit decisions. Systems prompt credit staff, and decision-making is reactive and mandate driven.

3.2.2.2 Research Method:

It has already been proven that decision-making is now no longer manual for consumer lending. To determine whether decision making within Absa is now fully automated or still reactive and driven by mandates, statistical analysis was applied using SAS software. A sampling period of 12 months is used and individuals who have been granted a cheque account within the period from August 1999 to July 2000 was selected. The collation of data from the time span August 1999 to July 2000 is due to the fact that credit scoring for cheque accounts first rolled out during the month of July 1999. August 1999 was thus the first month where a full months data figures could be extracted. At the time of analysis, only data up to the end of July 2000 was available for the purpose of the exercise.

The questionnaire which was distributed to Absa staff and various registered banks in South Africa also includes the above question, so the results obtained from the questionnaire will be compared to the results obtained from the statistical analyses in order to make a conclusion as to whether decision making is fully automated or if decision making is still reactive and driven by mandates.

3.2.2.3 Detail of data selection:

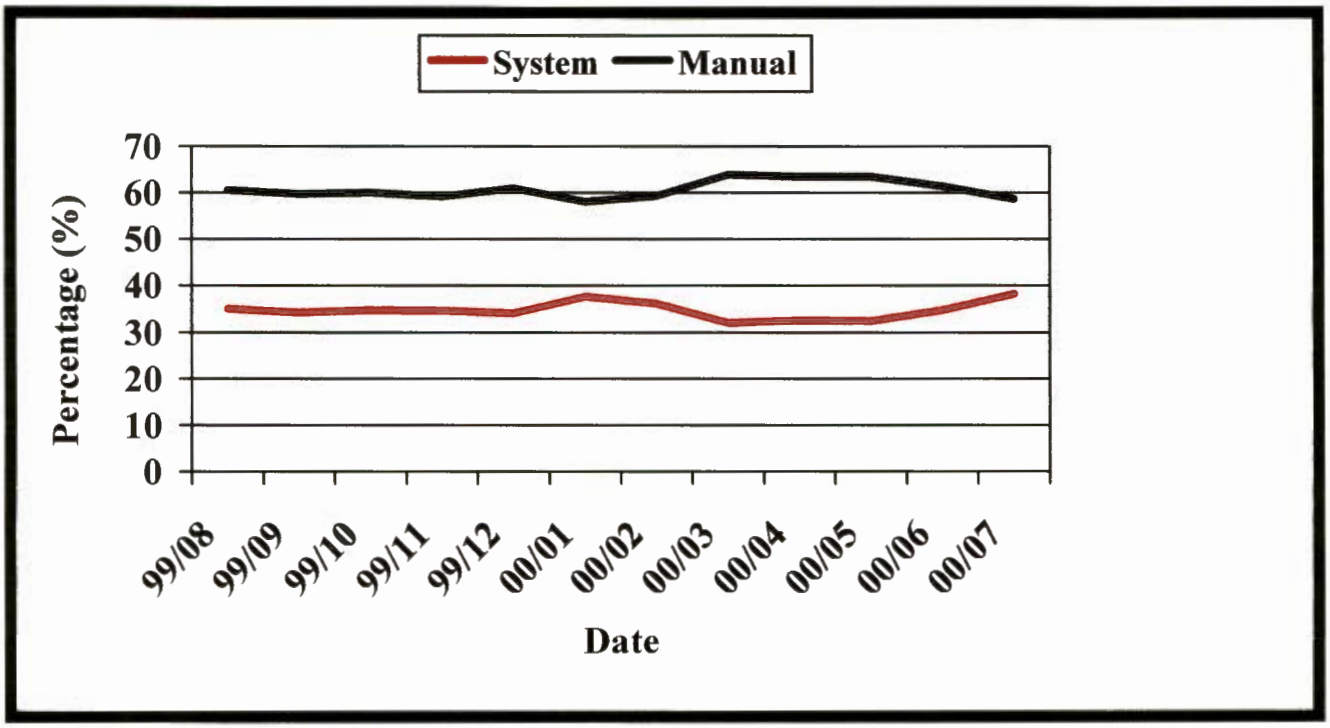
Actual data from the credit-scoring database was used for the analysis. A sample was not used; analysis has been done on the entire scoring population. The data was processed using SAS Software (Programming was done to extract and analyze the data from the credit scoring database).

3.2.2.4 Results of statistical analysis applied to determine whether decision making within Absa is fully automated or still reactive and driven by mandates.

Figure 7 – Hypothetical data used for testing of Automated versus Manual Decision Making

DATA	SYSTEM DECISION (%)	MANDATE DECISION (%)
199908	35.08%	60.62%
199909	34.22%	59.78%
199910	34.76%	59.98%
199911	34.67%	59.21%
199912	34.04%	60.96%
200001	37.72%	58.04%
200002	36.11%	59.31%
200003	32.04%	63.87%
200004	32.52%	63.43%
200005	32.49%	63.43%
200006	34.79%	61.43%
200007	38.28%	58.66%

FIGURE 8 – Graph: Systems Decision versus Manual (Mandate) Decision



3.2.2.4 Interpretation of results for system decision percentage figures versus mandate decision percentage figures:

Using the figures for the month of August 1999, from all the applicants that applied for a cheque account during the month, 35.08% was approved by the credit scoring system, while 60.62% of the applications were approved manually by human mandate decision intervention. The other months can be interpreted in this same way.

- From the data and graph it is evident that the process is not fully automated and is still driven by mandates
- With a new system everything is not known so it will still be mandate driven
- Over time, the system decision will move upwards and the manual decision will move downwards until the line representing the system will cross the line representing manual decisions by mandate holders when scorecards are monitored and fine tunings are done (Graph).

➢ The drawing factors behind the expected tendency are as follows:

- If the credit scoring system is in place for a longer period, fine-tuning will take place due to enhancement to the system through experience of operators over time, which will result in more applications being approved by the system and less manual decisions made.
- Fine-tuning can be described as the analysis of the weightings used in the scorecards where the results of the analysis is used to change existing strategies or implement new strategies in order to improve system decisions.

3.2.2.5 Conclusion

The results of this study show that the process is not fully automated and is still driven by mandates. This finding is consistent with the opinion of Edmonds and Callahan.

Edmonds (1998:60-62) maintains that even with automated scoring systems, organizations may still need to rely on additional credit criteria if they are to be perceived as fair and consistent in the application of credit policy.

Callahan (1998:18) agrees that the human touch is still necessary. When significant, unpredictable circumstances enter the picture, human experts are required to return to the scene as consultants to perform the routines that the machines have not yet been taught.

3.2.3 RESULTS TO QUESTION 3

QUESTION 3
Does credit scoring support systems assist in making good decisions?

3.2.3.1 Reasoning behind question to be addressed

A further problem identified by Experian (Credit Management Feasibility Study, Experian, 1993, Simon Baum & Charles Taylor) was that a manual environment within Absa, with weak decision support systems, has resulted in a process with little control as to whether the correct decision has been taken. The idea was then to test whether the credit scoring system at Absa is assisting in making good decisions.

3.2.3.2 Research Method

Statistical analysis is applied to determine whether scoring decisions are better than manual decisions. Firstly, a hypotheses test was done to determine if the two systems (manual versus scoring) perform exactly the same in respect of the rate of accounts that will go bad. The null hypothesis is that there is no significant difference between the performance of the accounts of the two systems and the alternative hypothesis is that there is a significant difference between the two systems.

When a credit scoring system is developed, a representative sample of good and bad accounts is developed based on the institution's actual credit experience.
A sample period of February 1998 to July 1998 has been selected, as this is the only period in which there were personal loans granted on both the systems. The Credit Scoring System was rolled out for personal loans during this period. Prior to February all applicants were assessed using the Manual system and after July 1998 all applicants were assessed using the Credit Scoring System.
The expected maturity period (the period needed for the data to show meaningful trends) for these accounts is 14 months, however preliminary analysis indicates that the maturity period could be significantly longer. It takes a minimum period of at least 12 months to get matured good/bad odds.

The accounts of individuals granted a personal loan between the period February 1998 and July 1998 are monitored over a 12 month period, as the period between when a decision is taken and when an account matures (outcome point) can be up to 12 months. Before this period has elapsed, it is difficult to say with certainty whether the lending decision was good or bad.

Secondly a log rank test was done to determine whether scoring decisions are better than manual decisions.

3.2.3.3 Hypotheses test to determine whether the two systems (manual vs. scoring) perform exactly the same in respect of the rate of accounts that will go bad:

I. HYPOTHESIS

Ho – The two systems perform exactly the same with respect to the rate that the accounts go bad.

Ha – The two systems do not perform exactly the same with respect to the rate that the accounts go bad.

* (The entire scoring population was used for the analysis and not a sample of the population)

II. DATA

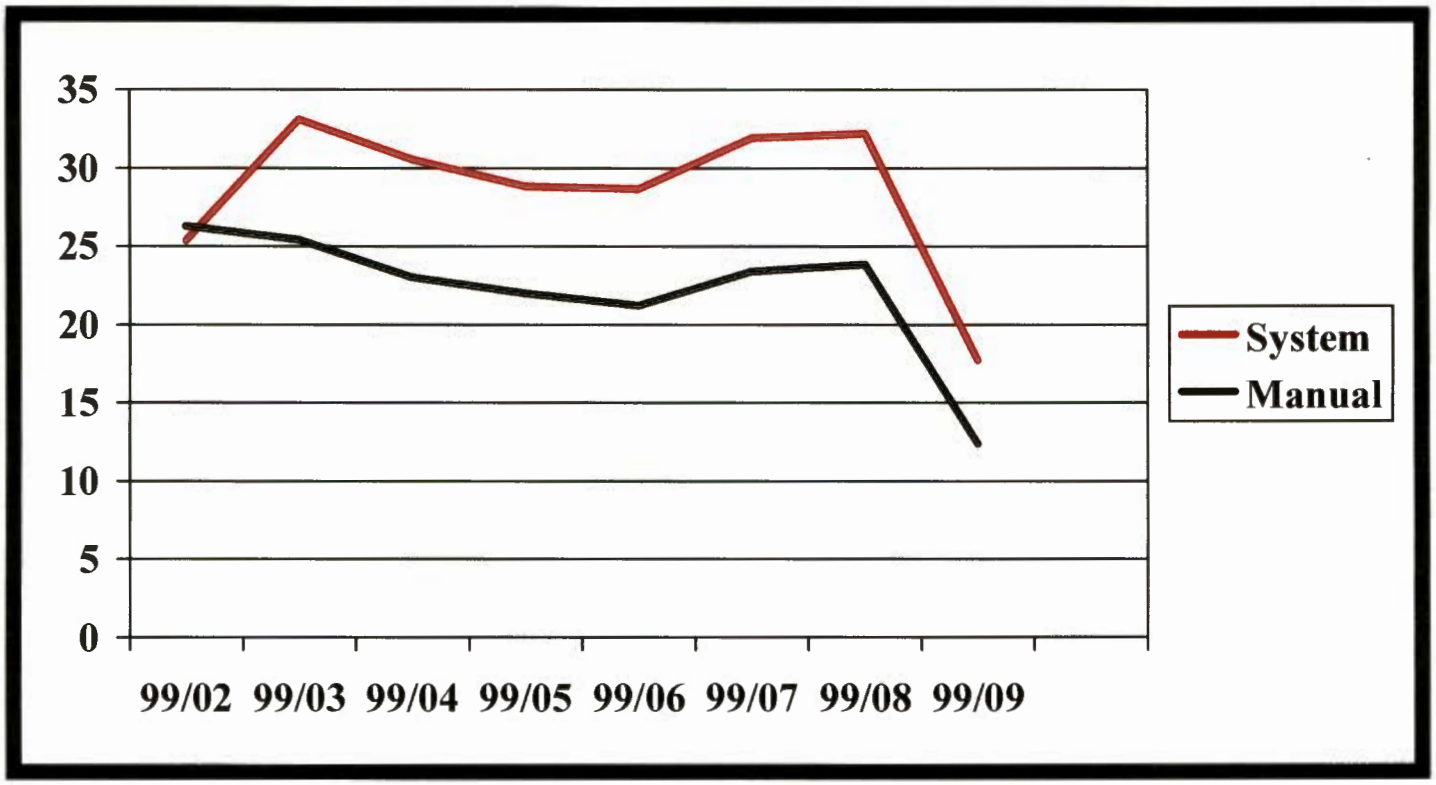
The table below compares the Good Bad Odds per month for the different methods used, i.e. decisions made manually versus decisions made by the scoring system.

FIGURE 9 – Hypothetical Data for Testing whether Support Systems assist in making good decisions (The data for this test was extracted from Absa's warehouse using a program called SAS)

MONTH	SCORING SYSTEM	MANUAL SYSTEM
199902	25.36	26.29
199903	33.09	25.42
199904	30.57	23.02
199905	28.83	22.10
199906	28.65	21.24
199907	31.92	23.42
199908	32.21	23.84
199909	17.74	12.38

III. GRAPH

FIGURE 10 – Graph: Good Bad Odds for the Scoring System versus the Manual System



3.2.3.4 Results of hypothesis test

From the table and graph it is evident that there is a difference in the Good Bad Odds for the different methods. The Good Bad Odds for the Scoring System is higher than for the Manual System. This means that if the good bad odds is higher for one system than the other, the one system made better decisions than the other system. Figure 11 shows that a credit decision made by the scoring system is better than a credit decision made by the manual system. This also means that the chances for an account to go bad are less for the scoring system than for the manual system. For example, if we look at the data in Figure 10 for the 7th month of 1999, odds of 32:1(rounded off to the nearest account) for the scoring system it means that for every 33 accounts scored by the scoring system, only one will go bad. For the manual system using the data for the same month, the odds of 24:1(rounded off to the nearest account) denote that out of every 25 accounts granted manually, one will go bad.

3.2.3.5 Explanation of terminology used for hypothesis test

Scoring versus Manual Systems (Good/Bad Odds)

Good/Bad Odds = % of good accounts / % of bad accounts

Maturity Period

In the first three months it is unlikely that an account will become bad, but there may be accounts that, according to Absa's Credit Manual for Application Scoring for Personal Loans' Reference definition, appear to be good but will become bad. In other words, if the borrower pays the loan account diligently for three executive months the loan will appear to be good but this is not to say that the borrower will not default at a later stage. The maturity period is therefore essential for clients to show their true colours.

The maturity period will differ from product to product and from decision point to decision point in the credit cycle. The maturity period of a personal loan is at least 12 months as it is a low volume transaction account. For high volume transaction accounts, such as cheque accounts or credit cards, the maturity period can be even shorter.

Scorecard Development

To build scorecards that predict future performance, it is necessary to go back in time and analyze applications of accounts/loans, which are operational.

One of the first steps in the development of scorecards is to define good and bad accounts so that a good/bad definition can be formulated. In short, bad credits may be defined as accounts that were charged off and good accounts those that have not ever been severely delinquent, and have been profitable.

It is unlikely that all accounts will be defined as either good or bad and such accounts will fall into an indeterminate category.

Accounts are tested against the good/bad definition. A sample of good and bad accounts will be selected and all application data such as age of applicant, period at current address, financial information, credit bureau reports, and repayment of previous loans, etc. will be collated.

All the data will be analyzed and the characteristics that have proved to be good determinants of risk will be included in the scorecard.
Scorecards have been developed for mortgage loans, personal loans, cheque accounts, overdrafts, credit cards and motor vehicle finance.

Good/Bad definitions

The score that a scorecard generates is a measure of the creditworthiness of a client and predicts the probability of a client being good or bad.

Note: The definition of good and bad accounts is determined by each lending organization and may change from time to time.

Using the products; cheque accounts, credit cards and personal loans as examples, **Good accounts** can be defined as (Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000:11):

a) Cheque accounts which:
    - Are active by showing regular deposits;
    - Have not been in excess;
    - Reflect no dishonors;
b) Credit Card accounts paid up to date and are not seriously over limit;
c) Personal Loan accounts that are up to date or are not more than one installment in arrears.

Using the products cheque accounts, credit cards and personal loans as examples, **Bad accounts** can be defined as:

a) Cheque accounts overdrawn substantially in excess of limits (or overdrawn without limits) or in excess for long periods or both. The credit turnover on accounts will also be taken into account;
b) Credit Card accounts that are substantially over limit or in a very advanced state of delinquency or both;
c) Personal loan accounts that are substantially in arrears (e.g. more than 90 days past due date);
d) Accounts where the following status codes have been captured: cheque book/card confiscated, potential bad debt, account compulsorily closed, black listed, legal action, under administration order, court order, curatorship, repossession, absconded, provision for bad debt, insolvent estate, sequestrated, bad debt written off.

Indeterminate accounts are defined as a class of account that is neither good nor bad. It may be moderately delinquent (e.g. up to 30 days in arrears) or currently up to date but having shown delinquency recently. Such accounts are regarded as indeterminate as they could develop into either good or bad accounts in future.

3.2.3.6 Log Rank Test

TEST (Using the Log Rank Test)

We can formally test the null hypothesis that the risk of an account going bad is the same in the systems using the log-rank test.

SAS programming was used to perform the log-rank test. The output of the program is as follows:

The LIFETEST Procedure

Testing Homogeneity of Survival Curves over Strata
Time Variable TIME2

Rank Statistics

Sample	Log-Rank	Wilcoxon
0	201.13	8527322
1	-201.13	-8527322

Covariance Matrix for the Log-Rank Statistics

Sample	0	1
0	799.184	-799.184
1	-799.184	799.184

Covariance Matrix for the Wilcoxon Statistics

Sample	0	1
0	1.437E12	-1.44E12
1	-1.44E12	1.437E12

Test of Equality over Strata

Test	Chi-Square	DF	Pr > Chi-Square
Log-Rank	50.6168	1	0.0001
Wilcoxon	50.5953	1	0.0001
-2Log(LR)	51.2884	1	0.0001

Sample = 0: Manual System

Sample = 1: Scoring System

FIGURE 11 – Log Rank Test

3.2.3.7 Result of Log Rank Test

The x (1) = 50.62 which is statistically significant at the 1% level.

The results indicate that there is a significant difference between the performances of the accounts of the two systems. The scoring system performs better than the manual system.

Accounts where a manual decision is made is 1:30 times more likely to go bad than an account where a decision was made by the scoring system.

3.2.3.8 Conclusion

The results of the tests performed using a sample period of February 1998 to July 1998 where personal loans were granted to individuals on the two systems (scoring system and manual system) indicate that there is overwhelming evidence that the risk of an account going bad is not the same in the two systems. The Good Bad Odds for the Scoring System is higher than for the Manual System. This means that a credit decision made by the scoring system is better than a credit decision made by the manual system.

Burgess (1996:25-26) agrees that automatic decision-making has the favourable effect of increasing overall approval rates, while significantly lowering write-offs. A benefit, that flows directly to the bottom line.

Similarly, Bill Uhrich from Alside believes that the reduction in bad debts has confirmed the validity of the scores. He notes that customers that get high scores prove to be good payers. Conversely, managers who occasionally override a score-based "Do not sell" decision have learned from experience to heed the risk indicator (Brill, 1998:16).

3.2.4 RESULTS TO QUESTION 4

QUESTION 4
Are strategies and procedures for granting credit using scoring all risk related?

3.2.4.1 Reasoning behind the question to be addressed

Experian during their feasibility study performed at Absa also pointed out that strategies and actions in the credit granting process are not always determined by the risk inherent in the relationship with a client.

3.2.4.2 Research method:

Pareto analysis is applied also using judgment and experience to argue whether strategies and procedures for granting credit using scoring are risk related.

3.2.4.3 Pareto analysis to determine whether strategies and procedures for granting credit using scoring is all risk related. (Scorecard characteristics differ for each lending institution and are regarded as confidential information. Figure 13 reflects some of the scorecard characteristics included in Absa's scorecard).

Figure 12 - Credit Scorecard Characteristics with there impact on scores and indication of whether these scorecard characteristics are directly risk related or not (Interview with ABSA Credit Scoring staff).

SCORECARD CHARACTERISTICS	IMPACT	RISK RELATED Y/N
Age of applicant	Varies	Y
Age of oldest insurance policy (years)	Higher = +	N
Time at current address (YYMM)	High = +	Y
Number of dependants (Excluding spouse)	Fewer = +	N
Time with present employer (YYMM)	Longer = +	Y
Telephone numbers given? (Order is Home, Business, Mobile)	Yes = +	Y
Cheque account institution	Yes = +	Y
Savings account institution	Yes = +	Y
Customer risk grade (ABSA wide)	Varies	Y
Term of loan (Years)	Fewer = +	Y
Occupation category	Varies	Y
Time since last loan	Longer = +	N
Marital status (single, married, divorced, separated)	Married = +	Y
Credit bureau searched	Yes = +	Y
Highest judgment value (R1 – R9999999)	Lower = +	Y
Identification number verified	Yes = +	Y
Total number of judgments	Fewer + +	Y
Number of adverse remarks on credit history	Fewer = +	Y

3.2.4.4 Results of Pareto Analysis

Risk related = 15

Not directly risk related = 3

3.2.4.5 Analysis of results

Discussion of variables and motivation why they are/are not considered risk related:

a) Age of applicant

Can be considered risk related. The most important factor to be determined here is whether the applicant is of legal age to sign a legal contract. Secondly, extremes of youth or age can be crucially important, and in these instances this quality is considered. For example, credit risk may decreases with increasing age, especially above 50.

b) Age of oldest insurance policy

Not directly risk related. Serves more as background information on the client as to whether the client is saving or providing for the future in any way. Can also serve as a source of security depending on the type of policy, how old it is, and whether it has a cash surrender value.

c) Time at current address

Can be considered to be risk related. Check of residence is first of all a routine verification of identity. In addition, residence information should show the length of time at the present location and any previous residences in the last three to five years. They reveal certain information about the other credit qualities of the applicant such as stability. In addition, information on whether the applicant owns or rents the property is beneficial. If the applicant owns property it has a positive impact as it could mean that the client does not move from properties or towns often and it could also improve his personal financial position if there is good equity in the property. The mortgage repayment amount is determined in order to determine overall affordability including any new loans applied for in relation to income earned. The amount of the rent and the manner of payment is normally determined if the property is rented.

d) Number of dependants (Excluding spouse)

Not directly risk related. Serves more as background information to determine affordability of loan, i.e. to see whether household expenditure mentioned by the applicant seems realistic in relation to the number of dependants.

e) Time with present employer

Can be considered as risk related. Five years and longer can be considered as a reasonable period. When employment has been for a comparatively short time (three to five years is considered short), it may be advisable to investigate previous employment. Investigation of credit prospects who are self-employed should be especially extensive, since applicants themselves supply their own employment and income information. Proof of income from a qualified accountant should be insisted on.

It can be considered that the longer the period that the applicant has been employed the lower the risk, as it is an indication that the client is more responsible than the person who changes jobs regularly. It must be taken into consideration though that it may be, for example, a young person who recently graduated and is looking for a better job opportunity.

A further assumption is made that the longer the client is employed with a company, the less likely the client is to be laid off in comparison to any new comers to the firm.

f) Telephone numbers

Can be considered risk related. It is a means of verification of information supplied by the applicant. Credit scoring automatically checks and verifies the number. Credit scoring will also identify whether it is a call box number.

g) Cheque account institution / Savings account institution

Can be considered risk related. It would be suspicious if the client, depending on the age, does not show any existing savings or cheque account. Cheque accounts can also provide good background information on a client such as turnover on accounts, dishonors on record etc. If a cheque account is held at another financial institution, a bank-to-bank full general report can be requested to confirm whether the cheque account is conducted in a satisfactory manner.

h) Customer risk grade (Absa-wide)

Can be considered risk related. Refer to Chapter 3, section 3.2.1 where behaviour scoring is discussed in detail. A customer risk grade will also determine whether a credit bureau enquiry is necessary.

i) Term of loan

Can be considered risk related, as it is important in determining repayment ability. Repayment amount obviously is less the longer the period of the loan and vice versa.

j) Occupation category

Can be considered risk related. In Absa's credit policy and manual, there are certain identified high-risk occupation categories. For example, a sales person working only on commission can be considered riskier lending than a person earning a fixed basic salary.

k) Time since last loan

Does not seem to be directly risk related. Appears to serve more as background information to determine a trend with a client. For example, if the previous loan for the client was within a six-month time span to when the new loan is requested it would be advisable to determine from the client what the reason is that another loan is required within such a short period from the previous loan.

l) Marital status

Can be considered risk related. The bank requires this information in order to determine the rights in terms of contractual capacity in terms of certain laws which the bank must abide to. Joint signatures are required from married couples on certain documents.

m) Credit bureaus searched / Highest judgment value / Total number of judgments / Total number of adverses

Can be considered risk related. It is important for a client to have a clear credit bureau record. Past experiences with credit lenders show that if a client has forfeited once, the chances are higher that he would forfeit again, more so than a person who has a clear credit bureau record.
If a person is not on record at all with a credit bureau, then this could also be suspicious as credit bureau's should have record of all individuals, businesses etc, even if only previous enquiries are reflected. After all, the majority of us have in the past applied for a clothing account, cell phone account etc.

n) Identification number verified

Can be considered risk related. This serves to verify identification.

3.2.4.6 Conclusion

Results of the applied Pareto Analysis using information considered by Absa's scoring model show that strategies and procedures for granting credit, using scoring are risk related.

Factors that can have a negative effect on credit scores include past-due balances and spending close to credit limits, which will have a negative effect on the Absa customer risk grade as calculated by the Behaviour scorecard for existing account holders. Also, factors such as having too many new accounts; insufficient length of credit history; too many revolving accounts; numerous recent credit checks; collections or charge-offs; and bankruptcy could influence credit scores negatively.

3.2.5 RESULTS TO QUESTION 5

QUESTION 5
How can credit scoring improve the automation of certain functions within Absa?

3.2.5.1 Reasoning behind question to be addressed

Experian lastly pointed out that there are too many functions carried out by branch staff that could be automated to allow the staff to focus on areas that require more attention.

3.2.5.2 Research Method

The manager of each Personal and Small Business Credit Services Center (PSBCS) at Absa was interviewed telephonically using a structured questionnaire.

Credit at Absa has been centralized:

- Head Office Credit
- Provincial Head Office Credit
- Personal and Small Business Credit Services / PSBCSs

Credit scoring does not apply directly to Head Office and Provincial Head Office Credit, as these departments assess the larger groups and business accounts. Absa has not yet implemented credit scoring for business accounts neither is credit scoring applied to accounts forming part of a group. Only individuals not forming part of a group with an ordinary credit exposure of not more than R50, 000 will fall under the credit-scoring category. Head Office Credit and Provincial Head Office Credit were thus not included for the purpose of the interview/questionnaire, as they do not currently make use of credit scoring.
There is only four Personal and Small Business Credit Service Centers countrywide, where in order to achieve a fair representation; the manager of each Center was interviewed telephonically using a structured questionnaire

3.2.5.3 Results of the questionnaire presented to the four Absa Personal and Small Business Credit Service Centers (PSBCS's) countrywide

Figure 13 - Absa, Personal and Small Business Credit Service Centers

GAUTENG NORTH	CENTER 1	(012) 338 9500
WESTERN CAPE	CENTER 2	(021) 946 1666
KWA-ZULU NATAL	CENTER 3	(031) 310 2300
GAUTENG	CENTER 4	(011) 221 6363

Figure 14 – Results of questionnaire presented to the four Absa Personal and Small Business Credit Service Centers (PSBCS'S) countrywide

QUESTIONAIRE	SUMMARY OF SIMILARITIES OF THE FOUR CREDIT CENTERS	ADDITIONAL COMMENTS
Question 5.1 From your perspective, how can credit scoring enable sales people to provide high quality lending applications and reduce turnaround time from the point when the application is received to when a final decision is made?	• Information from a loan application is fed into the computer program by the banks sales consultant in the presence of the customer. The automated system pulls the credit report for the client and a decision is made. The sales consultant is then in a position to give the client a reply during the initial interview within minutes if the system gives a straightforward "Accept" or "Decline" decision. • A manual decision will only be necessary where the computer program requests for it. This delivery channel is standardized throughout the bank. • In the past, before the introduction of credit scoring, the process was much longer and more labour intensive as there was not only a sales consultant involved, but more intermediaries, faxes and hours, or even days of lapsed time before a reply could be given to the applicant. • The credit scoring system has built in mechanisms, which assists in ensuring the completeness of information, as certain data fields have to be completed.	• Center 3 added that the scoring system is also designed in such a manner that it checks as far as possible for the correctness of information. The scoring system tests for the reasonableness of the data entered. "For example, a 20 year old whose data says he is a dentist can be marked for checking".

Question 5.2 From your perspective, how can credit scoring enable more rapid and better exception assessment of loan applications exceeding the system mandate?	• Loan applications of R50, 000 or less are now done by the credit scoring procedure. • Absa's scoring systems are also designed so that marginal applicants whose scores are not high enough to pass easily or low enough to fail absolutely are referred to a credit manager who decides whether the bank will extend credit. This allows for discussion and negotiation between the credit manager, the branch submitting the application for approval, and the client. • Since credit application scoring has been implemented, applications in excess of the scoring mandate are still scored by the bank official at the branch, but now the application is sent electronically to the credit center for assessment. The credit manager in turn electronically routes the outcome of the application back to the branch. This improves turnaround time. • Credit managers at the PSBCS now have the advantage of help indicators for all applications provided by the scoring system, whereas previously there was no guidance provided to decision makers.	An example of how the 'help indicators' provided by the scoring system assists credit managers in decision making was given by Center 4: • The system will guide the credit official on any areas on which he/she has to focus. For example it will give an exception of " insufficient security" or "tax portion incorrect". The first example of an exception is self explanatory, but with the tax portion, the system will calculate the tax portion in relation to income earned and check that it is realistic.

Question 5.3 From your perspective, how can credit scoring improve the monitoring and control of the quality of assets on the book with special reference to the review cycle of applications?	• Previously there was a problem where application forms at branch level were completed incorrectly, also when sent to credit managers at the credit center; insufficient information was given to the credit managers. This caused a delay in decision-making, as the credit manager would have to go back to the branch to obtain the necessary missing information in order to make a reasonable credit decision. • Since the implementation of credit scoring, information is more complete as there are mandatory fields that have to be completed. During data entry the computer demands that the data entered be formally correct; that is, in fields requiring numbers, numbers must be entered. In fields requiring one of a group of possible entries, any attempted entry outside the permitted group is rejected. In both cases the computer demands a formally correct entry before it will proceed to the next item to be entered. • If the credit score for a particular customer is borderline or low, the account is flagged for a quarterly or semi-annual review. This way it is possible to enforce the banks conservative credit policy and control the quality of assets on the book.	• Center 4 added that credit scoring models can be modified to reflect the banks own credit limit guidelines, therefore scoring models can grant automatic approvals to customers whose scores fall into a predefined range for the amount of the transaction.

Question 5.4 How can credit scoring be used to simplify and improve changes and application of policies and procedures?	• With credit scoring there is standard application and consistency of policies and procedures whereas previously this was not possible with manual decision-making. • It is also much easier to make changes to policy, as it is just a matter of keying in the changes to the mainframe and these changes will be implemented countrywide. Changes in credit policy can thus be implemented more rapidly and precisely than with judgmental evaluators.	• Center one added that credit scoring allows parameters for lending to be set and changed electronically from a central point. • Center 3 added that changes to policies and procedures are of effect immediately, countrywide.

Question 5.5 What portfolio information can be provided by the scoring system, which can assist in improving the banks view on risk and marketing?	• Credit scoring models measure the likelihood of delinquent payments using actual payment history along with other financial and demographic statistics which are useful tools for pre-qualifying sales prospects and making informed credit decisions. • Information required for credit scoring can be entered into a management information system and can be used to monitor the scoring system, generating demographic profiles of credit customers, measuring the quality and profitability of the portfolio and forecasting losses. • Strategies can be tested before rolling them out using the system's verification and testing components. Marketing mailing is expensive. Scoring provides a marketing tool to assist in reducing wasted mailings, as customers are pre screened and approval obtained beforehand.	• Center 2 added that historical background information is required in order to do growth projections on a particular product. It would be necessary to track accounts to get that background. Scoring lets you do that systematically. • Center 4 added that scoring automatically provides new service opportunities to staff at the point of contact. Loan representatives can see members' relative risk and pre-approve them for other products or credit lines if they qualify.

3.2.5.4 Conclusion

Since the visit by Experian a great deal has changed within Absa's credit environment to improve the automation of functions. One of the major steps taken was to take the credit functions out of the branches and place credit in centralized units.

There are four Personal and Small Business Credit Service Centers countrywide. To determine how credit scoring improves the automation of certain functions within Absa, the managers of the four PSBCS centers were interviewed using a standard questionnaire.

The results from the respondents of the four PSBCS centers that participated in the Questionnaire/Discussion shows that credit scoring has improved the automation of certain functions within Absa in the following ways:

- Enables sales people to provide high quality lending applications as users activate the system through simple-to-use screens and menus with certain mandatory fields, which ensures higher quality applications.
- The scorecard has set minimum scores in line with model performance forecasts. Applicants scoring in the upper ranges of the scorecard receive automatic approvals, dramatically increasing loan-processing efficiencies and improved turnaround time.
- Enables more rapid and better exception assessment of loan applications exceeding the system mandate. This is possible because these applications are also captured for application scoring which provides credit managers with help indicators to assist in decision-making. These applications are then routed through to the credit managers at the credit center electronically.
- Decision support software therefore aids credit managers in making decisions by interfacing with a decision-support database. The software helps speed up the decision-making process while making sure to follow the banks own guidelines.
- Scoring improves the monitoring and control of the quality of the assets on the book with special reference to the review cycle of applications. Scoring increases the efficiency of the review process and decreases the human effort as the system automatically clears up the integrity of the information. Mandatory fields ensure that the necessary information is obtained from the client. The system also checks for duplicate applications

- Credit scoring simplifies and improves changes and application of policies and procedures. Using credit scoring, policies and procedures can be translated onto the computer mainframe for execution into system decisions. The result is improved control of application of bank policies and procedures.
- Portfolio information is provided which can assist in improving the banks view on risk and marketing. Credit scoring models measure the likelihood of delinquent payments using actual payment history along with other financial and demographic statistics which are familiar to most credit managers as useful tools for pre-qualifying sales prospects and making informed credit decisions.

SECTION 2

3.2.6 GENERAL VIEWPOINT OF BANKERS COUNTRYWIDE ON THE EFFECTIVENESS OF CREDIT SCORING AS A RISK MANAGEMENT TOOL

3.2.6.1 Research Method

In order to determine the views and opinions of bankers countrywide on credit scoring, a questionnaire was designed and distributed to all the registered banks of South Africa who provide consumer lending. The investment banks and merchant banks and any other banks not in the consumer lending business were excluded from the survey as these banks are not in the business of consumer lending and would therefore not use a credit scoring system which is used as a tool for lending. The questionnaire was therefore sent to all registered banks of South Africa who provide consumer lending. The total was 18 banks, which represent the consumer lending industry as a whole in South Africa. This total includes Absa, as the same questionnaire was distributed within Absa in order to obtain a uniform and fair representation of the views of bankers on credit scoring countrywide. The questionnaire was also distributed to the four Absa Personal and Small Business Credit Service Centers situated in Johannesburg, Cape Town, Durban and Pretoria. A total of 68 Absa branches, countrywide, were targeted for completion of the questionnaire.

Although Absa bank forms part of the population for the purpose of the questionnaire, a separate record has been kept of the Absa results and the analysis and interpretation thereof. The reason for the separate record is firstly to determine whether the results of the questionnaire based on the opinion of staff at Absa correspond with the results of various other empirical studies performed within Absa (Refer chapter 4, Empirical Results, Section 1).

Various empirical studies were done to ascertain whether the implementation of credit scoring at Absa has had a positive impact within Absa's credit department and provided solutions to certain problems identified by Experian during their feasibility study performed at Absa (Credit Management Feasibility Study, Experian, 1993, Simon Baum & Charles Taylor).

The second reasoning behind the separate record is to provide a broad opinion of several sales staff and decision makers at Absa, i.e. both from a sales and credit perspective on the topic 'credit scoring as a risk management tool' as the questionnaire was distributed amongst the sales and credit staff. The responses of the 'other' banks however, present a summarized effect of each participating bank results. With the separate record, it allows for the comparison of Absa's results with those of the other banks forming part of the population.

3.2.6.2 Layout

Results of Questionnaire (3.2.6.3), provides the results of the questionnaire given as a percentage of the respondents. Analysis and discussion of results to questionnaire (3.2.6.4) will begin firstly with the question and answer results. Any additional facts and motivations by respondents will then be listed, followed by the analysis and interpretation of results.

- Black ink = Absa results
- Red ink = "Other bank" results

3.2.6.3 Results of Questionnaire

Refer Annexure B

3.2.6.4 Analysis and discussion of results to questionnaire

Of the 17 questionnaires distributed to the other registered banks of South Africa, 13 banks completed and returned the questionnaire, thus a response of 76% was achieved.

Of the total of 68 questionnaires distributed to various Absa branches, a total of 47 completed questionnaires were received. Included in the 47 are the responses from the four Absa Personal and Small Business Credit Service Centers countrywide. A response rate of 69% was achieved.
Although a separate record has been kept for the Absa response to the questionnaire and also the Absa results interpreted separately from that of the "other banks", the Absa response forms part of the total population.

SECTION A – APPLICATION AND USAGE OF CREDIT SCORING BY BANKS IN SOUTH AFRICA (Questions 1 – 6)

QUESTION 1

a) Question and answer results

		Yes	No
1	Is credit scoring as defined above, used by your institution?	100	0
		46	54

b) Additional facts and motivations

Absa implemented credit scoring for the commercial bank in 1998.

c) Analysis and interpretation of results

Absa is making use of credit scoring since 1998. Of the other 13 banks that participated in the survey, 6 banks are making use of credit scoring whilst the other 7 do not make use of credit scoring.

QUESTION 2

Change of sample population: This question is only applicable to the seven of the thirteen 'other' banks who do not make use of credit scoring.

a) Question and answer results

		Yes	No
2	Is your institution considering implementing credit scoring in the near future?	N/A	N/A
		43	57

b) Additional facts and motivations

None

c) Analysis and interpretation of results

Of the seven banks not making use of credit scoring, three banks are considering implementing credit scoring in the near future whilst the remaining four banks are not considering the implementation of credit scoring in the near future.

QUESTION 3

Sample population: This question is only applicable to the seven of the thirteen 'other' banks who do not make use of credit scoring.

Question 3A

a) Question and answer results

		Yes	No
3a	Are you aware of the inherent risks in implementing credit scoring to assist in decision-making? If yes, list in point form the risks involved.	N/A	N/A
		71	29

Five of the seven banks currently not using credit scoring answered yes to Question 3a. A summary of similarities of the risks identified by the five banks in implementing a credit scoring system follows:

- Credit scoring limits interaction with customer;
- Machine cannot reason more than man;
- Over dependence on credit score for decision making, leads to complacency in overall loan adjudication;
- Ignorance of non-quantifiable factors not modeled;
- Imperfect correlations between empirical modeling data and actual lending practice and regions;
- Credit scoring does not fully take into consideration human behaviour;
- Scoring card may not be relevant to market due to lack of data;
- Not flexible to changing environment;
- Inadequate data base used to create scoring card;
- With commercial/corporate entities there are too many variables;
- Over a period of time the end result can be manipulated;

- Lack of understanding of individual circumstances (i.e. credit scoring works on the basis of one size fits all);
- Limited in its ability to identify "non standard", cash flows and assets;

b) Additional facts and motivations

- Open to manipulation as the scoring system depends on input from a human and if wrong information is fed into the computer which is in favour of an applicant the result may be the approval of an application where if the correct information was fed into the system it may have been declined by the system.

c) Analysis and interpretation of results

Restrictions. Judging from the summary of risks identified, there seems to be a degree of skepticism from the banks not currently using credit scoring towards implementing a credit scoring system. The restrictions of a credit scoring system are highlighting such a scoring system's inability to interact with customers and its inability to adapt to a changing environment and unique circumstances.

Unfair. There tends to be an indication that credit scoring may not be entirely fair and without bias as the scorecard may not have been formulated on a broad enough representative sample data base.

Inflexible. From the summary of results it can be interpreted that a scorecard used for credit scoring cannot accommodate "non standard" transactions which may be unique for more complex entities such as commercial and corporate organizations.

Traditional lending is better. There seems to be preference for traditional lending where humans make the lending decisions. Some of the reasons in favour of traditional lending are that humans can interact with the customer; identify any unique situations; and use initiative to make a lending decision.

Scoring systems can be manipulated. Credit scoring systems can be manipulated because the result depends on the input of the operator.

Question 3B & 3C

Sample population: This question is only applicable to the seven of the thirteen 'other' banks who do not make use of credit scoring.

a) Question and answer results

		Yes	No
3b	Are you aware of the advantages in implementing credit scoring to assist in decision-making? If yes, list in point form the advantages involved.	N/A	N/A
		71	29
3c	Are you aware of the disadvantages in implementing credit scoring to assist in decision-making? If yes, list in point form the disadvantages involved.	N/A	N/A
		71	29

Two of the seven banks that do not use credit scoring are not aware of either the advantages or disadvantages in implementing credit scoring to assist in decision-making. The remaining five of the seven banks not currently using credit scoring, gave their opinion on the advantages and disadvantages of implementing a credit scoring system to assist in decision-making. The similarities in responses are summarized below:

Advantages	**Disadvantages**
• Quick turnaround times • Facilitates consistency of decisions • Subjectivity removed in credit assessment • If scorecard is efficient, loss could be minimized	• Relationship issues are ignored • No one case is identical to another • Human error can be blamed on the scoring system

b) Additional facts and motivations

Advantages	Disadvantages
• Easy access to machine (availability of computers) • Based on proven trends, it is a valuable tool, usually in consumer markets	• Generic risks are modeled. Loan structure and mitigation techniques may alter the outcome of an adverse score • Tendency may be to provide information specific to the question asked resulting in vital information being overlooked • De-motivating for staff (no intellectual required for job)

c) Analysis and interpretation of results

Although certain advantages to implementing a credit scoring system are prominent such as convenience, quick turnaround times, consistency and objectivity in decision making, credit scoring is not without shortcomings.

There seems to be a general feeling among the participants that the human interaction with a customer is important for reasons such as the building of customer relationships, for the staff members to feel valued and to ensure that all vital information not covered by the scorecard requirement is obtained for the customer to ensure that the right decision whether to accept or reject (decline) the application has been made.

It is also stressed that a scorecard must be designed correctly in order to be effective and reduce losses. A credit scoring system, however, relies on the input from an operator, which leaves room for manipulation of results.

QUESTION 4

Sample population: This question is only applicable to the seven of the thirteen 'other' banks who do not make use of credit scoring.

a) Question and answer results

		Yes	No
4	Is your institution not using credit scoring due to a conscious decision in this regard? If yes, state why.	N/A	N/A
		71	29

Five out of the seven "other" banks not using credit scoring answered yes to not using credit scoring due to a conscious decision in this regard. Their motivation is as follows:

- There are too many variables;
- Authenticity of information is not always verified;
- The nature of the client base is entirely individualistic;
- The client base is relatively small therefore statistically small anomalies skew the data dramatically;
- Skilled credit officers;
- Cost benefit trade-off;
- Credit scoring concentrates on stereotype situations, therefore reasoning behind decisions can be doubted.

b) Additional facts and motivations

- Client base is of a professional nature, specialize only in a niche market and due to changes in niche market, a credit scoring system would not be suitable;
- Insufficient data exists in our target market (emergent market);
- Cost of developing and implementing a scoring system cannot be justified for the size of the bank.

c) Analysis and interpretation of results

The cost of implementing a credit scoring system in relation to the benefits it can provide is in doubt. For smaller banks not dealing in large volumes, it may not be cost effective to implement a credit scoring system.
There are niche banks focusing on specific target markets such as the emerging market or the professional market where it may be more difficult to obtain sample data to build a scorecard due to insufficient data available in that specific market or maybe due to the more sophisticated lifestyle of a niche market it could, for example, be difficult to stereotype this market due to its complexity and rapid changes in this market.

Of the banks would rather rely on the skill of their credit managers for credit granting. Concerns raised in using a credit scoring system include; the non verification of authenticity of information and the fact that samples may not be taken from a broad enough representation of customers for decision making by the scoring system to be considered as fair and reliable.

It was determined in Question 2 that of the seven banks not using credit scoring, three banks are considering its implementation in the near future. In Question 4, it was determined that five out of the seven banks not using credit scoring are not using it due to a conscious decision in this regard. It seems then that there are banks that are considering the implementation of credit scoring in the near future despite the disadvantages to using a credit scoring system listed in the answer results to Question 4. The reason that these banks that are aware that credit scoring does have disadvantages may still be considering its implementation in the near future could be that these banks are still seeking additional information regarding the benefits, which a credit scoring system can provide.

These benefits can then be weighed up against the disadvantages and from there a final decision will be made as to whether a credit scoring system will be implemented. Some banks may realize for example, that although they have skilled credit officers, the more "straight-forward" applications can be handled by a credit scoring system, allowing credit managers to deal with the more complex credit applications.

The result could be reduced turnaround time for applications as a sales consultant can give a reply to a customer during the initial consultation with the customer as the consultant simply keys in the application data in the presence of the customer. The scoring system in many cases will then make a definite decision whether to grant or not to grant. Only the marginal cases will be referred to a credit lender for approval. In addition, there could be a cost saving for the bank due to possible reduction in credit staff, as the system would be making the more simple lending decisions.

QUESTION 5 & 6

Change of sample population: The questions from Question 5 onwards apply only to Absa and the six "other" banks, which are currently making use of a credit scoring system.

a) Question and answer results

		dd/mm/yyyy	
5	When was credit scoring implemented at your institution?	Various (refer results)	
6	For which products is credit scoring applied? (Tick all applicable blocks)	Mortgage Loans	
	Various (refer results analysis)	Personal Loans	
		Cheque Accounts	
		Overdrafts	
		Credit Cards	
		Vehicle Finance	

Absa implemented credit scoring for the commercial bank in 1998 and is currently applied to the following products; mortgage loans, personal loans, cheque accounts, overdrafts, credit cards and vehicle finance.
Of the other thirteen banks that participated in the survey, six banks use credit scoring in their credit decision process and seven of them not.

The implementation dates for the banks using credit scoring range from as far back as1980 to as recent as 1 March 2000. Only one of these banks applies credit scoring to all of the products listed on the questionnaire, i.e. mortgage loans, personal loans, cheque accounts, overdrafts, credit cards and vehicle finance. The remaining five banks use it for a total of five products, three products, and the remaining three banks apply credit scoring for one product only.

b) Additional facts and motivations

None

c) Analysis and interpretation of results

Credit scoring is not new to South African banks. Information gathered form the survey shows that from the participating sample the first bank to implement credit scoring was in 1980. Credit scoring is applied to various products such as mortgage loans, personal loans, cheque accounts, overdrafts, credit cards and vehicle finance.

Credit scoring is, however, not as popular amongst the South African banks as one would expect as only 50% of the banks who participated in the survey use credit scoring, i.e. of the total of the fourteen banks who participated, only seven use credit scoring be it only for one product such as for the granting of credit cards, or a variety of products.

Only three of the seven banks not currently making use of credit scoring are considering implementing credit scoring in the near future.

SECTION B – PROS AND CONS OF CREDIT SCORING

QUESTIONS 7 – 15

Sample population: Questions 7 to 15 includes purely the responses of the seven banks currently making use of a credit scoring system.

a) & b) Question and answer results & Additional facts and motivations

Evaluate the following statements on a scale of 1 to 5: 1 being "fully agree", 2 being "agree", 3 being "uncertain", 4 being "disagree", and 5 being "fully disagree".

		1	2	3	4	5
7	Credit scoring is an effective tool to separate risk class.	24	53	17	6	0
		83	17	0	0	0
8	Credit scoring speeds up the decision process on good loans.	51	38	7	4	0
		83	17	0	0	0
9	Credit scores are accurate determinants of credit risk.	4	34	41	15	6
		67	33	0	0	0
10	Credit scores are unbiased determinants of credit risk.	15	30	36	17	2
		50	33	17	0	0
11	Credit scoring contributes towards reducing bad debts.	19	45	28	6	2
		33	67	0	0	0
12	Credit scoring reduces operational costs.	17	53	15	13	2
		67	33	0	0	0
13	Credit scoring can result in potential good clients being turned away.	28	38	11	21	2
		33	50	0	17	0
14	Credit scoring is an expensive process to implement and maintain	9	17	53	19	2
		17	49	0	17	17
15	Credit scoring results in the deterioration of the institutions credit managers' intuitive capabilities.	15	25	17	32	11
		32	17	17	17	17
Motivate in point form what effect credit scoring has on credit managers at your institution.						

The final question in Section B, question 15, asks whether credit scoring results in the deterioration of the institutions credit managers' intuitive capabilities and asks for a motivation in point form on the effect credit scoring has on credit managers. The summary of similarities in motivations by participants is listed below.

15.1 Agree - Absa: 40% agreed that credit scoring results in the deterioration of the institutions credit managers' intuitive capabilities, with the following similarities in motivations in summarized, point form: • Credit scoring is a direct threat to the jobs of credit managers; • Takes away the responsibilities and assessment capabilities of good credit skills. Also the personal "gut feeling"; 15.1.2 Additional facts and motivations – Absa: • Although there are positives such as cost, speed, neatness, permanent record and greater volumes, within Absa there are credit managers with somewhat 30 years of experience. Of these experienced credit managers are based in a central office doing credit vetting for small consumer and retail facilities eight hours a day, which is absolutely soul destroying as they are not putting their years of advanced experience to use;	15.1 Agree - "Other banks": 49% agreed that credit scoring results in the deterioration of the institutions credit managers' intuitive capabilities, with the following similarities in motivations in summarized, point form: • Credit managers feel that their jobs are threatened as a computer can now make the decisions. 15.1.2 Additional comments and motivation – "Other banks" • The personal development of staff is lost as the system does the thinking for the credit managers.

15.2 Uncertain - Absa: 17% of the respondents were uncertain as to whether credit-scoring results in the deterioration of the institutions credit managers' intuitive capabilities with the following similarities in motivations in summarized, point form: • Credit managers still deal with the applications, which fall outside the credit scoring limits. 15.2.1 Additional comments and motivation – Absa • It depends on the specific credit manager whether he has a positive approach to credit scoring or whether he is negative towards its implementation. This will determine whether the credit manager will accept it as a tool to assist him in decision-making or alternatively to feel threatened by it and thus see it as a threat to his position.	15.2 Uncertain - "Other banks" 17% of the respondents were uncertain as to whether credit-scoring results in the deterioration of the institutions credit managers' intuitive capabilities with the following similarities in motivations in summarized, point form: • Credit scoring cannot operate entirely on its own for decision making, credit managers are still required for the more complex applications. 15.2.1 Additional comments and motivation – "Other banks" • None

15.3 Disagreed - Absa:	15.3 Disagreed – "Other Banks"
43% of the Absa respondents disagreed that credit-scoring results in the deterioration of the institutions credit managers' intuitive capabilities with the following motivations in summarized format: • Credit scoring has the effect that the boring, routine work has been taken away from credit managers. • Credit scoring enhances the experience of credit managers;	34% of the "other" bank participants disagreed that credit-scoring results in the deterioration of the institutions credit managers' intuitive capabilities with the following motivations in summarized format: • Credit managers can focus on non-scored lending; • More time can be spent on marginal cases; • Credit managers can assist branch personnel with complex decisions; • Gives credit managers more confidence; • Assists in consistent decision making;
15.3.1 Additional comments and motivation - Absa • Credit scoring simply identifies exceptions; this is providing assistance by giving guidelines. Normal credit principles are still applied in the granting of facilities. The result is that there is more time for management, monitor and control. • Credit scoring has no effect on the credit managers at the end of the day. Only credit mangers have the final say and make the final decision.	15.3.1 Additional comments and motivation – "Other banks" • Credit scoring serves as an effective filtering tool by automatically declining any applicants listed on the credit bureau etc, thereby allowing credit grantors time to concentrate on the 'good applications' • Credit scoring serves as a tool to assist inexperienced lenders in that it identifies 'exceptions' which assist credit managers. An example of a typical exception would be "Age of applicant – guardians consent required". This would mean that the applicant is a minor and cannot apply for a credit card for example, without the assistance of the guardian.

c) Analysis and interpretation of results

From the results above it is clear that the majority both at Absa and the "other" banks agree that:

- Credit scoring speeds up the decision process on good loans.
- Credit scoring contributes towards reducing bad debts.
- Credit scoring reduces operational costs.

Although majority agreed that credit scoring is an effective tool to separate risk class, majority also agreed that credit scoring could result in potential good clients being turned away. This is a contrary statement if interpreted that on the one hand it is an effective tool to separate risk class but on the other hand it results in potential clients being turned away. Surely it cannot be entirely effective to separate risk class if "good" clients applications are being turned away i.e. declined.

The "other" banks are comfortable that credit scores are both accurate and unbiased determinants of credit risk whilst majority of Absa participants are uncertain whether credit scores are accurate determinants of credit risk. There also seems to be some skepticism with the Absa participants as to whether credit scores are unbiased determinants of credit risk, as only 45% of Absa participants agree that credit scores are unbiased determinants of credit risk, 36% of Absa participants are uncertain and 19% disagree to the statement.
Majority of participants from the "other" banks agree that credit scoring is an expensive process to implement and maintain, whilst the majority of Absa participants are uncertain as to whether credit scoring is an expensive process to implement and maintain.

The Absa staff (40%) was less inclined to feel that credit-scoring results in the deterioration of the institutions credit manager's intuitive capabilities than the staff from the "other" banks (49%).

The more prominent feelings stemming from all participating banks were that credit managers have over the years gained vast experience and skill in credit lending which seems to be wasted as a scoring system is now making the decisions for them.

17% of both Absa and "other" bank participants were uncertain as to whether credit scoring results in the deterioration of the credit managers' intuitive capabilities. The main motivating factor being that credit managers still deal with applications, which fall outside the parameters of credit scoring limits.

43% of Absa and 34% of "other" banks disagreed that credit-scoring results in the deterioration of the institutions credit managers' intuitive capabilities. The main reasoning was that decision-making on the more complex applications is still made by credit managers. Credit scoring simply assists in the more 'straight forward' applications and provides guidelines for the exceptions which assist mangers in decision-making. This allows credit managers more time to spend on the more complex applications and responsibilities of a credit manager such as the collection of arrear accounts.

SECTION C – GENERAL (Questions 16 – 24)

QUESTION 16

a) Question and answer results

		Yes	No	Maybe
16	Does your institution make use of behavioural scoring for existing cheque accounts?	100	0	0
		17	83	0

Absa makes use of Behavioural Scoring for existing cheque accounts.
One of the six "other" banks making using of credit scoring, use behavioural scoring for existing cheque accounts.

b) Additional facts and motivations

None

c) Analysis and interpretation of results

It is surprising to see that only one of the six "other" banks making use of credit scoring are using behavioural scoring as one would think that behavioural scoring and credit scoring would go hand in hand. Credit scoring would be used for the initial application and behavioural scoring after the initial assessment has been done as it is based on historical account information.

Whilst credit scoring can be applied for various products such as credit cards, cheque accounts, installment sales, to mention but a few, behavioural scoring can only be used for the granting of overdraft facilities and to monitor the conduct and behaviour of existing cheque accounts.

The reason only one of the six "other' banks using credit scoring are currently also making use of behavioural scoring may be that the other five banks do not all offer cheque accounts and overdrafts, or there may not be sufficient data on which to develop a behavioural scoring scorecard.

QUESTION 17

a) & b) Question and answer results & and additional facts and motivations

		Yes	No	Maybe
17a	Is historical account information available within your institution?	100	0	0
		100	0	0
		Yes	No	Maybe
17b	If yes, is the historical data of value to your institution? Motivate in point form.	96	2	2
		100	0	0

Motivations given by the respondents for Question 17b are given below:

17.1 Similarities in motivations given by those that replied "yes" to Question 17b – Absa:	17.1 Similarities in motivations given by those that replied "yes" to Question 17b –"other banks":
• Provides detail of total Absa credit exposure; • Provides for credit bureau information which is based on historical information which is valuable for credit decision making; • Provides information of historical card notes, where any past comments and correspondence regarding client's affairs are noted;	• Historical account information, assists in establishing trends in the risk/credit sector.
17.1.1 Additional facts and motivations – Absa:	17.1.1 Additional facts and motivations – "other banks":
• Provides information on past conduct of existing accounts across all divisions of the Absa group. This information would include any history of dishonored cheques, turnover, overdraft limits, highest and lowest balances reflected on accounts, record of salary credits, dormancy etc; • Assists management in determining how the client has operated his accounts in the past. The statistics are used to group clients in various categories (behaviour scoring). This information is then used to make decisions on future funding;	• Historical account information will assist in determining whether any further credit should be extended to a customer based on previous conduct of existing accounts, i.e. past credit records.

17.2 Similarities of motivations given by those that replied "no" to Question 17b - Absa: No motivation given. 17.2.1 Additional facts and motivations – Absa None	17.2 Similarities of motivations given by those that replied "no" to Question 17b –"Other banks": N/a – 100% of the "other bank" participants agreed that historical data is of value to their applicable organizations. 17.2.1 Additional facts and motivations – "Other banks": N\A
17.3 Similarities of motivations given by those that replied "maybe" to Question 17b –"Absa": • Clients financial position can deteriorate or improve thus historical account information may not always be relevant. 17.3.1 Additional facts or motivations – Absa None	17.3 Similarities of motivations given by those that replied "maybe" to Question 17b –"Other banks": N/a – 100% of the "other bank" participants agreed that historical data is of value to their applicable organizations. 17.3.1 Additional facts or motivations – "Other banks" N\A

c) Analysis and interpretation of results

100% of Absa's respondents and "other" bank respondents agreed that historical account information is available within their institutions. 100% of the "other" bank respondents and 96% of Absa bank respondents agreed that the historical data is of value to the bank. 2% of Absa bank respondents said that historical data is not of value to the bank, and the remaining 2% of Absa bank respondents said maybe.

The 2% of Absa respondents who felt that historical data is not of value to the bank did not provide a motivation for their reasoning. A reason why the historical account information would not be of value to the bank in the author's opinion could be due to the changes in economic conditions. For example a rapid rise in interest rates could change the risk for a client completely. Based on historical account information, the clients credit record could show as satisfactory but the rise in interest rates may result in the client no longer being able to service his\her debts due to the increased repayment amounts. Another reason could be the rise in retrenchments in the workplace currently in South Africa where past historical information on the client would not be relevant as the client would no longer be able to afford repayments on loans due to loss of fixed income.

The remainder 2% of Absa's respondents whose response was 'maybe' when asked if historical data is of value to their institution gave the motivation that a clients financial position can deteriorate or improve and thus the historical data will not always be relevant.

It is the author's opinion that credit bureau information, which is based on historical information, is of the most important historical information necessary for decision-making. It has been the authors experience during the years of lending that if the client has defaulted in the past, the chances are higher that this person will default again than a person who showed a clear credit bureau record.

Following credit bureau enquiries in importance is the conduct of clients existing accounts if any, and total exposure with the banks, and number of times that the client has asked for increased facilities. Requests for increased facilities can be seen as a 'creeping facility' (where a client asks for his overdraft to be increased on a regular basis). A creeping facility may result in a position where the client has over-committed himself and may no longer be in a position to service the interest on the overdraft and repay the capital.
The author, as a credit grantor, would be far more comfortable approving a credit card for example to a person who has operated a well conducted cheque account with the bank for example for the past 5 years than to a person that walks into the bank requesting a credit card that has no previous accounts with a bank. (For example, where the client has a well-conducted cheque account that has been in the banks books for at least a few years with good turnover, no excesses or dishonors on record).

This historical information based on the conduct of the cheque account provides the credit grantor with some background information on the client. An assumption can be made that the client provides for drawings, as there is no record of excesses on his account, which shows that he seems responsible, and would not easily over-commit himself. It is also a requirement by banks that a client's salary be credited to the clients individual cheque account. This provides a means for the credit grantor to verify the pay slip provided by the applicant where he applies for example for a credit card. The most recent pay slip will be requested from the applicant and the net salary amount reflected on the pay slip can be compared to the amount credited to the cheque account for that month. This assists to avoid fraud as these days there is a growing amount of fraudulent pay slips produced to banks for the opening of bank accounts.

QUESTION 18,19 & 20

Questions 18,19 & 20 have been grouped together for discussion due to the connection value of Questions 18 and 20. Decision-making can either be fully automated or otherwise reactive and driven by mandates.

a) & b) Question and answer results & Additional facts and motivations

		Yes	No	Maybe
18	Is decision-making within your institution fully automated?	15	74	11
		67	33	0
19	Credit scoring ensures consistency within the credit decision process.	68	13	19
		100	0	0
20	Is decision-making within your institution reactive and driven by mandates? Motivate in point form.	75	19	6
		67	33	0

Motivations by participants on whether decision-making within their institutions is reactive and driven by mandates follow:

20.1 Similarities in motivations by Absa staff who answered "yes" to Question 20:	20.1 Similarities in motivations by "other banks" staff who answered "yes" to Question 20:
• Although the scoring system does recommend limits, this is largely on a reactive basis; • All approvals are done within mandate limits. Mandates are granted to individuals according to experience and qualifications and limited to job grades. • Branches using the credit scoring system may only approve up to a certain limit at branch level, i.e. within a functional mandate not exceeding total client group exposure of R50 000. A human mandated official signs all approvals by the scoring system before the outcome is given to the applicant. • All applications exceeding the branch functional mandate of R50 000 are to be referred to a credit center for approval together with manual and declined decisions with exceptions identified by the scoring system. These manual and declined decisions are dependant on the expertise, experience and insight of the mandate holders at the credit centers to override any negative decisions by the system where there is justification for a override.	• Mandates are always in use, even for system decisions;
20.1.1 Additional facts and motivations: None	20.1.1 Additional facts and motivations: • Decisions in the card division is driven by the scorecard, the rest of the bank is driven by mandates;

20.2 Similarities in motivations by Absa staff who answered "no" to Question 20: • Certain declines by the scoring system such as a policy decline where a client is for example listed recently on the credit bureau for a large amount owing is a final decision and does not allow for a credit manager to override the system decision.	20.2 Similarities in motivations by "other bank" staff who answered "no" to Question 20: • Some scoring decisions are final and may not be overridden by a credit official.
20.2.1 Additional facts and motivation: None	20.2.1 Additional facts and motivation: None
20.3 Similarities in motivations by Absa staff who answered "maybe" to Question 20: • The scoring system is designed to allow the sales consultant the authority to give a customer an immediate reply. The scoring system makes a decision. Sales consultants do not have mandates	20.3 Similarities in motivations by "other bank' staff who answered "maybe" to Question 20: N/a – none of the "other bank" participants replied "maybe" to Question 20.
20.3.1 Additional facts and motivations: None	20.3.1 Additional facts and motivations: N/a

c) Analysis and interpretation of results

100% of the "other" bank respondents agreed that credit scoring ensures consistency within the credit decision process, the majority also agreed that although decision-making is fully automated, it is still reactive and driven by mandates.

Whilst the majority of Absa respondents agreed that credit scoring ensures consistency within the credit decision process, the majority did not agree that decision-making within Absa is fully automated and agreed that decision-making in Absa is reactive and driven by mandates.

The motivation of the respondents who felt that decision making within Absa was not reactive and driven by mandates was that certain declines by the scoring system were taken as final and no manual override of the decision was allowed.

Credit scoring can, according to the author, be used as a marketing tool where decision-making can be proactive and not reactive, based on historical data. Credit scoring can be used proactively to identify potential high volume customers where pre-approved financing such as vehicle financing or a personal loan can be granted to these identified customers and a letter sent out inviting them to take up the financing and in this way bring in new business for the bank. The existing overdraft facilities of these identified 'low risk' customers can also be increased and a letter sent out notifying them that as valued Bank customers their respective overdraft facilities have been increased.

QUESTION 21

a) & b) Question and answer results & Additional facts and motivations

		Yes	No	Maybe
21	Is the criteria used for credit scoring all risk related? Motivate in point form.	64	23	13
		66	17	17

21.1 Absa participants who answered "yes" to Question 21 gave the following similar motivations in summarized format: • Credit bureau enquiries are drawn. Absa exposure and outside exposure is taken into consideration to determine total lending and affordability; • Behaviour of existing accounts is taken into consideration.	21.1 "Other bank" participants who answered "yes" to Question 21 gave the following similar motivations in summarized format: • All the characteristics and weights that are used in the credit score relate to a level of credit risk; • Based on ability to repay, affordability.
21.1.1 Additional facts and motivations: • Presumably no "connection value" or "out and out security based" lending considerations is taken into account.	21.1.1 Additional facts and motivations: • The characteristics and weights are determined from the demographic information provided and level of past performance related to that element.
21.2 Absa participants who answered "no" to Question 21 gave the following similar motivations in summarized format: • It is not only risk related but also behavioural related.	21.2 Other bank" participants who answered "no" to Question 21 gave the following similar motivations in summarized format: No motivation given.
21.2.1 Additional facts and motivations: • Credit scoring works according to affordability of a client and does not take into consideration the personal net worth position of a client. (Assets - liabilities = net worth).	21.2.1 Additional facts and motivations: No motivation given.

21.3 Absa participants who answered "maybe" to Question 21 gave the following similar motivations in summarized format:	21.3 "Other bank" participants who answered "maybe" to Question 21 gave the following similar motivations in summarized format:
None	None
21.3.1 Additional facts and motivations: • Part of the information taken into consideration includes personal detail of the client such as address and telephone number of client.	21.3.1 Additional facts and motivations: • Fraud occurs in all sorts and types. One cannot truly eliminate every aspect of fraud no matter how careful one is.

c) Analysis and interpretation of results

Majority of the Absa (64%) and "other bank" participants (66%) agree that the criteria used for credit scoring are all risk related. The main reasoning by the participants that agree to Question 21 seems to be that scorecards determine affordability, ability to repay and credit bureau results of the customer. Total exposure to determine affordability and to ensure that the client does not over-commit himself by taking out a new loan, together with the conduct of existing accounts, is also taken into consideration. These identified factors used by the scorecard to make decisions are considered by the participants to be risk related.

23% of Absa and 17% of "other bank" participants disagreed that the criteria used for credit scoring is all risk related. Although the "other banks" as to why they answered 'no' to Question 21 gave no motivation, not all the Absa bank participants agreed that the past behaviour of a client is risk related. Some Absa participants disagree with their colleagues who in contrast, consider past behaviour to be risk related (Refer 21.1 and 21.2). It is the authors opinion that past behaviour is a 'nice to have' when making lending decisions but cannot be considered directly as risk related. Past behaviour will include information such as how the client has met commitments in the past, and for example how he has conducted cheque accounts etc. It has been the author's experience where clients have in the past met commitments, and conducted satisfactory cheque accounts for quite some time with the aim to gain the trust of the bank official. The client then one day asks for a larger advance than usual and the bank official trusting that the client would repay as he has so diligently in the past, grants him the amount requested, instead has taken this large advance with no trace of him resulting in the bank taking a loss for the latter large amount advanced to the client. This example can, however, be considered to happen in minority of cases as it would be the clients intention to defraud the bank and thus first gains the trust of the bank official. It is for this reason that the author does not agree that past behaviour of the customer can be considered directly as risk related.

13% of Absa and 17% of "other bank" participants who answered 'maybe' to question 21 did not provide any similarities in motivation. Isolated opinions such as personal information which includes the address and telephone number of the client is included in the scorecard which cannot be considered as risk related information. Another participant felt that the scorecard information requested, irrespective of the content, would not be able to eliminate fraud.

QUESTION 22

a) & b) Question and answer results & Additional facts and motivations

		Yes	No	Maybe
22	In your opinion, does credit scoring assist in making good decisions?	60	4	36
	Motivate in point form.	83	0	17

22.1 Absa participants who answered "yes" to Question 21 gave the following similar motivations in summarized format:	22.1 "Other bank" participants who answered "yes" to Question 21 gave the following similar motivations in summarized format:
• Removes subjectivity. Grants what an official may not based on 'gut feeling' and declines where an official may, based on subjectivity. The quality of information captured, however, is of critical importance; • All critical points to make a sound decision are included. Credit policy and laid down procedures are applied consistently; • Allows for fairness.	• Decisions are not subjective; • Decisions are consistent; • The approval process is quick and cost effective; • Tracks future probability of loss; • Based on correlation between risk and opportunity; • It is a measurable tool to measure risk performance.

22.1.1 Additional facts and motivations: • It cuts right through a certain bulk of statistical information and highlights exceptions to the rule, giving the mandate holder more time to concentrate on other factors of the application. Scoring also serves as a backup by providing guidelines, as due to volumes of work or straightforward human error, critical points may be overlooked during the granting process.	22.1.1 Additional facts and motivations: • Because the outcome is a score, you can track that score to performance and measure that decision over time; • Credit scoring uses information and data not previously available to traditional lenders;
22.2 Absa participants who answered "no" to Question 22 gave the following similar motivations in summarized format: • It is not to say that the "gut feeling" must be ignored. Many honest, hardworking applicants do not qualify according to the set criteria on the scorecards.	22.2 "Other bank" participants who answered "no" to Question 22 gave the following similar motivations in summarized format: N/a. None of the "other bank" participants replied "no" to question 22.
22.2.1 Additional facts and motivations: None	22.2.1 Additional facts and motivations: N/a

22.3 Absa participants who answered "maybe" to Question 22 gave the following similar motivations in summarized format:	22.3 "Other bank" participants who answered "maybe" to Question 22 gave the following similar motivations in summarized format:
• The credit scoring system can be manipulated if incorrect information is fed into the system; • Credit scoring does not always assist in making good decisions, as there are clients, which conduct good accounts with Absa where increased facilities applied for are declined. For example, it is not to say that if you do not own fixed property that you are not capable of repaying a loan; • Reasons for system decisions are not always clear. In practice, there have been cases where according to human judgment, "good applications are declined and those considered fairly risky, according to human judgment, are surprisingly accepted".	None
22.3.1 Additional facts and motivations: None	22.3.1 Additional facts and motivations: • Newly installed credit scoring system requires investigation.

c) Analysis and interpretation of results

Majority of both the Absa participants (60%) and "other" bank participants (83%) agree that credit scoring assists in making good decisions. This is again contrary to majority of both Absa (66%) and "other bank" participants (83%) who agreed that credit scoring can result in potential 'good' clients being turned away (Refer to Question 13). It is interesting to note that exactly 83% of "other bank" participants agreed that credit scoring assists in making good decisions and in contrast exactly 83% agreed that credit scoring could result in potential 'good' clients being turned away. A similar contrary position is reflected in the results of the Absa participants when comparing the results of those that agreed to Question 13 and Question 22.

If we consider the main reasons why the Absa and "other bank" participants agree to Question 22, the prominent factors are that credit scoring removes subjectivity in lending; is consistent and unbiased; speeds up decision making; is risk related; cost effective and ensures the application of credit policy. Considering all these positive qualities of a scoring system, how then can it result in potential good clients being turned away?

It is the authors opinion that the underlying reasoning for this contradiction is that although participants do feel that credit scoring is an effective tool to separate risk class and thus assists in making good decisions, the human touch is still required in certain cases where an application is not entirely a 'clear cut' case and a human interaction in these specific borderline cases would be required to obtain a clearer picture of the situation by allowing, for example, for an explanation by the client of a past bad credit experience where there may be an acceptable explanation. The credit scoring system does not always allow for this interaction with the client, as in certain instances it decides on an outright decline, which then will not allow for a referral to a credit official for further investigation.

This "human touch"' is once again apparent in the motivation given by the Absa participants (4%) who disagreed that credit scoring assists in making good decisions. None of the "other bank" participants answered 'no' to Question 22. What comes out clearly from the motivations given by the Absa respondents who do not agree that credit-scoring assists in making good decisions is that they strongly believe in the personal "gut feeling" of credit managers which is obviously ignored by the credit scoring system.

The Absa participants (36%) who replied 'maybe' to Question 22 had certain concerns such as the fact that a human operator can manipulate a credit scoring system decision. Other reasons which seemed to concern these participants were the fact that so many times they have experienced incidents where as experienced credit managers, they did not agree with a system decision made, and therefore there seems to be some doubt in the credibility of the information used by the scorecards to make decisions. Although 17% of the "other bank" participants replied 'maybe' to question 22, no similarities in motivations were given except an isolated comment given by a participant explaining that a newly installed system requires investigation.

QUESTION 23

a) & b) Question and answer results & Additional facts and motivations

		Yes	No	Maybe
23	Does your institution apply credit scoring for small/medium business lending? Motivate in point form what is/would be the effect of credit scoring on a small/medium business' need for financial support.	0	100	0
		0	100	0

The opinion of the Absa participants on the effect of credit scoring on a small/medium business' need for financial support is given below. No motivations by the "other bank" participants were provided for Question 23.

23.1 Motivations by Absa participants *in favour of* credit scoring for business lending. Similarities in a summarized format follow:	23.1 Motivations by Absa participants *against* credit scoring for business lending. Similarities in a summarized format follow:
• Credit scoring for businesses would assist in consistent, unbiased decision-making; • Credit scoring could assist in pointing out negative trends which may be overlooked with manual decision making; • Credit scoring could assist in the analysis and interpretation of financial ratios and providing guidelines on which to base a decision on.	• Credit groups are difficult to cater for; • It would be difficult to implement as it would be necessary to look at the total group facilities for the business, i.e. the business itself, members, shareholders etc; • Credit scoring decisions will be based on history only; • It would be to the disadvantage of the applicant, as known facts about the business would not be taken into consideration, the decision would only be based on statistical data; • Businesses do not always show the true financial position in the financial statements, this could result in the bank turning away valuable clients; • Cannot apply one set of criteria for all types of businesses;
23.1.1 Additional facts and motivations:	23.1.1 Additional facts and motivations:
• Credit scoring would serve as a good pointer of risk for business and also as a good filing system. Many times paper applications go missing without trace causing frustration and inconvenience;	• Uncertain, but the system is not popular amongst experienced credit personnel. Perhaps it has application for existing clients with say five years or more banking relationship;

c) Analysis and interpretation of results

The results show that none of the Registered banks in South Africa who participated in the study currently apply credit scoring for small/medium business lending. No opinion was expressed from the "other" bank participants on what the effect of credit scoring would be on a small/medium business' need for financial support.

Judging from the motivations provided from the Absa participants on their opinion on what the effect of credit scoring on a small businesses need for financial support would be, the feeling is that it would be nice, yes, but there seems to be concerns on the implementation of such a system due to the more technical nature of the need of a business in comparison to the more simple retail market. The 'nice to have' includes benefits such as assistance by the credit scoring system to analyze and interpret the financial statements of a business, which in any credit managers experience is quite involved, lengthy and somewhat technical. Other benefits identified include consistent, unbiased decision making, the identification of any negative trends, decline in financial position of the business judging from comparison analysis of the financial statements over a number of years, ideally a minimum of three years, and even the elimination of paperwork was raised as an added benefit.

Concerns raised to Question 23 by the Absa participants include issues such as the difficulty to determine the total group exposure; the true financial position of the business, and the industry norms and trends for different businesses. The complexity of a business is emphasized here and once again, as with the consumer lending the "human touch" element is apparent in the comments of the Absa participants. There seems to be emphasis on the need for experienced credit managers to assist in decision lending and to ensure that all the relevant information is obtained to ensure that the correct decision has been made as to whether to lend or not to lend. If we look at the typical lending environment a few years ago where a 'bank manager' would still have had the authority to make a lending decision within a certain mandate, the manager would more than likely have gone out to visit the owner/director, or member at the business premises to obtain background information, for example, on the management of the business, its operations etc.

Credit at Absa has now been centralized. The branch managers within the branches therefore now no longer make credit-lending decisions but instead the credit managers at centralized credit units now make the lending decisions. An advantage, which could be debated, is that the credit managers are making 'cold' lending decisions as the applicant is not known to the credit manager, which ensures that the applicant cannot influence the credit manager in any way.

The disadvantage is, however, that vital information could be lost which may influence the lending decision outcome, as the credit manager relies solely on the background information provided in the application by the branch official and obviously, the financial statements provided to make the lending decision.

QUESTION 24

a) & b) Question and answer results & Additional facts and motivations

		Yes	No	Maybe
24	Do you consider credit scoring to be effective as a risk management tool within your institution? Motivate in point form.	68	9	23
		83	0	17

24.1 Absa participants who answered "yes" to Question 24 gave the following similar motivations in summarized format:	24.1 Other bank" participants who answered "yes" to Question 24 gave the following similar motivations in summarized format:
• Provides uniformity in decision making; • Eliminates the personal/subjective decision-making; • Credit scoring is a tool which ensures unbiased decision making; • Speeds up credit decision process, which results in better client service; • Credit scoring is a good determinant of customer affordability; • Uses most recent information available; • Picks up negative trends faster than manual assessment would; • All factors according to credit policy that could influence credit negatively are considered during credit scoring. If the points were not acceptable, the system would rather decline than approve.	• Removes intuitive and judgmental decision-making; • Ensures uniformity in decision making; • Improves turnaround time of applications.
24.1.1 Additional facts and motivations: • The system identifies when a client is over-committed, and when security would be required; • Better guidelines provided by credit scoring; result in reduced bad credit decisions, and thus reduced bad debt;	24.1.1 Additional facts and motivations: • Credit processes centralized – cannot rely on branch credit skills (there is a lack of credit skills at branch level)

24.2 Absa participants who answered "no" to Question 24 gave the following similar motivations in summarized format: • Credit scoring system is dependent on individual input; • Decisions can be manipulated by incorrect information being fed into the system.	24.2 Other bank" participants who answered "no" to Question 24 gave the following similar motivations in summarized format: N/a None of the "other bank" participants answered 'no' to this question.
24.2.1 Additional facts and motivations: None	24.2.1 Additional facts and motivations: N/a
24.3 Absa participants who answered "maybe" to Question 24 gave the following similar motivations in summarized format: • Credit scoring prohibits any additional lending to certain risk ratings; • Forced reductions on existing exposure on certain risk ratings; • Credit scoring eliminates the human element; • Whether credit scoring is effective as a risk management tool depends on the accuracy of information that is fed into the system by the individual. This could have the effect that approval could be given on a bad application because the information is misleading; • System sometimes approves applications that on face value one would not think would be approved and vice versa.	24.3 Other bank" participants who answered "maybe" to Question 24 gave the following similar motivations in summarized format: • A scoring system outcome can be manipulated by incorrect information fed into the computer by the operator.

24.3.1 Additional facts and motivations: • As behaviour deteriorates, so the individuals risk grade changes when it is updated once a month. For example, problems on a credit card are not always obvious to the commercial bank but the risk grade will be affected and in this way alert an official, which is positive but there are also negatives;	24.3.1 Additional facts and motivations: • Newly installed credit scoring system still requires investigation

c) Analysis and interpretation of results

Majority of the Absa participants and "other" bank participants consider credit scoring to be effective as a risk management tool. Motivations include benefits such as a scoring systems ability to provide uniformity, eliminate subjectivity, and speed up the credit granting process.
Credit scoring also applies the banks credit policy criteria when making a lending decision.

Drawbacks of a credit scoring system were highlighted by the small percentage of participants who did not agree that credit scoring is effective as a risk management tool. The major disadvantage identified was that a credit scoring decision could be manipulated. A credit scoring decision can be manipulated by incorrect information being fed into a computer by the operator.

3.2.6.4 Conclusions drawn from questionnaires distributed amongst Absa employees and thirteen other registered banks of South Africa who participated in the survey.

a) Credit scoring is effective as a risk management tool

The results of the questionnaire show that credit scoring is effective as a risk management tool in that it is successful in separating risk class. This statement is also consistent with the majority who agreed that; the criteria used for credit scoring are risk related, credit scoring contributes towards reducing bad debt, and that credit scoring assists in making good decisions.
The only contrary opinion to the above consensus is that majority agreed that credit scoring results in good clients being turned away.

b) Credit scoring is not without drawbacks

The overall impression gathered by the motivation from the participants who agreed that credit-scoring results in good clients being turned away was that the 'human touch' was still necessary and could not entirely be replaced by a credit scoring system. The general feeling was that although the credit scoring system was 'respected' for its ability to make good decisions, it couldn't exclusively be successful without man. Credit managers are still required to overlook the 'marginal cases' as it is not always as clear as being 'black' or 'white'.

The feeling that a 'human touch' is still necessary for the decisions which are not, as mentioned earlier, either 'black' or 'white' is once again prominent amongst the Absa employees, as less than 50% of the Absa participants agreed that credit scores are unbiased determinants of credit risk and majority of Absa participants were also uncertain whether credit scores are accurate determinants of credit risk. What was apparent from the reasoning of the participants which once again proves that 'humans' are still required to overlook the applications which are not 'clear cut' are prominent in the motivations provided by the Absa employees where it was repeatedly mentioned that their were instances where the experienced credit lenders did not agree with the decision made by the credit scoring system.

c) Benefits of credit scoring

Distinct benefits that were identified from the results of the questionnaire include; the elimination of subjectivity in lending, speedier decisions on good loans and consistency with decision-making.

d) Credit scoring is costly to implement but this cost is made up from the long-term benefits provided by a scoring system

Although it was agreed that credit scoring reduces operational costs, majority of the Absa bank participants were uncertain and majority of 'other bank' participants agreed that credit scoring is an expensive process to implement and maintain.

An assumption can then be made that while credit scoring may be an expensive process to implement and maintain, its ability to make good decisions, which results in a reduction in bad debts, will in its own pay for the maintenance and original implementation costs. What this means is that the saving in bad debt far outweighs the original cost of implementation and subsequent maintenance of the system and therefore, an assumption can be made that the end result will be a reduction in operational costs. What must also be borne in mind is that the implementation cost of a credit scoring system is a 'once off' and thereafter the only cost is upgrading and maintenance costs.

CHAPTER 4

CONCLUSION AND RECOMMENDATIONS

Changing market conditions continually challenge lending institutions to adapt better technologies and strategies to improve customer service while minimizing overall risk. Credit scoring is a tool that can be used to set standard parameters in the granting process be it for the approval of a cheque account or for the extending of credit, approving applicants scoring over a certain level and declining applicants scoring below a certain level.

The main objective of the study was to try and prove that by using credit scoring as a risk management tool the decision as to whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and for management to have better control over the granting of credit. The effectiveness of a credit scoring system is becoming even more important as pressure mounts on lenders to take responsibility for ascertaining a client's credit-worthiness and ability to repay.

It was concluded that credit scoring is effective as a risk management tool but not without shortcomings. During the study certain advantages and also some spinners to using a credit scoring system came about. Disadvantages and shortcomings of a credit scoring system, however marginal, were also acknowledged.

4.1 SUMMARY OF FINDINGS

Improved management control. Credit scoring improves management control. Through credit scoring, the lending institution can control the risk/volume trade-off level of approvals precisely by adjusting the decision cut-off scores. Changes in credit policy can be implemented more rapidly and since the scoring system is programmed to reflect the lending institutions own credit risk policies and procedures, decisions are made consistently and reduces the possibility of analyst bias. This was proven in Chapter 3, Empirical Study and Results Evaluation, Section 1: 3.2.5 & Section 2: 3.2.6.

Improved decision-making. It was also proven that a credit decision made by a credit scoring system is better than a credit decision made by the manual system (the traditional method where a credit manager makes the credit decision). Refer Chapter 3, Empirical Study and Results Evaluation, Section 1: 3.2.3.
To support this statement, it was further proven that the strategies and procedures for granting credit using scoring are risk related. Refer Section 1:3.2.4 & Section 2: Question 21.

Additional support was provided by majority agreement by bankers throughout South Africa based on the results of a questionnaire that credit scoring is an effective tool to separate risk class (Section 2: Question 7) and that credit scoring contributes towards reducing bad debts (Section 2: Question 11).

Increases the efficiency of the review process. Behavioural scoring improves the monitoring and control of the quality of the existing assets on the book. Whilst credit scoring is used for new applications, behavioural scoring is used for the existing current accounts on the book and identifies a risk grading for each account varying from very low risk to high risk.

Behavioural scoring increases the efficiency of the review process and decreases the human effort as the system automatically clears up the integrity of information used for decision making. Mandatory fields ensure that the necessary information is obtained from the client. If the risk grading for a particular customer is identified as high risk, the account is flagged for a quarterly or semi-annual review. Refer Chapter 4, Empirical Study and Results Evaluation, Section 1:3.2.1 & Section 2:3.2.6.

Credit scoring is not without drawbacks. Despite the benefits provided by a credit scoring system, it cannot entirely be successful without man due to its inability to cope with complex problems with two or more possible outcomes. It is therefore not possible for a credit scoring system to provide complete automation of the decision making process. Credit managers are still required to overlook the 'marginal cases' as decisions are not always as clear as being 'black' or 'white'. Refer Chapter 4, Empirical Study and Results Evaluation, Section 2: Question 18.

4.1.1 Advantages of credit scoring

Reliable. Because credit scoring is based on real data and statistics, it usually is more reliable than subjective or judgmental methods. It also treats all applicants objectively. Judgmental methods typically rely on criteria that are not systematically tested and can vary when applied by different individuals.

Consistency. Looking at processes, credit scoring has been especially helpful in decentralized processes where credit has been moved out of the branches and placed in centralized units. There are therefore several people responsible for making credit decisions, credit scoring helps by assisting in setting consistent parameters. If there are several credit managers with different levels of experience looking at the same application, they may come up with different conclusions. Credit scoring helps to avoid this.

Centralization. Where there are various locations for the credit centers; credit scoring offers management a way to ensure some consistency within the credit decision process and assures the implementation of credit policies and procedures.

Cost saving. It is an ideal tool to quickly evaluate smaller consumer loan applications. It is often a less expensive alternative to a full report. Calling trade references can take a lot of time and these days' companies are very reluctant to provide information. Pulling a full report may not make sense from a cost standpoint. Credit scoring is a good alternative to save time and money.

Increased productivity. With credit scoring, not every application will have to be attended to by a credit manager, but only the exception, which will allow credit managers to apply their skill on other important tasks such as collections. The system can be designed so that marginal applicants whose scores are not high enough to pass easily or low enough to fail absolutely are referred to a credit manager who decides whether the lender will extend credit.

4.1.2 Spin offs of credit scoring

Management information. Credit scoring can be used as a marketing tool Information required for credit scoring can be entered into a management information system and can be used to monitor the scoring system, generating demographic profiles of credit customers, measuring the quality and profitability of the portfolio and forecasting losses.

4.1.3 Disadvantages of credit scoring

It makes lending rigid. A borrower may have had only one previous bad credit experience in the past, but credit scoring simply does not make any exceptions.

4.2 RECOMMENDATIONS

4.2.1 Consumer Lending

A scale of risk exists. It is important that organizations are aware of the limitations of traditional approaches if they are to survive in today's new global market. Credit scoring is not as clear-cut as an applicant being either a good or a bad risk. Just as between black and white lies an array of different shades of gray, a scale of risk exists

Credit scoring models are not perfect. Credit scoring is a tool and it must be acknowledged that scoring models do suffer from drawbacks. It is therefore up to the lending organization to apply it in the best way possible, taking into consideration profit margins and what the company can afford to put at risk and set the parameters in the scorecard accordingly.

4.2.2 Small Business Lending

Credit scoring of consumer loans has been part of banking for many years. Scoring for the small business applicant, however, is relatively new. Although credit scoring is used to a smaller degree for commercial lending abroad than what it is used for consumer lending, it seems that banks in South Africa for commercial lending, do not currently use credit scoring. The small business applicant is often faced with the need to access funds quickly and in most situations does not have the time to wait out a traditional loan process.
Further research needs to be undertaken to address how credit scoring will accommodate certain traditional commercial lending practices as credit risk models have not advanced to a stage where risk at the micro-level of an organization or individual has been connected to factors at the macro-level of the economy. Most models are built using historical information and therefore these models cannot take into consideration macro-economic factors such as inflation, unemployment etc.

Questions have been designed covering the areas of concern where it would seem a very difficult task to replace the traditional lending system with credit scoring:

Financial statements. How will credit scoring accommodate the spread of financial statements for companies?

Groups. Businesses are normally far more complex and normally involve more than one party, how will credit scoring cope with the grouping of facilities in order to ascertain the full credit exposure of the group?

Industry norms. How could industry norms and trends be taken into consideration?

Economic circumstances. What effect would credit scoring have during a period of recession, when the economy makes a turn for the worst?

Net worth. How would the personal financial position of the owners, partners, members or directors of the undertaking be taken into consideration in the decision-making process?

Background information. Other subjective factors normally taken into consideration during traditional lending are the reputation of owners, management experience and qualifications, to name but a few. How would these factors be integrated in the decision-making process using scorecards?

One fits all. Can it be possible to have one profile for all types of businesses?

4.3 MEASUREMENT OF OBJECTIVES MET

It can be accepted that by managing credit risk effectively there can be a substantial impact on the bottom-line performance of any organization. Over time business organizations have recognized that proactive management of credit can impact the bottom line in two significant ways, contribution to increased revenues and reduction of financing and delinquency costs. Bearing this in mind, the study was focused on determining the effectiveness of credit scoring as a risk management tool. The author is satisfied that the objectives of the study were fulfilled.

4.3.1 Objectives satisfactorily met

The first and main objective of the study was to try and prove that by using credit scoring as a risk management tool the decision as to whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and for management to have better control over the granting of credit.

In Chapter 2, Literature Study, background information on credit scoring is discussed and the motivation for change from a traditional lending system to a credit scoring system is expanded on. The literature study then goes on to provide the views of various authors worldwide on the advantages and disadvantages of using a credit scoring system as a risk management tool.

In Chapter 3, Empirical Study and Results Evaluation, it was established that by using credit scoring as a risk management tool, the decision as to whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and for management to have better control over the granting of credit.

It can therefore be said that from the empirical results drawn from the study, credit scoring has proved to be effective as a risk management tool. Refer to Chapter 3, Empirical Study and Results Evaluation, where to support this statement, the following was demonstrated:

1. Section 1: 3.2.1- Scoring improves the monitoring and control of the quality of the existing assets on the book with particular reference to the review cycle of applications. Accounts scoring below a certain point are 'flagged' for a six monthly review. Scoring also decreases the human effort as the system automatically clears up the integrity of the information.

2. Section 1:3.2.3 & Section 2: Question 22 - Credit scoring systems assist in making good decisions. It was proven that a credit decision made by the scoring system is better than a credit decision made by the manual system.

3. Section 1:3.2.4 & Section 2: Question 21- That strategies and procedures for granting credit using scoring are risk related.

4. Section 1:3.2.5 - That credit scoring improves the automation of certain functions in the following ways:

    - The scorecard has set minimum scores in line with model performance forecasts. Applicants scoring in the upper ranges of the scorecard receive automatic approvals, dramatically increasing loan processing efficiencies and improved turnaround time.
    - Help indicators provided by the scoring system for applications exceeding the scoring mandate assist credit managers in decision making while making sure to follow the banks own guidelines.
    - Scoring ensures more correct and higher quality lending applications as the system automatically clears up the integrity information and mandatory fields ensure the completeness of the application.
    - Credit scoring ensures the application of policies and procedures. Using credit scoring, policies and procedures can be translated onto the computer mainframe for execution into system decisions. The result is improved control of application of bank policies and procedures.
    - Portfolio information is provided by a scoring system, which can assist in improving the banks view on risk. Credit scoring models measure the likelihood of delinquent payments using actual payment history along with other financial and demographic statistics, which assist in making more informed credit decisions.

The second objective of the study was to establish the exact meaning of risk management and to investigate what tools are used nowadays in risk management for consumer lending.

This objective was satisfactorily met. The Literature study, Chapter 2, after determining the meaning and importance of risk management and more specifically, credit risk management, identifies the various credit models used in organizations nowadays to manage risk. The advantages and disadvantages of the various credit models used are then identified together with their domain of application, which includes; judgmental systems, quantitative credit scoring models, decision tree models, expert system models and neural network models. Included in the quantitative credit scoring models are the credit approval (credit scoring) models and behavioural scoring models. Credit scoring models are used to reach a decision concerning whether to extend credit whilst behavioural scoring models, by contrast, are used on the existing consumer current accounts to improve the profitability of accounts by subjecting them to different treatments with regard to credit limits offered and collection methods used.

The final objective was to provide, once the study had been completed, suggestions to banks on improvements that can be made within credit departments for credit lending, as a result of findings that emanate from the study.

To meet this objective the advantages and drawbacks associated with the implementation of a credit scoring system were identified. Chapter 2, Literature Study, includes the views of various authors worldwide on the benefits that a credit scoring system can provide.

In Chapter 3, Empirical Study and Results Evaluation, Section 1: Questions 1-5, the results of various empirical studies performed provide valuable information, which could add value to the credit department of any lending institution.

The opinion of various banks of South Africa on the topic 'credit scoring as a risk management tool' is also included in Chapter 3, Empirical Study and Results Evaluation, Section 2:3.2.6.

The results of the Empirical Study however, also highlighted certain shortcomings of a credit scoring system, which requires attention. These shortcomings are listed below.

4.3.2 Shortcomings still to be addressed

Systems need full implementation. It seems though that too many applications are referred to credit managers for a decision as the results showed that although the credit scoring support systems used assist in making good decisions, processes are not yet fully automated as decision making is reactive and driven by mandates.

Inaccuracies. It was proven that the strategies and procedures for granting credit using scoring are risk related. Credit scores can therefore be used as an effective tool to separate risk class and speed up the decision process on the good loans. But unfortunately, the information used to create a credit score is often inaccurate. The old axiom "garbage in, garbage out" applies. The credit score decision for an applicant depends on the input of the operator and therefore a decision made by a scoring system is open to manipulation by the operator.

4.4 FINAL CONCLUSION

The main objective of this study was to try and prove that by using credit scoring as a risk management tool, the decision whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and for management to have better control over the granting of credit. The main focus of the study was in the banking industry

Hefferman (1996:163) describes the 'business of banking' very briefly; "the fact is that bankers are in the business of managing risk. Pure and simple that is the business of banking".

According to Cade (1997:20), credit risk is the risk that has historically proved to be the most lethal hazard of all, in every continent. Briefly defined, credit risk is the risk of loss to the bank through default by an obligator.

Bessis (1998:23) confirms that risk can be managed. His view is that the primary goal of risk management is to measure risk in order to monitor and control risk.

Carter (1997:19) believes that the first rule of risk management is to start working on the risk at the earliest possible opportunity. That is usually when the greatest impression can be made for the lowest cost.

Credit scoring is a tool designed to give credit management the ability to measure risk and to take the action best suited to each risk that is identified. This risk measurement is also applied at the earliest possible opportunity, which is on original application for a current account or facilities by a customer.

Credit scorings' ability to separate risk class proves that the decision whether to grant or not to grant credit can be more scientifically based in order to reduce risk in lending and therefore allows for management to have better control over the granting of credit. Scoring makes it possible to assign a numerical measure of risk to each application for credit. There is also consistency in lending as credit scoring allows credit mangers to set standard parameters – approving applicants scoring over a certain level and declining applicants scoring below a certain point. Traditionally, each credit evaluator decided for himself what level of risk the applicant presented and what level of risk the lending organization as a whole should tolerate.

Credit scoring therefore addresses any diversity, inconsistency, non-uniformity of decisions and discriminatory practices, which may be experienced with traditional lending.

For existing accounts, the follow up of approved facilities is done through periodic reviews. 'Warning indicators' referred to as 'risk gradings' provided by the scoring system, signal the deterioration of the situation of the borrower before default whenever possible.

When considering the cost implication of a credit scoring system, the conclusion drawn from the study is that the initial installation of such a system is costly. These costs can however, be set off over the long term by the cost savings, which a credit scoring system can provide. These cost savings include not only the saving on accounts going bad (write offs) but also other indirect savings. These indirect savings include the freeing up of time of credit managers to focus on more technical issues requiring credit expertise such as large commercial lending applications and collections.

It must be acknowledged, however, that a credit scoring system is not perfect and does suffer from drawbacks. A credit scoring system cannot operate entirely on its own and therefore cannot provide complete automation of the credit granting process. Credit scoring can make lending rigid in its inability to use initiative. The skills of credit managers are therefore still required to oversee the marginal cases, which are not as clear as being either 'black' or 'white' and to deal with the more complex applications which a credit scoring system cannot accommodate.

5. BIBLIOGRAPHY

Bessis, J., (1998). Risk Management in Banking. England: John Wiley & Sons Ltd. 430 p.

Bidoli, M. and McLeod, (1999), The Future of Banking – VIVE L'Infotech Revolution, *Financial Mail,* 1(5), [Available on Internet:] http://www.fm.co.za/report/infobank/itbanka.htm [18 Aug. 2000]

Boyes, W.J., D.L. Hoffman and S.A. Low, (1989), An Econometric Analysis of the Bank Credit Scoring Problem, *Journal of Econometrics* 40, 3-14

Brill, J., (1998), The Importance of Credit Scoring Models in Improving Cash Flow and Collections, *Business Credit,* NACM, (5): 16-17, January.

Burgess, P.N., (1996), Instantaneous Credit Reporting Offers Economical Gains to Credit Lenders, *Business Credit,* NACM, (6): 25-26,February.

Cade, E., (1997), Managing Banking Risks. England: TJ International LTD. 237 p.

Callahan, J., (1998), A Practical Solution for Doing More with Less, *Business Credit* NACM, (6): 18, January.

Caouette, J.B., Altman, E.I., Narayanan, P. (1998), Managing Credit Risk. Canada: John Wiley & sons, Inc. 452p.

Carter, B., Hancock, T., Morin, J., Robins, N. (1997), Introducing Riskman Methodology. Spain: NCC Blackwell. 428p.

Cole, R.H., (1992), Consumer and Commercial Credit Management. 9th ed. United States of America: Irwin. 536 p.

Cox, D., (1990), Success in Elements of Banking. London: John Murray. 554p.

Edmonds, I., (1998), Winds of Change, *Business Credit,* 98(11): 60-62, May.

Edwards, B., (1997), Credit Management Handbook. England: Gower. 486 p.

Fassett, W.S., (1991), Safer credit scoring: First USA adds two applications to eliminate some risk and increase profits, *Bank Management*, 67(12): 59, December.

Gardner, D.C., (1996), Corporate Credit Risk. Great Britain: Pitman. 46 p.

Hansell, S., (1995), "Need a Loan? Ask the Computer: 'Credit Scoring' Changes Small-Business Lending," *New York Times*, 154(9): 18, April.

Hefferman, S., (1996), Modern Banking in Theory and Practice. Chichester: Wiley. 455p.

Hempel, G.H., & Simonson, D.G., (1999), Bank Management. United States of America: John Wiley & Sons. 683 p.

Jackson, P., (1990), Introduction to Expert Systems. Wokingham: Addison-Wesley. 526p.

Koch, T.W., & Scott MacDonald, S., (2000), Bank Management. United States of America: Harcourt Brace & Company. 968 p.

Lamb, E.C., (2000), Opportunities in Consumer Lending, *Community Banker*, 9(9): 20, Sep.

Lewis, E.M., (1994), An Introduction to Credit Scoring. California: The Athena Press. 169p.
Meli, J., (2000), "Customized credit scoring helps manage risk," *Credit Union Magazine,* 66(7): 45, July.

Mallach, E.G., (2000), Decision Support and Data Warehouse Systems. United States of America: McGraw-Hill Companies, Inc. 664 p.

Meli, J., (2000), "Customized credit scoring helps manage risk," *Credit Union Magazine,* 66(7): 45, July.

Mester, L. J., (1997), "What's the Point of Credit Scoring?" *Business Review,* 97 (4): 28, September.

Moser, N. F., (2000), "The Good, The Bad And The Inconsistent In Credit Scoring," *Credit Union Journal,* 4(27): 7, March.

Mularz, L., (1987), "Statistical Origins and Concepts of Point Scoring," *The Credit World,* 50 (3): January.

Nadler, P., (2000), "Say It Proudly: Our Bank Doesn't Do Credit Scoring," *American Banker,* 165(161): 5, August.

Nathan, S., (1998), "Credit scoring by big banks is forcing smaller ones to cut loan decision time," *American Banker,* 163(41): 7, March.

Oppenheim, S., (1997), "Gearing Up for Small-Business Push, PNC Building an Assembly Line," *American Banker,* 154(38): 8, May.

Parkinson, K, L., Ochs, J, R., (1998), Using Credit Screening to Manage Credit Risk, *Business Credit,* 100(3): 22,March.

Planting, S., (1999), The Future Bank – Your Bank, Five years from now, *Financial Mail,* 2(1). [Available on Internet:] http://www.fm.co.za/report/infobank/itbankf.htm [18 Aug. 2000].

Richeson, L., Zimmermann, R, A., Barnett, K, G. (1996), Predicting Consumer Credit Performance: Can Neural Networks Outperform Traditional Statistical Methods? *Neural Networks in Finance and Investing,* (*4*): 15, January.

Riley, G., (1989), Expert Systems: Principles and Programming. Boston: PWS-KENT. 632p.

Roszbach, K.F., (1998), Bank lending policy, credit scoring and the survival of loans, *Manuscript, Stockholm School of Economics.*

Sargent, J., (2001), Rules Based Credit Scoring, *Business Credit,* 103(3): 56, Mar.

Stiglitz, J.E., & Weiss, A., (1981), Credit rationing in markets with imperfect information, *American Economic Review* 71, 393-410

Valsamakis, A, C., Vivian, R.W., Du Toit, G.S., (2000), Risk Management. Johannesburg: Heinemann. 31p.

Williamson, S., (1987), Costly monitoring, loan contracts and equilibrium credit rationing, *Quarterly Journal of Economics* 102 (1): 135-145.

Zmiewski, M., and B. Foster, (1996), "Credit Scoring speeds Small Business loan processing," *Journal of Lending and Credit Risk Management,* 79(3): 6, November.

Consumers Union. 1998. Credit Scoring Facts. (Web:) http://www.consuersunion.org/finance/scorewc200.htm [3 Oct. 2000].

Credit Policy, Absa Bank, Manual for Credit Application Scoring, 2000.

ANNEXURE A

Glossary of terms

Consumer credit. The term "Consumer Credit" is broadly understood to mean any of the many forms of commerce under which an individual obtains money, goods or services on condition of a promise to repay the money or to pay for the goods or services, along with a fee (the interest) at some specific future date or dates (Lewis, 1994:1).

Risk. Risk is defined as the variation of the actual outcome from the expected outcome. Risk therefore implies the presence of uncertainty (Valsamakis et al., 1999:33).

Credit Risk. The owner of the obligation (or creditor) needs to be convinced that there exists, from a financial perspective, the strongest possibility that the other entity (the debtor or obligor) will be able to satisfy its obligations in the future. An understanding and evaluation of all the components of the other entity and its business is needed in order to establish a prudent opinion that an obligation is likely to be satisfied. The opinion formed will have been reached having identified the primary source for settlement or repayment of the obligation, plus if possible a secondary source of repayment. The ultimate source will be, where considered appropriate and necessary, reliance upon any security taken to support a positive credit decision. An investigative, analytical and interpretative process using a variety of techniques and procedures needs to be undertaken in order to have sufficient understanding to be able to form an opinion (Gardener, 1996:4).

Risk Management. Risk management is a managerial function aimed at protecting the organization, its people, assets, and profits, against the physical and financial consequences (adverse) of event risk. It involves planning, coordinating and directing the risk control and the risk financing activities in the organization (Valsammakis et al, 1999:22).

ANNEXURE B

QUESTIONNAIRE

Black = Response from Absa bank participants (shown as a percentage).

Red = Response from "other" bank participants (shown as a percentage).

CREDIT APPLICATION SCORING AS A RISK MANAGEMENT TOOL

What is now generally understood to be "credit scoring" is a process whereby some information about a credit applicant or a credit account is converted into numbers that are combined (usually added) to form a score. This score is a measure of the credit-worthiness of the individual concerned (Lewis, 1994:XV).

Section A – Application and usage of Credit Scoring by banks in South Africa

		Yes	No
1	Is credit scoring as defined above, used by your institution?	100	0
		46	54

If the answer to question 1 is NO, answer only questions 2, 3 and 4.

If the answer to question 1 is YES, answer questions 5 to 24.

		Yes	No
2	Is your institution considering implementing credit scoring in the near future?	N/A	N/A
		43	57
3a	Are you aware of the inherent risks in implementing credit scoring to assist in decision-making? If yes, list in point form the risks involved.	N/A	N/A
		71	29

		Yes	No
3b	Are you aware of the advantages in implementing credit scoring to assist in decision-making? If yes, list in point form the advantages involved.	N/A 71	N/A 29

		Yes	No
3c	Are you aware of the disadvantages in implementing credit scoring to assist in decision-making? If yes, list in point form the disadvantages involved.	N/A 71	N/A 29

		Yes	No
4	Is your institution not using credit scoring due to a conscious decision in this regard? If yes, state why.	N/A 71	N/A 29

		dd/mm/yyyy	
5	When was credit scoring implemented at your institution?	Various (refer results)	
6	For which products is credit scoring applied? (Tick all applicable blocks)	Mortgage Loans	
	Various (refer results analysis)	Personal Loans	
		Cheque Accounts	
		Overdrafts	
		Credit Cards	
		Vehicle Finance	

Section B – Pros and Cons of Credit Scoring

Evaluate the following statements on a scale of 1 to 5: 1 being "fully agree", 2 being "agree", 3 being "uncertain", 4 being "disagree", and 5 being "fully disagree".

		1	2	3	4	5
7	Credit scoring is an effective tool to separate risk class.	24	53	17	6	0
		83	17	0	0	0
8	Credit scoring speeds up the decision process on good loans.	51	38	7	4	0
		83	17	0	0	0
9	Credit scores are accurate determinants of credit risk.	4	34	41	15	6
		67	33	0	0	0
10	Credit scores are unbiased determinants of credit risk.	15	30	36	17	2
		50	33	17	0	0
11	Credit scoring contributes towards reducing bad debts.	19	45	28	6	2
		33	67	0	0	0
12	Credit scoring reduces operational costs.	17	53	15	13	2
		67	33	0	0	0
13	Credit scoring can result in potential good clients being turned away.	28	38	11	21	2
		33	50	0	17	0
14	Credit scoring is an expensive process to implement and maintain	9	17	53	19	2
		17	49	0	17	17
15	Credit scoring results in the deterioration of the institutions credit managers' intuitive capabilities.	15	25	17	32	11
		32	17	17	17	17

Motivate in point form what effect credit scoring has on credit managers at your institution.

Section C - General

		Yes	No	Maybe
16	Does your institution make use of behavioral scoring for existing cheque accounts?	100	0	0
		17	83	0
17a	Is historical account information available within your institution?	100	0	0
		6	0	0
		Yes	No	Maybe
17b	If yes, is the historical data of value to your institution? Motivate in point form.	96	2	2
		6	0	0
		Yes	No	Maybe
18	Is decision-making within your institution fully automated?	15	74	11
		67	33	0
19	Credit scoring ensures consistency within the credit decision process.	68	13	19
		100	0	0
20	Is decision-making within your institution reactive and driven by mandates? Motivate in point form.	75	19	6
		67	33	0

		Yes	No	Maybe
21	Is the criteria used for credit scoring all risk related? Motivate in point form.	64	23	13
		66	17	17

		Yes	No	Maybe
22	In your opinion, does credit scoring assist in making good decisions? Motivate in point form.	60	4	36
		83	0	17

		Yes	No	Maybe
23	Does your institution apply credit scoring for small/medium business lending? Motivate in point form what is/would be the effect of credit scoring on a small/medium business' need for financial support.	0	100	0
		0	100	0

		Yes	No	Maybe
24	Do you consider credit scoring to be effective as a risk management tool within your institution? Motivate in point form.	68	9	23
		83	0	17