

Expertise in Credit Granting:
Studies on Judgment and Decision-Making Behavior



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EFI, Box 6501, S-113 83 Stockholm, Sweden • Internet: www.hhs.se/efi/
Telephone: +46(0)8-736 90 00 • Fax: +46(0)8-31 62 70 • E-mail efi@hhs.se

Expertise in Credit Granting:
Studies on Judgment and Decision-Making Behavior

Patric Andersson



STOCKHOLM SCHOOL OF ECONOMICS
EFI, THE ECONOMIC RESEARCH INSTITUTE



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To mom and dad

PREFACE

This report is a result of a research project carried out at the Center for Economic Psychology at the Economic Research Institute at the Stockholm School of Economics.

The present volume is submitted as a doctoral dissertation at the Stockholm School of Economics. As is usual at the Economic Research Institute, the author has been entirely free to conduct and present his research in his own way as an expression of his own ideas.

The Economic Research Institute is grateful for the financial support given to the present research project by Sparbankernas' Research Foundation, Ruben Rausing's Foundation for Research on New Firm Creation and Innovation, and Handelbanken's Research Foundations. This volume would not have been realized without the cooperation of the loan officers and credit managers participating in the project. The Economic Research Institute wishes to thank warmly all the people involved for their support and participation.

Stockholm in March 2001

Bo Sellstedt
Director of the Economic
Research Institute at the
Stockholm School of Economics

Lennart Sjöberg
Professor, Head of the Center for
Economic Psychology at the
Stockholm School of Economics

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The present dissertation on judgment and decision-making behavior illustrates in a way my own judgment and decision-making for the last six years. I made a crucial decision when I decided to start postgraduate studies. The reasons for this decision were my curiosity, my thirst for knowledge, and my appetite for analyzing problems. That decision has then pushed me to make further judgments and decisions, which eventually resulted in the present research endeavor. This endeavor could not have been accomplished without judgment and decision-making (JDM) of different people to whom I am much grateful.

First, I wish to express my deep appreciation to my chief dissertation advisor Prof. Lennart Sjöberg for his guidance, his wide experience, and his confidence in my research ideas. His suggestion that I would employ an economic-psychological perspective has brought me into many exciting research areas and stimulated my curious, inquiring, and analytic mind. He has also spurred me to apply for grants and scholarships, to acquire international experience in terms of attending conferences and spending an academic year abroad, as well as to get my work published. As a result, I believe that I have blossomed out as a capable and independent researcher.

I would also like to acknowledge my gratitude to my co-advisors, professors Ingolf Ståhl and Henry Montgomery, for their friendly support and their critical but helpful comments on preliminary manuscripts. Their different roles have been highly appreciated. Ingolf pinpointed weak spots in my writing and gave me instant support when needed. At numerous occasions, I have had the pleasure of sharing his wits. Henry introduced me to the research area of judgment and decision-making, invited me to interesting seminars with leading researchers, and gave me creative suggestions for analyzing data.

Besides my dedicated hard work and my harmonious thesis committee, this research endeavor has been enabled by financial support. Scholarships from Sparbankernas' Research Foundation and grants from Ruben Rausing Foundation for Research on New Firm Creation and Innovation are gratefully acknowledged. I am obliged to Handelsbanken's Research Foundations for funding my academic year abroad. I have also gratefully received financial support from Stockholm School of Economics (SSE).

I am also thankful for the cooperation of the loan officers and credit managers participating in this research endeavor.

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Stockholm March 26, 2001,

Patric Andersson

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INTRODUCTION

Background

Judgment and decision-making (henceforth JDM) pervades business life. To provide a complete list of JDM activities in business life would be an impossible mission to accomplish, but the following three typical examples act as illustrations. Human resources managers form judgments whether a job candidate fits certain requirements, and if that is the case, should the candidate be hired or should the job offer, in contrast, go to a subsequent applicant. Investment analysts make forecasts about security prices that result in recommendations of buying or selling stocks. On the basis of information about supply, demand, cost, and competitors, etc., managers make decisions about what strategy to pursue. No matter whether those judgments and decisions are made by individuals or by groups, they shape business life in direct or subtle ways. For that reason, JDM in business life always deserves attention.

An important kind of JDM in business life is the granting of credit. It is a well-known fact for economists that credit granting, or lending, plays an important role for economic growth. But credit granting may be associated with negative consequences. For instance, in the earlier part of the 1990s, Sweden went through a financial crisis resulting in Swedish banks and other lending institutions suffering heavily from credit losses.¹ On the aggregate level, Swedish banks experienced during 1992-1993 annual credit losses of more than 3% of their total assets. In general, the corresponding ratio had in the 1980s been less than 0.5%. Although the reasons can be found primarily on the macro-economic level, poor risk management by banks and other lending institutes also triggered the financial crisis (Lybeck, 1994).² As a result, a nation-wide research project on risk analysis, risk behavior, and risk management was initiated by the Swedish National Board for Industrial and Technical Development (see Green, 1995, for an overview). As concluded by that project, the financial crisis pointed out, among other things, the need for a better understanding of the individual JDM that precedes credit granting. In other words, how credit decisions are really made.

A widely spread belief is that experienced professionals make the most accurate judgments and the best decisions. Because they have been confronted with so many situations demanding their JDM-skills, they have learnt about all the possible consequences of various choices making it possible for them to carry out rational behavior (Hogarth & Reder, 1986). Rational behavior would imply, for instance, the selection of the best job candidate, the correct forecasts of security prices, and the implementation of the best strategy. Accordingly, in order to gain insights into rational (or at least good) decision behavior, research on how experts make judgments and decisions should be carried out. Among

other things, such insights are essential for the development of decision aids and training programs (cf. Shanteau & Stewart, 1992) as well as for the economic efficiency (cf. Camerer, 1995).

In conclusion, the aforementioned circumstances set up the goal of this dissertation: To provide insights into the so-called “Black box” of experienced lenders’ JDM. To be specific, in six separate studies I will investigate various aspects of JDM behavior by both experienced loan officers in Swedish bank organizations and experienced credit managers in Swedish supplying companies. The investigated aspects are information processing strategies, information acquisition behavior, personal attributes of expert credit analysts, as well as attitudes to decision support systems and requesting collateral. The rationale for investigating those aspects and the results from these multiple investigations are reported in separate studies.

The remainder of this introductory chapter is organized into three sections. The next section maps out the research perspective applied in this dissertation. Then, the scope of research and its limitations are described and, finally, the organization of subsequent contents of this dissertation is outlined.

Research Perspective

The dissertation applies an integrated economic-psychological perspective. The discipline of economic psychology studies psychological processes in economic behavior by employing theories and methods from the psychological science (Wärneryd, 1988). A related discipline is behavioral economics, but in contrast to economic psychology behavioral economics has its starting point in economic theory when explaining or describing economic behavior. In addition, the field of economic psychology has its roots in Europe with its pioneers in the Dutchman Van Raaij and the Swede Wärneryd, whereas behavioral economics originates from the United States.³

Psychological mechanisms refer to cognitive processes, attitudes, beliefs, expectations, motivational and emotional factors, and learning. These concepts constitute the components in the “Black box” that economists and business researchers over the years have made attempts to get insights into by employing their own theories and methods rather than relying on psychological theories and methods. All these concepts interact and the resulting interaction has impact on economic behavior. For instance, the theory of reasoned action assumes that behavior is a function of attitude and intention, where attitude is the tendency to evaluate something (e.g., objects or activities) as positive or negative and intention is determined by social norms and attitudes (Fishbein & Ajzen, 1975). Determinants of attitudes are cognitive activities and emotions. An important cognitive activity is the processing of information.

Economic behavior concerns the management of scarce resources (e.g., money, time and efforts) and its consequences. Typical kinds of economic behavior are consumption, allocation, and production. Economic behavior is goal oriented in the sense that people have some purposes when they consume, produce, or allocate resources (Simon, 1947/1997). For example, credit granting involves allocation of scarce resources and fulfils two goals: returns for the lender and consumption or production for the creditor. In most cases, economic behavior includes choices between options (e.g., grant or reject credit or what stock to pick). Thus, economic behavior is closely related to JDM.

Psychology is often referred to as the study of mind and behavior. For that reason, it follows that psychological theories and methods are particularly applicable when investigating and explaining economic behavior. Unfortunately, this proposition is not widely known amongst, on the one hand, researchers in economics, business studies, and even in psychology, and, on the other hand, politicians and journalists (Wärneryd, 1988). Applying psychological theories and methods has made path-breaking contributions to our understanding of the underlying factors behind economic behavior by individuals and organizations. Some of the most distinctive contributions are the idea of bounded rationality by the Noble Prize laureate Herbert Simon (1947/1997), the behavioral theory of the firm by his colleagues Cyert and March (1963/1992), and the paradigm of heuristic and biases by Kahneman, Slovic, and Tversky (1982). In psychology, theory is generated by a close fit to the empirical material. Focus is put on the process. Behavior may be studied at the individual or group level on the basis on systematic data collection. In general, experiments with single or multiple manipulated variables and participation of students are employed, but other commonly used methods in psychology are questionnaires, protocol analyses, and interviews.

In contrast, economics has one core theory and relies to a large extent on deduction in terms of modeling behavior on the basis of mathematical derivations. The core theory postulates that an economic agent (i.e., “homo economicus”) maximizes his/her values and, accordingly, makes rational decisions by considering all possible kinds of information about the options in present and future time. The focus on research is put on making rational choices. Data are generally taken from the aggregated but highly abstracted level (e.g., income statistics), but some economists have started to employ experiments (i.e., in experimental economics) and sometimes case studies (Simon, 1997).

Apart from the scope of investigation (i.e., to test economic theory versus studying factors triggering human behavior), experiments employed by economists differ from those set up by psychologists. Participants in both types of experiments receive rewards, but the participants in economic experiments are in general rewarded with respect to their performance (see Camerer, 1995). Incentive-based performance, however, does not have any substantial impact on

stimulating people to act in accordance with the axioms of rational behavior: Economic theory remains a poor description of economic behavior (Camerer, 1995).

Combining views from economics and psychology is a risky task, because most inter-disciplinary research ultimately runs the risk of emphasizing one of the disciplines resulting in an unbalanced research perspective. When shaping the economic-psychological perspective, I deliberately attempted to reduce such unbalance by constructing a framework of literature from economics, psychology, and business studies (e.g., accounting and organizational studies). To what extent this framework is balanced is perhaps best reflected in the reference lists. It is, however, inevitable that a perspective from the psychology is favored for two main reasons. First, research on JDM, which is the prime component of the present framework, has since the 1950s been developed essentially by psychological research findings, but it must be noted that this research topic is strongly inter-disciplinary; for instance before the 1950s the main contributions were made by political economists (Goldstein & Hogarth, 1997). Second, the scope of this dissertation concerns investigation on the individual level and emphasis on how individuals really make credit decisions.⁴

Finally, the economic-psychological perspective may be regarded as one of an empirical positivist. Such a view postulates that in order to obtain knowledge about phenomena in business life the researcher must make empirical observations in an objective and systematic way. Methods that can be easily replicated by other researchers should be chosen, because such an approach vouches for research findings that are to a lesser extent influenced by the individual researcher's subjective interpretations. At least, such an approach makes it possible to control for such biases and, thus, replicate research findings using the same or an additional method. The empirical materials should involve multiple (i.e., the more the better) participants and, preferably, those participants should be selected by randomized procedures, but in some cases such as investigating expert decision-makers one has to make some modifications. Nonetheless, the economic-psychological research perspective is not in the purest form of empirical positivism, because some kinds of hermeneutic interpretation are also required. That is, one has to interpret the research findings with respect to what business implications they suggest. In most cases, such interpretations rest upon earlier research, but sometimes they may be viewed as speculations although based on logical reasoning.

Research Scope

As previously stated, the scope of research is on individual judgment and decision-making behavior by experienced loan officers in bank organizations and experienced credit managers in supplying companies. By employing in-depth interviews, questionnaires, and experiments, those professionals are investigated on the individual level. Such a scope is beneficial as it gives detailed insights into the aforementioned psychological mechanisms that determine the “Black box” of human economic behavior. With the use of psychological theories and methodology that “Black box”, or rather the Black boxes of experienced lenders, become(s) observable and then it is possible to find those invariants of economic behavior (cf. Simon, 1990) that unfold how credit decisions, on the average, are made. This contrasts with the view held by some researchers in economics, business studies, and other disciplines who, on the contrary, believe that insights into the determinants of economic behavior are either simply impossible or best illustrated by abstracted models based on aggregated data.

Like most process-oriented JDM research, the present scope of research is mainly intended to be descriptive. On the whole, the studies included in the dissertation aim at describing how professionals really form judgments and make decisions. However, on the basis of the research findings it is possible to make normative recommendations as regards how professionals ought to behave when making credit decisions or, at least, contribute to how training programs for novice credit analysts should be designed and how experienced credit analysts can improve their JDM skills. One can, therefore, argue that the dissertation has prescriptive purposes. As argued by Stanovich (1999), a prescriptive purpose implies specifications of “how processes of belief formation and decision making should be carried out given the limitations of the human cognitive apparatus and the situational constraints (e.g., time pressure) with which the decision maker must deal” (p. 3).

The scope of research concentrates on the following issues. First, the scope emphasizes individual decision behavior (e.g., information acquisition, information processing strategies, and attitudes) for the aforementioned reasons and the simple reason that such a scope had not before been widely applied in Sweden. Second, experienced lenders in bank organizations and large supplying companies were investigated. Equivalent professionals in other lending institutions, like financial companies, housing loan institutions, and credit-rating institutions, were not included. Third, only lending to businesses was considered as such loan and credit play important an role in business life and the economy, but this does not mean that the effect resulting from the large quantity of loans as regards the other parts of the society are not acknowledged. Fourth, due to its significance in terms of frequency and economic growth,

special focus was put on credit granting to small firms. Some researchers (e.g., Cressy & Olofsson 1997) argue, for instance, that lending to small firms is associated with funding gaps reflecting inefficient allocation of capital.

It would be impossible to thoroughly focus on all types of important factors involved in the granting of credit, so some limitations of the research scope were required. Beyond the scope of the investigation are organizational and institutional factors. An example of an organizational factor may be coordinating multiple credit analysts so that they act in accordance with the goal of their bank, whereas an institutional factor might be legislation, triggering certain kinds of behavior. Although not explicitly investigated, the significance of the organization and the institution is acknowledged and commented upon later in this thesis.

Organization of the Dissertation

The dissertation consists of seven separate but related parts: a review of the literature and a summary of my studies, five empirical studies, and a methodological paper (see Table 1). The review and summary, whose remaining content follows next, covers the relevant literature that makes up the theoretical framework. The five empirical studies concern investigations of decision-making behavior such as information processing strategies, information acquisition, characteristics of expert credit analysts, and attitudes toward decision aids in lending and requesting collateral. The methodological paper reports on a process-tracing software program.

Table 1. *Organization of the Dissertation.*

| |
|---|
| Literature review and summary of the studies |
| Study 1. Personal attributes of expert credit analysts |
| Study 2. P1198: Software for tracing decision behavior in lending to small businesses |
| Study 3. Does experience matter in lending? A process-tracing study on experienced loan officers' and novices' decision behavior |
| Study 4. Risk attitude and acquisition of information in credit risk assessment: A survey among credit managers in Swedish supplying companies |
| Study 5. Business decisions aided by information technology: A survey study of attitudes towards decision support systems by credit managers in Swedish supplying companies |
| Study 6. Collateral in lending: Attitudes, intentions, and behavior |

Next follows the remainder of the review and summary. It elaborates on four relevant topics (in consecutive order): (i) an overview of the theoretical and practical issues when granting credit, (ii) research on judgment and decision-making, (iii) research on expert decision-makers, (iv) earlier research on individual judgment and decision-making by loan officers and equivalent professionals. The first topic is broad, because it outlines the fundamental issues of lending like the conceptual background, the procedure of credit granting, and credit assessment. The three remaining topics are literature reviews. After the literature reviews, the research findings from the five empirical studies and the methodological paper are summarized. Lastly, the implications of those findings and future research are discussed.

CREDIT GRANTING: AN OVERVIEW AND A DESCRIPTION

This chapter elaborates on the characteristics of credit granting or, as it is also referred to as, lending. Recall that the dissertation is restricted to concern lending to firms and especially small firms. The chapter consists of eight sections: (i) distinctions between bank loan and trade credit, (ii) the notion of credit assessment, (iii) information involved in credit assessment, (iv) return and risk associated with credit granting, (v) a description of credit granting in practice, (vi) an economic-theoretical perspective on credit granting, (vii) a psychological perspective on credit granting, and (viii) a summary of key points.

Some Distinctions between Bank Loan and Trade Credit

Credit originates from the Latin word *credere* meaning to trust somebody. The Latin origin of the word *credit* points to the very essence of credit granting; that is the confidence in someone's ability and intention to fulfill his/her obligations that he/she has agreed to undertake when being entrusted with a loan or, alternatively, goods or services without immediate payment. Banks and supplying companies share this notion of credit, but their credit granting differs with respect to the following features. Nevertheless, the contents in this chapter are relevant not only for banks but also supplying companies in spite of the deliberate focus on bank lending.

Both bank and supplying companies grant credit. More specifically, banks grant loans that generally span over a number of years involving interest and installments whereas supplying companies by tradition deal with trade credit that often span over at the most a few months involving penal interest on arrears but no amounts for interest or installment. Trade credit can be defined as the loan agreement between non-financial firms where the agreement is made in connection with sale or purchase of products or services (Ingves, 1984). The terms of trade credit are in Sweden generally 30 days, but may vary due to industrial practices; for instance, the forwarding agencies and the petroleum suppliers deal with 10 and 90 days of credit, respectively. The main reasons for granting trade credit are lower transaction costs (Kim & Atkins, 1978), recognized custom in business life, and the risk that the client places his/her order of products (or service) with a competitor in case of rejection of trade credit. For micro- and macroeconomic aspects of trade credit, see Ingves (1984).

Another distinction is that bank lending has special rules and regulations stated by the government, whereas there are no such special regulations for supplying companies. The Swedish banks are regulated by a special legislation

that set the agenda for bank business. Recently, there have been some changes in order to restrain so-called squander-wise credit granting (SOU, 1992). The Swedish Financial Supervisory Authority makes sure that the banks follow the set of regulations, so that stability in the domestic financial system is secured. In connection, it should be mentioned that the banks have an incentive to follow those rules, because instability is bad for business. The Basle Committee on Banking Supervision sets the agenda for international banking to assure stability in the global financial system (see the site <http://www.bis.org>). Changes in the agenda will in the end also influence the decision behavior of the individual loan officers.

Unlike bank lending, the trade credit by the supplying companies does not belong to the credit markets. This means that there is little statistics on the total amount of trade credit prevailing business life, but considering the wide use of trade credit it is reasonable to expect that trade credit adds up to a substantial amount, which may be comparable to that of bank lending. In conjunction, it should be noted that banks seldom provide risk capital (i.e., capital invested as equity) to entrepreneurs and new ventures.

Finally, banks are in a stronger position to collect their claims as they often require collateral implying that they become prioritized creditors. In contrast, supplying companies seldom demand collateral in fear of missing the deal and obstructing the customers. This means that supplying companies are not prioritized creditors and have poor chances of receiving compensations for their claim in bankruptcies. Leasing is an exception where the customer rents rather than purchases equipment (e.g., computers, cars, copy machines, and aircraft) from a supplying company.

The Notion of Credit Assessment

Certain people within banks, supplying companies, and other lending organizations are accountable for assessing the credit worthiness of the credit applicants. This task is called credit risk assessment, credit evaluation, or credit examination, but credit assessment will be used as the generic term. In general, the people accountable for credit assessments are referred to as loan officers, but sometimes they may be referred to as credit analysts or as credit managers, which is the case for supplying companies.

Accordingly, the loan officer faces a judgment and decision-making (JDM) situation, where he/she assesses the applicants' ability to pay interest and installments by evaluating the likelihood that the debtor actually will pay back the loan including the interest (or pay for the obtained product and service) on the basis of the current information about the debtor. In addition, he/she may

also estimate the benefits and the costs associated with granting (or rejecting) credit; see below.

There are different mnemonic rules concerning credit assessment (Steel, 1994). For instance, CAMPARI denotes seven factors of the applying firm one should carefully investigate. These are *Character, Ability, Means, Purpose, Amount, Repayment, and Insurance*. Similarly, the rule PARSERS refers to *Purpose, Amount, Repayment, SEcurity, Renumeration, and Services*. These two mnemonic rules connect to another mnemonic rule that is called the five Cs of credit where the five concepts stand for the following (Beaulieu, 1994): *Character of management's determination of paying debts, Capability of management to run a business, Capital to fund the business, Conditions of the business cycle, and Collateral*, which is an additional source of payment. A mnemonic rule named MESS has recently been suggested and this rule emphasizes the importance of examining the *Market context, Experience of the management, Serviceability, and Security* when granting credit to a firm (Steel, 1994). To my knowledge based on literature and my interviews with 31 Swedish professionals in banks and supplying companies, such corresponding mnemonic rules appear not to be used by Swedish loan officers.

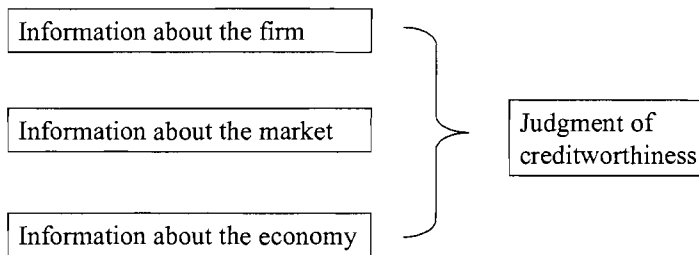


Figure 1. Credit risk assessment: The judgment and decision-making task of loan officers.

In spite of the various names, the mnemonic rules point at the essence of credit assessment. That is, to form a judgment about credit applying firms' financial strength in the present as well as in future time on the basis of various kinds of information about the financial status of the firm, the skills of the management, and the market including competitors, customers, and economical forecasts. Expressed differently, when performing a credit assessment the loan officer extracts information from various sources, weights the information, and arrives at a conclusion about the creditworthiness of the credit applicant (see Figure 1). The next section is devoted to describing such information and sources.

Information Involved in the Credit Assessment

There are two basic clusters of information involved in the credit assessments: accounting and non-accounting information. The prime source of the former cluster is the individual client, public records, or credit rating agencies. In contrast, the non-accounting information originates mainly from interacting with the clients, but additional sources are credit rating agencies, reports on statistics made within the bank, and colleagues. In addition, the business plan made by the entrepreneur may serve some purposes, but as argued by Sahlman (1997) this plan must be regarded with caution. His argument was that despite numerous financial projections the business plan generally describes the four core factors poorly: the people running the company, the opportunities, the context, and the risk.

Accounting Information

Because accounting is “the process of identifying, measuring and communicating economic information to permit informed judgements and decisions by users of the information” (Dury, 1988, p. 3), it is not a surprising fact that accounting information plays an important role in the credit assessment. Economic information concerns mainly data about the economic behavior of the firm, such as incomes, costs, volumes, assets, and debts. There are established principles set by legislation and the association of auditors (e.g., the Swedish Association of Auditors) that govern how accounting information should be derived and what should be reported. Such principles enable the agents outside the firm to have confidence in the reported information in the sense that there exists among the economic agents a consensus about what it stands for, how it has been measured, and how it is reported.

In particular, the financial statement that includes balance sheet, income/cost report, and cash-flow estimations has a substantial role in credit assessment. By tradition, financial ratios have been employed by loan officers to evaluate the creditworthiness of the credit applying company.

Predicting corporate failure on the basis of financial ratios has engaged many researchers.⁵ In general, they have attempted to differentiate between a sample of failed firms and a sample of non-failed firms. The most common method has been discriminant analysis (Rosenberg & Gleit, 1994). Although the predictive power varies, the resulting models show that financial ratios have strong diagnostic values for the prediction of corporate failure. Due to their frequent use in various models, it seems reasonable to assume that return on assets, the ratio working capital/total assets, the ratio debt/assets, and the ratio cash-flow/debt are important indicators of failure (cf. Altman, 1983; Skogsvik, 1989). Moreover, Skogsvik (1989) found that return on owners' equity and the

ratio interest-expenses/debt were good predictors of corporate failure. It must, however, be noted that the predictive power of financial ratios depends upon how far away in time the impending corporate failure is. Ratios within two years and more than three years prior to the corporate failure are good and poor predictors, respectively (cf. Altman, 1983; Skogsvik, 1989). For instance, Skogsvik (1989) noted that ratios concerning three to six years prior to corporate failure had about the same percentage of incorrect predictions.

Critique of Accounting Information

Despite their predictive power, the advantages of financial ratios should not be exaggerated. Argenti (1976) claimed that financial ratios are mere symptoms of corporate failure and for that reason they cannot yield insights into the cause of failures. Because the management of failing companies might perform manipulative accounting in attempts to hide the poor condition, financial ratios may become less reliable predictors. In spite of the possible manipulative accounting, financial ratios within one year prior to the corporate failure give accurate predictions in about 80-85% of the cases (cf. Skogsvik, 1989).

Argenti (1976) suggested a dynamic model where corporate failure originates from poor management (see Figure 2). Poor management results from either omission errors or commission errors. Among the omission errors are neglect of accounting information systems and inability to respond to environmental changes. Examples of commission errors are over-trading, launching big projects beyond the firm's resources, and allowing the gearing to increase. He argued that the major cause of poor management is "the one man band", where a single individual dominates and controls the board of directors without taking any advice.

There exists some empirical evidence that agrees fairly well with Argenti's ideas. For instance, it has been shown that failed entrepreneurs had poor risk management and tended to be unable to react or adapt to the changes in the environment, whereas successful entrepreneurs had excellent risk management enabling them to proactively adapt to the changing environment (Delmar, 1996).

Moreover, there are some time lags associated with reporting accounting information. To be specific, the financial statement does not accurately represent the financial status of the firm, because the statement rests upon data that were measured some months or even a year before that information reached the loan officers or other agents outside the firm. In addition, firms in financial distress tend to make their statements publicly available later a few or several months after the end of the financial year.

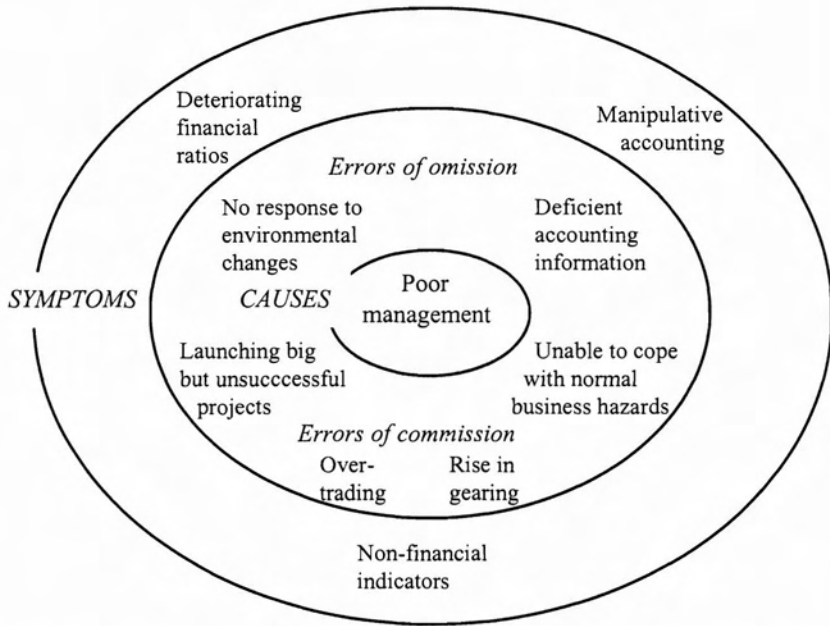


Figure 2. Relationship between causes and symptoms as adapted from Argenti (1976). Note that the metaphor of a stone thrown in a pond is useful in describing the causes and symptoms of corporate failure. The first ring shows the fundamental cause of failure, i.e. poor management. The second ring displays the errors that poor management makes. The third ring describes the indicators, or symptoms, of the impending failure.

Non-Accounting Information

Rather than merely considering symptoms like financial ratios, Argenti (1976) claimed that loan officers and equivalent professionals should also take into account those non-financial factors that better reflect the causes of corporate failure. Keasey and Watson (1987) tested his claim using a sample of 73 failed and 73 non-failed small firms. They found that a model where the predictors were five non-financial factors (i.e., average submission lag, number of directors, bank floating charge, prior years of qualification, and current year qualification) predicted more cases correctly (76.7% vs. 75.3%) than a model with five financial ratios (i.e., debt/assets, fixed assets/assets, pre-tax/assets, income before interest/equity, and income before interest/debt). A model including a combination of such non-financial factors and financial ratios yielded the best predictive power: 82.2% of the cases were accurately classified.

As previously stated, loan officers try to get a picture about the character of the people in general and the management (including the board of directors) in particular involved in the credit applying company. Cues of information like certificates, references from former employers, and remarks of payment may be viewed as objective measures of the management. Such background information have also been proved to be significant predictors of new venture survival and growth (Cooper, 1993).

In most cases, loan officers have to rely on ambiguous information when making judgments about management. An example of such ambiguous pieces of information is the personality of the entrepreneur (or the person in the firm like the managing director who encounters the loan officers) which the loan officer – intentionally or unintentionally – forms judgments about after interviewing him/her.

Moreover, loan officers should consider information about business conditions such as forecasts about market, economic growth, and additional macro-economic factors. Those cues are essential in order to get a feeling about the management's ability to handle changes in the environment.

Even if both clusters of information point at an affirmative decision, the loan officers have to consider the values of granting credit to that particular client. The next paragraphs are devoted to that issue.

Return and Risk Associated with Credit Granting

Credit granting is also a JDM task where return is balanced against risk. This balance between return and risk is particularly valid for bank lending. As regards trade credit, the credit managers often lack returns to balance the risk against, because trade credit is generally granted on other grounds as previously stated.

Over the years, many economists and decision-theorists have formalized this decision problem of credit granting (i.e., balancing return against risk) by relying on micro-economic theory and operation research. The following three references work as examples of models of credit granting. About 35 years ago, Cohen and Hammer (1966) showed how operation research methods could be applied in banking. Four years later, Bierman and Hausman (1970) applied dynamic calculations to formulate decision rules in trade-credit granting. In a seminal paper, Stiglitz and Weiss (1981) presented a general model of credit rationing which, among other things, considered the effects of changes in interest rates and collateral requirements (see below).

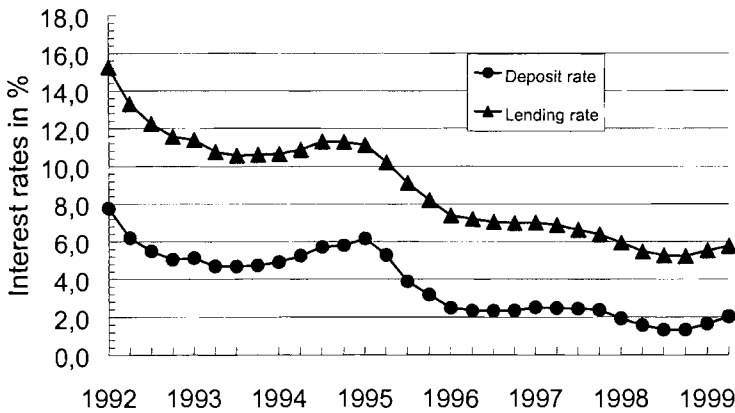


Figure 3. Interest rate margin regarding Swedish banks. (Source: Statistics Sweden and Swedish Bankers' Association)

The Return of Lending

Return concerns the values the lender obtains if loan is granted. There are two related measures of return (McNamara & Bromiley, 1999). First, the discrepancy between interest rate charged a borrower and the deposit interest rate. Second, the risk-adjusted expected return, which is the expected return concerning an individual borrower adjusted for administrative costs and for a charge concerning estimated default risk. Since the early 1990s the gap between Swedish lending rate and Swedish deposit rate has constantly narrowed from about 8% to the current (the fall of 2000) gap of 4%, (see Figure 3). On the other hand, the lending volume has increased largely as shown in the Figure 4.

Approximately 50% of the Swedish banks' total revenues are attributed to this net interest rate margin as reported by the Swedish Bankers' Association. According to interviews with bankers, this margin should cover the administrative costs (i.e., costs and expenses for loan officers), capital expenses, risk premium (i.e., charge for an estimated average credit loss), and a substantial profit margin.

In addition to the interest-rate margin, the creditors may obtain additional benefits in terms of the deposit (or more sales as regards supplying companies) and new potential business given that credit was granted to the clients.

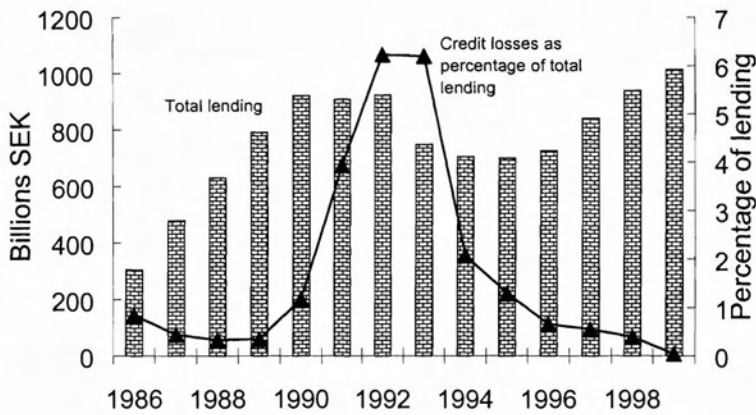


Figure 4. Total lending and credit losses regarding Swedish banks. (Source: Statistics Sweden and Swedish Bankers' Association)

It might be reasonable to argue that loan officers have an individual incentive from credit granting. The interviews suggest, however, that this is not the general case. Loan officers might possibly be rewarded for how well they manage their portfolio of credit, but they do not generally gain any bonus for granting more credit. In contrast, they may receive reprimands if the firm they granted loans to turns out to be a corporate failure. Moreover, many credit decisions are made by groups, which are called credit committees, where each individual loan officer presents his/her affirmative cases. Loan officers receiving no support for their positive judgments may in extreme cases be replaced.

The Risk of Lending

The value of lending must be viewed in the light of the risk that the credit applicant will default (or repay). The risk, as expressed in terms of probability, is negatively correlated with the aforementioned discrepancy in interest rates but positively correlated with risk-adjusted expected return (McNamara & Bromiley, 1999). Debtors deemed as less risky may receive lower interest rates.

When making judgments and decisions about firms' creditworthiness, loan officers face the risk of making two types of errors. First, they can judge firms to be creditworthy and, accordingly, grant them credit, but later the firms turn out to be failures. This Type I error results in clear consequences, such as credit losses. As described in Figure 4, Swedish banks experienced large credit losses in the early 1990s, which at the most amounted to about 9.5% of the total

volume of lending. Swedish supplying companies experienced more or less the same dramatic increase in credit losses forcing many of them into bankruptcy (Dernroth, 1993). Note that these extremely large credit losses were primarily due to macro-economic reasons (Lybeck, 1994).

The second error concerns misclassification of economic viable firms that, on the contrary, are judged to be corporate failures, so that loan officers deny them credit. This Type II error has not as clear consequences, because estimating the amount of income reduction that those rejecting decisions have resulted in is hard and seldom done. One can speculate that if credit had been granted, the lender would have obtained the aforementioned return but also some additional contributions, like deposits as regards banks (or more sales as regards supplying companies).

As one would expect, loan officers are overly concerned with Type I error, because making judgments and decisions that end up in credit losses clearly hamper their future career (Deakins & Hussain, 1994). Rejecting potentially viable firms does not have the same evident impact. In other words, loan officers prefer to avoid risk. Furthermore, bankers may tend to reduce and control financial risk, whereas entrepreneurs may search for an acceptable risk level and then push for larger profits (Sarasvathy, Simon, & Lave, 1998).

One can speculate whether such risk-averse behavior is due to organizational and institutional factors or individual characteristics. When recruiting people, bank organizations might aim at hiring those people who have low degree of risk-propensity (Engwall, 1991). An organizational factor is that a strong decentralization of accountability may lead to caution among the loan officers that may ultimately result in fewer credit losses (Lybeck, 1994). Decentralization requires that the individual loan officers' JDM behavior is coordinated. Institutional factors, like legislation and surveillance by governmental institutions (e.g., the Swedish Financial Supervisory Authority), also have significance.

In conjunction, consideration should be given to the comprehensive research on individual risk behavior. People tend to prefer sure gains but gamble with losses (Kahneman & Tversky, 1979). Decision-makers are prone to view problems as unique so they neglect past statistics or base rates (Kahneman & Lovallo, 1993). The more personal involvement, the stronger tendency of the decision-maker to remain or increase his/her commitment in an implemented investment or project (Staw, 1976). Such escalation behavior is associated with managerial turnover, because new bank managers do not suffer from status quo bias so that they are able to efficiently cope with the credit losses (Staw, Barsade, & Koput, 1997).

In short, one can assume that such risk-averse behavior depends upon a combination of individual and organizational factors.

Descriptions of the Procedure for a Credit Application

To give the reader an idea of how credit granting works in practice, I hereby give illustrations of two typical credit cases as regards a loan proposition and an application for trade credit. Figure 5 describes the procedures for the loan proposition and the trade credit application. Those illustrations are based on extensive interviews with experienced bank loan officers and experienced credit managers in supplying companies.

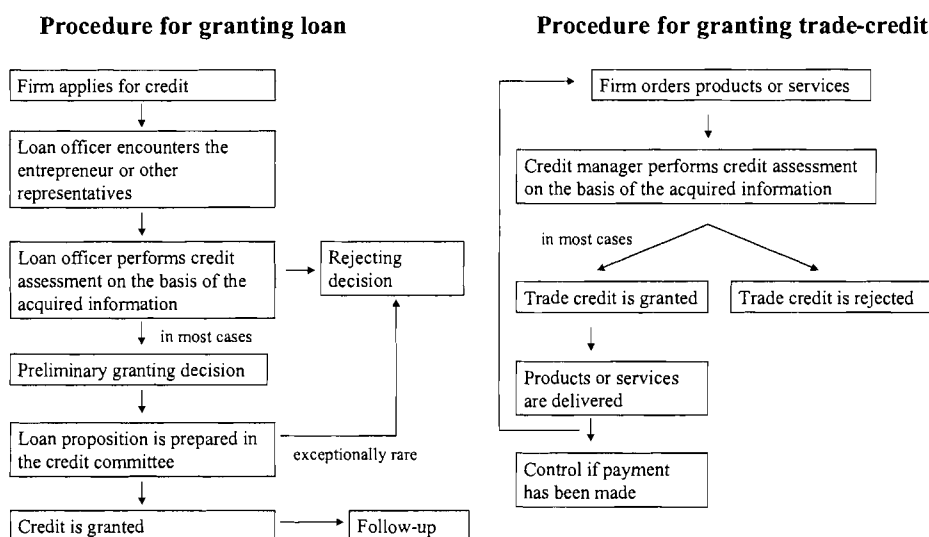


Figure 5. Procedures for typical credit cases. Based on interviews with experienced lenders.

The Typical Case of a Loan Proposition

A typical application for a loan as regards small firms starts with the entrepreneur turning to the bank and requesting a loan. The small firms (i.e., firms with turnovers below about 60 million SEK) can concern all kinds of businesses, for instance, call centers, consulting agency, youth hostels, and garage. Before that stage, the entrepreneur has often been in contact with either development funds and county administrative boards (i.e., ALMI) or professional organizations (e.g., business associations) where he/she has learnt how to write business plans including additional information and may have even been granted some funds. In general, the entrepreneur is already a client to the bank.

My interviews suggested that a rough estimate of the number of new loan propositions assessed by the loan officer is about two cases per weeks. In addition, he/she makes updated credit assessments for the portfolio of outstanding loans. On the whole, a loan officer can make roughly 500 credit assessments in a year.

The loan officer encounters the entrepreneur or representatives like the managing director of the firm. As regards small firms, the entrepreneur is often the managing director, so henceforth no distinction will be made between those two roles. At the encounter, the entrepreneur presents his/her case by specifying the purpose of the loan proposition, reporting accounting and non-accounting information for the past and present time, and estimating forecasts. The loan officer receives written documentation, raises questions, and makes notes. The encounter may take place either at the bank or the entrepreneur's office.

After the encounter, the loan officer performs a credit assessment on the basis of the information acquired by the entrepreneur, external sources such as credit rating agencies, and internal sources like bank account statements. That is, given that the proposition concerns a substantial amount (i.e., more than 500,000 SEK). Credit cases that concern minor amounts (e.g., less than 50,000 SEK) are called no-brainer, as they require little cognitive effort and, thus, are granted almost immediately. Two loan officers generally grant credit cases exceeding the minor amount but falling short of the substantial amount.

If, given a case with a substantial amount, the assessment points to a rejecting decision, the loan officer informs the entrepreneur that the proposition has been rejected. In most cases, the credit assessment results in a preliminary affirmative decision as uncertainty is balanced against additional collateral or conditions. Before the credit can be granted, the formal decision is made by a credit committee, which generally consists of three to seven senior loan officers. According to the interviews, it is seldom that a case prepared for the credit committee turns out to be rejected, despite the initially positive judgment made by the individual loan officer. An explanation might be the training programs for junior loan officers that include practical exercises aiming to teach them how to prepare credit cases for the credit committee. After the formal affirmative, the credit is granted and the decision is implemented.

The Typical Case of a Trade Credit Application

The procedure for a case of trade credit application varies primarily with regard to line of business, so it is problematic to give an illustration of a typical case. However, the following illustration is a simplified but adequate representation of how a case of trade credit generally proceeds in (Swedish) supplying companies operating as, for example, wholesale dealers of computer and electronic products, various building materials, petrol, and tires.

First, a sales person representing the supplier encounters the new customer company, which then places an order with the firm. In the ideal case, before the products are delivered, the credit manager performs a credit assessment aiming at examining the customer's credit worthiness so that a credit limit can be set. This limit states the highest amount of total credit that can be given. For most cases he/she grants trade credit without any conditions. After that, the products are delivered. Because trade credit deals with short time periods, the credit manager can receive immediate feedback whether his/her judgment was accurate. If the customer does not pay for the delivered products, the credit manager takes actions such as preventing the customer to order more products. It must be noted that supplying companies are not in the same strong position as banks when it comes to collect claims. This strong position is due to the fact that banks demand collateral whereas suppliers do not, for the reason that such behavior may interfere with business.

Alternatively, the trade credit case may proceed in the following way. An existing customer places the order directly without encountering the sales person. Unless he/she does not exceed his/her credit limit, the products will be delivered instantaneously. Otherwise, the credit manager will reassess the creditworthiness of the customer, so that a new limit can be set. In this updated credit assessment, consideration is given to the customer's track record of payment.

The credit managers do not set the credit limits by themselves. Simply put, higher levels of limits are set in co-operation with the market manager or the managing director. The higher the level, the greater involvement by the top management team. Typically, this is the case for matters with considerable amounts of trade credit exceeding a couple of millions SEK. For example, such matters may concern constructions of large projects like switchboards, aircraft, and ships. However, such matters are beyond the scope of the investigation.

An Economic-theoretical Perspective on Credit Granting

From an economic-theoretical perspective, credit granting may be like a game between the debtor and the creditor (Camerer, 1990). This game is associated with information asymmetry. Such asymmetry assumes that a debtor is privately informed in terms of the fact that he/she has incentives to make his/her firm to appear more viable resulting in presumed difficulties for the lender to make accurate predictions about the debtor's behavior, intentions, and incentives. Applied to the case illustrations above, the credit applicants would, accordingly, have opportunistic reasons to report financially strong solvency making the task for the loan officer (and the credit manager) more complicated. However, in real life, the reverse asymmetry in information may exist due to the fact that lenders

with their extensive experience of assessing debtors have obtained advantages in information processing enabling them to make accurate judgments and decisions (Cressy, 1994).

Imperfect information may result in two kinds of economic inefficiencies, moral hazard and adverse selection, preventing the credit market to function efficiently (Milgrom & Roberts, 1992). In a seminal paper, it has been shown how adverse selection (in theory) arises in credit markets in the way that higher interest rates suppress credit-worthy debtors, but attract debtors with poor economic viability (Stiglitz & Weiss, 1981). The authors' argument was as follows: It is only the risky projects (i.e., in terms of variance in the profit) that can afford borrowing money to such high levels of interest rate. Such risky projects have low probability of being successful. As a consequence, the loans will not be repaid, the lenders will lose money and in the long run the credit market might be terminated. On the other hand, this problem of adverse selection might result in over-cautious demands on the credit applicants so that not only the risky projects are suppressed, but also some of the financially viable projects are turned down (Cressy, 1994). In addition, due to the restrictive demands, the viable projects may prefer not to apply for credit and, in contrast, employ alternative ways to obtain credit. This tendency may lead to a funding gap as is argued to be the case for lending to small firms (Cressy & Olofsson, 1997).

To prevent adverse selection, the creditors (e.g., banks and supplying companies) undertake differentiation activities in order to find out about the informed debtors' behavior, intentions, and incentives (cf. Milgrom & Roberts, 1992). In the terminology of economics, such activities are called screening, which correspond to the earlier mentioned credit assessments performed by loan officers. An alternative way is, in theory, that the debtors with financially viable projects might signal their good ability and intention to fulfill their obligations (Milgrom & Roberts, 1992). Due to the opportunism by dishonest debtors and given the fact that the lenders know about this kind of opportunism, such signaling behavior might have little impact on increasing one's likelihood of receiving credit. Some evidence from business life suggests that this kind of signaling might have an effect. Consider, for example, the embezzlement of the Swedish investment company Trustor where the person (with a shady past) accountable for this embezzlement used a British nobleman (with a presumed clean past) as the front figure in order to decoy the stockowners (Lindstedt, 2000). This decoy turned out to be successful in Sweden (but failed in Finland).

A Psychological Perspective on Credit Granting

As stated in the previous chapter, the dissertation studies individual judgment and decision-making behavior in regard to credit granting. There are, however, additional psychological processes underlying the credit assessment that is not investigated. For instance, the focus of investigation does not concern the social interaction between the loan officer and the entrepreneur or the decision-making by the credit committee. In this last section, I will briefly comment on those two aspects.

The Interaction between the Loan Officer and the Entrepreneur

Many people believe that the encounter between the loan officer and the entrepreneur provides a large quantity of diagnostic information as regards the entrepreneur's ability to run a business as well as his/her intention to fulfil the obligations. This belief must be viewed in the light of the vast body of research showing that, apart from marginal addition of diagnostic information, interviews might, on the contrary, be severely misleading (Garb, 1998) unless they are well structured.

Social-psychological research has shown, among other things, that encountering a person may seriously bias the processing of information in the way that a person with some positive or negative personal traits is also deemed having additional positive or negative traits despite such evidence. This tendency is called the halo-effect (Plous, 1993). Applied to the lending context, the halo-effect means that an entrepreneur, who is hypothetically judged to be reliable, energetic, responsible, and sincere, may also be assumed to have good leadership skills. The loan officer might also merely pay attention to circumstances that confirm rather than disconfirm his/her preliminary impression about the credit applying entrepreneur. This tendency is coined confirmation bias (Plous, 1993) and will be further described in chapter 3.

Furthermore, the loan officer should consider the entrepreneur's statements with caution, because it is likely that they are distorted. According to the economic-theoretical perspective, the distortion is simply due to the entrepreneur's opportunistic aspiration for receiving credit. A more plausible reason for the distortion is that the entrepreneur like other people has underlying values that affect his/her judgments and beliefs, so that he/she may be a victim of wishful thinking (cf. Sjöberg, 2001). For instance, by underestimating the influence of situational factors (e.g., business condition) and by overestimating his/her ability, the entrepreneur may have made too optimistic forecasts on the fate of his/her firm.

As regards the length of the interviews, it should be noted that a five-minute encounter is in most cases sufficient to make accurate predictions about an individual and that a longer encounter does not yield more accurate predictions (cf. Ambady & Rosenthal, 1992).

The Decision-Making by the Credit Committee

When making decisions in groups, the group members may behave as the individual decision-maker (see the next chapters), but in addition there is social influence. This influence can be expressed as the tendency to seek conformity within the group (Plous, 1993). This tendency might mean that a member in the credit committee suppresses his/her doubts about a loan proposition, because he/she might not want to put forward a view that contrasts with the one held by the majority of the committee members. The well-known phenomenon of groupthink may also have relevance (for a review, see Esser, 1998). Group discussions can also trigger a group member to advocate judgments and decisions that are either more risky or more conservative compared to those he/she made individually (Plous, 1993). Thus, the credit committee is associated with different social psychological factors.

Summary

To sum up the content of this chapter, the key points have been:

- There are some distinctions between bank loans and trade credit.
- Credit granting is a judgment and decision making task aiming at assessing the likelihood that the debtor fulfills his/her obligations when being entrusted with a loan.
- Credit assessment includes accounting and non-accounting information and aims at screening repaying firms from the non-paying ones.
- The return of lending is balanced against the risk involved.
- Loan officers and equivalent professionals tend to be risk averse.
- Credit granting is associated with information asymmetry.

AN OVERVIEW OF RESEARCH ON JUDGMENT AND DECISION-MAKING

In the introduction of this thesis it was argued that judgment and decision-making (JDM) is fundamental for all kinds of economic behavior and, thus, shapes credit granting and other business decisions. For that reason, it is essential to review the substantial body of research focusing on describing how people form judgments and make decisions. The goal of this chapter is to provide such an overview with emphasis on psychological research on individual JDM. The chapter is organized in eight sections: (i) the interdisciplinary influence, (ii) dimensions of JDM, (iii) two research strands, (iv) the structural perspective, (v) critique of the structural perspective, (vi) process-tracing methods, (vii) the process-oriented perspective, and (viii) summary of key points.

The Interdisciplinary Research Area of Judgment and Decision-Making

Research on judgment and decision-making is a broad area that has attracted researchers in various disciplines, like business studies, economics, philosophy, psychology, and statistics. This interdisciplinary interest may be motivated by the fact that JDM pervades and shapes our lives. That is, properly (or for that matter poorly) made judgments and decisions may mark progress (decline) in our lives, because they might boost (damage) our careers and determine our place in society and in the world. As a result, researchers in various disciplines have approached the area from different perspectives in the pursuit of finding ways enabling individuals (and organizations) to make better decisions or, alternatively, to find formulas representing human decision-making.

When studying decision-making, economists concentrate on the decision outcome as their prime research interest is to investigate to what extent individuals (and organizations) make rational choices (Simon, 1986). In other words, economists apply a normative and substantive perspective on rationality assuming that the decision-maker reaches a decision that is objectively best in terms of a given abstract utility function (Simon, 1986). No considerations are taken to cognitive limitations, task characteristics, goals, and values of the individual. It is also noteworthy that no distinction is made between judgment and decision-making; they are simply viewed as inseparable concepts. Deviations from the prediction of the normative decision theories are essential as those deviations might imply economic inefficiency and, therefore, research should be devoted to eliminating or reducing those factors, or errors, causing such deviations (Camerer, 1995).

In contrast, psychologically oriented research on JDM focuses mainly on describing the factors underlying the decision outcome. As was previously mentioned, such factors involve cognition, attitudes, beliefs, expectations, motivation, emotions, and learning. The cognitive activity (i.e., the decision process) occurring between decision inputs and decision output is deemed particularly important. In their best-selling primer on JDM, Russo and Shoemaker (1990) emphasized the importance of having an accurate decision process, because that increases the likelihood of making accurate decisions.⁶ People can otherwise rely equally on coins, dices, or other random devices when making judgments and decisions. Thus, the quality of decisions should be evaluated with respect to the process unfolding the decision rather than the outcome (Russo & Shoemaker, 1990). Such a procedural view on rationality takes into account the cognitive limitations, task characteristics, goals, and values of the decision-maker (Simon, 1986). This view presumes also research endeavors aiming at describing empirically how people form judgments and make decisions.

In essence, the JDM-area has progressed as follows: Before the middle of the 1950s economists, mathematicians, philosophers, and statisticians made most contributions, but since that period mainly researchers in psychology have enriched the area (Goldstein & Hogarth, 1997). An explanation for that development may be found in two circumstances traced back to the middle of the 1950s (Payne, Bettman & Johnson, 1992). First, psychologists were introduced into the area by a seminal paper authored by Ward Edwards (1954). Second, the argument by Simon (1947/1997) that future research on JDM should be devoted to studying how people (and organizations) actually make decisions, as such an approach gives a better understanding of decision behavior. The best way to achieve such an understanding is to make direct observations of decision behavior concerning people (and organizations).

Because research on JDM is interdisciplinary, there is not a single paradigm but rather multiple research programs with different methodologies and theories (Goldstein & Hogarth, 1997). In many cases these programs overlap and act independently of each other, but there are interdisciplinary schools within research on JDM. For instance, *Behavioral Decision Research* is an important and stimulating area that employs concepts and methods from economics, social and cognitive psychology, and statistics (Payne et al., 1992). Other examples of areas are *Behavioral Accounting and Finance* and *Consumer Behavior Research* where the empirical findings from the psychologically oriented decision research have been acknowledged by researchers in economics, finance, accounting, and marketing.⁷

In conclusion, this section has argued that psychologically oriented research on JDM is particularly necessary in order to provide insight into how people make judgments and decisions.

Dimensions of Research on Judgment and Decision-Making

There are many distinctions to be drawn within the psychologically oriented research on judgment and decision-making. In the next sections, I will discuss two of those distinctions: (i) choice versus judgment and (ii) structural versus process-oriented perspective. One may argue that the former distinction is particularly relevant when the structural perspective is applied, as most of the process-oriented research concern choice (cf. Abelson & Levi, 1985). However, alternative distinctions are acknowledged and briefly mentioned below.

In their review of research on decision-making and decision theory, Abelson and Levi (1985) suggested two dimensions of JDM research. First, the choice situation may involve a small or large amount of risk. That is, in some situations the decision-maker chooses between alternatives with fixed and almost riskless outcomes (e.g., hypothetical choices between apartments), whereas in other situations that person is confronted with probabilistic and, thus, risky outcomes (e.g., lotteries). Because risk pervades life, situations without uncertainty appear to be unlikely. Second, research can have either normative or descriptive goals. It must be noted that the descriptively oriented research may serve some prescriptive purposes, as such research gives suggestions of how to improve JDM (cf. Stanovich, 1999).

Furthermore, research may be categorized with respect to the ecology in which the studied judgments and decisions were made. Basically, there are three types of ecology: controlled, real, or simulated. Perhaps the most commonly employed one in JDM research, the *controlled ecology* concerns hypothetical situations that require participants (often students) to form judgments and make decisions. An example of the controlled ecology is the study on information distortion by Russo, Meloy, and Medvec (1998) where students made hypothetical choices of consumer-products. The *real ecology* relates to JDM-tasks studied in the real world and can be referred to as naturalistic decision-making (cf. Klein, 1999). Features of naturalistic tasks include time pressure, high stakes, inadequate information, ill-defined goals, and dynamic conditions (cf. Klein, 1999). Naturalistic decision-making may be illustrated with studies aiming at investigating how professionals (e.g., firefighters) make decisions (see Klein, 1999). Studies on action sampling (e.g., Sjöberg & Magneberg, 1990), where participants are prompted to report their ongoing activity with respect to different factors (e.g., mood and emotions), can be argued to be examples of research investigating decision-behavior in real world settings. Finally, the *simulated ecology* involves JDM-tasks occurring in artificial but realistic settings. For instance, so-called computerized micro-worlds (e.g., NewFire and MORE) have been designed to investigate how people make interdependent decisions in a changeable world where the changes occur autonomously and as a result of the earlier made decisions (cf. Brehmer, 1999).

Business games may also be examples of simulated ecology designed to study decision-making in business contexts (e.g., Ståhl, 1986; Edman, 2000).

Two Research Strands within Judgment and Decision-Making Research

Psychologically oriented research on JDM can be divided into two different but interacting avenues (Goldstein & Hogarth, 1997): choice and judgment. Although not completely integrated, the two avenues have recently approached each other because of the increasing focus on decision process and task characteristics; see, for instance, work by Gigerenzer and his colleagues (1999).

The Choice Strand

The first avenue concerns research on how people choose between multiple options and make probability estimations. A starting point is the normative decision theory including expected utility models and Bayesian probability integration. Violations of those rational models must be viewed with respect to the underlying procedures resulting in erroneous judgments and decisions.

In the 1970s this avenue was evolved and dominated by a research program aiming at studying those heuristics that people relied on when making probability estimations and choices despite the fact that such cognitive shortcuts tend to severely bias people's judgment. Crudely speaking, the use of heuristics was deemed to be irrational. A collection of representative studies within this research program as well as a repertoire of such heuristics and biases can be found in Kahneman et al. (1982). In general, this research program has shown that people tend to make probability estimations concerning events on the basis of representativeness, availability in memory, or valid or invalid anchor values (Kahneman et al., 1982). The program has also shown that people (including business experts) tend to be poorly calibrated in the sense that events they claim will occur with certainty will in fact only happen in about (hypothetically) 80% or 20% of time. Simply put, people are either overconfident (most likely) or underconfident (Camerer, 1995).

It should be noted that this "heuristics-and-biases paradigm" have been challenged in the 1990s and some biases, like overconfidence, has been claimed to be results of experimental artifacts (Juslin & Olsson, 1999). Extending the notion of bounded rationality by Simon (1947/1997), it has been recently argued that the human mind has an "adaptive toolbox" of specialized cognitive shortcuts that "make us smart" in terms of enabling us to cope rationally with the environment (Gigerenzer et al., 1999). Thus, relying on heuristics is not necessarily irrational – it can be quite rational.

The Judgment Strand

The second avenue deals with research on psychological evaluation of stimuli or, simply, judgment. More specifically, this avenue concerns work on how people integrate multiple, probabilistic, potentially conflicting cues of information to arrive at an understanding of the situation (Goldstein & Hogarth, 1997).

Principally, this avenue, which may also be referred to as judgment analysis, stems from the notion of probabilistic functionalism which was originally founded by the Austrian psychologist Egon Brunswik (Cooksey, 1996). This notion has three principles (Brehmer & Joyce, 1988; Cooksey, 1996). First, individuals adapt to an ambiguous environment reflected in probabilistic cues and the adaptation is achieved with some uncertainty. Second, when evaluating the probabilistic cues, the perceptual system of individuals functions like an intuitive statistician. As will be further explained in the next section, the cues have varying diagnostic values. Third, emphasis was put on studying natural task environments and studying behavior occurring in the natural task environments. That is, laboratory experiments must employ representative designs with respect to characteristics of task and participants.

A Structural Perspective when Studying Judgment and Decision-Making

The structural perspective studies the activity in the Black Box of the decision-maker by deriving through mathematical or statistical techniques the relationship between input and output variables. A representative and stimulating example of such an approach is the previously mentioned judgment analysis, which will be described in this section. Other JDM models conducted within the structural perspective are expected utility theory and its variants as well as the interacting but independent research programs on adaptive decision-making (Payne, Bettman & Johnson, 1993) and fast and frugal heuristics (Gigerenzer et al., 1999). Among other things, the latter two programs have employed simulation methods (i.e., Monte Carlo) in order to evaluate the accuracy and the generalization of various decision strategies. Moreover, information integration theory (Anderson, 1996) is another example of a structural perspective on JDM and has some similarities with judgment analysis apart from the fact that the former theory employs another statistical method (i.e., factorial design).

Judgment Analyses

Judgment analysis rests upon Brunswik's ideas of probabilistic functionalism that are summed up in the conceptual framework called the Lens model as illustrated in Figure 6. In the Lens model two subsystems, task and cognitive systems respectively, are linked together by intermediate or proximal sensors (Cooksey, 1996). The task system concerns the relationship between the (distal) criterion and the proximal cues, which will be explained below. A criterion is simply the phenomenon (e.g., the health of a patient or the financial condition of a company) that the individual attempts to make predictions about. The cognitive system focuses on the structural relationship between the proximal cues and the judgments (or decision) made by the individual (e.g., the illness of the patient or the insolvency of the company).

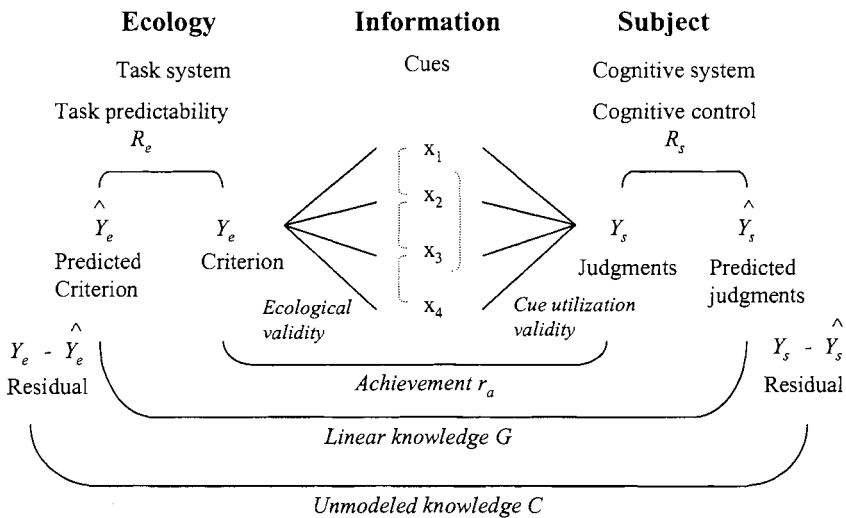


Figure 6. The Lens model adapted for the study of human judgment (Cooksey, 1996)

The notion of information. Proximal cues are pieces of information available in the ecology (or the environmental context) reflecting to a varying extent the criterion. For example, blood pressure and temperature or accounting and non-accounting information may reflect the health of a patient or the credit worthiness of a firm, respectively. The link between the criterion and a single cue is called ecological validity measuring to what extent the cue reflects the criterion. The link between an individual cue and the judgment is referred to as

cue utilization validity expressing to what extent the judge is able to rely on relevant and diagnostic information when making judgments and decisions.

The cues are assumed to provide overlapping information about the distal criterion. In other words, the cues have intercorrelated diagnostic values. Perfectly correlated cues suggest that a judge might merely consider one such cue and disregard the remaining ones as they are redundant and, thus, cannot yield any additional information about the criterion. However, it is reasonable to expect that the proximal cues are neither perfectly correlated nor perfectly uncorrelated, implying that there exist varying levels of intersubstitutability between the cues.

The notion of intersubstitutability can be illustrated with the variety of information being the topic for this dissertation. The large numbers of financial ratios overlap each other to varying extents as regards the prediction of the financial state of firms. Research on prediction of financial distress aims to reduce the number of cues and find those few ratios that best reflect the criterion (i.e., bankruptcy or financial distress). Condensing techniques that have been employed are mainly factor analysis that often resulted in solutions with orthogonal variables (cf. Altman, 1983).

It is rare that one single (proximal) cue can unambiguously capture the criterion, but this might happen in a few isolated cases. Consider the following mystery of Sherlock Holmes where the racehorse Silverblaze has disappeared and a stableman has been found dead. As usual in detective stories several cues pointed in one direction; in this particular case, the prime suspect was a gambler who would profit from the horse's disappearance. He had been seen around the stable and had lost a scarf that had been found near the stable. Hence, the proximal cues were motive, occasion and lost belongings. However, Holmes was annoyed at the following observation: The night the horse disappeared, the watchdog did not bark despite its habit of barking when a stranger entered the stable. The absence of barking suggested that the culprit must have been a person familiar to the dog and, accordingly, it could not have been the prime suspect. That single proximal cue was the key to the solution of the mystery; the suspect was proved innocent and the horse was found.

Pieces of information like the "dog did not bark" are called broken-leg cues and have highly diagnostic value in some isolated cases but for the typical case they might not reflect the criterion. The following two cases act as examples of business related broken-leg cues. First, the made-up Ph.D. title of the upcoming entrepreneur in the Swedish medical company Fermenta, which after the disclosure of the non-existing academic title ended up in financial distress (e.g., see Petersson, 1987). Second, the embezzlement of the Swedish investment company Trustor where a British nobleman acted as the front man but due to his shady past a journalist managed to uncover the tangle (Lindstedt, 2000).

Indeed, recent research shows that a single cue may have strong prediction power for most cases. In particular, Gigerenzer and his colleagues (1999) have shown that a fast and frugal decision rule based on one single cue has remarkable prediction power and often outperforms more complex rules involving more information. Two examples of such rules are the recognition and the "take-the-best" heuristics, respectively (Gigerenzer et al., 1999). First, the recognition heuristic can be illustrated with the fictional situation of picking the best of two soccer clubs (e.g., Manchester United versus Leicester City) where the uninformed individual simply asks him/herself: Which club do I recall? Given the fact that a well-known club is generally associated with good performance (e.g., cup and league titles), making it widely known and, thus, more available in memory, the individual has no effort in predicting the best club (i.e., Manchester United). Second, the "take-the-best" heuristic works as follows: estimate the cue with the highest validity, employ that single cue to predict the criterion, and then make the judgment or decision. On the basis of simulation, this rule and additional rules (i.e., a linear regression model and a model with equally weighted cues) have been tested in various environmental contexts. The resulting comparisons indicate that the "take-the-best" rule made 76% correct predictions across the 20 different environments (e.g., predicting attractiveness of people, house prices, salaries, car accidents, and rainfall); a number that equaled the power of the regression model (Gigerenzer et al., 1999). Gigerenzer et al. (1999) have explained that the success of this kind of reason-based decision-making depends on the structure of the environment (i.e., the link between criterion and cues). In short, the "take-the-best" heuristic performs best in environments characterized by multiple and non-compensating pieces of information. With non-compensating cues a certain cue is more valid (in terms of reflecting the criterion) than any combination of less valid cues (Gigerenzer et al., 1999).

An example from a business environment might better illustrate this point. In a seminal study by Libby (1976), 42 loan officers predicted which 30 of 60 firms would go into bankruptcy within three years. Their predictions were then compared with ones made by statistical combination of the five employed financial ratios and it was shown that the loan officers scored on the average somewhat worse (74% correctly predicted cases) than the model (85%). More important was the fact that one single ratio, current assets to current liabilities, correctly classified 80% of the cases, as pointed out by Dawes (1982).

Finally, it has been argued that information may be differentiated between diagnostic and relevant cues. Diagnostic cues refer to information that to some extent is predictive of judgment, whereas relevant cues refer to information that could be used regardless of the situation (Schwarz & Norman, 1989).

The match between task and cognitive systems. Recall that the two subsystems, task and cognitive systems, were assumed to be to some extent linked together as illustrated in Figure 6. The stronger the link, the better the achievement of the individual judge. To be specific, the goal of the individual is to strive to make his/her judgments or decisions match the criteria, because when the two systems fit perfectly the individual is presumably able to make correct judgments and the best decisions (Cooksey, 1996). The match between the two systems (r_a) can be expressed in the following formula:

$$r_a = G R_e R_s + C [(1-R_e^2)(1-R_s^2)]^{1/2}$$

G = the correlation between the linearly predictable variance in the task system and that in the cognitive system; $-1 < G < 1$

R_e = the multiple correlation between the proximal cues and the distal criterion; $0 < R_e < 1$

R_s = the multiple correlation between the proximal cues and the human judgments; $0 < R_s < 1$

C = the correlation between the resulting residuals from the regression models of the two subsystems; $-1 < C < 1$

This Lens Model Equation decomposes the achievement into a linear component ($G R_e R_s$) and a non-linear component or a residual ($C [(1-R_e^2)(1-R_s^2)]^{1/2}$). If the task and cognitive systems can be perfectly modeled by a linear regression model, there will be no non-linear component. The non-linear component represents the knowledge that cannot be modeled and has been claimed to correspond to intuition (Blattberg & Hoch, 1990). The first parameter (G), or the matching index, concerns the relation between the systematic features of the cognitive subsystem and those of the task subsystems (Brehmer & Joyce, 1988). The second parameter (R_e) refers to the extent to which the distal criterion can be estimated by the proximal cues and is expressed as the multiple correlation of these concepts. It defines the predictability of the task: that is, a value near zero or one indicates that the task is impossible or possible, respectively, to predict using the proximal cues. The third parameter (R_s) indicates the cognitive control of the subject's judgment policy. Cognitive control can be defined as the similarity between subject's actual judgment and the prediction made by the model of the subject's judgment (Cooksey, 1996). It is measured by the multiple correlation between actual judgment and the prediction.

In conjunction, it should be mentioned that variables in the Lens Equation can be further decomposed into seven factors: (i) environment predictability, (ii) the fidelity of the proximal cues, (iii) the match between environment and judge, (iv) the reliability of information acquisition, (v) the reliability of information processing, (vi) regression bias, and (vii) base-rate bias. For the

complete statistical derivation, see Stewart & Lusk (1994) or see Hedberg (2000) for a discussion about the implications of the seven components for economic forecasts.

Possible comparisons. Judgment analysis assumes basically that insights into JDM can be obtained through comparisons between inferences made by a human judge (i.e., clinical judgment) and those inferences made by a simple statistical combination (i.e., actuarial model) of the same information available to the judge. In many cases, this statistical combination is a linear model. Note that the actuarial model does not necessarily, although preferably, have to be derived from actual outcomes; it is possible to construct such models on the basis of outcomes made by, for instance, expert judges.

Alternatively, the actuarial model may be compared with a paramorphic representation of the individual judge (Doherty & Brehmer, 1997). Basically, this model of man is a linear regression model where the dependent variable (Y) is the judgments made by the individual, the predictors (X_1 , X_2 , etc) are the cues available to the individual, and those cues have been statistically weighted (B_1 , B_2 , etc) in an optimal manner through regression analysis. The paramorphic model can also be constructed on the basis of a so-called improper linear procedure implying that the cue weights are not optimally calculated (as is the case of regression analysis) but, in contrast, are set to non-optimal values such as equal, random or other weights (Dawes, 1982). Constructing models of man is often called bootstrapping, because the derived model can improve judgment without any information about the real outcomes or as Camerer and Johnson (1991) put it: "It [the model of man] pulls experts up their bootstraps" (p. 199).

Agreement with other judges. In addition to comparisons between judgments made by an individual judge and those generated by diverse models, it is also possible to estimate the agreement among a group of judges. In this case, a criterion is not necessarily required. The level of agreement is achieved by correlating an individual's judgments with those made by his/her peers. Alternatively, the models of the individuals may be correlated. Depending on whether the task and the cognitive systems are strongly or weakly correlated (i.e., the G -variable above), the phenomena of false disagreement and false agreement might arise (Cooksey, 1996). These phenomena can result in statistical artifacts indicating that people hold, on the one hand, quite different judgment policies when they in fact may agree in some of their judgments or, on the other hand, quite similar judgment policies when they in fact may disagree in some of their judgments.

To sum up, the structural approach in the study of JDM concentrates on indirectly inferring the cognitive process that occurs between input, like information, and output, like judgments and decisions. The next section discusses the critique of this approach.

Critique of the Structural Perspective

Theories of JDM that rest upon a structural perspective have over the years been criticized and claimed to be an unrealistic and inadequate description of how people form judgments and make decisions. Judgment analysis, or rather Brunswik's theory of probabilistic functionalism, has been argued to be a matter of poor conceptual analysis of mental concepts for two principal reasons (Sjöberg, 1987). First, the use of beta weights estimated by a regression analysis is inappropriate, because that requires (almost) perfectly orthogonal cues; otherwise it is not possible to establish the importance of the cues. Second, when forming judgments people probably do not consider the statistical distributions of the cues. Hence, it is likely that means, standard deviations, and inter-correlations concerning the cues are not mentally processed (Sjöberg, 1987).

Empirical evidence clearly suggests that people organize cues in a non-linear and interactive (e.g., configural) manner rather than in a linear and independent way (cf. Camerer & Johnson, 1991). Linear models have also been argued to be weak inference statistics, because they do not capture the required parallelism (i.e., the non-existence of crossover effects in the cues) in a factorial graph where the dependent variable is plotted against an independent variable for each level of the other independent variable (Anderson, 1996). In contrast, it is suggested that the integration of information (i.e., the cognitive algebra) follows an averaging procedure where the cues are multiplied by absolute weights and then divided by the sum of those weights (Anderson, 1996).

Moreover, the structural approach assumes that all possible information is available for the individual decision-maker and that all that information is processed. This assumption is somewhat unrealistic, because in real life information is not evident, leaving the decision-maker to search and acquire cues. Accordingly, the structural perspective does not provide insight into how people search, acquire, and stop acquiring cues when making judgments and decisions. Empirical studies infer that people rely on less rather than more information in their judgments and decisions. When organizing those pieces of information it is not only the amount that matters but also the sequence of how those pieces were acquired or presented, as will be discussed in the next chapter.

In conclusion, the structural perspective yields limited insight into the decision process and, therefore, focus should instead be on the cognitive activity occurring during JDM. Before embarking on this process perspective, I will briefly describe methods unfolding decision process.

Process-tracing Methods

A fundamental principle for the process perspective is that data is collected during the making of judgments and decisions. Data collected after the decision process tend to be distorted by participants' tendency to rationalize thoughts and reasons. Three process-tracing methods are used to explore cognitive processes: verbal protocols, information display boards, and eye tracking. These methods should be regarded as complements rather than substitutes as they yield almost the same results (Biggs, Rosman, & Sergenian, 1993; Lohse & Johnson, 1996). However, there is a distinction: Verbal protocols provide insight into how information is acquired and used, whereas information display boards and eye-tracking focus on acquisition of information. The latter two methods may be regarded as more or less substitutes (Lohse & Johnson, 1996). Moreover, a review article concerning process-tracing studies (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989) showed that studies with information display boards tended to have twice as many participants as did verbal protocol studies.

Verbal Protocols

The core idea behind verbal protocols is that people can report their thoughts and that these thoughts reflect their cognitive processes. There are two kinds of verbal protocols: concurrent or retrospective. Concurrent verbalization implies that subjects think aloud while performing a task, whereas retrospective verbalization means that they explain what they were doing (after the performance). Ericsson and Simon (1993) recommended that both concurrent and retrospective verbalization are employed, but in situations requiring immediate action (e.g., extinguishing fire) retrospection must be used (Klein, 1999).

Verbal protocols may be associated with two forms of invalidity (Russo, Johnson & Stephens, 1989). First, verbalization may change the primary cognitive process so that a subject takes more time to perform the task and/or performs it poorly (i.e., reactivity). Second, subjects may fail to report thoughts or report thoughts that have not occurred (i.e., non-veridicality).

The instructions to participants can influence their cognitive processes. Ericsson and Simon (1993) distinguished between effects caused by instructions to verbalize per se and effects caused by instructions to verbalize explanations or to keep a high level of verbalization. The former effects have little impact on subjects' on-going cognitive process, whereas the latter effects change the process and decrease the validity of the concurrent and retrospective protocols (Ericsson & Simon, 1993). Therefore, the researcher should simply remind the participants to "please, think aloud".

Verbal protocols are associated with phenomena that may decrease reliability. First, although verbal reports are codified by clear rules, there is a risk of subjective interpretations. The common way of dealing with this problem is to have several coders who independently code the protocols, so that a measurement of agreement can be established. However, the coding of verbal protocols may be biased by coders knowing about the hypotheses or by encoders assuming that subjects think in the same way as they do themselves (Ericsson & Simon, 1994).

The second problem is perhaps the main drawback of verbal protocols. Analyzing verbal reports is time-consuming, and there is presumably an implicit restriction of the number of participants in the experiment as well as the complexity of tasks.

Information Board Techniques

This process-tracing method refers to a variety of devices used to track information acquisition behavior. The devices span from simple tools, such as envelopes or posters to sophisticated software programs (see Study 2). Computerized process-tracing offers many advantages including accurate measurement of JDM behavior, complex information environments with multiple human interactions, and participation of several subjects (Brucks, 1988). The main drawback is that the software program might represent an artificial way to search for information in the sense that, for example, participants cannot simultaneously view information on several screens (Biggs et al., 1993). On the other hand, the rapid development of the Internet as a tool to buy and sell products and services may suggest that research findings generated by computerized process-tracing techniques have external validity and provide valid generalizations. However, this method has a restricted scope of investigation because it only gives insight into how people search for information with respect to depth, sequence, amount, and content.

Eye Tracking

Eye tracking is similar to information board devices with respect to its emphasis on information acquisition behavior and aims at recording participants' eye movements while they browse through information. This glance time is claimed to be a rough estimate of the duration of the cognitive process that has initiated the task (Russo, 1978). Eye movements can be measured by automatically recording devices like Eyegaze or by videotaping the participant's face and then manually code the eye fixations. The latter tedious measurement connects to the coding procedure regarding verbal protocols and corresponding concern must

be taken to assure reliability; that is, clear coding rules as well as the use of encoders who are unfamiliar with the purpose of the experiments.

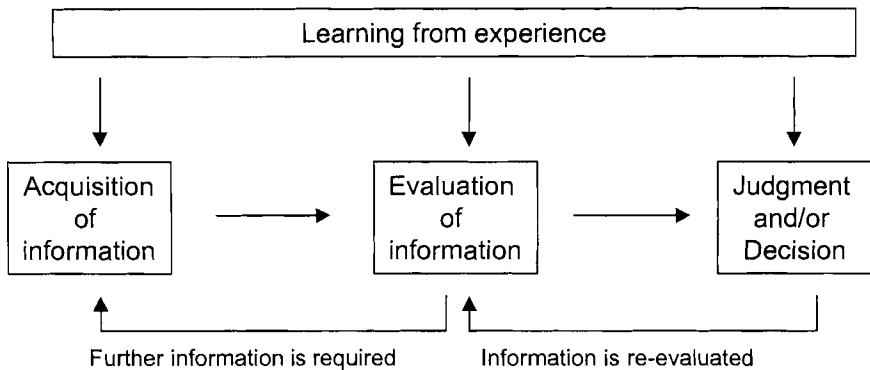


Figure 7. Components of the judgment and decision-making process as adapted from Einhorn and Hogarth (1980).

A Process Perspective when Studying Judgment and Decision-Making

Focusing directly on the mental activities occurring between the informational input and the decisional output, the process-oriented research on JDM postulates that direct observations (i.e., the aforementioned process-tracing methods) of decision behavior should be made. In essence, the cognitive process occurring during JDM passes through three phases (Einhorn & Hogarth, 1980): information acquisition, evaluation of information, and judgment/decision. The phases overlap each other and have interactions implying that JDM is a sequential process. As illustrated in Figure 7, learning from experience should influence the three phases and this impact will be described in the next chapter.

One can argue that framing is an additional phase of the decision process, because framing structures the questions by determining what must be decided and what criteria must be fulfilled. In a sense, framing determines our way of perceiving the world. A serious trap when making judgments and decisions is to have narrow frames, which are mental structures that we create to simplify and organize the world (Russo & Shoemaker, 1990). Narrow frames might lead to inadequate judgments and decisions as the decision-maker has merely considered a limited set of possibilities rather than a larger number of such possibilities.

Acquisition of Information

Information acquisition behavior is derived from search patterns. When making decisions, a subject considers information in two basic ways. On the one hand, he/she may acquire the information concerning each option separately; this is a so-called inter-dimensional or alternative-based search. On the other hand, he/she may acquire certain pieces of information about all options; that is a so-called intra-dimensional or attribute-based search. Consider the hypothetical choice between two potential loan candidates, where the loan officer must choose to whom he/she will grant credit. The loan officer may acquire all cues about each candidate separately (inter-dimensional search) or acquire only one single item of information (e.g., current assets to current liabilities) across the two candidates (i.e., intra-dimensional search).

As regards judgment, the subject may process information in a similar way: He/she may acquire cues within or between categories of information. Recall that loan officers might be trained to make credit assessments in accordance with the five C-factor model (character, capability, capital, conditions, and collateral). A loan officer may process the information in the following way: (i) acquiring information regarding a specific C-factor and then proceed to the next C-factor or (ii) acquiring information back and forth across all the C-factors.

Moreover, when acquiring information people apply heuristics. In particular, the subject may apply the so-called core-attributes heuristic implying that he/she stops acquiring information and commits him/herself once the last of his/her core cues have been acquired (Saad & Russo, 1996). In connection to that, one must note that the sequence of cues has significance and impacts the information processing. It is likely that loan officers receiving a number of negative cues tend to stop acquiring information and arrive at a conclusion faster than their colleagues obtaining a number of positive or mixed cues.

Evaluation of Information

The acquired information is evaluated by employing various decision strategies that are rules or algorithms weighting the cues. Table 2 presents an overview of potential decision strategies. Recall also the aforementioned recognition and “take-the-best” heuristics. Decision strategies can either be compensatory or non-compensatory. Compensatory strategies imply that disadvantages like failing to meet specific criteria do not entirely result in rejection of that option. In contrast, non-compensatory strategies imply that options with disadvantages will not be further considered. Furthermore, before evaluating the information the subject might re-consider the information that has earlier been acquired. This tendency has been coined backtracking and empirical evidence indicates that people tend to re-consider those cues they deemed important (Saad, 1998).

The use of the decision strategies is contingent upon the characteristics of the individual, the task, and the context. Given the characteristics of a specific decision situation, subjects strive to make the most accurate decisions by selecting the rule of the repertoire of strategies yielding the highest accuracy for reasonable amounts of cognitive effort (Payne et al., 1993). The perhaps most important individual factor is experience enabling people to acquire and refine their decision strategies. This factor will be described in the next chapter.

Task and context characteristics can be clustered into four categories of judgments and decisions (Svenson, 1992). First, some tasks are made in a habitual manner without any conscious reflection of information. Second, other tasks are made with respect to one of few attributes favoring the chosen option. The third category takes into account ambiguity that exists because options may have both pros and cons. Still, there is almost a clear idea about the options and their attributes. As soon as the individual has learnt how to consider the third category, those tasks may then belong to the first or second category. Fourth, there are judgments and decisions that represent new, unfamiliar, and uncertain situations. Once the individual has learnt how to deal with such tasks, they might be transposed to the other three task categories.

The adaptation of decision strategies may work as follows. If emphasis is put on generating the highest accuracy people tend to process information in an extensive, less selective, alternative-based, and compensating manner (Payne et al., 1993). In contrast, under time-pressure people tend to rely on a less extensive, more selective, attribute-wise, and non-compensating kind of information-processing (Payne et al., 1993).

Table 2. *Potential Decision Strategies as adapted from Svenson (1979).*

| Decision strategy | Description |
|--|--|
| Dominance rule | An option must be better at least on one attribute to be chosen over other options. Compensatory. |
| Conjunctive rule | The attributes of an option must exceed or equal specified criteria in order to be chosen. Compensatory. |
| Disjunctive rule | The attributes of an option must exceed certain criteria in order to be chosen. Compensatory. |
| Lexicographic rule | An option must have better ranked attributes to be chosen. Non-compensatory. |
| Elimination by aspect rule | Eliminate those options that fail to meet specified criteria of important attributes until one option remains. Sequential and compensatory. |
| Minimum lexicographic rule | Similar to the lexicographic rule, but with the extension to involve differences between criteria and the options with respect to attributes. To be chosen an option must have the least aggregate sum of differences. Non-compensatory. |
| Lexicographic semi-order rule | Similar to the lexicographic rule, but with the extension to involve differences between criteria and options with respect to certain attributes. To be chosen an option must have the least aggregate sum of differences. Non-compensatory. |
| Maximizing number of attributes with greater attractiveness rule (MNAGA) | For each attribute the aspect of a decision option must be classified as better, equal, or worse than the attractiveness of the other option of that attribute. The chosen option has the most favorable classifications. Compensatory. |
| Elimination of least attractive aspect rule | Similar to the MNAGA, but options having the overall worst aspects are eliminated. Compensatory. |
| Choice by most attractive aspect rule | Similar to the MNAGA. The option with the overall most attractive aspects is chosen. Compensatory. |
| Choice by greatest attractiveness difference rule | The option having the greatest attractiveness difference on a certain attribute is chosen without consideration to other attributes. Compensatory. |
| Addition of attractiveness rule | The option having the greatest attractiveness values of the attributes is chosen. Compensatory. |
| Subjective utility model | The attractiveness value or utility of each aspect should be weighted by the subjective probability (ratio scale). The option having the greatest weighted attractiveness (subjective utility) is chosen. Compensatory. |

Two Examples of Process-Oriented Judgment and Decision-Making Research

Over the years, researchers within the process-oriented strand of research on JDM have generated several valid and interesting models. Those models have in common that they attempt to reflect the cognitive activity. I will only describe two such models, but the interested reader is advised to consult the excellent review by Abelson and Levi (1985). The described models by the Swedish JDM-researchers Montgomery and Svenson have not been chosen for any patriotic reasons but rather because their models give adequate representations of human judgment and decision making and, thus, can be generalized to various contexts. Their models are also closely related and should be employed as frameworks for analyses of JDM (Svenson, 1996).

The dominance-structuring model. Montgomery (1989) assumes that the decision process consists of four different phases. First, in the pre-editing phase the decision-maker selects those options and attributes that the decision problem requires. Second, in the "finding a promising option" phase, the decision-maker seeks to find the option that is likely to be selected. Third, in the dominance-testing phase, the decision-maker tests whether the promising option dominates the other options. In this phase the decision strategies in Table 2 are employed. If there is a dominant option, then the decision process is terminated and the option is chosen. If no dominant option exists, then the last phase is pursued. Fourth, in the dominance-structuring phase, the decision-maker restructures the acquired information so that a dominance structure can be obtained. The restructuring of the given information may be manifested in two interdependent ways: (i) devaluating the disadvantages of the preferred option and (ii) bolstering its advantages. In addition, the pros and cons of competing options are in this phase neglected and boosted, respectively. In short, Montgomery (1989) regards the decision process as a search for a dominance-structure; that is a cognitive structure in which one option dominates the other alternatives.

A related model is the so-called image theory that views JDM as a process to find compatibility between an option, or a conclusion, and the individual's cognitive structure, which is represented by images (Beach, 1990).

The differentiation-consolidation framework. The model of Svenson (1992) contrasts with Montgomery's model in the way that considerations are taken to what happens before a decision is made and after it has been made. This model assumes, therefore, two interacting processes: pre-decision and post-decision processes.

First, in the pre-decision process, the subject establishes goals, needs, potential options, and criteria. In order to find a sufficient option, the subject aims at differentiating by employing the decision strategies in Table 2. An important concept in the differentiation phase is the differentiation parameter

estimating the aggregated overall attractiveness difference between two decision options (Svenson, 1992). It is assumed that the subject strives for an increasing differentiation parameter when preparing for the future or when consolidating a decision. This striving for differentiation is highly biased, as people tend to distort information prior to making judgments and decision (Russo, Meloy & Medvec, 1998).

Second, the post-decision process, also known as the consolidation phase, begins once an option has been judged to be sufficient. This phase attempts to defend the decision against possible threats such as regret, which may cause a preference reversal. The greater the degree of differentiation in a decision, the less the probability of changing that decision. In order to reduce cognitive dissonance, people tend to subsequently distort information in favor for the chosen option (Festinger, 1957).

Summary

To conclude, this chapter has summarized and discussed psychologically oriented research on JDM. This research area consists broadly of two interrelated avenues: one dealing with how people choose between options and another concentrating on how people integrate information to arrive at conclusions. Loosely speaking, the former one relates to decision-making and the latter one to judgment; it is, thus, possible to differentiate between judgment and decision. Due to the increased focus on the decision process and task characteristics, the two avenues have recently begun to merge.

JDM can either be approached from a structural or a process-oriented perspective. The structural perspective assumes that the relationship between input and output (i.e., the Black Box) can be indirectly studied by employing statistical and mathematical techniques. As a result, the validity of the information can be calculated so that one can determine whether cues are relevant or redundant. Linear or non-linear models may reflect JDM, but they are in fact poor representations and provide little insights into how people really make judgments and decisions.

In contrast, the process perspective studies the decision process and postulates that decision behavior should be directly observed on the basis of process-tracing methods (i.e., verbal protocols, information display boards, and eye-tracking). This perspective has found that people acquire information in an alternative- or attribute-based manner and adaptively rely on various decision-strategies when evaluating information. The reliance on those strategies is contingent upon the characteristics of the task. In situations demanding high accuracy, people search extensively and alternative-wise, but when in shortage of time they search little and attribute-wise.

The two perspectives should not be viewed as competitive, but rather complementary for several reasons. First, the two perspectives tend to converge fairly well as regards empirical findings (e.g., see Harte & Koele, 1995). Second, the structural perspective indicates the level of diagnostic values regarding the cues and their intercorrelations, whereas the process perspective gives a better indication of how those cues are processed. Third, the process perspective captures realistically how people make judgments and decisions, whereas the structural perspective enables simulation of the resulting JDM representation. For instance, such an approach has been practiced within the research program on adaptive decision-making (Payne et al., 1993).

An additional factor influencing decision behavior is the level of experience (i.e., novice vs. expert) and the next chapter reports on this impact.

A REVIEW OF RESEARCH ON EXPERT DECISION-MAKERS

In the introductory chapter it was claimed that people generally assume that experts search for extensive information and make the most rational decision. To evaluate to what extent this belief is in fact true is the goal of this chapter, which reviews the research on experienced decision-makers and experts. Some research projects focusing on novice decision-makers are also mentioned. The chapter proceeds as follows: a definition of expertise, reports on two research strands and their findings, a discussion on the implication of those findings, and in the end a summary of the conclusions.

The Concept of Expertise

The word *expert* originally comes from the Latin word *expertus* meaning someone who has extensive skill or knowledge in a particular field or as the Roman author Virgil put it: "Trust one who has proved it" (*experto credite*). In the old Swedish language the word *expert* has been traced back to the 17th century. Apparently, someone stated in 1653 that (free translation to English) "I may derive an advantage from my disease so that I become an expert in medicine" (see the site: www.g3.spraakdata.gu.se/saob).

However, expertise is a fuzzy concept. In general, people (e.g., journalists) use the word *expert* rather generously when they call someone an expert despite the fact that he/she may not have expert competence in comparison to his/her colleagues in the field. For instance, people outside the domain of finance may call a stockbroker an expert, whereas people inside that domain may refer to him/her as a novice.

There exist different types of expertise: epistemic experts who know a lot and performative experts who perform a skill well (Weinstein, 1993). The following three expert distinctions may also be valid (Shanteau, 1988): (i) perceptual (e.g., livestock judges) versus cognitive experts (e., auditors), (ii) knowledge (e.g., academics) versus diagnostic experts (i.e., physicians), and (iii) advice (i.e., accountants) versus action experts (business managers). Another expert distinction might be experts working inside and outside an organization.

An axiomatic component of expertise is knowledge. Hoffman, Shadbolt, Burton and Klein (1995) have suggested that knowledge ranges over seven stages: naivette, novice, initiate, apprentice, journeyman, expert, and master. First, naivette is someone who is almost ignorant of a specific domain. Second, novice is someone with a minimal knowledge of the domain but may be regarded as a potential member of the craft. Third, once a novice starts with basic instructions he/she is called an initiate. Fourth, after going through a

training program beyond the introductory level the initiate becomes an apprentice. Fifth, journeyman is an experienced and reliable person who can perform a day of labor without being supervised. Sixth, the next step is expert who may be (i) a skilled journeyman with accurate and reliable performance, (ii) someone dealing with complicated cases, or (iii) someone with special knowledge derived from extensive experience. Seventh, the last level of knowledge is master involving three definitions: (i) a journeyman or an expert who is qualified to teach, (ii) an expert accountable for regulations and standards, or (iii) an expert regarded by his/her colleagues to be the best.

Shanteau (1992c) has claimed that expert competence must be viewed in the light of five interacting factors: (i) domain knowledge, (ii) diverse psychological traits, (iii) information processing skills, (iv) a variety of decision strategies, and (v) task characteristics. In other words, having extensive knowledge is not the only determinant of experts: Experts must process information effectively, rely on multiple decision rules, and reflect a certain air of expertise. As will be discussed in the end of the chapter, the task must also have some certain characteristics in order to enable the expert to perform well.

Moreover, judgment and decision performance has been argued to be a function of four factors: ability, knowledge, motivation, and environment (Libby, 1995). The relations are complicated further as knowledge is itself determined by ability, experience, motivation, and environment (Libby, 1995). In addition, the empirical evidence on the study of experts shows that deliberate practice is a core determinant of exceptionally good performance rather than inborn talent (Ericsson, 1996). Deliberate practice means that one trains in a purposive and goal-oriented way.

How can experts be identified? In the judgment and decision-making (JDM) literature on accounting and auditing, experts have often been defined with respect to experience, self-rating, and seniority, but those measures may not accurately identify persons performing exceptionally well (Choo, 1989). Expert performance refers to superior behavior regarding a specific but representative task where superior behavior can be expressed as two standard deviations above the average level of performance in the population of judges within the domain (Ericsson & Lehmann, 1996). In many domains, it is hard to find reliable and accurate measures of performance, so the problem of identifying experts remains. One way of getting around the problems is simply to ask professionals whom they consider to be the best in a particular domain (Shanteau, 1995). By doing that both the requirements of knowledge and personal traits can be satisfied. Two years ago, a new alternative approach to identify expertise was introduced (Weiss & Shanteau, 1999). Resting upon a psychometrical foundation, this approach takes into account that experts should be both reliable and discriminating (see below). The idea with the approach is essentially to compare potential experts' judgments with those of an assumed expert.

Two Strands of Research on Expert Decision-Makers

The literature on expertise can be divided into two strands of research: behavioral and cognitive.

The Behavioral View on Expertise

The behavioral view on expertise focuses on the output of the decision process and originates from behavioral decision-making. As regards probability judgment, expert judges should be perfectly calibrated against an objectively measured probability and updating probabilities in accordance with the axioms (e.g., Bayes theorem) of probability theory (Bolger & Wright, 1992). In a seminal paper on expert judgment, Einhorn (1975) proposed three conditions for expert judges. The conditions were: (i) when identifying and organizing cues of information, experts should cluster variables in the same way, (ii) when measuring cues, experts should exhibit high within-subject agreement, high between-subject agreement and no judgmental biases,⁸ and (iii) experts should weigh and combine cues in similar ways.

The assumption of agreement connects to the idea of a unique truth that only true experts know about, to a normative research approach, and to the claim that the goal of behavioral science is to find regularities (Shanteau, 1997).

The purpose of Einhorn's paper was to introduce some objective measurements to define expert judges, but the three professionals (i.e., pathologists) used as an empirical illustration failed to meet the three conditions forcing Einhorn (1975) to admit that "there may be more than one way to perform the cognitive tasks involved in judgments" (p. 571). Nevertheless, many research projects have been conducted on the basis of the three conditions. Some of the empirical findings regarding the behavioral view on expert decision-makers will be described later.

The Cognitive View on Expertise

The cognitive view on expertise points out the importance of the decision process and the knowledge base underlying the behavior of experts and novices (Bédard, 1989). The view comes from cognitive psychology. A core concept in the cognitive view is knowledge. According to the cognitive theory of skill acquisition, knowledge can be divided into two types, declarative (i.e., textbook) and procedural (i.e., tacit and automatic), where a shift from the former to the latter type of knowledge denotes skill acquisition (Anderson, 1987).

Herbert Simon's work (e.g., Simon, 1974) on chunking (i.e., memorizing facts by breaking them down into units), human problem solving, and artificial intelligence has played an important role for the cognitive view. A classic

example of problem solving is how grandmasters evaluate chess positions and possible moves (see DeGroot's studies as cited by Ericsson, 1996). Their vast experience (i.e., more than ten years) enables them to recognize board positions from previous games and remember moves to make from these positions. In other words, they rely on pattern recognition rather than on extensive search for possible moves but in spite of that fact they are able to rapidly produce a small number of moves with the highest quality during the initial perception of the chess position (Ericsson, 1996). Some empirical findings on expert decision-makers within this research strand will be reported below.

Behavioral Studies on Expert Decision-Makers

Expert (and novice) studies carried out within the behavioral view have focused on accuracy, consensus, internal consistency, and policy capturing. The theoretical fundament has been the paradigm of judgment analysis and in particular the Lens model. Most research projects have been conducted in laboratories with realistic but artificial experimental tasks.

Accuracy has been measured with respect to an objective criterion (i.e., actual bankruptcy), comparisons to those judgments produced by a statistically derived model, or by comparing expert judgments with those made by novices. Experts' accuracy varies across different domains; for instance, weather forecasting and stock price forecasting are associated with excellent and poor accuracy, respectively (Bolger & Wright, 1992; Shanteau, 1995). With few exceptions, a simple linear model (i.e., actual model or a bootstrapping model) provides better judgments than those made by expert judges (Grove & Mehl, 1996), because the model evaluates the information variables in a consistent manner whereas a human judge tends to be not so stable. In general, expert decision-makers outperform true novices but once the novices obtain training their performance does not substantially differ from those by experts (Camerer & Johnson, 1991). For instance, experienced clinicians do not make better judgments than trained students (Garb, 1998).

Consensus refers to what extent experts agree about their judgments and decisions. In some domains they agree almost perfectly ($r > 0.75$), whereas in other domains they agree poorly ($r < 0.40$). Apart from good accuracy, excellent consensus has been found among weather forecasters (Shanteau, 1995). A classic study on two stockbrokers' decision processes showed that the two professionals agreed poorly ($r = 0.32$) despite the fact that they viewed themselves as similar in orientation (Slovic, 1969). In the auditing literature, a review showed that consensus did not increase with the level of experience (Bédard, 1989).

Internal consistency (also known as reliability) concerns to what extent an expert makes similar judgments and decisions when faced with the same case (i.e., stimuli). A person with inconsistent JDM may eventually lose the confidence that other people, who are dependent upon the judgments and the decision, have in his/her ability. Shanteau (1995) has argued that experienced auditors are more consistent than other professionals. A recent meta-analysis on studies with test-retest reliability measures shows that, in order, mean reliability for professionals in medicine/psychology, weather forecasting, human resources management, and accounting/auditing were 0.73, 0.91, 0.76, and 0.82 (see Ashton, 2000).

Policy capturing refers to how a person weights and integrates information (see the previous review of research on JDM). In general, the behavioral research on expert judgment indicates that experts rely on configural rules implying that information is organized in a non-linear form where the impact of one cue depends on the value of other cues (Camerer & Johnson, 1991). Despite being unable to perfectly combine the cues, experts may be able to extract the relevant information so that they can rely on less information compared to the amount of information that non-experts need (Shanteau, 1992b). On the other hand, expert judges are prone to rely on so-called “broken leg cues”, which are rare but often have highly diagnostic values. Moreover, some evidence suggests that experts have poor insights into how they weight the information (cf. Slovic, Fleissner, & Bauman, 1972).

To sum up, the behavioral research on expert decision-makers suggests that the idea of expert performance is in most domains a myth as experts seldom differ from non-experts and cannot outperform statistical models (Bédard, 1989; Camerer & Johnson, 1991).

Cognitive Studies on Expert Decision-Makers

The cognitively oriented research on experts (and novices) focuses on the decision process and knowledge. In their experiments, researchers have employed process-tracing techniques such as verbal protocols, information display boards, and computer programs.

Compared to novices, experts have more knowledge that is effectively stored and organized in memory (Bédard, 1989). Memory can be categorized into an episodic part, which deals with the storage of particular experiences (e.g., the characteristics of the management team in a certain growing small firm), and a semantic part, which concerns a mental thesaurus of concepts and their relationships (e.g., for the typical growing small firm, the management team should have certain characteristics). The two memory parts interact. By

grouping information into clusters, experts can store large amounts of knowledge (Bédard, 1989).

In comparison to novices, experts search less information but more relevant information (Shanteau, 1992b). Whereas experts search information in a methodological manner by relying on hypotheses and checklists, novices acquire information in a passive, undirected, and sequential manner (Choo, 1989). Simply put, non-experts pick cues in the order as they are presented on the paper or the screen and experts tend to carefully select what cues to acquire as they have a sense of the diagnostic value of each cue. Novices tend also to solve problems by working backwards from the goal to find appropriate solutions, while experts' problem-solving is characterized by retrieving solutions as a part of the initial comprehension of the problem (Ericsson, 1996).

But experts' decision process is contingent on task characteristics. For instance, master chess players kept their high standard of making moves in spite of the presence of time pressure, whereas amateurs made moves of worse quality (Klein, 1999). But the key is to know when to adapt and when not.

Experts create mental models of how tasks should be performed that enable them to identify evidence that is inconsistent with the present situation by running mental simulations of past events (Klein, 1999). In other words, due to their extensive experience, experts can rely on pattern recognition rather than mental calculation making it possible for them to simplify complex problems so that they see the big picture of the situation. Parallels can be drawn between pattern recognition and intuition. The simplification of problems is also explained by the fact that experts often break large problems into smaller parts and then put the parts back together (Shanteau, 1992a).

In conclusion, the cognitively oriented research has shown that experts are in fact superior to non-experts with respect to knowledge, information processing capacity, and other cognitive functions.

Some Explanations of the Process-Performance Paradox

The research findings of the two strands of research on experts imply a paradox: "How can experts know so much and predict so badly?" (Camerer & Johnson, 1991). In the following section, I will discuss four tentative explanations for this paradox: experimental flaws, task characteristics, the use of configural rules, and inadequate learning.

Experimental Flaws

The variation of conclusions about reliability and validity of expert judgments might be criticized concerning flaws or inadequacies in the experimental settings. First, the studies might have involved participants with heterogeneous experience in terms of quality and quantity implying that the participants exhibited varying performance or that they were not true experts (Bolger & Wright, 1992). Recall the earlier comment that people tend not to be sparse when calling someone an expert. There exist studies where participants have been referred to as experts when in fact it is doubtful that they had expertise (e.g., Slovic, 1969). In addition, senior auditors have been referred to alternately as experts and as non-experts in relation to students and partners, respectively.

Second, the studies might have employed experimental tasks that were poor representations of the real world due to the lack of naturalistically occurring phenomena like feedback, degree of probabilistic reasoning, and desirability of the outcome (Bolger & Wright, 1992). In other words, there is a problem with correspondence: The researcher has to ensure that the participants' small worlds adequately correspond to the small world reproduced in the experiment (Beach, 1992).

Task Characteristics

The poor expert performance must be viewed in the light of the task characteristics for the reason that in some domains it is impossible to achieve excellence. Experts tend to perform well in domains characterized by static stimuli, decisions about things rather than people, agreement on stimuli, relatively predictable problems, available feedback, and common decision aids (Shanteau, 1992a). Some examples of such domains are weather forecasting, chess, livestock, and grain judgments (Shanteau, 1992a).

In contrast, experts tend to perform poorly in domains that are associated with changeable stimuli, decisions about behavior, disagreement on stimuli, poorly predictable problems, lack of feedback, and lack of decision aids (Shanteau, 1992a). Some examples of such domains are clinical psychology, astrology, and court judgments (Shanteau, 1992a).

In well-defined tasks, experts can rely on their extensive experience enabling them to outperform non-experts, but this comparative advantage is lost in unstructured tasks so that experts and non-experts perform equally poorly (Spence & Brucks, 1997). A good illustration is the classic chess experiment in the 1970s involving two groups of chess players (masters and amateurs) who recalled board positions where the chessmen had been placed in accordance with a real game or in a random fashion (as cited by Ericsson, 1996). As regards

the real game, masters recalled more chessmen correctly than the amateurs, but in the randomly placed board positions the two groups scored equally poorly.

Use of Configural Rules

Camerer and Johnson (1991) argued that the process-performance paradox is due to experts relying on configural decision rules. Those rules have non-linear forms and can be illustrated with the two common rules (see the earlier chapter on JDM). The conjunctive rule assumes that the cues of information must exceed or equal specific criteria (e.g. grant credit if the equity-debt ratio is above 1.5, the cash-flow is adequate, and the management team has trustworthy characteristics). The disjunctive rule states that the cues must be above certain criteria (e.g., grant credit if the firm is creditworthy or the entrepreneur has collateral).

In spite of the fact that configural rules lead generally to poor performance, experts rely on them. Camerer and Johnson (1991) offered the following three reasons for the use of such rules. First, they are simple to learn, as they do not require that one carefully consider the importance and the relevance of each cue in order to find the combination of cues yielding the best prediction. Second, they are associated with a reasonable story that facilitates learning. For instance, a credit manager in an IT-supplying company told me about a colleague who had this rule of thumb: Filthy toilets predict corporate failure. The rationale was that a filthy lavatory implies poor service management, which is one of the cornerstones in that sort of business, and as a consequence the clients of his client might be reluctant to do business with his client given the filthy toilet. The credit manager claimed this rule to be an accurate predictor of business venture.⁹ Third, configural rules are flexible so that they can fit data. To be more specific, when one looks at one particular observation a configural rule might be correct but across multiple observations a simple linear model often outperforms such rule. Often the particular observation includes so-called broken-leg cues.

Inadequate Learning

A plausible explanation for the process-performance paradox is that experts have obtained knowledge by experience or practice that may be severely biased. Research in cognitive psychology has shown that there are factors preventing people, including experts, from learning from experience (Brehmer, 1980). Those factors involve illusion of validity, different belief systems, and additional fallacies.

Illusion of validity. Experts may be confident that they have found the valid information to rely on when making judgments and decisions. On the contrary, they might have developed an illusion, because finding the important and the relevant cues demands that they have almost performed scientific investigations in order to control for errors.

In the real world, information does not arrive in such sequences required to refute hypotheses, so it is likely that one makes systematic misinterpretation of the information. For instance, it has been shown in an experiment that auditors who received sequences of negative information tended to reject new clients to a larger extent than those auditors who received sequences of mixed or positive information (Asare & Knechel, 1995). As a result, people might deduce a distorted base-rate (i.e., the relative frequency with which an event occurs). Research shows that expert judgments are affected by different base rates (Maines, 1995). The distortion of the base-rate may grow worse considering that people tend to make conclusions about causality on small samples and misinterpret random data (Gilovich, 1991; Kahneman et al., 1982).

Table 3. *Fields that should be Considered for Effective Learning in Lending.*

| | Grant credit | Deny credit |
|---------------------|--------------|-------------|
| Accurate decision | | |
| Inaccurate decision | | |

Table 3 depicts the situations that are present when granting credit. Learning from experience requires total feedback (Brehmer, 1980). First, the loan officer may grant credit, which could be an accurate (e.g., repayment) or an inaccurate (e.g., non-payment) decision. (Type I error would be to grant credit to failed firms.) In this case, the loan officer will learn about to what extent his/her decision was accurate. Second, he/she may reject the loan proposition, but in this case it is harder to find out whether the decision was correct. (Type II error would be to reject an economically viable firm.) In order to make such an evaluation, the loan officer must know what happened to the firm that was rejected.

Recently, Fiedler (2000) introduced a cognitive-ecological sampling approach to analyze judgment biases such as the illusion of validity. In short, this approach assumes that people sample information with respect to either the predictor or the criterion. Applied to the lending context, predictor sampling would mean that the loan officers focus on a particular independent dichotomous variable (e.g., presence or absence of payment remarks) when learning about its validity (e.g., whether the absence of payment remarks actually leads to financial distress). On the other hand, criterion sampling would

mean that the loan officers consider the dependent variable (e.g., the outcomes of their decisions) to evaluate to what extent a particular independent variable reflects the criterion. Thus, learning from experience is dependent upon the focus of the cognitive-ecological sampling and upon the number of observations (i.e., the sample size) experienced by the individual loan officer. However, predictor and criterion sampling, combined with different kinds of experience, may result in different views on the relevance of the independent variables (cf. Fiedler, 2000).

The interviews with experienced lenders indicate that neither loan officers in banks or credit managers in supplying companies evaluate their rejecting decisions for the reasons that such a procedure would be impossible or demand large resources. In connection to that, one should mention that loan officers might be accountable for a self-fulfilling prophecy; that is, their credit decision may result in further credit for the firm that were granted credit whereas no additional credit might be given to the rejected firm. Recall also the earlier discussion on lenders' risk-averse behavior.

Different belief systems. Gilbert (1991) claimed that there are two kinds of belief systems. First, the Cartesian belief system, which is based on the French philosopher Descartes' assumption that accepting or rejecting ideas are associated with cognitive efforts. For that reason, people comprehend an idea and then try to accept or reject the idea. Second, the Spinozian belief system, which rests on the Dutch philosopher Spinoza's argument that comprehension and acceptance occurs simultaneously. Accordingly, people comprehend and accept an idea, then they try to falsify or certificate the idea. Gilbert (1991) illustrated the two views of the belief system as two different tagging systems. Consider a simple library with two categories of books: fiction and non-fiction books. In Descartes' belief system the two categories are tagged, whereas in Spinoza's belief system only one of the categories is tagged - the rest of the books remains untagged.

Research findings indicate that the Spinozian assumption may actually be an accurate description of how the belief system works. For instance, it has been shown that people tend to search for positive evidence rather than negative evidence, that is, the confirmation bias (Plous, 1993). In other words, "People are credulous creatures who find it very easy to believe and very difficult to doubt" (Gilbert, 1991, p.117).

Additional fallacies. Over the years there have been many research endeavors on cataloguing the fallibility of human judgment (Gilovich, 1991; Kahneman et al., 1982). Apart from the previously mentioned factors, three additional factors may contribute to the distortion of learning from experience. First, people tend to recall salient events such as exceptionally good or exceptionally bad companies (i.e., availability bias). Second, people also tend to over- or underestimate their past predictions (i.e., hindsight bias). This tendency might occur when experts recall past judgements of successful as well as

unsuccessful cases. Third, attribution errors may occur implying that causality might be drawn between a certain event and an outcome although such a causal relationship is seriously flawed.

In conclusion, there are multiple factors that can distort learning from experience and may, accordingly, explain the process-performance paradox. In general, there is not a single factor, but rather a variety of such distorting factors. The best way to improve one's learning from experience is to be aware of those factors, to keep records of correct and incorrect judgments and decisions, and rely on decision aids. An experiment showed that participants who relied on a linear model and a database of historical cases generally performed better than those who relied on their minds when making judgments and decisions (Hoch & Schkade, 1996).

Summary

To conclude, this chapter has reviewed the research on individual expert decision-makers and related literature. The research casts doubts about their performance, but consolidates the view that experts have excellent decision processes and great knowledge. In general, expert judgments are seldom better than those made by trained novices, and simple linear models often yield more accurate judgments and decisions. The excellent decision process is partly due to experts' tendency to acquire less information on the whole, but most of the relevant information.

This result is paradoxical, because how can experts know so much but not be able to give analogous good predictions? This paradox must be viewed in the light of task characteristics and factors preventing learning from experience. In domains with certain characteristics (e.g., changeable stimuli and prediction about human behavior) it is almost impossible to achieve excellent performance. Common sense implies that more experience makes one better, but there are cognitive tendencies (e.g., confirmation bias and inadequate feedback) distorting learning from experience.

In short, the review indicates that experienced decision-makers are not so perfectly rational as one would expect considering the assumptions in economics (Hogarth & Reder, 1986) and the general view on experts. In contrast, expert decision-makers appear to be bounded rational in the sense that they do not search for all information and have cognitive limitations (cf. Simon, 1947/1997). One can, however, object that expert performance can not be achieved in a laboratory, as the real world cannot be represented completely.

Despite the somewhat discouraging picture of expert decision-makers, the chapter (or for that matter the present dissertation) does not infer that non-experts should be promoted to perform complex JDM tasks. In contrast, the main point is that one should in general view experienced decision-makers with some skepticism.

A REVIEW OF RESEARCH ON EXPERIENCED LENDERS

This chapter reviews earlier research projects with special focus on individual judgment and decision-making (JDM) of experienced lenders or other professionals accountable for granting credit to firms. Besides the comprehensive literature review, the chapter includes an overview of other relevant studies, such as JDM involving multiple decision-makers.

Literature Review

To my knowledge, there have only been two previous reviews. An excellent review of JDM in financial accounting has been provided by Maines (1995). Furthermore, Belkaoui (1989) has summarized some studies on the present topic that have employed the methodology of the aforementioned Lens model paradigm.

The present review is not intended to be a substitute to those by Maines or Belkaoui, it works rather as a complement with additional and up-to-date research projects. Major differences to the earlier reviews are that I only consider projects concerning experienced lenders and that I describe the reviewed projects in a rather detailed form.

Selected Studies

To be considered in the present review, the studies had primarily to investigate individual decision behavior by professionals accountable for granting credit to firms, such as loan officers, bankers, bank managers, credit managers, credit analyst, lenders, lending officers, and financial analysts. On the basis of this criterion, searches in various bibliographic databases and in other sources (e.g., reference lists and browsing through journals) resulted in a selection of 22 published articles out of which six are referred by Maines (1995) and three by Belkaoui (1989).

Appendix A summarizes the 22 selected studies in a chronological order. In general, one can conclude that the majority of the studies have been conducted by North American researchers in behavioral accounting, which is a sub-discipline in accounting aiming at understanding how creditors and investors use accounting information when making decisions. This sub-discipline had a sort of break-through in the middle of the 1970s when theories and methods from the JDM paradigm were employed (Ashton & Ashton, 1995). In accordance with the development of that paradigm, the research focus has changed from viewing decision-makers as passive cue-decision transformers to viewing them as diagnosticians (Ashton & Ashton, 1995). As a consequence,

process-tracing methods have to a larger extent been employed from the middle of the 1980s to the present time.

For some reasons, the first published European studies on lenders appeared in the 1990s. In contrast to prior research, the European researchers came from other fields, like business studies or psychology, and relied on another methodology. Whereas the North American researchers have explored their research questions by conducting experiments, Europeans have employed quasi-experiments, interviews, and questionnaires. This observed difference is not unique. According to Bengtsson, Elg, and Lind (1997) business research carried out in North America is associated with a rather strong positivistic viewpoint, whereas Europeans prefer an idiographical scope of research. In a sense, one can also argue that the European researchers have applied a kind of naturalistic research approach (cf. Klein, 1999) as they have often studied loan officers in real action.

The main conclusions of the selected and reviewed studies can be summarized as:

- Accounting information is essential but not in sole control when granting credit.
- Skills and personality of entrepreneurs are relevant.
- Decision-processes have significance for the type of decision that is made.
- Experienced loan officers are not so accurate in predicting bankruptcy.
- Loan officers tend (in real life setting) to disagree about credit decisions.

Categorizing the Selected Studies

In her review, Maines (1995) classified the research on JDM in financial accounting into two broad topics: on the one hand, decision processes and outputs and, on the other hand, decision inputs. The present taxonomy is similar, but the former topic is divided into two parts implying that the 22 selected studies fall into three categories: stimuli, processes, and responses. These categories reflect the prime research interest of the individual researchers.

Stimuli. Stimuli refer to the information used by the lenders when making credit assessments and decisions. Many of the European studies fall into this category. That is, the survey studies by Hedelin and Sjöberg (1994, 1995) who explored the impact of the entrepreneurs' personality and the quasi-experiments by Deakins and Hussain (1994) and by Fletcher (1996) who primarily investigated the importance of various kinds of information when making credit decisions as regards small firms. In addition, some American studies are argued to belong to this category. For instance, the studies by Beaulieu (1994, 1996) aiming to finding out about how accounting information is perceived by novice

and experienced loan officers. Another instance is Libby's (1979) study on how positive or negative footnotes in the financial statement affected the loan decision.

In conclusion, this category suggests the following: (i) accounting information is particularly important for the credit decisions, (ii) personality factors of entrepreneurs reflecting realistic business ambitions (i.e., responsibility and credibility) are important, and (iii) the financial status of the entrepreneur and forecasts play essential roles.

Responses. Responses allude to the decisions or the predictions made by loan officers. In principal, the studies that are argued to belong to this category have focused on investigating the ability of lenders to predict failed (or bankrupt) and non-failed companies on the basis of financial information. The theoretical underpinning has been the generic concept of judgment analysis (Cooksey, 1996).

For the period from 1976 to about 1986, many research projects were devoted to investigating prediction ability (Belkaoui, 1989). Such efforts have almost died out, possibly due to the difficulties in getting access to loan officers as suggested by Libby (personal communication 1999-09-10), who has made pioneering work within this approach.

The typical study concerning this category involved the following components: (i) samples of failed and non-failed large (i.e., in comparison to Swedish standards) firms, (ii) some financial ratios per firm, and (iii) a group of loan officers or equivalent professionals. On the basis of the financial ratios, the loan officers made judgments about the samples of companies. In many studies, the participants also made repeated judgments about some cases in order to test to what extent they made identical judgments when facing identical stimuli (i.e., test-retest reliability, see Ashton, 2000). The results were typically analyzed by comparing the participants' judgments with those of a linear model derived from the samples and those of a model of the individual or the composite judge. In essence, the body of this research applied to a lending context shows that such statistical models outperform the human judge (Maines, 1995). The only exception is Libby (1975, 1976).

In conjunction, it should be mentioned that there have also been studies (not referred to in Appendix A) that have aimed at investigating the impact of additional information on the accuracy of the judgments. This approach has been partly inspired by Oskamp (1982), who found that more information did not result in significantly more accurate judgments by clinical psychologists. A recent meta-analysis of 31 experiments regarding the prediction of bankruptcy showed that more information was not associated with more accurate judgments; on the contrary, five financial ratios from two subsequent years appeared to be the optimal level of information load (Hwang & Lin, 1999).

Decision processes. Decision process concerns the “Black box”, that is the cognitive activities occurring between stimuli and responses. Obviously, studies employing the process-tracing methods (i.e., verbal protocol and information boards) constitute the essence of this category. Typical studies are Biggs, Bedard, Gaber, and Linsmeier (1985), Danos, Holt, and Imhoff (1989), Bouwman, Frishkoff, and Frishkoff (1987), and Rosman with co-authors (1993, 1999). For instance, Danos et al (1986) set up experiments to track how lending decisions unfolded over three stages: (i) examination of publicly available information, (ii) encounters with clients to request financial forecasts and additional reports, and (iii) performance of detailed credit assessments. Those studies have also shown that task characteristics and individual differences matter in the way that the more cases, the less number of acquired cues and the less time spent the more restrained loan conditions.

There are some additional studies involved in this process category, although they have not employed process-tracing methods. In contrast, they have attempted to derive the decision processes through statistical techniques, such as partial least squares (Rodgers, 1991; 1999), experimental procedures (Wahlund, 1995), or hermeneutics (Svensson & Ulvenblad, 1995).

Implications of the Reviewed Studies

Researchers are, of course, interested in the implications of the research findings, but perhaps the findings have immediate relevance for practitioners as they point out ways to utilize the shortcomings of loan officers. An illustrative implication may be that an entrepreneur might manipulate his/her loan proposition with respect to the amount of information given initially to a loan officer (cf. Danos et al., 1989). In the case of rejection, the entrepreneur should attempt to request credit from another loan officer. On the other hand, bank organizations and other lending institutions may take measures to improve the prediction ability of their loan officers.

Furthermore, the reviewed studies have made contributions to various research fields. Theories and methods from the JDM paradigm have been applied in realistic decision environments with professionals rather than, as often is the case in JDM research, simplistic and artificial tasks with students (Maines, 1995). Other contributions concern developments of decision-support systems to improve JDM in lending and design of diverse training programs aiming at teaching novices to become better decision-makers. For instance, Hoch and Schkade (1996) showed that students made substantially better bankrupt predictions when they had access to a linear model and a database of historical cases. Researchers in economics should also be interested in the findings, because they may touch upon market inefficiency caused by systematic biases in human judgment (Camerer, 1995).

Finally, the reviewed studies point out considerations for future research. The majority of those studies have concentrated on how accounting information is processed in experimental settings where the participants received limited information. In spite of some realism, the present review indicates that the experimental tasks have been artificial in the way that the participants seldom obtained realistic loan propositions with clearly stated applied amounts of loan. Few studies have employed tasks related to small firms and new ventures. No study has considered the impact of business environment, organizational, and institutional factors (Maines, 1995).¹¹ Despite the wide practice of trade-credit, few research projects have been devoted to studying how credit managers in supplying companies make decisions.

In conclusion, the reviewed literature has motivated the goal of the present doctoral thesis: To investigate and analyze, on the one hand, experienced loan officers with respect to their decision behavior as regards credit granting to small firms and, on the other hand, experienced credit managers in supplying companies.

Other Relevant Studies on Professional Judges in Lending

There exist other published studies on lenders' decision behavior, but they have not directly focused on individual decision behavior in lending. Because the research findings and the research approach of those studies are of some interest for the present dissertation, they will be briefly mentioned in the following paragraphs. In addition, some relevant studies on lenders, which elaborate on the issues related to credit granting have been reported in a former chapter.

Credit Evaluation Process

On the basis of archival data, some researchers have employed econometric procedures to derive (on the aggregate level) how loan officers make credit decisions. The resulting models have often had substantial explanatory power (see Dietrich & Kaplan, 1982; Hester, 1966, for examples of such studies). Alternatively, researchers have attempted to simulate the evaluation process by programming a computer to perform judgments analogous to those made by experienced credit analysts (Cohen, Gilmore & Singer, 1966). This approach connects to the development of expert systems. However, it must be stated that such approaches do not explicitly give insights into how experienced lenders make judgments and decisions.

Multiple Decision-Makers

Recall that credit committees in Swedish banks often make the formal granting decisions and credit limits of substantial amounts are set by the credit managers in consultation with the market manager or the managing director. In other words, groups of lenders make many credit decisions. Research shows that groups of interacting lenders tend to make more accurate predictions than individual lenders (Maines, 1995), because the groups have an advantage in processing information (Guzzo & Shea, 1992). This advantage over the individual judge is, however, lost in settings with less amount of information (Stocks & Harrell, 1995).

Summary

This chapter has reviewed earlier research on individual lenders' judgment and decision making. Such projects have been conducted predominantly by North American researchers in the field of behavioral accounting. In short, it has been found that: (i) accounting information but also character facts about the credit applicants are important for credit decisions; (ii) the decision-process is adaptive; (iii) experienced lenders do not predict bankruptcy accurately; and (iv) they tend (in real life settings) to disagree whether credit should be granted or rejected.

SUMMARY OF THE STUDIES

Five empirical studies and one methodological paper (for the sake of simplicity henceforth called study) are summarized below. Studies 1 to 3 concern research made after my licentiate thesis and are reported in chronological order. Studies 4 to 6 originate from my licentiate thesis (Andersson, 1998). Furthermore, Studies 1, 4, 5, and 6 employ empirical material that was collected from the same nation-wide survey involving 165 experienced credit managers in supplying companies.

Study 1. Personal Attributes of Expert Credit Analysts

This paper investigates desirable personal attributes that expert credit analysts should have. Lack of knowledge about such characteristics combined with earlier research on personal attributes of expert auditors by Abdolmohammadi and Shanteau (1992) stimulated me to implement this study.

As no explicit theory existed and little was known about expert credit analysts' personal attributes, it was deemed necessary to employ a grounded-theoretical research approach in which the responses of in-depth interviews with 26 credit managers were used to construct a measurement of 27 attributes with respect to expert credit analysts. Responses from 93 credit managers and 98 business students constituted the data.

Apart from five similarly rated attributes (i.e., experience, analytical skills, knowing what is relevant, accuracy, and ability to judge human nature), the credit managers tended to give higher but less dispersed ratings of the attributes than the students, presumably reflecting professionals' difficulties in prioritizing. There was also little consensus about the ratings between and within the two groups of respondents.

The credit managers stated that common sense, experience, responsibility, energy and interest, and current knowledge were the five most important attributes of expert credit analysts, whereas communication skills, ability to focus on sales, curiosity, warmth and friendliness, and being a good teacher were deemed the five least important ones.

An exploratory factor analysis condensed the responses of credit managers into three factors that arguably represented capability, basic skills, and interpersonal skills.

The findings have particular relevance to managerial matters like recruitment of credit analysts, by providing a checklist of desirable personal attributes and the design of educational programs for novice credit analysts so that efforts may be devoted to training the essential expert characteristics. The

study also contributes to our understanding of the characteristics of experts in the domain of credit assessment and in general.

Study 2. P1198: Software for Tracing Decision Behavior in Lending to Small Businesses

This methodological paper reports on a process-tracing program specially designed for capturing experienced loan officers' decision behavior when they make lending decisions with regard to small firms. Inspired by the process-tracing devices by Brucks (1988) and Saad (1996), I developed a software program called P1198 for three reasons. First, small firms are hard to assess due to ambiguous information. Second, insights into experienced loan officers' decision processes may facilitate the understanding of how small firms should be assessed. Third, computerized process-tracing provides such insights accurately.

The task in the software is to acquire information so that one is able to make separate decisions for three propositions. To be specific, a subject decides whether the proposition should be granted or rejected and writes explanations for his/her decisions. If the proposition is granted then he/she also states the interest rate and years of amortization.

The software P1198 runs in the web-browser and consists of two interacting systems: (i) a database of three loan propositions and (ii) a user interface. The three propositions include realistic information that originates from different but real-life small firms. The selection of the 57 accounting and 17 non-accounting cues has been made in accordance with research findings and viewpoints from loan officers. The user interface involves the following interacting screens: (i) an introductory menu, (ii) a menu including some biographical questions, (iii) a loan proposition screen, (iv) four menus for the information categories, (v) a decision menu, and (iv) a pop-up window. The latter component aims to unfold the decision process.

While a subject performs the task in the software, a log-file is created. The log-file collects the following entries of decision behavior: (i) responses to the biographical questions and the pop-up window, (ii) stated decision, confidence, interest rate, and years of amortization, (iii) the acquisition of cues and the sequence in which the cues were acquired, (iv) the sequence in which the screens were navigated, and (v) the seconds spent on various moments of the task.

An empirical example is presented to give the reader an idea about the insights into judgment and decision making provided by the software P1198.

Study 3. Does Experience Matter in Lending? A Process-Tracing

Study on Experienced Loan Officers' and Novices' Decision Behavior

This empirical study investigates the impact of experience on decision behavior in lending to small firms. For this purpose, three groups of participants (19 business students, 19 junior and 23 senior loan officers) corresponding to three levels of experience (novice, intermediate experience, and expertise) participated in experimental sessions where they interacted with the specially designed software P1198, which is thoroughly described in Study 2. Their task was to acquire the information they deemed relevant in order to make separate decisions whether two loan propositions regarding two small firms should be granted or rejected.

A literature review of research on expert decision-makers motivated five basic hypotheses: (i) the more experience, the less amount of information acquired, (ii) the less experience, the less propensity to acquire cues in the order as they are presented, (iii) the more experience, the more consistent acquisition of cues, (iv) the more experience, the more agreement about cue acquisition behavior, and (v) the more experience, the more agreement about the decisions that are made. All those hypotheses were, however, refuted. In contrast, it was found that: (i) experienced loan officers acquired significantly more cues than non-experienced ones, (ii) experienced loan officers tended to acquire the cues in the order as they appeared, (iii) the participants tended to have good levels of consistency but poor levels of agreement as regards cue acquisition behavior, and (iv) experienced loan officers were apt to reject the propositions and disagree about them.

In addition to testing the formulated hypotheses, this study also describes and analyzes data on the participants' decision processes. The data suggest that senior loan officers were cautious in the sense that they acquired an extensive number of cues before leaning towards one of the two decision alternatives (i.e., grant or deny credit). The business students were prone to plunge into judgment and decision-making by quickly leaning towards a decision option with a relatively small number of cues. Junior loan officers were almost like their senior colleagues. Junior and senior loan officers also took more time before making up their minds.

The results have theoretical and practical implications for research on judgment and decision-making, research on expertise, small business finance, and banking. For instance, the observation that the majority of the participants did not change their preliminary judgment despite the acquisition of additional cues may be compatible with the pre-decisional distortion paradigm (Russo et al., 1998). Alternatively, the observed tendency among senior loan officers to disagree about the decisions may suggest that entrepreneurs should in case of a

rejection decision turn to another loan officer, because he/she might arrive at a contradictory decision.

Study 4. Risk Attitude and Acquisition of Information in Credit Risk Assessment: A Survey among Credit Managers in Swedish Supplying Companies

Based on data from the previously mentioned survey, the purpose of this study was to explore the following issues: (i) the relation between risk attitude and information acquisition behavior, (ii) the relation between experience and risk attitude, and (iii) the relation between experience and information acquisition behavior.

Risk attitude was measured by averaging responses to an instrument consisting of 22 items presumably reflecting risk-taking behavior in lending. Information acquisition behavior was determined by taking the mean responses to an instrument involving 14 different types of information employed in credit assessments. In essence, the latter measure represented self-reported behavior.

No substantial relation between risk attitude and information acquisition behavior could be established. The picture might have been different if the respondents had been asked to have a particular case in mind, but it is not evident that a positive risk-taking propensity would imply less information use. Risk takers might instead have used more types of information, since they do not want to rule out the possibility to grant credit and, thus, search for more information.

There was a tendency among experienced credit managers to be risk takers. A plausible explanation is that years of practice give credit managers knowledge in terms of a large number of cases. That enables them to better discriminate paying customers from non-paying ones. In connection to that, one of the interviewed credit managers stated that experienced credit managers have a high risk propensity, but it is limited by the company's policy and because of that they require more negative information to deny credit.

Less experienced managers tended to acquire more types of information. On average, the participating credit managers stated that they did not extensively acquire all types of information. That may support the assumption that prior knowledge implies the acquisition of fewer types of information.

**Study 5. Business Decisions Aided by Information Technology:
A Survey Study of Attitudes towards Decision Support Systems by
Credit Managers in Swedish Supplying Companies**

This paper concerns how experienced credit managers perceive decision support systems (DSS) and was motivated by DSS designers' claim that it would be possible to completely automatize the granting of trade credit. This claim relates to the interaction between the credit manager and the DSS. As he/she often obtains additional information about customers and may rely on a "gut feeling", the judgment by DSS may differ from the judgment by the manager. Suppose they differ, which decision is expected to be made?

Attitudes are assumed to reflect behavior, so the question can be answered by exploring the attitude to DSS. A negative attitude would suggest that managers are restrictive in their use of DSS and rely more on their own judgement. A positive one would imply extensive use of and consequently more trust in DSS.

The empirical materials collected from the aforementioned survey were used. Attitude to the use of DSS was measured by an instrument constructed in accordance with the theory of reasoned action (Fishbein & Ajzen, 1975). This attitude measurement included ten DSS properties, which the responding 92 managers rated on a seven-point and verbally anchored scale with respect to belief and evaluation concerning DSS.

On the average, the credit managers displayed a moderately positive attitude to the use of DSS. A regression model was estimated, which accounted for 37.9 per cent of the variance in attitude to use DSS. The model included six independent variables: intuition, source of motivation, use of special decision aids, number of collaborators, and items from a risk taking attitude scale.

The intuition variable was negatively related to the dependent variable suggesting that the more intuition that managers stated that they use when making credit decisions the more negative was the attitude towards DSS. Managers who stated responsibility as the main source of motivation were more inclined to evaluate DSS as advantageous. The same tendency was valid for managers who used special decision aiding systems in their decision-making. Special decision aiding systems are systems that have been made especially for a specific company.

The number of collaborators seemed to influence attitude: The more collaborators a manager had, the more positive his or her attitude was. This tendency may be explained by the circumstance that it is important for a manager to appreciate the implemented DSS, because an influential factor for the success of DSS is argued to be employees' perception of their manager's perception of the DSS. In addition, as the manager is accountable for his or her

collaborators, it is likely that he or she demands clear arguments based on analyses from them rather than hunches based on intuition.

Study 6. Collateral in Lending: Attitudes, Intentions, and Behavior

This study describes empirically credit managers' attitudes, intentions, and (self-reported) behavior as regards requesting collateral in trade-credit granting. Those concepts are also analyzed with respect to personal characteristics (i.e., risk propensity, experience, gender) and business data (i.e., branch of industry, financial ratios). The data consist of materials from the earlier stated survey as well as in-depth interviews.

The well-known fact that supplying companies get little compensation for their claim in bankruptcies (i.e., at the most 4%) motivated the study. Because it is possible to enlarge one's share of compensations in bankruptcies by requesting collateral, credit managers should be inclined to request collateral. Empirical evidence suggests, however, that they seldom demand collateral. Surprisingly little is known about the underlying factors triggering this behavior. From an economic-psychological view, attitude and intention should be investigated as they are regarded to be determinants of behavior (Fishbein & Ajzen, 1975).

It was found that the average attitude of participating managers was one of constraint. This means that credit managers in Swedish supplying companies on the average do not request collateral to a large extent. It was found that collateral was requested in about two out of ten credit cases. The most frequently requested collateral was bank guarantees.

Apart from a weak correlation between risk propensity and attitudes toward requesting collateral, no personal characteristics were associated with attitudes, intentions, and behavior regarding requesting collateral. In addition, it was not possible to find any correlations with particular branch of industry, performance, or other business data.

GENERAL DISCUSSION OF THE STUDIES

As stated in the introductory chapter, the purpose of my dissertation is to provide some insights into the so-called Black Box of professional lenders' judgment and decision-making (JDM) by investigating various aspects of judgment and decision-making behavior of both experienced loan officers in Swedish banks and experienced credit managers in Swedish supplying companies.

This perhaps vaguely formulated purpose becomes clearer when considerations are taken to the specific issues on which each of the aforementioned six studies focuses. In order, the studies shed light on (1) desirable personal attributes of expert credit analysts; (2) the design of a special process-tracing software program to be employed when investigating decision behavior in lending to small firms; (3) the effect of experience on decision behavior in lending; (4) the links between information acquisition behavior, risk attitude, and experience of credit managers; (5) attitudes towards credit decision-aids; and (6) experienced credit managers' views on collateral. Table 4 summarizes the main findings of the studies. The implications of them are discussed in detail in respective study.

In this chapter, I discuss the conclusions of the dissertation and its limitations. The chapter ends with suggestions for future research and concluding remarks.

Conclusions and Discussion

On the whole, the present dissertation gives a somewhat ambiguous picture of the alleged superiority of the experienced lenders' judgment and decision-making behavior. On the one hand, the experienced lenders appear to be capable, careful, and conscious of their responsibility. They tend to consider large numbers of cues before making up their mind, rely on decision-aiding systems, and reject credit when in doubt. On the other hand, there is no evidence that these tendencies vouch for reliable performance. In other words, the experienced lenders are apt to passively consider the cues in the order as those are presented. They are also inclined to disagree and make inconsistent judgments and decisions. To what extent their judgments and decisions are more (or, for that matter, equally or less) accurate than those of non-expert lenders could neither be confirmed nor refuted due to little empirical material on that issue.

Table 4. *Main Findings of the Six Studies.*

| | |
|----------------|--|
| Study 1 | <ul style="list-style-type: none"> • Experienced credit managers rated common sense, experience, responsibility, energy and interest, and current knowledge to be the most important personal attributes of expert credit analysts. • Experienced credit managers tended to have little consensus. • The personal attributes of the imaginable expert credit analysts could be grouped into three factors: capability, basic skills, and inter-personal skills. |
| Study 2 | <ul style="list-style-type: none"> • The use of a computer program to track JDM behavior provides interesting insights into how judgments and decisions are made. |
| Study 3 | <ul style="list-style-type: none"> • Highly experienced loan officers acquired more cues in the balance sheet and the income/cost report and financial ratios than novices. • Highly experienced loan officers acquired more financial ratios than intermediately experienced ones. • Highly and intermediately experienced loan officers and novices tended to passively acquire cues in the order as they appeared. • Highly experienced loan officers were biased toward rejecting loan propositions and tended to make contradictory decisions. • Experienced loan officers were cautious by acquiring an extensive number of cues before forming judgments, whereas novices plunged into judgment and decision-making. • Highly and intermediately experienced loan officers took more time making decisions than took novices. |
| Study 4 | <ul style="list-style-type: none"> • Experienced credit managers tended to acquire fewer types of information (e.g., financial statement, credit reports, etc). • Experience was weakly related to risk attitude. • Information acquisition behavior was not related to risk attitude. |
| Study 5 | <ul style="list-style-type: none"> • Experienced credit managers relying on intuition held a more constrained attitude to credit-decision aids than those who were analysis-prone. • Experienced credit managers driven by responsibility as the source of motivation were positive toward credit-decision aids. • Experienced credit managers with collaborators tended to have a positive attitude toward credit decision aids. |
| Study 6 | <ul style="list-style-type: none"> • Experienced credit managers were reserved in their attitude to requesting collateral and requested collateral in about two out of ten cases. • Attitude, intention, and behavior with regard to requesting collateral were not associated with any particular type of business, performance, or personal characteristics (i.e., experience). |

The picture has emerged using different angles of approach. In the initial stage of the present research endeavor, I employed in-depth interviews and a nation-wide survey to collect data on JDM behavior of expert lenders or, to be specific, experienced credit managers in supplying companies in Sweden (see Studies 1, 4, 5, and 6). Because such data might be argued to merely reflect self-reported and rationalized behavior, I soon deemed it necessary to develop a software program to track actual behavior in lending situations. As a result, the process-tracing software P1198 was designed (Study 2) and then experiments involving loan officers with varying levels of experience and business-students were carried out (Study 3).

Regardless of method, survey or experiment, the findings indicate overall that experience does not unambiguously lead to specific and superior JDM behavior. When the present research project was initiated, I assumed, for instance, that experienced lenders would acquire less information and that experience could be linked with attitudes towards risk-taking, using decision support systems, and requesting collateral. Surprisingly, many of the findings in Table 4 pointed in the opposite direction. How do those findings fit with the body of research investigating expert decision-makers?

The picture of experienced lenders that emerges in this dissertation coincides and contrasts with earlier research. It agrees fairly well with the research carried out within the previously referred to behavioral view on expertise, whereas it agrees poorly with the aforementioned cognitively oriented research on expertise. However, the present picture may relate to the commonly held view that basically assumes that experienced decision-makers consider extensive amounts of information when making judgments and decisions. Nevertheless, what are the explanations for the present picture of expert lenders, given that replication, a larger sample of participants, and additional loan propositions could validate it?

One explanation relates to the phenomenon of overconfidence and task characteristics. It has been argued that confidence increases as more cues are acquired, but a corresponding increase in the decision accuracy may not occur; rather it tends to diminish after a certain number of cues (see Oskamp, 1982; Sjöberg, 1982). Iselin (1996) suggested that the degree of accuracy generally stagnates once 10-15 relevant financial cues had been considered. Recall that credit granting is a risky task in the way that erroneously made decisions can result in credit losses or reduction of revenues. Note also that loan officers and credit managers are accountable for the credit risk assessment and the credit decision. Therefore, one might speculate that the experienced lenders feel confident that their JDM is accurate, as they have considered the major categories of information and all possible cues within those categories, and, accordingly, they are pretty sure that nobody would blame them even if the decision turns out to be poor.

It might also be the case that task characteristics, nonetheless, demand extensive consideration of information, because credit granting may be an ecological system where cues are non-compensating and weakly intercorrelated. In such ecology, it is theoretically possible to extract more values from multiple cues (cf. Cooksey, 1996; Gigerenzer et al., 1999).

Another tentative explanation connects to the idea of rule-based decision-making. This idea assumes that decision-making is based on logic of appropriateness rather than logic of consequences (cf. March, 1994). Applied to the present setting, this perspective predicts essentially that the experienced lenders may adopt JDM behavior that corresponds to an image of expertise; that is, to search for more and rely on more information as this procedure presumably gives better judgments and decisions. No account is taken of the fact that information may have varying levels of importance and relevance.

As previously reported, experts may learn from experience in a corrupt manner. There are factors making adequate feedback almost impossible and distorting learning from experience (cf. Brehmer, 1980; Gilovich, 1991; Fiedler, 2000). Due to those factors, the expert lenders may develop JDM behavior that is not more efficient than or superior to those of trained non-experts.

However, the dissertation may have some shortcomings. For instance, the various constructs representing JDM behavior and related concepts might be questioned whether they are valid and reliable measures, that is whether the underlying instruments really reflect what they are intended to measure. This might explain some of the unexpected results. In particular, this may be the case for the attitude measurements in the survey reported in Studies 1, 4, 5, and 6, but this speculation might easily be psychometrically evaluated by replication. One can speculate whether this may also be the case for the process-tracing device in Studies 2 and 3 for the reasons that the participants lacked the encounters with the presumed entrepreneurs and that they were not informed about the risk and the return associated with the loan propositions. However, those reasons must be regarded in view of the following facts. Firstly, research shows that interviews in general contribute with marginal diagnostic information and tend to be misleading unless well structured (Garb, 1998). Recall also that a five-minute encounter is often sufficient to make accurate predictions about an individual and that a longer encounter does not yield more accurate predictions (Ambady & Rosenthal, 1992). Secondly, no participants remarked that they lacked statements about risk and return.

Moreover, the results of the studies are limited to concern bank loan officers dealing with credit to small firms and credit managers managing trade credit in supplying companies. Consequently, one should be careful when generalizing the present findings to other professionals in lending, such as credit analysts working in large multi-international investment banks.

Future Research

The dissertation may stimulate future research projects. Those projects may, on the one hand, concern further studies on how expert or non-expert loan officers (and credit managers) make credit decisions, and, on the other hand, deal with analogous studies on how other professionals make decisions. I discuss these two avenues of future research below.

Further Studies on Lenders

Future research projects within this avenue can take two paths. First, the projects may rely on a naturalistic decision-making approach (cf. Klein, 1999) by directly studying lenders in action. That is, the researcher makes a direct observation when the lender meets his/her clients and when he/she makes the decisions (preferably by verbal protocols). Such an approach would result in insights into the social interaction between the lender and his/her clients and how relevant this interaction is for the credit decision. Pioneering work on this path is the studies by Hedelin and Sjöberg (1994, 1995) who in the early 1990s employed such a naturalistic decision-making approach. Despite provision of good insights into decision behavior, this approach lacks the understanding of how the task characteristics shape judgment and decision-making, because the task is reported by the lenders in their terms (cf. Hammond, 1999). This lack of control for task characteristics motivates the second path.

On the whole, the second path concerns projects that are better based on the previously described JDM theories. Those projects involve controlled experiments where participants (e.g., lenders with varying experience or business students) interact with software like the one in Studies 2 and 3 and make decisions about loan propositions, which may concern small firms or private persons. Alternatively, verbal protocols may be used in the experiments. Future research within the second path can be illustrated with the following three potential projects. First, the paradigm of pre-decisional distortion (Russo et al., 1998) may well be used for studies on how different types of information (including their sequence) influence lenders' JDM behavior. Second, the idea of adaptive decision-making (Payne et al., 1993) could be employed to investigate the links between personal and task characteristics. Third, the framework of cognitive-ecological sampling (Fiedler, 2000) might be used to investigate whether lenders exposed to environments with varying degrees of client failure differ with respect to decision behavior. Tentatively, one would imagine that a lender working in an environment where hypothetically 50% of the assessed small firms go into bankruptcy tends to be biased toward rejection. His/her decision process should also be different from that of his/her colleagues who

have experienced that only 10% of the small firms end up in bankruptcy. Little research exists on that issue.

However, the two assumed paths should not be viewed as incompatible. In my view, they interact and support each other in our pursuit of gaining better insights into how lenders judge and decide on loan propositions concerning small and large firms as well as people.

Analogous Studies on Professionals

The present research focus and methods may stimulate the implementation of research projects on other experienced decision-makers. In the first place, my hope is that similar research projects on stockbrokers and financial analysts should be materialized. Directly studying their decision processes might give a better understanding of fluctuation in stock prices.

Considering their potential to provide insights, process-tracing devices like the one in Studies 2 and 3 may be employed to investigate venture capitalists' information acquisition behavior when they make decisions about corporate prospects. The dissertation and the study by Rosman and O'Neill (1993) may work as starting points. Particularly, it would be interesting to employ process-tracing software that not only includes accounting information but also film sequences in which the entrepreneur gives further details about his/her business plans. Such a device would make it possible to investigate, in a controlled manner, how the entrepreneur's personality affects the decision-process of venture capitalists and lenders.

Finally, future research projects are not restricted to concern experienced decision-makers in business life; they can also concern experts in other areas like medicine. The summary of JDM theories should also be of interest for consumer researchers.

Concluding Remarks

This dissertation has taken some modest steps to increase our knowledge of how experienced loan officers and credit managers make judgments and decisions. I hope that this dissertation will encourage more research projects in Sweden applying a similar research perspective and that research funds will be readily available for those projects. After all, research endeavors investigating how experts (and non-experts) decide, provide us with insights that we can take advantage of when we make our own judgments and decisions or, alternatively, when we are in the comfortable but passive position of having to rely on experts. The present dissertation has given such insights by essentially

expanding upon the words of the roman poet Virgil: “*Experto credite*” (trust one who has proved it).

NOTES

1. At almost the same time, Denmark, Finland, and Norway experienced a similar bank crisis and during the period from 1970 to 1990 the USA also had some bank crises where some banks almost went into bankruptcy (Lybeck, 1994). In conjunction, it can be mentioned that in the 1870s and in the early 1920s there had also been bank crises in Sweden (Lindgren, 1994).
2. According to Lybeck (1994) the Swedish bank crisis happened due to four factors: (1) the boom economy with steadily high growth and growing inflation resulting in increased volume of lending; (ii) deregulation of the credit markets; (iii) poor risk management by banks and other credit granting institutes; and (iv) the banks focused on market shares rather than profitability. The interaction between those four factors and the collapse of the overvalued real estate market lead to the bank crisis (Lybeck, 1994).
3. In fact, Stockholm School of Economics initiated in 1962 a special center devoted to research in economic psychology and that center was consequently one of the first of its kind in the world.
4. A researcher in the history of ideas might argue that an additional reason would be that my supervisors have been predominantly professors with backgrounds in psychology. On the other hand, the late Herbert A Simon, who has made important contributions to cognitive psychology, political economy, and research in business studies, had in fact a chair in computer science and psychology at Carnegie Mellon University.
5. Despite some differences the researchers have viewed corporate failure as equivalent with insolvency, bankruptcy, and liquidation. Corporate failure occurs when a company does not earn adequate return on its risk capital and it that can go on doing so for some time without closing down. Insolvency occurs when a firm cannot meet its current obligations due to a temporary or constant lack of cash. Bankruptcy happens when a company is forced by court to liquidate its assets or to reorganize. Liquidation means that the company terminates its business by selling off assets and by paying its creditors in a strict order where the prioritized creditors are paid first.
6. Parallels can be drawn to golf, where good golf shots ultimately come from good golf swings. Therefore, those players who want to improve their golf handicap should aim at training the fundamentals (i.e., grip, stance, back swing, and follow-through) of a good golf swing. Likewise, good decision-making emanates from a good decision process.
7. The reaction to those research findings might take two extreme shapes. On the one hand, the findings might be adopted in an enthusiastic but somewhat uncritical manner. The application of the popular “heuristics and biases paradigm” in behavioral auditing can be argued to be such an example where researchers may search for evidence confirming the

ideas that human judges employ cognitive shortcuts resulting in biased judgments (Shanteau, 1989). On the other hand, some researchers might be overly critical and make repetitive attempts to empirically falsify a certain finding. A good example is the attempts by economists to eliminate the preference-reversal phenomenon (e.g., the tendency to choose options that are inconsistent with one's preferences) by increasing the amount of money incentives for the participants involved in various experiments (Camerer, 1995).

8. Judgment biases concern the cognitive shortcuts that people use when making judgments and decisions. Basically, the shortcuts include variants of the three heuristics that have been described by Kahneman and his co-authors (1982). First, the representativeness heuristic means that people make probability estimations on the basis of the resemblance of two events. Second, the availability heuristic implies that people estimate probabilities of how available an event is perceived. Third, the heuristic of anchoring and adjustment suggests that people have anchor values from which they make adjustment. There are some additional biases. Overconfidence is the tendency to have more faith in one's judgment than what is motivated by an objective criterion. Hindsight bias means that people tend to give higher likelihood estimates to an event after it has occurred than before. Confirmation bias is the propensity to acquire information that confirms one's initial perception. Failure to learn from experience is another cognitive shortcoming that has been fitted into the judgment bias literature and this shortcoming will be discussed later in some details.
9. This rule, which is a sort of a broken leg cue, must be viewed in the light of other lines of business. An interviewed credit manager, who was employed in a tire supplying company, objected that in his business such a rule would be useless as most of his clients had not so clean toilets but were still prosperous firms.
10. In fact, in his forthcoming Ph.D. thesis Lars Silver (In press) at the Department of Business Studies, Uppsala University, Sweden, has investigated whether loan officers in non-metropolitan districts rely to a greater extent on qualitative sources of information than loan officers working in metropolitan districts. His analyses showed statistical differences between the two groups as regards qualitative information. It should be emphasized that he did not apply a JDM-approach when studying this issue.

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APPENDIX A. *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|---|--|---|--|
| <p>Libby (1975): To investigate to what extent loan officers could make correct predictions using financial ratios.</p> | <p>16 US small bank loan officers and 27 US large bank loan officers. No differences between these groups. Mean age = 39 years. Mean experience = 9 years. Range of applications per year: 51 to >250. Gender was not reported.</p> | <p>Experimental design where participants categorized a sample of 60 large firms (30 failed and 30 non-failed firms) plus 10 repeat cases using five ratios: net income/total assets, current assets/sales, current assets/current liabilities, current assets/total assets, and cash/total assets. Participants were told about the base-rate.</p> | <p>Accuracy ranged from 27 to 50 correct out of 60 correct predictions ($M = 44.4$). 13 out of 43 participants exhibited perfect test-retest reliability. Inter-rater reliability ranged from 31 to 57 agreements out of 60 ($M = 48$). Composite judge correctly predicted 49. No individual differences.</p> |
| <p>Libby (1976): To investigate to what extent a model of a judge (i.e., bootstrapping) would outperform the judge. In contrast to earlier bootstrapping studies, the dependent variable was binary</p> | <p>Same as above.</p> | <p>Same as above.</p> | <p>Participant outperformed his/her own model in 26 cases, in 7 cases they were even, and in 10 cases the model was superior. Mean validity of model was 43.3. The model of the composite judge correctly predicted 46 of the 60 cases. Linear predictability of criterion was 51 out of 60 cases.</p> |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|---|--|---|--|
| Libby (1979): To investigate how disclosing uncertainty in footnotes in financial statements influences loan decision behavior. | 36 US loan officers from four large commercial banks. Mean age = 34.5 years. Mean experience = 8.6 years. Gender was not reported. | Experimental design involved 20 cases (medium-sized firms) that had been manipulated with respect to three kinds of information: financial statements (good vs. bad), management evaluation (good vs. bad), and uncertainty disclosures and supplement (no disclosure, a single detailed, positive or negative, footnote, or a, positive or negative, detailed report added to that footnote). In all, there were 20 (2*2*5) combinations. Participants were asked to grant or deny. If loan was granted, they stated the required interest rate premium. | Main effect of uncertainty disclosure-supplemental report was significant. Participants assigned a significantly higher rate premium to negative supplemental report cases (2.15) than the other two types of cases (1.32 and 1.43). Main effects of financial statement and management evaluation were also significant. If they were good, the interest premium was lower. Inter-rater reliability was 0.75. Participants treated cases with no disclosure footnote like those cases with positive footnotes. The study may lack external validity (Schultz JR, 1979). |
| Casey Jr (1980): Replication of Libby (1975), that is, to investigate loan officers' prediction ability as regards failed and non-failed firms | 46 US bank loan officers. Mean experience = 7 years. Range of applications assessed per year was 101 to 150. Age and gender were not reported. | Experimental design involved 15 failed and 15 non-failed firms. Participants were not told about the frequency of failure. Same ratios as Libby but also total liabilities/ owner's equity. Ratios were taken from three consecutive years prior the failure. Participants obtained Myers-Briggs measurement of information-processing style. | Average overall predictive accuracy was 17 out of 30 firms. Composite judge was 18. Participants classified as intuition prone tended to perform better than those classified as sensors. Participants rated that the importance of the ratios were in accordance with research in finance. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|--|---|--|--|
| Zimmer (1980): See above. | 30 Australian loan officers. 30 part-time accounting students from Australia. Age, experience, and gender not reported. | Experimental design was similar to Libby (1975) but other cases involving 42 listed Australian firms (50% experienced bankruptcy within one year subsequent to the ratios) were used. The five ratios were: earnings before interest and taxes to total assets, quick asset ratio, ordinary dividends to ordinary earnings, total debt to gross cash flow, and long term debt to equity. | 28 participants performed better than chance. Mean accuracy = 32.4. Accuracy improved with greater confidence. Insignificant correlation between actual and estimated performance. No individual differences. Average consensus = 72%. A consensus judge scored 36 correct predictions. No significant differences between loan officers and students. |
| Zimmer (1981): Replication of (Libby, 1976) | Same as above but only the loan officers. | Same as above. | Mean validity of model was 33.7. Linear predictability of criterion was 37 out of 42 cases. Most accurate model scored 38. Bootstrapping yielded better predictions. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|--|--|---|--|
| Biggs et al. (1985): Would lending officers adapt their decision behavior to changes in task environment? | 11 US commercial loan officers. Mean experience = 5.8 years. Age and gender were not reported. | Each participant performed 6 tasks that required he/she to pick a company to grant a \$100,000 one-year, unsecured loan. The tasks were varied with respect to number of candidate companies (3 or 10) and amount of available information (3 or 7 cues). Cues measured on 11-point scale ranging from extremely poor to excellent. Two process tracing methods, verbal protocol and information display boards, were used and agreed well (92%). | Participants adapted their decision behavior to task characteristics. Number of acquired cues decreased as task size increased. Number of cues acquired increased as the similarity of the option increased. The tendency to rely on non-compensating decision strategies increased as task size increased. High levels of consensus ($W = 0.91$) with regard to the chosen companies. |
| Doukas (1986): To compare the prediction ability of loan officers with those of two scoring models. | 22 Canadian bankers. 41% had 5 to 10 years of experience. Age and gender were not reported. | A sample of 20 good and 20 poor privately owned, small and medium-sized Canadian companies. Participants made prediction of this sample. Predictions were also derived using the Z-model by (Altman, 1971) and an unpublished discriminant model. | Using only 3 minutes the loan officers outperformed the models. The models predicted bankruptcy poorly. It must be pointed out that the models were applied to Canadian companies despite being derived by data on US companies. Doukas claimed that with more information and more time loan officers could have performed even better. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|---|--|---|--|
| Danos et al. (1986): To investigate how financial information influences the judgments in the three stages of a lending decision (examination of financial statements; a fictitious encounter where a management forecast report is given; performance of detailed credit report). | 52 US loan officers. Age, experience, and gender were not reported. | Experiments had a 2*2*2 design implying that there were two cases (a financially strong and a financially weak) with additional management forecast upon request (available vs. not immediately available). The third manipulation variable involved the quality of the forecast (well-grounded vs. not well grounded. After each stage, participants were asked to grant or reject and to estimate their confidence. | Participants agreed extremely well: 92% rejected the weak case and 90% granted the strong case. Initial confidence (after stage 1) was high, but increased steadily as more information was acquired. The availability of forecast and the quality of that report was important only for the strong case. Performing a credit report had more impact on judgment than the availability of forecast report. |
| Bouwman et al. (1987): To examine decision making processes of professional financial analysts screening a prospective investment. | 12 US financial analysts. Mean experience = 16 years. Age and gender were not reported. | Participants obtained a package of financial information regarding an undisguised but unfamiliar listed company. When browsing through the package, participants concurrently reported their thoughts. | Two dimensions of information search strategies were found: directed vs. sequential and episodic vs. continuous. Participants employed directed search. There were three directions of search: checklist, theme, and conditional checklist. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|---|--|---|---|
| Rodgers (1991): To illustrate how a parallel distributed processing two-stage model could be applied on loan officers' decision processes. | 33 US loan officers were classified into two groups, data-driven and conceptually-driven, using Myers-Briggs Measurement. Age, experience, and gender were not reported. | The experimental design implied that participants on the basis of three cues made judgments about whether a company should obtain an unsecured loan of \$1,000,000. 10 cases were used. | Structural modeling technique resulted in the following conclusions: Conceptually-driven loan officers were more risk averse than the data-driven ones concerning financially good companies. The former group focused on debt/equity, whereas the latter ones were concerned with liquidity and income. |
| Rosman & O'Neill (1993): To compare information acquisition strategies of venture capital and commercial lenders. | 19 US venture capital lenders. 23 US commercial lenders. Mean experience = 5.9 and 7.9 years, respectively. Age and gender were not reported. | Participants interacted with software Brucks, 1988) to select information they deemed important to make separate judgments about four loan applying firms. Applied loan amounts are not reported. There were 10 categories of information. A warm-up case was used. | Venture capitalists gathered a smaller proportion of historical financial cues but a larger proportion of strategic cues than commercial lenders. No other group differences with regard to time, total amount of acquired cues, and search focus. The groups were persistent in their decision behavior across the four companies. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|--|---|--|---|
| Deakins & Hussain (1994): To investigate what information bankers consider when evaluating a new venture. | 30 British bank managers. Age, experience, and gender were not reported. | A quasi-experiment design implying that the authors took the role of entrepreneurs applying for a £60,000 loan concerning a start up venture. A standardized business plan was used. | Participants were mostly concerned with the ratio debt/equity, entrepreneurs' personal financial status, and forecasts. Participants disagreed about the decision; 14 were positive. |
| Hedelin & Sjöberg (1995): To study how the personality of entrepreneurs influences the loan decision | 135 of 173 Swedish loan officers responded to a nationwide survey. Of those, 44% and 38% responded to two additional questionnaires. Mean age = 43. Mean experience = 13 years. 87.5% male. | Three questionnaires were used. (A) had 388 questions about what personal factors and information were deemed important when evaluating entrepreneurs seeking loan. (B) was completed before the encounter with an entrepreneur. (C) was completed after the encounter with that entrepreneur. | Two personality factors were important for the loan decision: business realism and personality impression. The two most important predictors of loan decisions: likelihood of operating after 5 years and realism in business plan. Risk prone loan officers tended to search for less information and grant. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|--|--|---|--|
| Hedelin & Sjöberg (1994): The same as above. | 57 of 75 Swedish credit analysts at development funds and county administrative boards responded to similar surveys as the ones in (Hedelin & Sjöberg, 1995) | Same as above. | The most important personality factor was business realism. Participants stated that the entrepreneur's personality influenced the lending decisions. They claimed that they often made correct judgments but they preferred to rely on intuition rather than on analyses. |
| Svensson & Ulvenblad (1995): To identify patterns in which bank loan officers manage loans. | 55 Swedish loan officers. 4 Swedish loan officers and 4 Swedish entrepreneurs. Age, experience, gender were not mentioned. | Interviews were performed. Questions concerned problems in credit management and information important for credit assessments. | Interpretations of interviews resulted in two approaches when making credit assessments: a static approach meant reliance on objective data and a dynamic approach meant no such reliance but focus on complexity. |
| Wahlund (1995): To investigate to what extent confirmation bias exists among professionals. | 54 Swedish bank managers. Mean age = 37 years. 70% male. Experience was not reported. There were also other kinds of professionals. | Two experimental tasks. First, to test the claim that a card has a vowel on one side and an even number on the other side (i.e., Wason-card task, see Plous, 1993). Second, to find out if loans associated with credit losses initially had been assessed to be risky. | About 54% of the participants searched for confirmation evidence; i.e., they stated that they would acquire information about cases initially assessed as risky (or risk-free) and acquire indicators of credit losses (or lack of such). Business students tended to do the same. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|---|--|--|--|
| Fletcher (1996): To replicate Deakins & Hussain (1994) and to investigate how Scottish bankers make lending decisions to small firms and the important factors used to evaluate loan propositions. | 38 Scottish bank managers. Age, experience, and gender were not reported. | Same as Deakins & Hussain (1994) | As regards the business plan, participants were mostly concerned with management capabilities, location, and forecasts. Participants disagreed about the decision of this plan; 26 were positive. In general, trading experience, equity stake, and debt/equity were the most important factors when evaluating loan propositions. |
| Beaulieu (1994): To investigate the impact of character facts given positive or negative accounting information about the credit applicant. | 67 inexperienced lenders with less than 2 years practice. 63 experienced lenders with more than 2 years practice. Over all, Mean age = 35 years and mean experience = 12.5 years. 15% females. | Experimental task. Participants made decisions about a loan proposition that was manipulated in four ways: (i) all positive facts, (ii) all negative facts, (iii) positive accounting but negative facts, (iv) negative accounting but positive facts. Facts were measured on a seven point scale ranging from poor to strong. | Experienced lenders never granted when accounting information was negative, but inexperienced ones sometimes did when the character fact was strong. |
| Beaulieu (1996): To investigate whether loan officers recall more JDM consistent facts than inconsistent facts. | Same as above. | Same experimental task and procedure as above but participants were after their decisions asked to recall the information in the proposition. | More consistent facts were recalled than facts that were inconsistent with the judgment and decision-making (JDM). No differences was found between the two groups. |

APPENDIX A (contd). *A review of published studies investigating JDM behavior of lenders or equivalent professionals.*

| Study and Purpose | Participants | Method | Results |
|--|--|--|--|
| Rodgers (1999): To investigate and explain the impact of conflicting information on novices' and loan officers' decision behavior. | 40 US commercial lending officers and 67 US MBA-students. Age, experience, and gender were not reported. | Experimental design involving two good and two poor companies seeking an unsecured loan of \$1,000,000. After reading each case, participants were asked to evaluate economic and management information, judge credit worthiness, and make loan recommendation. | Partial least squares modeling resulted in the following observations. Loan officers but not students were influenced by conflicting information. Novices tended to focus on accounting information. Novices and loan officers made correct decisions in 86% and 82% of the cases, respectively. |
| Rosman & Bedard (1999): To investigate the impact of decision-process effort on loan conditions (defined as level of collateral and covenant) | 32 US lending officers. Mean experience = 9.1 years. Age and gender were not reported. | Participants interacted with software (Brucks, 1988) to select information they deemed important to grant loan to one of three firms. Applied loan amount was not reported. | More restrained loan conditions were associated with less time spent on judgment and less effortful search behavior (i.e., acquiring cues through each firm). Amount of acquired, risk attitude, and experience had insignificant effects. |

Study 1.

Personal Attributes of Expert Credit Analysts

PERSONAL ATTRIBUTES OF EXPERT CREDIT ANALYSTS¹

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics, Sweden

Manuscript submitted for publication. This is a revised version of a conference paper entitled "The Identity of Expert Credit Analyst", which was awarded the best doctoral student paper in the area "Psychology and Business Risk" at the Third International Stockholm Seminar on Risk Behaviour and Risk Management in June 1999.

Abstract

This paper investigates desirable personal attributes of expert credit analysts. The empirical material consisted of interviews as well as responses to a measurement. In-depth interviews were performed with 26 experienced credit managers in order to learn more about important personal attributes of expert credit analysts. On the basis of the results on these interviews, a measurement was constructed. Two groups of subjects responded to the measurement: 93 experienced credit managers and 98 business students. The credit managers deemed the following five attributes to be the most important attributes of expert credit analysts: common sense, experience, responsibility, energy and interest, and current knowledge. The credit managers' responses were condensed by an exploratory factor analysis into three factors: capability, basic skills, and interpersonal skills. The empirical findings should contribute to our understanding of experts performing credit assessments.

Keywords: characteristics, credit analysts, experts, personal attributes

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Introduction

Credit analysts play an important role in the credit market as their main task is to make credit risk assessments that determines who will receive credit and who will not. This judgmental task is characterized by information asymmetry implying that credit analysts have presumed difficulties in observing behaviors and intentions among credit applicants as well as among clients that have already received credit (Milgrom & Roberts, 1992).² The consequences of this asymmetry may result in inefficient capital allocation caused by moral hazard and adverse selection (Stiglitz & Weiss, 1981). Accordingly, demand should be made on the competence of the credit analysts in order to reduce or eliminate the erroneous decision-making.

Prior research on credit analysts and on related professionals (i.e., bankers, loan/credit officers, and credit managers) has mainly focused on their decision behavior; see Maines (1995) for a review. In previous volumes of the *British Accounting Review*, Berry et al (1993), Deakins & Hussain (1994), and Berry & Waring (1995) performed interviews with bankers to find out about the financial information they consider important when they make lending decisions to small firms. Deakins & Hussain (1994) also found that bankers were overly concerned with not granting credit to non-creditworthy companies. The ability to predict corporate failure has been tested in experimental situations where loan officers have performed well sometimes (Libby, 1975) but most of the time poorly (Casey Jr, 1980; Zimmer, 1980). In order to identify the relevant financial statement cues, researchers have also attempted to model loan officers' decision-making processes. Two independent techniques made modeling procedures possible: (i) simulation of the evaluation process employed by one loan officer (e.g., Cohen, Gilmore & Singer, 1966) and (ii) constructing simple linear models on the basis of experimental settings (e.g., Libby, 1976) or on the basis of a sample of real outstanding loans (cf. Hester, 1966; Dietrich & Kaplan, 1982). The resulting models often outperformed the credit analysts in terms of making correct prediction. Moreover, as indicated by searches in various bibliographical databases (e.g., SSCI, EconLit, Proquest, and PsychLit), there exists no study that has systematically investigated desirable personal attributes required to be a successful credit analyst.³ In conclusion, surprisingly little is known about what one needs to be a successful credit analyst.

Empirical evidence on the requirements of an expert credit analyst is essential, because such evidence may identify an expert in a given domain and then it is possible to study how this individual chooses, processes, and acts upon relevant information. Such insights are important for constructing expert systems, developing training programs, setting standards for requirements (cf.

Shanteau & Stewart, 1992), and for economic efficiency (Camerer, 1995). Thus, efforts to improve credit granting should also be devoted to identifying expert credit analysts. Such means may improve the skills of future credit analysts and reduce or eliminate both type I errors (i.e., credit granting to non-paying companies) and type II errors (i.e., the denial of credit to paying companies) and ultimately result in reduced funding gaps (see Cressy & Olofsson, 1997).⁴

In this paper, I have attempted to take some steps to fill the empirical gap in the knowledge of successful credit analysts by describing and analyzing import personal attributes associated with expert credit analysts. For this purpose, I will assume that being a successful credit analyst implies that one is basically an expert in the credit-granting domain and I will use a theoretical framework consisting of literature on expert judgment.

The remainder of this paper is organized in five sections. First, the relevant literature is reviewed. Second, the employed methods are described. Third, the empirical material is reported and analyzed. Fourth, the conclusions are summarized. Finally, comes a discussion concerning the implications of the conclusions.

Literature Review

One strand of research on expert judgment aims specifically to identify experts. Expertise is an ambiguous concept. In accounting and auditing literature experts have been defined with respect to experience, self-rating, and seniority. Hoffman et al (1995) suggested that an expert is: (i) someone who can accurately and efficiently deal with complicated matters or (ii) someone who has specific skills or knowledge obtained from extensive experience. The quest for a cognitive view of expertise has motivated new methods (Bédard & Chi, 1993). Shanteau (1995) has suggested that asking professionals, whom they consider to be the best in a given domain, makes it possible to identify experts. Although the importance of talent cannot be neglected (Gardner, 1996), the empirical evidence suggests that deliberate practice is the core requirement when examining expertise (Ericsson & Lehmann, 1996). Shanteau (1992a) has claimed that expert competence depends on the five following interacting factors:

1. Experts must have domain knowledge that combines learning with the experience of working on real problems.
2. To be acknowledged as an expert, it is necessary to have certain psychological traits (i.e., self-presentation), such as strong self-confidence, excellent communication skills, ability to adapt to new situations, and a clear

sense of responsibility. Simply put, it is essential to behave like an expert if one wants to be acknowledged as an expert by other people (Shanteau (1992a).

3. Cognitive skills refer to the ability to extract information that non-experts either overlook or are unable to see, a sense of what constitutes relevant and irrelevant information, the ability to simplify complex problems, and the capacity to work effectively under stress.
4. Experts use a variety of decision strategies to systematize decision-making and to overcome cognitive limitations. More specifically, experts tend to adjust initial decisions, to rely on other people, to use decision aid systems, and to simplify decision situations (Shanteau, 1988).
5. Task characteristics are essential determinants of expert performance. Shanteau (1992b) makes the following conclusions. First, experts perform well (i.e., making a correct decision or judgment) in domains involving among other things static stimuli, decisions about objects, available feedback, and decision aids. Second, experts perform poorly (i.e., not making a correct decision or judgment) in domains that concern among other things volatile stimuli, decisions about people, no feedback, and no decision aids. The claim that experts are knowledgeable but perform poorly (e.g., Camerer & Johnson, 1991) must be modified accordingly in light of the task characteristics.

The theory of expert competence by Shanteau (1992a) requires some comments. First, the theory should be regarded as a framework to employ when evaluating expert competence rather than as theoretical propositions. Second, this framework should be regarded with respect to type of expertise. This was also pointed out by Shanteau (1988) who suggested three kinds of expert distinctions: (i) perceptual (e.g., livestock judges) versus cognitive experts (e., auditors), (ii) knowledge (e.g., academics) versus diagnostic experts (i.e., physicians), and (iii) advice (i.e., accountants) versus action experts (business managers). In contrast, Weinstein (1993) drew a distinction between, on the one hand, experts who are evaluated with respect to their performance and, on the other hand, experts who are evaluated with respect to their knowledge. Another expert distinction might be experts working inside and outside an organization. It follows that the five interacting factors above are contingent upon the type of expertise. For instance, it might be the case that an expert working inside an organization has different psychological traits than an expert working outside that organization.

Table 1. *Importance Ranking of Pre-Specified Expert Attributes by Auditor Partners Adapted from Abdolmohammadi and Shanteau (1992).*

| Attributes | Explanation | Attribute | Explanation |
|--|---|---|---|
| 1. Knows what's relevant ^C | Experts can distinguish relevant from irrelevant information. | 11. Creativity ^D | Experts can generate new approaches to solve decision situations. |
| 2. Current knowledge ^C | Experts keep up with current facts, trends, and developments. | 12. Communicates expertise ^S | Experts are able to convince other people. |
| 3. Assumes responsibility ^S | Experts accept their responsibility for the decision outcomes. | 13. Problem simplification ^D | Experts can simplify decision situations. |
| 4. Experience ^C | Due to pattern recognition experts can make decisions with less effort. | 14. Makes exceptions ^D | Experts have several ways to approach the decision situation. |
| 5. Adaptability ^S | Experts adjust their decision-making to the current situation. | 15. Warm and friendly | Experts get along well with people. |
| 6. Perceptive ^C | Experts can extract new information. | 16. Energetic | Experts are highly motivated. |
| 7. Decisiveness ^S | Experts make decisions quickly. | 17. Problem selection ^D | Experts can identify solvable and unsolvable problems. |
| 8. Self-confident ^S | Experts have strong confidence in their decision making. | 18. Methodical | Experts approach decision situation systematically. |
| 9. Stress tolerance | Expert can cope efficiently with stress. | 19. Perfectionist | Experts search for the best decision option. |
| 10. Inquisitiveness ^D | Experts tend to work on problems out of curiosity. | 20. Physical appearance | Experts have the image of being the best. |

Note. Cognitive attributes (denoted by C) were considered most important. Then the attributes reflecting self-presentation (S) followed. Attributes associated with decision strategies (D) were next. The remaining attributes were rated as least important. They were also intended to distract the subjects.

Searches in the aforementioned databases reveal only one published study that has tested the theory of expert competence. Abdolmohammadi & Shanteau (1992) (henceforth A&S) tested this idea in an empirical study on characteristics associated with expert auditors. Three groups of subjects (19 audit partners, 17 senior auditors, and 36 auditing students) were asked to rank

important attributes for expert auditors. The partners viewed themselves as experts, whereas the seniors did not. Two types of questions were used: open-ended and pre-specified. A categorical ranking procedure was employed in which subjects assigned "A" to the four most important attributes, "B" to the next four, etc., and "E" to the four least important. Table 1 describes the pre-specified attributes, which were ranked as follows: cognitive/knowledge, psychological, decision-making, personal appearance/style. The three groups gave almost identical answers to both types of questions. It was also found that the audit partners had higher levels of agreement (i.e., lower dispersion in the responses). This observation supports the claim of consensus among experts (Einhorn, 1975). On the basis of the strong consensus among subjects, A&S asserted that their findings indicated that professionals were able to identify expert attributes.

There are some related studies that connect to the theory of expert competence, but the individual researcher has often not explicitly stated this connection. Such studies have been carried out within the fields of leadership and entrepreneurship. For instance, on the basis of a survey where 100 leading American entrepreneurs participated Hood & Young (1993) concluded that there were four prime areas that one needs to develop to become a successful entrepreneur. The four areas were: (i) essential knowledge in business related matters (i.e., finance, accounting, engineering), (ii) leadership and communication skills, (iii) creative and opportunistic thinking, and (iv) self-motivation and risk-taking propensity. The four areas suggested by Hood & Young (1993) connects fairly well with Shanteau's (1992a) ideas above.

In addition, the comprehensive research field on personality measurement connects implicitly to the characteristics of expertise. As indicated by meta-analytical procedures some personality factors are positively related to career success (Judge et al, 1999). As pointed out by Hogan, Hogan & Roberts (1996) standardized personality measurements should always be used in conjunction with specification of those personal attributes that the individual job demands, as those attributes may not be captured by the standardized measurements, which rather reflect general personal attributes.

To sum up this section, the theory of expert competence by Shanteau (1999a) and the empirical evidence by A&S seems, accordingly, to be of particular interest for the purpose of present paper. Consequently, it can be stated that the paper in a sense attempts to test Shanteau's (1992a) claim, and to replicate that of A&S. It can be argued that the replication of A&S is irrelevant because auditing and credit granting are two different domains despite some similarities. For instance, auditors work outside organizations whereas credit analysts work within organizations, but the two domains correspond to each other as they involve diagnostic tasks. A replication, however, is both relevant and important for two reasons: (i) similarities between the two crafts may reflect

general expert attributes, and (ii) dissimilarities may reflect domain-specific expert attributes that are particularly relevant for auditing and credit granting respectively.

Methodology

Given the fact that few research projects had focused on the personal attributes of expert credit analysts, and a lack of an explicit theory on this topic, a research approach characterized by induction was carried out. As a result, it was essential to apply an approach suggested by Glaser & Strauss (1967). They claimed that a substantive theory should be generated by systematic comparative analyses of data and that the emergence of the conceptual elements in a new theory should preferably not be "contaminated by concepts more suited to different areas" (Glaser & Strauss, 1967, p. 37). I decided, therefore, that rather than using the questionnaire employed by A&S to employ the following procedures.

First, to learn more about important personal attributes associated with expert credit analysts, in-depth interviews were performed with 26 managers (four women) who had more than 15 years practice of credit risk assessments. All subjects had extensive experience and had, therefore, been selected by the Swedish Credit Managers' Association to participate in the interviews. Both telephone interviews ($n=9$) and separate face-to-face interviews ($n=17$) were performed.⁵

Second, the interviews were analyzed using a grounded theoretical methodology (Glaser & Strauss, 1967). To enable systematic data collection aiming for an empirical generalization (Glaser & Strauss, 1967), a measurement regarding the personal attributes of expert credit analysts was constructed on the basis of the results from analyses of the interviews. This measurement included the 27 personal attributes in Table 2 and, accordingly, summarized the findings from the interviews. Responses to this measurement were rated on a seven-point verbally anchored scale ranging from "extremely unimportant" (0) to "extremely important" (6).

Third, this measurement was then distributed to two different groups of subjects: professionals and students. The professional group consisted of 165 experienced credit managers in Swedish supplying companies selected by the Swedish Credit Managers' Association in 1997 to participate in a nation-wide survey in which the measurement was included; see Andersson (1998) for more details. Primarily, this group was chosen because it was easy to get access to such professionals. In all, 93 (27 women) experienced credit managers returned completed questionnaires. Their years of experience ranged from a minimum of

3 up to 40 ($M=13.44$, $SD=8.09$) and the responding credit managers will henceforth be referred to as professionals. In order to evaluate the validity of professionals' responses it was essential to have a benchmark consisting of responses from a novice group. This group consisted of 207 business students at the Stockholm School of Economics who participated in a course on economic behavior in the fall of 1998. They were asked on a purely voluntarily basis to answer a short questionnaire in which the measurement was included. This questionnaire did not include background questions such as age, gender, etc. In all, 98 students returned completed questionnaires. Many students raised questions about what a credit analyst does, so the responding students will be referred to as novices.

To conclude, the empirical material in the present paper consists of the qualitative data from interviews as well as the professionals' and novices' responses to survey questions.

Results

Desirable Personal Attributes of Expert Credit Analysts

Table 2 summarizes the findings from the interviews. Analyses of the interviews extracted 27 important attributes associated with expert credit analysts. Besides the pedagogical skills (i.e., "being a teacher") few attributes were mentioned by single interviewees. The majority of interviewees mentioned the following attributes as important for the expert credit analyst: analytical skills, intuition, education, knowledge, and experience. It is not surprising that these attributes were frequently mentioned, because they are likely to constitute the fundamentals of expert competence. They certainly correspond to Shanteau's (1992a) first requisite for expert competence: "domain knowledge".

It is interesting to note that twelve of the expert attributes appearing in A&S as pre-specified attributes and as open-ended responses, were also mentioned by the interviewed credit managers. The coinciding attributes are marked in Table 2. The twelve pre-specified attributes were: (1) assumption of responsibility, (2) current knowledge, (3) decisiveness, (4) energy and interest, (5) adaptability, (6) experience, (7) initiative and creativity, (8) calmness and stress-tolerance, (9) perceptiveness, (10) curiosity, (11) warmth and friendliness, and (12) knowing what's relevant. All four cognitive attributes, three of five self-presentation attributes, two of five decision-strategic attributes, and three of five distractors in A&S's study were reported to be important characteristics for the expert credit analysts. It is striking that the cognitive attributes were replicated completely as such findings suggest general expert characteristics.

Table 2. Important Personal Attributes of Expert Credit Analysts: Explanations and Quotes Extracted from the In-Depth Interviews (Translated From Swedish).

| Attribute | Explanation and Quote |
|--|---|
| Analytical skills [^] | The expert must be able to analyze. "Ability to combine different kinds of information, weigh them, and arrive at conclusion." |
| Assumption of responsibility ^{^*} | The expert feels accountable for his/her decision-outcome whatever the outcomes are. "One strives for responsibility." |
| Ability to master decision aids | The expert must be able to rely on decision aids as well as to accept new decision aids. "An efficient decision support system replaces poor memory." |
| Current knowledge [*] | The expert keeps up with current facts, trends, and developments. "One always meets new situations, so one can't stop learning." |
| Decisiveness ^{^*} | The expert must be able to form judgments and make decisions quickly. |
| Energy and interest [*] | The expert is committed to his/her work. "It is important to be committed and to find credit issues exciting as well as to develop new routines." |
| Adaptability ^{^*} | The expert must adapt to new situations. |
| Negotiation skills | The expert must be able to reach good agreements with clients and to bargain with people in his/her own organization. "The expert should be able to negotiate so that everybody understands that credit limits and conditions are parts of the sales." |
| Experience ^{^*} | The expert must have extensive practice to be able to make good judgments. "Credit granting is a domain that one can't learn in school. The only way to acquire knowledge is through one's own experience." |
| Education | The expert must have a good education, such as a degree at a business school. "It is required to have a business background in terms of post-secondary education." |
| Knowledge [^] | The expert has good knowledge of accounting and finance, and he/she knows how business and markets work. "To understand and to know how one's firm, competitors, and products operate." |

Table 2 (contd). *Important Personal Attributes of Expert Credit Analysts: Explanations and Quotes Extracted from the In-Depth Interviews.*

| Attribute | Explanation and Quote |
|-----------------------------|--|
| Intuition | The expert must be able to rely on gut-feelings. "One must have indefinable feelings to see that a business makes sense." |
| Initiative and creativity^* | The expert can find new solutions and new ways of thinking. "He must be able to see possibilities." |
| Stubbornness | The expert does not give up easily. "The expert does not give up until he/she gets the right answer or at least an answer from the client." |
| Stress-tolerance* | The expert must remain calm when faced with clients who apply for more credit or further days of grace. "By being calm and composed one can appease angry clients and turn them into devoted clients." |
| Perceptiveness^* | The expert must perceive hints that indicate insolvency. "He must be able to read between the lines." |
| Judgement of human nature | The expert must be able to accurately judge people with respect to their intentions to pay. "The trend towards more know-how firms requires that the credit analyst must be able to judge people to understand them and their ability to run a business." |
| Accuracy | The expert should always perform well. |
| Curiosity^* | The expert is curious to learn new things. "In one's spare time, one can observe if a certain client really has on-going business." |
| Reliability | The expert should always be reliable. "Be as reliable as a soldier." |
| Warmth and friendliness* | The expert must be sociable, because credit risk assessment is interacting with people. "By being warm and friendly it is possible in a sales promoting way to induce major clients that have firm opinions to accept the credit conditions." |
| Common sense^ | The expert should have a common sense and be suspicious. "The salesperson may be gullible, but not the credit manager." |
| Ability to focus on sales | The expert must concentrate on sales of his/her firm rather than credit losses. "Credit granting works as a marketing tool." |
| Sincerity^ | The expert expresses demands firmly to the clients or to salespersons. "Fortiter in re suaviter I modo." |

Table 2 (contd). *Important Personal Attributes of Expert Credit Analysts: Explanations and Quotes Extracted from the In-Depth Interviews.*

| Attribute | Explanation and Quote |
|--------------------------|--|
| Being a good teacher | The expert must be able to transfer his/her knowledge and experience. "Informing collaborators and salespersons about one's experience so that they can recognize a good or bad client." |
| Knowing what's relevant* | The expert is able to focus on relevant issues. "It is vital to acquire the relevant cues and disregard the irrelevant cues." |
| Communication skills^ | The expert has excellent writing and speaking skills. "It is important that the credit analyst can express himself/herself because credit risk assessment is interacting with people." |

Note. In most cases the personal attributes have been exemplified by relevant quotes from the interviews or summarized statements. The attributes appear in the same sequence that they had in the measurement. ^ denotes attributes that were similar to the open-ended responses in Abdolmohammadi and Shanteau (1992). * denotes attributes that were similar to the pre-specified attributes in Abdolmohammadi and Shanteau (1992).

Responses to the Personal Attribute Measurement: Between-Group Analyses

Appendix A describes the mean responses by the professionals and novices. The Cronbach's alpha coefficient was 0.89 suggesting excellent reliability (cf. Peterson, 1994). The professionals tended to give higher ratings overall compared to students. Whereas the professionals' mean responses ranged between 3.97 and 5.15, the equivalent range for novices was 2.22 to 4.86. In terms of dispersion, the professionals had less variation in their responses compared to the students. Averaging the standard deviation for each item within each group resulted in a mean standard deviation of 0.83 for the professionals and 1.41 for novices. The evidence suggests that the professionals on average did not vary their answers as much as the novices did on average.

The responses of the two groups differed significantly regarding the attributes as indicated by the Kruskal-Wallis test, see Appendix A. With respect to the size of the rating differences, the attributes could be classified into three categories: (i) 17 strongly significantly different (i.e., $p < 0.000$) attributes, (ii) five significantly different (i.e., $p < 0.05$) attributes, and (iii) five similarly rated attributes. This disagreement between the two groups of subjects was inconsistent with A&S, who reported strong consensus among the three groups of subjects. However, in the present study there were five exceptions: "experience", "analytical skills", "knowing what is relevant", "accuracy" and "ability to judge human nature" generated similar ratings by the two groups of

subjects. Apart from the last attribute, the first four attributes had relatively high mean ratings (5.11 to 4.78 for the professionals and 4.86 to 4.76 for the novices). This may be due to the fact that they expressed essential cognitive skills (cf. Shanteau, 1992a) as well as stereotypes of experts. These four attributes may also be more representative of experts or even stereotypes of expert (cf. the representativeness heuristics by Kahneman, Slovic, & Tversky, 1982).

As described in Appendix A, the two groups not only differed with respect to ratings but also with respect to rankings, despite highly correlated ratings ($r=0.71$). However, correlating the average ranks does not capture the dispersion within the two groups and requires the following procedure be used to calculate average correlation between the two groups of subjects as well as average correlation within the two groups of subjects (see below).⁶ The two samples were repeatedly divided into four random groups of subjects: (i) even-numbered professionals, (ii) odd-numbered professionals, (iii) even-numbered novices, and (iv) odd-numbered novices. For each odd-numbered professional, an average correlation between his/her response with the responses of each even-numbered novice was calculated. For each odd-numbered novice, an average correlation between his/her response with the responses of each even-numbered professional was calculated. This procedure resulted in an average correlation of 0.15 ($SD=0.11$) indicating weak consensus between the two subject groups.

Responses to the Personal Attribute Measurement: Within-Group Analyses

Analyses within the two groups were performed using the following procedure. Average correlation within the two groups of subjects was calculated further by the aforementioned procedure in which the samples were repeatedly divided at random. For each odd-numbered professional, an average correlation was calculated between his/her response with the responses of each even-numbered professional. For each odd-numbered novice, an average correlation was calculated between his/her response with the responses of each even-numbered novice. This procedure resulted in a mean correlation among professionals of 0.15 ($SD=0.08$) and in a mean correlation among novice of 0.29 ($SD=0.12$). These values indicate weak consensus. The Kruskal-Wallis test indicated that these two correlations were significantly different (mean ranks were 624.80 and 1269.33 respectively, $\chi^2=651.71$, $p<0.000$) implying that the consensus among novices was significantly higher than among professionals.⁷

Condensing the Personal Attribute Measurement

To investigate the existence of patterns in the responses of the professionals an exploratory factor analysis was run.⁸ The professionals' responses could be condensed by Principal component and Varimax rotation into three factors as suggested by the scree test. Cronbach's alpha coefficients for the three consecutive factors were on satisfactory levels ($a_1=0.79$, $a_2=0.73$, and $a_3=0.75$), indicating reliable estimators (cf. Peterson, 1994).⁹

The first factor covered the following eight attributes (explained variance of 15.08%): responsibility, current knowledge, reliability, sincerity, ability to know what is relevant, being a good teacher, stress tolerance, and ability to master decision aids. These attributes manifest essential qualities to be able to efficiently work with on-going tasks as well as to keep up with the development in the domain. The first factor, therefore, captures the dynamic aspects of expert credit analysts. Consequently, it was labeled "capability".

The second factor included the following six attributes (explained variance of 14.08%): judge of human nature, perceptiveness, warmth and friendliness, intuition, education, and knowledge. Since these attributes are considered necessary conditions for expert competence, the second factor was called "basic skills". (cf. Shanteau, 1992a).

The third factor incorporated the following five attributes (explained variance of 13.73%): stubbornness, negotiation skills, adaptability, decisiveness, and creativity and initiative. These attributes were assumed to represent skills that are essential to interact with people outside and inside the organization. To interact successfully with clients, for example, it is necessary to have negotiation skills, so that clients accept the payment demands. Due to the conflict between the sales and credit department (cf. Dernroth, 1993), negotiation skills are also required in contacts within the organization. The third factor was, therefore, called "interpersonal skills".

Conclusions

The key findings of the paper can be summarized as follows.

- Professionals stated that common sense, experience, responsibility, energy and interest, and current knowledge to be the five most important attributes. The five least important attributes were communication skills, ability to focus on sales, curiosity, warmth and friendliness, and being a good teacher. It might be argued that the rating of the attributes does not necessarily reflect actual competence.

- Professionals gave higher ratings compared to the students and their responses did not vary as much as the students'. This tendency might reflect that the professionals had difficulties in prioritizing due to their extensive knowledge and experience from credit risk assessment. It can also be the case that professionals tend to give extreme responses (i.e., a ceiling effect) or that professionals are generally more confident.
- There was little consensus between and within the two groups of subjects. The significantly different level of consensus may be due to the professionals having various experiences that disunite them, whereas the students lack experiences that united them. The disagreement among the professionals in the present study contradicts the claim that experts should agree (Einhorn, 1975), but connects to Shanteau's (1997) idea that experts should rather disagree because of structural factors (e.g, there is no unique truth and the reality faced by experts is a moving target) and process factors (e.g., disagreement leads to increased understanding).
- The responses of the credit managers were condensed by an exploratory factor analysis into three factors that were argued to represent capability, basic skills, and interpersonal skills.

Discussion

As pointed out in the introductory section, empirical evidence of the requirements of expert credit analysts is essential. First and foremost, the findings of this paper have implications for credit assessment and credit analysts. In a sense, the observed expert characteristics condensed into the three factors reflect the desirable competence of credit analysts. Companies recruiting new credit analysts may take the findings into account to assure that their candidates have expert competence; i.e., have the personal attributes reported in the present paper. But how can they establish that a candidate really has those personal attributes? Several possibilities exist. On the basis of meta-analytical findings, Schmidt & Hunter (1998) concluded that combining the general intelligence test with either job simulations, structured interviews, or virtue tests was most appropriate in terms of accuracy, given resource restrictions. Alternatively, psychometric measurements might be used to establish to what extent a subject has the expert attributes as suggested by the present paper. For instance, the attribute "decisiveness" might be measured by the Melbourne DMQ (Mann, Burnett, Radford, & Ford, 1997). However, some of the expert attributes, such as common sense might be hard to measure psychometrically.

Another implication is that educational programs aiming to train novices to be like expert credit analysts may be better designed, so that efforts are devoted to training the essential expert characteristics; for instance, training skills like assuming responsibility and current knowledge. However, it is noteworthy that some important expert personal attributes may be hard to learn, such as common sense and energy and interest.

It can also be speculated whether the observed characteristics can be used to identify experts in credit assessment. If that is the case, it should be possible to construct an expert system. For instance, the Bank of Scotland constructed a lending advice system on the basis of in-depth interviews with the bank's leading credit manager (Sangster, 1995).

Moreover, the findings have implications on research on expert judgment. Broadly speaking, the paper attempted to replicate Shanteau (1992a) as well as A&S, so in what ways does the present study relate to these studies? There were some similarities. First, almost all of the interviewed credit managers stated that analytical skills, education, knowledge, and experience were important attributes for experts. Those correspond to the requisite "domain knowledge" in the theory of expert competence (Shanteau, 1992a). Second, the factor labeled "basic skills" coincides with the requisite "domain knowledge". Third, all four cognitive attributes, three self-presentation attributes, two decision-strategic attributes, and three distractor characteristics were replicated. This may give support to Shanteau's (1992a) idea of expert competence. However, for the interviewed credit managers the personal attributes might appear to be representative when describing expertise. Thus, parallels can be drawn to the well-known representativeness heuristic (cf. Kahneman et al, 1982) in the sense that the subjects rated attributes that reflected stereotypes of expertise as more important.

It should be emphasized that the present paper and the study by A&S employed different methods: ratings on a seven-point scale versus a categorical ranking procedure. In addition, auditors and credit analysts have fundamentally different tasks (cf., Ashton & Ashton, 1995). Often poor performance by credit analysts has greater consequences than poor performance by auditors. The professional association of auditors was established earlier than the corresponding association of credit analysts: The Association of Authorised Public Accountants in Sweden was founded in 1923, whereas The Swedish Credit Managers' Association was founded in 1968. The large global audit firms facilitate the standardization of the auditor's task and the audit training programs.

The paper has some limitations. It can be argued that some of the rated attributes expressed stereotypes of expertise rather than performance. This argument should be valid for the two attributes (i.e., "energy and interest" and "warmth and friendliness") that coincided with the distractors in the study by

A&S as well as for the attributes that the two groups of subjects rated similarly. Given the present methodology it is hard to differentiate between stereotypical and performance attributes. One way to do that would be to compare successful with unsuccessful credit analysts with respect to certain characteristics measured by psychometric tests. Since only the consequences of type I error (i.e., granting credit to non-viable companies) are observable and credit analysts are overly concerned with avoiding type II error, it is difficult to measure as well as define success and failure by credit analysts (cf. Deakins & Hussain, 1994). One way of getting around this problem is to test credit analysts in experimental settings.

Finally, a word of caution regarding generalizing this paper's empirical findings. The empirical findings are based on data on experienced credit managers in supplying companies. Obviously, such companies differ from banks and other financial institutions; for instance with respect to the terms of credit, the characteristics of client portfolios, and the regulations. As a result, future research should be devoted to investigate expert characteristics of credit analysts in such companies. Preliminary analyses reported elsewhere (Andersson, 1999) indicated that loan officers working in a Swedish commercial bank gave more consistent responses that were fairly (weakly) correlated with the responses of students (credit managers) in the present paper. Thus, it is likely that expert credit analysts in other credit granting companies may have other personal attributes than those reported in this paper. In other words, consideration should be taken to the role of task characteristics when generalizing (cf. Shanteau, 1992a). It is, however, likely that the measurement in the paper can be employed in future research on expert personal attributes.

Despite the argument of self-description of expertise and the caution of generalizing, the empirical findings contribute to our understanding about experts in the domain of credit assessment and about experts in general.

Notes

1. The author is grateful for the financial support from the Sparbankernas Research Foundation that made this study possible. Comments from two anonymous referees are acknowledged. Thanks also to Professor J. Edward Russo and Kurt Carlson for helpful viewpoints.
2. It has been argued (e.g., Cressy, 1994) that credit analysts with their experience of several companies can in fact assess the prospect of the clients' business more accurately than the clients themselves.
3. Searches in a variety of the professional literature such as *Investment Dealers' Digest* and the *Banker* also showed this lack of studies.
4. Reports from Statistics Sweden give evidence that errors in judgment, such as deeming an insolvent firm to be a viable one, have considerable economical consequences. For instance, they report the Swedish banks experienced accumulated credit losses of US\$ 1,360 million in 1990 and US\$ 1,134 million in 1995.
5. Eighteen of the interviewed credit managers were also asked about other issues, see Andersson (1998).
6. I am indebted to Professor Robyn M Dawes for suggesting this analysis method.
7. Professionals within the same industry did not exhibit greater consensus. Male and female professionals had similar levels of agreement. As Kruskal-Wallis analyses indicated there were few gender differences in the ratings. Female professionals (the range of mean ranks was 54.27 to 57.96) tended to rate the following seven attributes as more important than male professionals did (the range of mean ranks was 42.52 to 43.58): intuition, perceptive, judge of human nature, accuracy, sincerity, current knowledge, and adaptability (the range of chi-squares was 4.13 to 8.06). Whereas the last attribute had $p < 0.01$, the first six attributes had $p < 0.05$.
8. The measure of sampling adequacy was 0.75 implying that the assumptions for factor analysis were middlingly fulfilled (cf. Norusis, 1992). It should be emphasized that the data from the novices was only used as comparison. As a consequence, factor analysis of this data will not be reported. Preliminary analyses showed a different solution. This was due to differences in the statistical distribution as have been reported.
9. Strictly speaking, principal component is not equivalent to factor analysis, but is often referred as a variant. However, the method was chosen, because it summarizes the observed data in linear combinations and is widely used (cf. Kim & Mueller, 1978). Other methods of rotation yielded similar results.

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Appendix A. Descriptive statistics regarding the responses of professionals and of novices and tests by Kruskal-Wallis analyses.

| Order | Attributes | Professionals n = 93 | | | Novices n = 98 | | | Kruskal-Wallis Analyses | | | |
|-------|---------------------------------|----------------------|------|------|----------------|------|------|-------------------------|-------------------------|----------------|-----|
| | | Mean | SD | Rank | Mean | SD | Rank | Prof. Mean rank | Novices Mean rank | Chi- square | |
| 22 | Common sense | 5.15 | 0.64 | 1 | 4.56 | 1.32 | 6 | 108.55 | 84.09 | 10.44 | ** |
| 9 | Experience | 5.11 | 0.71 | 2 | 4.80 | 1.10 | 3 | 100.93 | 89.26 | 2.46 | |
| 2 | Assumption of responsibility | 5.03 | 0.72 | 3 | 4.45 | 1.38 | 7 | 106.41 | 85.26 | 8.10 | ** |
| 6 | Energy and interest | 5.01 | 0.73 | 4 | 4.00 | 1.41 | 12 | 117.63 | 75.47 | 30.29 | *** |
| 4 | Current knowledge | 4.97 | 0.65 | 5 | 4.07 | 1.37 | 10 | 115.20 | 75.85 | 27.43 | *** |
| 11 | Knowledge | 4.96 | 0.64 | 6 | 4.65 | 1.03 | 5 | 102.41 | 87.97 | 4.00 | * |
| 5 | Decisiveness | 4.90 | 0.87 | 7 | 3.64 | 1.49 | 16 | 120.97 | 72.30 | 39.96 | *** |
| 8 | Negotiation skills | 4.89 | 0.80 | 8 | 3.46 | 1.55 | 18 | 124.16 | 69.28 | 50.31 | *** |
| 15 | Stress tolerance | 4.84 | 0.92 | 9 | 3.74 | 1.33 | 14 | 120.52 | 72.73 | 38.19 | *** |
| 1 | Analytical skills | 4.83 | 0.70 | 10 | 4.86 | 1.14 | 1 | 90.24 | 99.52 | 1.65 | |
| 24 | Sincerity | 4.80 | 0.84 | 11 | 3.68 | 1.48 | 15 | 119.12 | 74.06 | 34.35 | *** |
| 26 | Knowing what is relevant | 4.79 | 0.78 | 12 | 4.86 | 1.11 | 2 | 91.36 | 99.38 | 1.14 | |
| 18 | Accuracy | 4.78 | 0.67 | 13 | 4.67 | 1.16 | 4 | 97.04 | 95.01 | 0.07 | |
| 20 | Reliability | 4.75 | 0.81 | 14 | 4.03 | 1.35 | 11 | 111.71 | 80.29 | 16.90 | *** |
| 3 | Ability to master decision aids | 4.73 | 0.76 | 15 | 4.32 | 1.17 | 8 | 103.31 | 84.98 | 6.06 | * |
| 7 | Adaptability | 4.73 | 0.77 | 16 | 3.40 | 1.53 | 19 | 121.82 | 71.49 | 42.50 | *** |
| 13 | Initiative and creativity | 4.66 | 0.75 | 17 | 3.03 | 1.60 | 23 | 125.09 | 66.40 | 58.53 | *** |
| 16 | Perceptiveness | 4.65 | 0.72 | 18 | 3.40 | 1.50 | 20 | 121.62 | 71.69 | 41.96 | *** |
| 12 | Intuition | 4.55 | 0.91 | 19 | 3.56 | 1.66 | 17 | 113.03 | 79.05 | 19.74 | *** |
| 10 | Education | 4.50 | 0.78 | 20 | 3.83 | 1.49 | 13 | 108.05 | 83.71 | 10.18 | ** |
| 17 | Judgement of human nature | 4.47 | 0.96 | 21 | 4.10 | 1.51 | 9 | 101.12 | 91.14 | 1.69 | |
| 14 | Stubbornness | 4.45 | 1.15 | 22 | 2.47 | 1.56 | 26 | 128.13 | 63.58 | 68.43 | *** |
| 27 | Communication skills | 4.40 | 0.85 | 23 | 3.22 | 1.54 | 21 | 118.04 | 74.34 | 31.96 | *** |
| 23 | Ability to focus on sales | 4.33 | 0.95 | 24 | 2.56 | 1.41 | 25 | 130.16 | 62.96 | 74.47 | *** |
| 19 | Curiosity | 4.22 | 0.92 | 25 | 3.08 | 1.67 | 22 | 116.53 | 75.76 | 27.45 | *** |
| 21 | Warmth and friendliness | 4.21 | 0.97 | 26 | 3.03 | 1.61 | 24 | 116.19 | 74.58 | 28.92 | *** |
| 25 | Being a good teacher | 3.97 | 1.03 | 27 | 2.22 | 1.63 | 27 | 125.58 | 67.26 | 55.41 | *** |

Notes: Order denotes the sequence in the measurement.

Prof. denotes professionals.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Study 2.

P1198: Software for Tracing Decision Behavior
in Lending to Small Businesses

**P1198: SOFTWARE FOR TRACING DECISION BEHAVIOR
IN LENDING TO SMALL BUSINESSES¹**

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics

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Abstract

This paper describes a process-tracing software program specially designed to capture decision behavior in lending to small businesses. The source code was written in Lotus Notes. The software runs in the web-browser and consists of two interacting systems: a database and a user interface. The database includes three realistic loan applications. The user interface consists of different but interacting screens that enable the participant to operate the software. Log-files register the decision behavior of the participant. An empirical example is presented to show the software's potentials in providing insights into judgment and decision-making. The implications of the software are discussed.

Keywords: Computerized process-tracing, Credit assessment, Judgment and Decision-making, Lending, Small firms

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Introduction

Researchers in judgment and decision-making (JDM) are increasingly using process-tracing software to capture how people make judgments and decisions (Svenson, 1996). Computerized process-tracing is basically an advanced variant of the information display board techniques employed in the 1970s and 1980s by researchers within the descriptive JDM tradition (for a review see Ford, Schmitt, Schechtman, Hults & Doherty, 1989). Like the information display boards, process-tracing software is used to investigate mainly information acquisition behavior with respect to depth, sequence, amount, and content regarding the search strategy (cf. Biggs, Rosman & Sergenian, 1993). However, the rapid development of information technology has made it possible to design more complex JDM situations resulting in additional measures of decision behavior.

Computerized process-tracing provides the JDM researchers with several benefits. Software measures decision behavior accurately and reliably (Biggs et al., 1993; Lohse & Johnson, 1996) by registering in log-files the following decision behavior: acquired cues, time spent on examining those cues, response inputs, and total time spent on making the decision. It is possible to incorporate more factors that create richer and more complex information environments as well as more interactions (Brucks, 1988). For instance, so called computerized micro-worlds (e.g., NewFire and MORO) have been designed to study how people make series of interdependent decisions in a changeable world where the changes occur autonomously and as a result of earlier made decisions (Brehmer, 1999). By setting up local network or by using the web, multiple participants can be investigated simultaneously implying less tedious and less expensive data collections (Brucks, 1988). The participants may be randomly provided with access and password to the web-site.

Biggs et al (1993) discussed two forms of invalidity of computerized process tracing. First, different computer practice among participants may threaten internal validity. Second, the inability of participants to view information simultaneously on several screens may make the task dissimilar to actual practice, thus limiting the researcher's ability to generalize findings and indicate task complexity. These objections must, however, be viewed in the light of people's increasing use of computers. In addition, the rapid increase of the World Wide Web as a way to buy and sell products and services has not only meant that the process-tracing software has external validity, but also that empirical findings obtained by such software can be generalized (Lohse & Johnson, 1996). It can, therefore, be argued that there may be increased possibilities for the JDM theories to reflect how people make decisions.

Searches in various literature databases indicated that there are three main process-tracing software programs: Search Monitor (Brucks, 1988), MouseLab (Johnson, Payne, Schkade & Bettman, 1996), and the two versions of Saad's (1996, 1998) device for collecting data in sequential choice environments. These programs are designed to deal with varying but artificial JDM-tasks. In addition, several computer interfaces have been constructed for specific experimental designs. For instance, Hoch and Schkade (1996) employed a computerized forecasting task to examine the accuracy of pattern matching strategies. Despite the potentials in getting insights into JDM, there seems to be few process-tracing software having been specially designed for certain real world JDM-tasks. An exception is the INFOCUS, which is a windows-based computer program developed to assist auditors (Davis, 1996).

In the present paper, I describe a software program especially designed to capture professionals' decision behavior in a real business context. Using this software participants decide whether a loan proposition concerning a small firm should be granted or denied. This is an important and realistic business JDM task. I also give an example of an analysis of preliminary data collected by the present software.

The remainder of the paper is organized in four sections. First, the rationale for developing the software is described. Second, the software is described. Third, an example of possible analyses of the data captured by the software is reported. Fourth, the paper ends with a discussion.

Rationale for Developing the Software P1198

The process-tracing software P1198 has been specially designed to investigate how experienced loan officers make decisions about loan propositions concerning small firms. The name P1198 refers to the fact that the development of this software started in November 1998. Besides being designed as a process-tracing device, the software may be well suited to be employed as a pedagogical tool in educating novice and experienced credit analysts, because it gives insights into decision behavior. With such insights, it might be possible to improve the judgment and decision-making as regards credit granting to small firms.

The design was motivated by two circumstances. First, small firms are hard to assess mainly because of the following factors: (i) the traditional analyses of financial ratios reflect the future performance of small firms poorly (Keasey & Watson, 1987); (ii) loan officers, thus, have to rely on other kinds of information that are ambiguous (Altman, 1983); and (iii) empirical research on bankruptcy cannot be generalized to small firms due to their special

characteristics such as high variance in expected returns (Hall, 1992). Second, insights into how experienced loan officers make lending decisions are crucial for developing training programs for novice loan officers and constructing expert systems (cf. Shanteau & Stewart, 1992). Such insights may also improve economic efficiency (cf. Camerer, 1995) in the way that the number of incorrect decisions might be decreased; implying a more efficient capital allocation to small firms (cf. Cressy & Olofsson, 1997).

Similar to the other process-tracing software, the P1198 considers that decision-making is a sequential process spanning over four stages (cf. Einhorn & Hogarth, 1980): acquiring information, evaluating the acquired information, deciding to acquire additional information, and making the final decision. The sequence of the stages does not necessarily reflect the way decision-makers actually make decisions. March (1994) has argued that the decision-maker acquires information, makes the decision, and then acquires more information in order to justify the made decision. Thus, the software P1198 is flexible, so the participant can acquire information and make a decision in whatever sequence.

In contrast to the aforementioned programs, the software P1198 has strong external validity because it has been designed to reflect a specific decision domain. Viewpoints from experienced loan officers and empirical research findings on lending (Argenti, 1976; Altman, 1983; Beaulieu, 1996; Hedelin & Sjöberg, 1995; Andersson, 1999) ensured a strong fit between the experimental world and the real word (cf. Beach, 1992).

Description of the Software P1198

The software P1198 is run in a web-browser (e.g., Internet Explorer 5) that must be connected to a special server (i.e., Lotus Domino).² The source code was written in Lotus Notes. The software consists of two interacting systems: a database of the three loan propositions and a user interface. Collected data on decision behavior are stored in log-files.

The Loan Proposition Database

The database includes three loan propositions with information about three real but anonymous small firms. The three small firms have been selected from a small sample ($n < 25$) that was randomly drawn from the stratified sample of 465 small firms used by Wiklund (1998) who collected his data in 1996. One of these three companies constitutes a warm-up case used for practical purposes. The other two companies represent the propositions used to capture decision

behavior. The first proposition concerns a solvent small firm producing lifting devices with a turnover about \$3.5 Million for the last year (1996) and an applied amount of \$294,000. The second proposition concerns an insolvent small firm producing metallurgy products with a turnover about \$1.6 Million for the last year and an applied amount of \$235,000.

In contrast to earlier studies performed within the descriptive JDM tradition involving at the most 12 cues (Ford et al, 1989), a participant can consider a total of 74 cues in the software P1198 before making a decision. Table 1 describes the available information in the database. The accounting information consisting of balance sheets, income/cost reports, and financial ratios was taken from credit reports proved by a Swedish credit rating agency. The financial cues spanned over three adjacent years. As the credit reports had abundant information, some simplifications were made to decrease the number of financial cues. For each loan proposition, the database provides the participant with a total of 57 financial cues. It must be emphasized that all these cues represent the information that is accessible for loan officers in the real world.

The 17 non-accounting cues were derived from two main sources. First, some responses to the questionnaires employed by Wiklund (1998) were used. The questionnaires included several questions about the company, the board of directors, the decision style of management, the industry, and the business environment. Responses to those questions are essential for accurate credit assessments. Second, the credit rating agency provided some data. To facilitate reading and understanding, these statements were written in a simple and straightforward manner with short sentences and simple words. For instance, the range of the number of words for the non-financial information spans between a minimum of 2 words (i.e., "certificate auditor") and a maximum of 41 words (i.e., the description of the manager). It must be emphasized that the selection of the non-financial information has been done in accordance with research findings as well as discussions with loan officers.

User Interface

The user interface is window-driven and consists of the following interacting components: (i) an introductory screen, (ii) a short questionnaire screen (iii) a loan proposition menu, (iv) four menus for the information categories, (v) a decision menu, and (vi) a pop-up window. In principal, the components interact in the sequence as follows. Figure 1 describes a flowchart summary of the software P1198's interactive flow.

Table 1. *The Available Information in the Software P1198: 74 Cues.*

| Category of Information | Content of Cues | | |
|--|--|---|---|
| Accounting information: Balance Sheet (21 cues) | <ul style="list-style-type: none"> • Fixed assets • Land, buildings and improvements • Plant and equipment • Total fixed assets • Inventories • Trade accounts receivable • Other accounts receivable | <ul style="list-style-type: none"> • Liquid assets • Total current assets • Total Assets • Share capital • Legal reserves • Retained earnings • Net income for the year | <ul style="list-style-type: none"> • Total share-holders' equity • Total untaxed reserves • Long term debt • Accounts payable-trade • Other current liabilities • Total liabilities • Total share-holders' equity and liabilities |
| Accounting information: Income and Cost report (11 cues) | <ul style="list-style-type: none"> • Sales • Cost of goods sold • Depreciation • Earnings before interest and taxes | <ul style="list-style-type: none"> • Financial income • Financial expenses • Income from ordinary activities • Non-recurring income and expenses | <ul style="list-style-type: none"> • Special adjustments • Taxes • Net income for the year |
| Accounting information: Financial ratios (25 cues) | <ul style="list-style-type: none"> • Return on equity • Return on total assets • Average interest rate on debt • Gross margin • Profit margin • Net margin • Interest coverage ratio • Working capital turnover • Cash-flow-to-total-cost-ratio | <ul style="list-style-type: none"> • Cash-flow-to-total-debt-ratio • Rate of self-financing • Inventory turnover rate • Annual sales per employee • Ratio of personnel costs to annual sales • Ratio of working capital to annual sales • Ratio of accounts receivable to annual sales | <ul style="list-style-type: none"> • Ratio of average inventory to annual sales • Ratio of current liabilities to annual sales • Average collection period • Average supplier credit period • Current ratio • Acid test ratio • Equity-asset ratio • Capitalization rate • Debt-equity ratio |
| Non-accounting or qualitative information (17 cues) | <ul style="list-style-type: none"> • Business • The purpose of the proposition • Managing director • Board of directors • Customers | <ul style="list-style-type: none"> • Competitors • Products • Development of industry • Suppliers • One year prognosis • Five year prognosis | <ul style="list-style-type: none"> • Accountant • Collateral • Auditor's report • Employees • Salaries • Credit rating |

Note. The cues in each category of information appear from left to right in the sequence they appear on the screen. Additionally, the financial cues are reported in the traditional sequence. All accounting cues are numbers. Most of the non-financial cues are written as very short statements.

Introductory screen. The software P1198 starts with an introductory screen informing the participant about the purpose of the research project (i.e., to investigate loan officers' credit assessment of small firms). This screen informs also that he/she is asked to make decisions about two loan propositions on the basis of four categories of information that have been reported by an assumed colleague: balance sheet, income/cost report, financial ratios, and qualitative information. Besides a short instruction on how to operate the software, the participant is also told that clicking on special buttons activates the hidden cues on the individual information categories. (A paper-wise overview of the cues is placed alongside the computer.) Finally, the participant is instructed that a warm-up case will be used for practical purposes, but before this case is presented some short biographical questions will be raised. It is mentioned that the responses will be treated confidentially. The participant proceeds by clicking on a button.

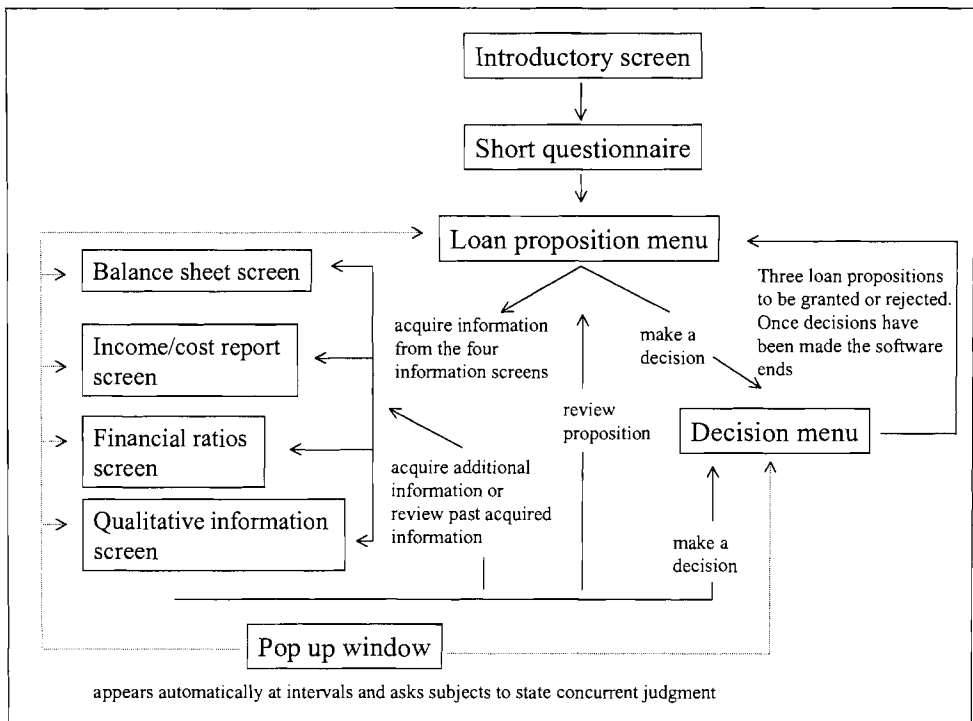


Figure 1. Flowchart of the processing tracing software P1998's interaction flow. The dotted lines represent interaction that occurs automatically, whereas the unbroken lines denote participant interaction.

Short questionnaire screen. The participant is asked to state his/her name, age, gender, education, years of experience with credit assessment, and to specify what industries he/she has assessed before. When he/she has responded to all the questions, he/she proceeds by clicking on a button.

Loan proposition menu. This menu describes briefly (37-59 words) the company and the demanded amount of loan. In addition, this menu informs the participant that "by means of available information, your task is to make a decision about this loan proposition". In the top of this menu there is a toolbar for the following menus: (i) the loan proposition menu, (ii) four screens for each category of information, and (iii) a decision screen. The participant can jump back and forth between these five menus in any sequence.

Information screens. Four menus with the aforementioned toolbar represent the four information categories (see Table 1). All cues are hidden, so that information acquisition behavior can be captured. By mouse clicking the participant activates the cues one by one. For instance, to view the financial cue "Return on equity", the participant mouse clicks on a button and then the figures for three subsequent years are shown. The other cues are activated in a similar way except that the non-accounting cues do not display figures but written statements. Once a cue has been activated it remains so. For an example of one of the information screens, see Figure 2.

Pop-up window. At intervals of a pre-determined time period (e.g., 2 minutes) the pop-up window appears automatically. To the present author's knowledge, the pop-up window is unique for the software P1198. However, this technique connects to the sliding bar employed by Saad (1996, 1998) to measure cumulative confidence in the artificial choice between two apartments as well as the experimental designs employed within research on the pre-decisional distortion (cf. Russo, Meloy & Medvec, 1998). The pop-up window aims to investigate the ongoing decision process by asking the participant at intervals to state his/her current judgment on a seven-point verbally anchored scale ranging from "loan is absolutely denied" (0) to "loan is absolutely granted" (6). The scale has a neutral point (3) implying that the participant is dubious.

Some criticisms can be raised towards this approach to asking participants at intervals about their concurrent judgment, because this approach might unintentionally influence the decision process. First, a participant may search for confirmatory rather than dis-confirmatory information and thus be a victim of the well-known confirmation bias (Plous, 1993). Second, a participant can actually distort diagnostic information and thus be a victim of pre-decisional distortion bias (Russo et al 1998). Third, cognitive dissonance might be created resulting in efforts to reduce that dissonance by neglecting or boosting information (Festinger, 1957). Fourth, the approach differs also from real world

practice, as people are seldom asked to state concurrently their decision processes. Nevertheless, it is argued that the pop-up window has limited influence and provides valuable insights into how credit decisions are made.

| Balance Sheet | Income/Cost report | Financial Ratios | Qualitative Information | Loan proposition | Decision Menu |
|--------------------------------|--------------------|--|-------------------------|------------------|---------------|
| SEE | BUSINESS | | | | |
| THE PURPOSE OF THE PROPOSITION | | The purpose is to improve the long-term and short-term credits by increasing bank loan and decreasing the more expensive suppliers' credits and the short-term debts. | | | |
| MANAGING DIRECTOR | | The company has had the same managing director for three years. He is one of the founders. The managing director is 40 years old and has a great deal of experience in the trade. He has upper secondary school education and has earlier been the managing director for a company with 40 employees. He is also an adviser, member of the board and owner of another company. | | | |
| SEE | BOARD OF DIRECTORS | | | | |
| CUSTOMERS | | Only sales to business. More than 95% is export sales. The three biggest customers account for 25-50% of the sales. Loyal three years customers account for 75-95% of the sales. According to the managing director, the demand is somewhat easy to predict. | | | |
| SEE | COMPETITORS | | | | |
| SEE | PRODUCTS | | | | |

Figure 2. The qualitative information screen (translated from Swedish). The cues appear in the order as described in Table 1. Cues with a so-called SEE-button have not been activated and, accordingly, remain hidden. A toolbar exists in the top of the screen and scroll bar appears on the right hand side of the screen. To view the other qualitative cues the participant scrolls down. The revealed cues represent the warm-up case.

Decision screen. When the participant has made up his/her mind, he/she moves to the decision screen where he/she is asked to grant or deny the loan proposition. If a loan is granted, he/she is asked to state the interest rate and the number of years of amortization as well as to write an explanation why the loan is granted. On the other hand, if a loan is denied, the participant is asked to motivate why he/she rejects the loan proposition and what complementary

information, if any, is required. For both kinds of decisions, the participant is asked to rate his/her confidence in the decision on a seven-point verbally anchored scale ranging from “absolutely unsure” (0) to “absolutely sure” (6).

Once the participant has made a decision and written an explanation, he/she proceeds by mouse clicking on a button. Then he/she is asked to proceed with the next loan proposition and the loan proposition screen appears. This procedure is repeated until the participant has made decisions about all the three loan propositions.

Collected Data on Decision Behavior

A log-file registers in chronological order the participant's decision behavior regarding each loan proposition. The log-file is argued to be a blueprint of the decision process (cf. Biggs et al, 1993). In particular, the log-file contains the following decision behavior:

The participant's inputs such as responses to the biographical questions and to the pop-up window, decision, confidence, interest rate and years of amortization given that the proposition was granted as well as written explanations.

- The acquired cues and the sequence in which the cues were acquired.
- The sequence in which the participant has navigated the different screens.
- The seconds spent on acquiring cues and examining the different screens.

A short analysis of the log-file can be viewed in a Lotus Notes document and it is possible to export the log-file to Microsoft Excel. The log-file can be better arranged in Excel and then be transferred to a statistical software program (e.g., SPSS) where more powerful analyses can be performed. Because the software P1198 provides a vast amount of data on decision behavior stored in log-files, it is important to know in advance what kind of analyses to perform. It is otherwise easy to get lost in the data.

Table 2. *Decision Behavior Concerning Two Experienced Loan Officers: Captured by the Software P1198.*

| Decision Behavior | Total Available Cues | Loan Proposition 1 | | Loan Proposition 2 | |
|--|----------------------|--------------------|------------------------|----------------------|--------------------|
| | | Loan Officer 1 | Loan Officer 2 | Loan Officer 1 | Loan Officer 2 |
| | | 1 | 2 | 1 | 2 |
| Decision Confidence | | Deny Very sure | Deny Absolutely unsure | Deny Absolutely sure | Deny Somewhat sure |
| Total time spent on decision making: Seconds | | 994 | 453 | 866 | 598 |
| <i>Amount of acquired information</i> | | | | | |
| Total acquired cues in Balance sheet | 21 | 17 | 13 | 18 | 15 |
| Total acquired qualitative cues | 17 | 12 | 17 | 10 | 17 |
| Total acquired cues in Income/Cost report | 11 | 10 | 7 | 7 | 5 |
| Total acquired cues in Financial ratios | 25 | 8 | 9 | 9 | 4 |
| =Total acquired cues | 74 | 47 | 46 | 44 | 41 |
| <i>Depth of acquisition</i> | | | | | |
| Acquired cues in Balance sheet | 21 | 81.0% | 61.9% | 85.7% | 71.4% |
| Acquired cues in Income/Cost report | 11 | 47.6% | 33.3% | 33.3% | 23.8% |
| Acquired cues in Financial ratios | 25 | 38.1% | 42.9% | 42.9% | 19.0% |
| =Acquired financial cues | | 55.7% | 48.0% | 56.8% | 39.3% |
| Acquired on qualitative information | 17 | 57.1% | 81.0% | 47.6% | 81.0% |

Note: Depth of acquisition refers to the ratio between each category of acquired cues and the total available cues in each category.

An Example of an Analysis of Log-Files

This section reports results of tentative analyses of log-files concerning two experienced loan officers' decision behavior to illustrate the insight into judgment and decision-making provided by the software P1198.

Table 2 summarizes the captured decision behavior. The two participants made identical decisions: they rejected the two propositions. As regards to the confidence and time spent on making decisions, there was some variability. For example, concerning the first proposition, loan officer 1 acquired a total of 47 cues (63.5% of all the available cues) and 8 financial ratios. On the other hand, loan officer 2 acquired almost the same amount of information, 46 cues (62.2%)

as well as almost the same amount of financial ratios. As the depth of information acquisition indicates loan officer 1 tended to acquire more cues in the balance sheet as well as income and cost report but less qualitative cues than loan officer 2 did. It follows that loan officer 1 (2) was prone to rely on financial cues (qualitative cues).

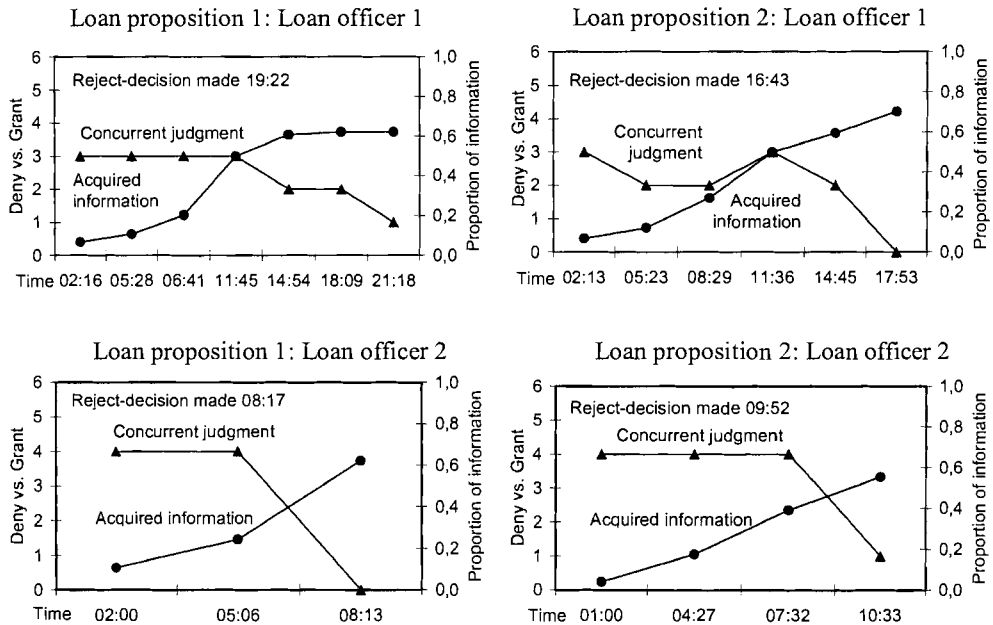


Figure 3. Decision processes and amount of acquired information concerning two experienced loan officers. The graphs show the first impression of the propositions and how that impression is influenced by information acquisition. The horizontal axis indicates minutes. The left vertical axis measures concurrent judgment on seven point scale ranging from “deny absolutely” (0) to “grant absolutely” (6). The midpoint (3) of this axis corresponds to “dubious”. The right vertical axis measures the accumulated amount of acquired information (defined as the number of acquired cues divided by the total number of available cues). Due to minor technical problems some intervals deviated from three minutes. The observant reader may note that the time for the final decision deviates from time spent on decision making as reported in Table 2. The reason is that the stated time in Table 2 also included the time the participants spend on motivating their decision.

Figure 3 reports results from the pop-up window. Besides the time measure, the graphs show two important points: (i) the first impression of the loan proposition and (ii) how that impression is influenced by acquisition of information. The first impression might reflect the initial attitude towards making lending decisions. As Figure 3 indicates, loan officer 1 was dubious, whereas loan officer 2 had a somewhat positive attitude towards granting loans. Acquisition of cues influenced the first impression. Loan officer 1 was uncertain about the first loan proposition during almost twelve minutes although he had acquired 50% of the available cues. He then acquired an additional 12% of the cues (i.e., financial ratios and the cue about collateral) and arrived at a rejecting decision. Loan officer 2, on the other hand, was positive during about eight minutes, but after acquiring cues from the balance sheet and financial ratios he rejected the proposition. The loan officers acquired the cues in a similar sequence ($r_s=0.64$). In addition, they motivated their decisions almost similarly in the sense that they stressed low profitability and low equity/asset ratio.

As regards the second proposition, loan officer 1 had a variable attitude. Initially he was dubious. Next he tended to reject the proposition while acquiring cues from the income/cost report. After acquisition of cues from the balance sheet, he was dubious again. Then, just like in the first proposition, he acquired financial ratios and decided to reject. In contrast, loan officer 2 followed more or less the same pattern as he did in the first proposition; that is he was positive while viewing the qualitative cues, but he rejected after considering some financial ratios. The loan officers acquired cues in almost the same sequence ($r_s=0.67$). In connection to this it should be mentioned that they had high degrees of internal consistency in terms of the sequence in which the cues were acquired ($r_s>0.98$).

To sum up, the results of the tentative analysis fit with the assumptions that there should be consensus among expert judges (cf. Einhorn, 1976) and that experts do not rely on a large amount of information (cf. Shanteau, 1992). In addition, the results illustrate two approaches to make credit assessments of small businesses: focus on financial cues and on qualitative information. Note that regardless of approach, the participating loan officers arrived at the same decisions. It can also be argued that the results coincide with the idea of viewing the decision process as a search for a dominance structure (cf. Montgomery, 1989) and as stages of differentiation and consolidation (cf. Svenson, 1996), respectively. However, it must be emphasized that caution must be taken regarding the conclusions of these results, because the data were restricted to only two loan officers and a preliminary version of the software P1198 was employed.

Discussion

In this paper I have described the software P1198 designed to capture professionals' decision behavior as regards lending to small businesses. Although this software might be argued to concern a narrowly defined decision-domain, it should be of interest to researchers employing computerized process-tracing. For example, the inclusion of a large number of cues and the use of a pop-up window as a tool to capture the on-going decision process may stimulate future designs of process-tracing software. The tentative analysis of log-files may also be of some interest.

At present, the software P1198 has been used to study the effect of experience on decision behavior in lending (Andersson, 2001). In this study, three groups of participants (19 business students, 19 intermediately experienced, and 23 highly experienced loan officers) interacted with the software. Among other things, the study indicated that highly experienced loan officers tended to acquire an extensive number of cues and took more time than students. In an attempt to evaluate the validity of the software, a follow-up questionnaire was handed out to the 42 loan officers. Their responses indicated that they believed that the loan propositions included sufficient information and were realistic; an indication that observations made by the software P1198 have some external validity.

There are some limitations associated with the software P1198. Despite the large number of cues available, some loan officers remarked that they lacked the encounter with the client (Andersson, 2001). One can also argue that the software forms participants to be passive information collectors, because it defines what information to acquire and does not allow the participant to request additional information (cf. Raynard & Williamson, 2000). In real life loan officers encounter the clients, demand more information, consider the revenues of granting loans, and rely on portfolio thinking.

Some improvements of the software P1198 may be required. At present, the loan database includes only three loan propositions, so efforts may be devoted to expanding that database to include more propositions, but such efforts are tedious and time-consuming. Information about the revenue associated with each loan proposition (given loan is granted) may be added. Another improvement would be to change the decision task from granting or rejecting the loan proposition to, in contrast, involve risk assessments (McNamara & Bromiley, 1999). This would be achieved by replacing the present categorical scale with a seven-point scale ranging from low risk (1) to high risk (7) in the decision menu. Finally, efforts should be devoted to computerizing the analyses of log-files, so that a participant can instantaneously obtain a graphical illustration of his/her decision behavior regarding each loan proposition.

Future research may deal with further validation studies. For instance, such a study may aim at examining to what extent observations of decision behavior made by the software P1198 differ from those made by think-aloud protocols. This study would involve two experimental settings: One group of participants performs the task in the software without verbalizing their thoughts, whereas another group thinks aloud while making judgments and decisions about the same loan propositions, which are presented in paper-form. With reference to Biggs et al. (1993), it is likely that this procedure shows that computerized process-tracing and verbal protocol give insights into acquisition of and use of information, respectively. The procedure could also evaluate to what extent the pop-up window influences the decision process.

The software P1198 has, nevertheless, external validity. Loan officers are in real life confronted with the majority of the cues in the present format. In addition, some banks may implement procedures where subordinates send documents concerning loan propositions via the web to their senior loan officer so that he/she can make the final decision. Devices such as the P1198 can then be easily set up. The decision behavior stored in log-files would then not only attract JDM researchers but also internal auditors who might ask why a loan was granted.

Notes

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2. At the present time, the software has primarily been run and tested in Internet Explorer 5, but it might work with other web browsers.

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Study 3.

Does Experience Matter in Lending?

A Process-Tracing Study on
Experienced Loan Officers' and Novices'
Decision Behavior

**DOES EXPERIENCE MATTER IN LENDING? A PROCESS-TRACING
STUDY ON EXPERIENCED LOAN OFFICERS' AND NOVICES'
DECISION BEHAVIOR¹**

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics, Sweden

Submitted for publication.

Abstract

This empirical study investigates the effect of experience on decision behavior in lending to small firms. There were three groups of participants, business students ($n=19$), junior loan officers ($n=19$), and senior loan officers ($n=23$), reflecting the following three levels of experience: novice, intermediate experience, and expert. Participants interacted with a software program and made decisions about two realistic loan propositions. The results showed that: (i) senior loan officers acquired significantly more cues than the other two groups; (ii) the three groups had similar levels of internal consistency; (iii) neither senior nor junior loan officers acquired information in an active manner; (iv) senior loan officers tended to be cautious whereas novices plunged into judgment and decision-making; (v) senior loan officers were biased towards rejecting; and (vi) junior and senior loan officers took more time before making decisions. Besides the contribution to our understanding of experienced decision-makers in business life, the findings have implications for research on decision-making, small business finance, banking, and risk research.

Keywords: credit assessment, decision making, expert judgment, information, loan officers, small business finance .

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Introduction

Most people in business life believe that experience improves the quality of decision-making. In particular, experienced decision-makers are believed to make accurate decisions. Besides accountability they are entrusted with problematical decision tasks. An example of such tasks is lending to small firms, because that task often involves ambiguous information and risk-taking. Little is, however, known about how experience influences decision behavior in lending to small firms. Prior research on financial judgment and decision-making has mainly focused on listed companies; see reviews by Maines (1995).

The few research projects investigating expert - novice differences with respect to financial decision behavior have resulted in the following findings. Novices tend to acquire information in the same order as it is presented and search for confirmatory information, whereas experts tend to direct their information acquisition by using mental checklists and search for contradictory information (Anderson, 1988; Bouwman, Frishkoff & Frishkoff, 1987). Moreover, Beaulieu (1994) found that experienced lenders always reject propositions with perceived negative accounting information, but this is not the case for inexperienced ones. Recently, Rodgers (1999) showed that experienced loan officers managed to detect conflicting information where novices failed.

Insights into how experienced decision-makers make judgments and decisions are important for several reasons. First, experts are accountable for many judgments and decisions in business life. Second, economic efficiency in markets might be improved (Camerer, 1995). There are two causes for this improvement: (i) the possibly superior decision rules by experts can be copied and used by all involved players (cf. Simon, 1983) and (ii) the biases in experts' decision behavior can be eliminated or at least be reduced (e.g., Olsen, 1997). Third, such insights can be used for constructing expert systems, setting standards for requirements of candidates, and developing training programs for novices (Shanteau & Stewart, 1992).

In this paper, I describe and analyze the effect of experience on decision behavior in lending to small firms. For this purpose, participants corresponding to three levels of experience were used: novice, intermediately experienced, and expert. These levels are related to three of the seven stages of the knowledge continuum suggested by Hoffman, Shadbolt, Burton & Klein (1995): (i) novice (second stage), (ii) journeyman (fifth stage), and (iii) expert (sixth stage). According to Hoffman et al (1995), a novice is someone who has minimal knowledge in a domain and who may be considered as a potential member, a journeyman is an experienced and reliable individual who can perform without being supervised, and an expert is either a skilled journeyman who can effectively deal with complicated cases or someone who has special skills derived from extensive practice.

The participants interacted with a software program depicting a situation where both accounting and non-accounting information about a loan applying small firm was available. Their task was to acquire the relevant information and make decisions whether the two loan propositions should be granted or rejected. The software captured the participants' decision behavior including information acquisition behavior, made decisions, confidence in the decisions, and the time spent on making decisions.

The remainder of the paper is organized in four sections. First, the next section provides background and hypothesis development. Second, the method is described. Third, the empirical material is reported. Fourth, the paper ends with a discussion of the conclusions and some concluding remarks.

Background and Hypotheses

Research on Lending to Small Firms

Similar to lending to other economic agents, lending to small firms is a decision task involving (assumed) asymmetric information and risk-taking. The information asymmetry implies that entrepreneurs know the status of their firms and have, in theory, incentives to make their firms appear more economically viable than they really are (i.e., they are better informed). As a consequence, banks have assumed difficulties in observing the entrepreneurs' behavior, intentions, and incentives in present and future time (Milgrom & Roberts, 1992). In contrast, it is possible to argue that the banks with extensive experience of lending have advantages in information processing and should, accordingly, have no problem in predicting the outcome of small firms (Cressy, 1994).

There are two kinds of risks: (i) rejecting loan propositions that turn out to be economically viable and (ii) granting credit to business failures. These two kinds of risks may theoretically result in adverse selection because interest rates might be set to levels that only attract the most risky (i.e., in terms of high variance in future returns) projects (Stiglitz & Weiss, 1981). Empirical research shows that loan officers tend to be overly concerned with the risk of granting credit to bad companies (Deakins & Hussain, 1994). Such risk averse behavior reflects the fact that granting credit to possibly insolvent small firms results in credit losses and may have an explicit impact on the individual loan officer's future career. Rejecting potentially successful firms has no such evident effects.

Research on lending to small firms shows that there exists inefficiency in terms of funding gaps (Cressy & Olofsson, 1997). An example of such inefficiency is the evidence of contradictory reasoning (i.e., a loan proposition is alternately granted or rejected). Deakins and Hussain (1994) found that 14 out of 30 English loan officers were positive towards the same loan proposition

concerning a new venture. Their study was later replicated by Fletcher (1996) who found that 26 out of 38 Scottish loan officers were positive towards the same loan proposition. None of those authors considered the participating loan officers' years of experience. Perhaps, such contradictory reasoning could be reduced if loan officers were more experienced.

Research on Judgment and Decision-Making by Experts and Non-experts

Research on expert decision-makers can be divided into two broad avenues (Camerer & Johnson, 1991): research on expert performance and research on experts' decision processes. The first avenue emerges from behavioral decision research. Einhorn (1975) suggested that experts should judge situations in a similar way (i.e., be consistent) and judge situations similarly (i.e., have consensus). These two conditions connect to the assumption that there exists a unique truth that only experts are able to access (Shanteau, 1997). In a recent review on test-retest reliability (i.e., the extent to which a judge makes similar judgments when facing the same information), Ashton (2000) reported that the grand mean of within-subject agreement across 41 studies involving professionals in four broad topics (medicine and psychology, weather forecasting, personnel-evaluation, and accounting) was 0.78. The mean value for accounting task was 0.82, but the weather forecasting task had the highest mean of 0.91. According to the review by Shanteau (1999), auditors and weather forecasters tend to have consensus (between-subject agreement ranging between $r=0.76$ and $r=0.95$) whereas psychologists and stockbrokers tend to disagree ($0.32 < r < 0.40$) (Shanteau, 1999).

The behavioral view on experts has focused on the accuracy of expert judgments. Accuracy has either been determined by comparing expert judgment with actual outcomes or with predictions of statistically derived models or by comparisons between experts and non-experts. The majority of comparisons between experts and non-experts have indicated that experts perform significantly better than true novices, but as soon as the novices receive training their judgments do not differ so much from those of experts (Camerer & Johnson, 1991). For instance, research on clinical judgments has shown that experienced clinicians do not perform better than trained students (Garb, 1998). It has been unambiguously shown in a vast number of domains that simple linear models outperform experts because those models are robust and weight information consistently; see reviews by Camerer & Johnson (1991) and by Grove & Mehl (1996).

Expert performance must, however, be viewed in light of the task characteristics (Stewart, Roebber & Bosart, 1997; Shanteau, 1992a). In domains characterized by static stimuli and decisions about static targets (e.g., weather forecasting and livestock judgment), experts tend to perform well (Shanteau,

1992a). On the other hand, in domains associated with changeable stimuli and decisions about human behavior (e.g., clinical psychology and court judgments), experts tend to perform poorly (Shanteau, 1992a). It should also be noted that within a domain there exist various subtasks that have different levels of performance. For instance, auditing involves many tasks and it has been shown that auditors assess management fraud accurately but make poor assessments of audit risks (Bonner & Pennington, 1991).

The second avenue of research on expert decision-makers emerges from cognitive science and has concentrated on how experts make decisions. On the whole, the empirical evidence shows that experts' decision processes are superior to those of non-experts. Experts acquire less information but more relevant information as they can differentiate relevant cues from irrelevant cues (Shanteau, 1992b). Davis (1996) found that experienced auditors (with more than five years of practice) acquired fewer cues but managed to better identify the relevant cues than novice auditors (with less than two years of practice). Waller Shelton (1999) found that irrelevant information influenced novice auditors but not expert auditors. In contrast to novices who acquire information in a somewhat undirected and passive manner, experts acquire information methodically by relying on hypothesis testing and checklists (Choo, 1989). Because experts can pinpoint cues that are inconsistent (i.e., counterfactuals), they are able to see patterns that are invisible to non-experts (Klein, 1999). Concerning tasks (i.e., microworlds) that require a series of interdependent decisions it has been shown that experienced decision-makers take more time studying the prerequisites of those decision tasks than novices (Brehmer, 1992).

Hypotheses

The reviewed literature suggests some hypotheses concerning the effect of experience on decision behavior in lending to small firms. Recall that experience has three levels: novice, intermediate experience, and expert. Decision behavior includes made decisions, confidence in decisions, information acquisition behavior, and time spent on the decision task.

- H1. The more experience the less amount of information acquired.*
- H2. The less experience the more passive manner to acquire information (i.e., acquiring cues in the order as they are presented).*
- H3. Experienced decision-makers acquire information more consistently than novices.*
- H4. As regards information acquisition behavior, the more experience the more agreement.*
- H5. As regards decisions, the more experience the more agreement.*

In addition to testing these hypotheses, I will also describe and analyze other aspects of decision behavior such as confidence and how credit decisions unfold.

Method

Participants

In all, there were 61 participants representing novices, junior loan officers, and senior loan officers.³ The novice group consisted of 14 business students and five Ph.D.-students in business administration. The majority of the business students were recruited from an advanced course in managerial finance given at Stockholm School of Economics.² These 19 (15 male) participants are referred to as novices, because they had adequate theoretical knowledge in accounting and finance (i.e., they had studied how to read balance sheets and income/cost reports and were familiar with the common financial ratios) and may, therefore, be regarded as potential loan officers (cf., Hoffman et al., 1995). The age of the novices ranged between 21 and 32 ($M=25.21$) years.

The second group of participants consisted of 19 (11 male) junior loan officers from two major Swedish banks. They are referred to as junior loan officers as the majority ($n=14$) of them participated in a training program within one of the banks. On the basis of the terminology of Hoffman et al. (1995), the participants in the second group can be referred to as journeymen. They have intermediate experience as the average numbers of years of experience was 3.13 ($SD=1.29$). The age of the 19 junior loan officers ranged between 28 and 53 ($M=34.05$) years. The majority (52.6%) had university education such as MBA or LL.M.

Twenty-three senior (21 male) loan officers from the same two Swedish banks were included in the third group. Because they were managers or deputy managers and had extensive experience of credit assessment ($M=12.52$, $SD=6.52$), they are referred to as senior loan officers. It might be more appropriate to call them experts due to empirical evidence showing that it takes about ten years to master some domains (Ericsson, 1996) and due to the terminology by Hoffman et al (1995). Their age ranged between 32 and 57 ($M=41.19$) old and the majority (52.1%) of them had MBA-degrees.⁴

Task and Software

Participants interacted with the web-based process-tracing software P1198; see Andersson (In press) for a thorough description. This software program has been especially developed for tracing decision behavior as regards lending to small firms. The core idea behind the development was to achieve a strong fit between the real world and the experimental world. For that reason, the software includes, in principal, all information that is available for loan officers when making credit decisions. There were 74 cues belonging to four different categories of information: (i) 21 cues concerning balance sheet, (ii) 11 cues concerning income/cost report, (iii) 25 financial ratios, and (iv) 17 qualitative cues. These cues were hidden and needed to be activated one by one, so that information acquisition behavior could be captured. Once activated, the cues remain so.

The prime task in the software was to acquire information in order to grant or reject an individual loan proposition. Besides a warm-up case used to teach the participants about the software (e.g., navigation by mouse clicking and the cues), there were two loan propositions. The first one concerned a solvent small firm applying for a loan of USD 294,000 (2.5 Million SEK), whereas the second one dealt with an insolvent firm applying for a loan of USD 235,000 (2.5 Million SEK). Each loan proposition had in all 74 cues. All propositions and the cues were derived from real small firms and the cues were reported as they appeared in reality.

After granting or rejecting a proposition, the participant stated his/her confidence in that decision using a seven-point verbally anchored scale ranging from “absolutely unsure” (0) to “absolutely sure” (6). The scale had a midpoint (3) anchored as “dubious”. If credit was granted then the participant stated interest rate and years of amortization, and wrote an explanation. On the other hand, if a loan was denied, the participant was asked to motivate why the loan proposition was rejected and what complementary information was required.

Additionally, the software program used a so-called pop-up window to repeatedly ask at intervals of two minutes what the participant ongoing believed about the present loan proposition. This technique connects to the paper-wise designs employed to study pre-decisional distortion (Russo, Meloy, & Wilks, 2000). The participant stated his/her judgment on a seven-point verbally anchored scale ranging from “loan is absolutely denied” (0) to “loan is absolutely granted” (6). This scale had a neutral point (3), which basically implied that the participant was indifferent to the loan proposition.

Log-files registered the decision activities by the participant with respect to what information had been acquired, how many seconds the participant had spent on the task, how the participant had navigated the software, and the participant's responses.

Procedure

There were five separate sessions in which the following number of participants interacted with the software: (i) twelve loan officers, (ii) eight novices, (iii) eight novices and a loan officer, (iv) 23 loan officers, and (v) six loan officers and three novices. Sessions (i) to (iv) were conducted in different seminar rooms where a local network consisting of portable computers had been set up. These sessions were divided into sub-sessions where at the most seven participants individually interacted with computers that were already connected to the software's website. Session (V) took place either at the loan officers' offices or, as was the case for the novices, at the author's office. This session involved only one portable computer with which the participants individually interacted to perform the software. On the average, the sessions took about 60 minutes.

Participants received the following instructions (as translated from Swedish) on paper together with a handout describing the available cues placed alongside the portable computers.

You will be given information about three loan propositions from three small firms. Your task is to make credit assessments and make decisions about them. A software program will present the loan propositions as well as the adherent information. One loan proposition is used for practical purposes. The other two loan propositions are used for the present study. The items of information are hidden. You activate them by clicking on special buttons. You are expected to activate the items of information you consider relevant and in the sequence you prefer. You operate the software program by mouse clicking - just like surfing the Web. You will also be asked regularly by the software program about how you feel about the current loan proposition.

They were also verbally informed about these instructions and, in particular, the experiment leader (i.e., author) emphasized that they were expected to merely acquire the information they deemed relevant and important.

Besides these brief instructions, participants received thorough instructions on the active web page, which welcomed them to the experiment. In short, this web page informed the participant that he/she was asked to make decisions about two loan proposition on the basis of four categories of information that have been reported by an assumed colleague. Besides a short instruction that mouse-clicking operates the software, the participant was told that clicking on special buttons activates the hidden cues on the individual information category. Finally, he/she was instructed that a warm-up case would be used for practical purposes, but before this case was presented some short biographical questions (i.e., age, gender, education, years of experience, and experience of industries) would be raised. It was mentioned that his/her responses would be treated confidentially.

After the completion of the task a follow-up questionnaire was handed out (see Appendix A). Some of the loan officers were also verbally debriefed. Each novice received a gift voucher of a cinema ticket (around USD 8) for their participation. No such incentive was given to the loan officers, because given their role as professionals they were assumed to have intrinsic motivation to participate and make a good performance without incentives (cf. Shanteau & Stewart, 1992).

Variables

Independent variables. The main independent variable denoting the three levels of experience is categorical. In order to control for within-subject effects caused by the two loan propositions there was an additional independent dichotomous variable representing the two propositions.

Dependent variables. Variables measuring information acquisition behavior were partly based on the methodology developed by Rosman and O'Neill (1993), which in turn was based on Payne (1976). In their study on information acquisition strategies among venture capitalists and commercial lenders they used three measures: (i) scope, (ii) amount, and (iii) depth. Scope referred to acquisition of certain cues. Amount denoted the number of cues that had been acquired across all information categories. Depth was the proportion of acquired cues within an information category. The present study applies the latter two measures: amount and depth. Amount of information was the total number of cues that participants had acquired across the four categories of information and the value ranges theoretically between 0 and 74. There were four measures representing depth of search. First, depth of acquired balance sheet referred to the proportion of the number of cues participants had acquired from the balance sheet to the total number of cues within that information category. Second, depth of acquired income/cost report measured the proportion of the number of cues acquired within the income/cost report. Third, depth of financial ratios denoted the proportion of ratios participants had acquired within the category of financial ratios. Fourth, depth of qualitative information referred to the proportion of cues acquired within the category of qualitative information. Expressed as the proportion of acquired cues to totally available cues, the latter four variables reflected the depth of information acquisition.

Like Russo et al (2000), I also examined variables representing the ongoing decision processes. These variables were based on data captured by the pop-up window (see above) and the relevant data can either be analyzed on the individual level or on the aggregate level. Svenson and Shamoun (1997) emphasized the importance of analyzing such data on the individual level rather than on the aggregated group level. They argued that each piece of information has different subjective importance and that due to a mixture of within- and

between-subjects effects aggregating data might not result in an accurate description of the decision processes. In contrast to the present study, Svenson and Shamoun (1997) had fewer participants (i.e., 20 subjects making real life decisions about what university course to study). Analyzing 122 logfiles (2 propositions times 61 participants) was, however, a time-consuming and tedious venture. As a consequence I performed analyses on the group level assuming that subjective interpretation of cues would play a minor role.

There were also variables that were based on time: (i) the total number of seconds spent on the decision task, (ii) the number of seconds spent on reading the loan proposition screens, and (iii) the moment when the decisions occurred. Finally, I examined variables describing participants' decisions, confidence in this decision, interest rate, and years of amortization.

Results

This section is organized in three parts. In the next part issues related to how the decisions were made are reported. The second part reports what decisions were made. Then data from the follow-up questionnaire are reported.

Table 1. *Descriptive Statistics on Information Acquisition Behavior for the Three Groups of Participants across the Two Loan Propositions.*

| | Novices (<i>n</i> =18) | | Junior Loan Officers (<i>n</i> =19) | | Senior Loan Officers (<i>n</i> =19) | |
|-------------------------------------|----------------------------|-------|---|-------|---|------|
| | Mean | SD | Mean | SD | Mean | SD |
| Total number of acquired cues | 48.22 | 18.63 | 55.11 | 15.24 | 65.13 ^{ab} | 8.02 |
| Depth of Balance sheet | 0.63 | 0.31 | 0.86 ^c | 0.19 | 0.93 ^a | 0.10 |
| Depth of Income/cost report | 0.67 | 0.32 | 0.82 | 0.22 | 0.92 ^{ab} | 0.15 |
| Depth of Financial ratios | 0.57 | 0.30 | 0.56 | 0.34 | 0.81 ^a | 0.19 |
| Depth of Qualitative information | 0.78 | 0.24 | 0.82 | 0.18 | 0.89 | 0.18 |

Note. As indicated by Wilcoxon signed rank tests, there were no statistically significant differences between the two loan propositions.

a denotes statistically significant differences between senior loan officers and novices

b denotes statistically significant differences between senior and junior loan officers

c denotes statistically significant differences between junior loan officers and novices

How Were the Decisions Made?

Hypothesis 1. In contrast to the common sense view on experts but in accordance with the cognitive view, the first hypothesis predicted that the more experience the less amount of acquired information. However, as indicated by Table 1, senior and junior loan officers tended to acquire more cues across the four information categories compared to novices rather than the other way around as predicted by the first hypothesis. The variation within the group of senior loan officers as well as within the group of junior loan officers was tighter than the variation within the novice group implying that senior and junior loan officers had more consensus about the amount of information to acquire than novices.

The first hypothesis was tested using separate repeated measures ANOVA models for total amount of acquired information and for each of the four categories of information. Each model included one between-subject variable (level of experience), one within-subject variable (loan proposition), and the interaction of those two constructs. Expressed differently, the ANOVA models tested the following relationship: Dependent measure = Level of experience + Loan propositions + Level of experience * Loan propositions. First, the ANOVA model with total amount of acquired information as dependent measure showed a significant between-subjects effect resulting from experience ($MS=2683.58$, $F(2, 53) = 6.33$, $p<0.01$).⁵ Other effects were non-significant. Tamhane's conservative post hoc test showed that: (i) senior loan officers acquired significantly more information than their junior peers (mean difference was 10.03, $p=0.05$) and than novices (mean difference was 16.91, $p<0.01$) and (ii) junior loan officers did not differ from the novices.

Second, the ANOVA model with four dependent measures, which represented the proportion of acquired cues to totally available cues within each category of information, indicated significant between-subjects effects concerning the balance sheet ($MS=0.89$, $F(2, 53) = 9.60$, $p<0.001$), the income/cost report ($MS=0.57$, $F(2, 53) = 4.95$, $p=0.01$), and the financial ratios ($MS=0.76$, $F(2, 53) = 4.78$, $p = 0.01$). For the balance sheet, there was also a significant within-subject effect concerning the interaction between the two propositions and the three participant groups ($MS=0.03$, $F(2, 53) = 2.94$, $p=0.02$). Other interaction effects were non-significant.⁶ Tamhane's post-hoc tests were performed and showed the following significant differences: (i) senior loan officers versus novices as regards depth of balance sheet (mean difference=0.30 $p=0.003$), depth of cost/income report (0.25 $p=0.02$) and depth of financial ratios (0.25, $p=0.03$), (ii) senior loan officers versus junior loan officers as regards depth of financial ratios (0.25, $p=0.03$), and (iii) junior loan officers versus novices as regards depth of balance sheet (0.22 $p=0.04$).

One can argue that there could be a time effect implying that the more time a participant spent on the task the more acquired information. On the average across the two loan propositions, senior loan officers ($M=1016$, $SD=299$) and junior loan officers ($M=856$, $SD=321$) spent more seconds on the decision task than novices ($M=768$, $SD=301$). A repeated measures ANOVA model showed a significant between-subject effect ($MS=819003$, $F(2, 47) = 4.87$, $p=0.01$). Tamhane's post hoc test indicated that senior loan officers differed significantly from novices (mean difference = 254.24, $p=0.04$) and that the other group comparisons were non-significant. To control for the time-effect, a covariate variable representing the average time spent on the task (i.e., mean time for the two cases) was added to the ANOVA models above. Multivariate tests showed, however, that this covariate was non-significant and the resulting models had almost the same values. In all, the first hypothesis was rejected.⁷

Table 2. *Order Effects Measured as Correlation Coefficients. Median, Standard Deviations, and Number of Participants with Passive Acquisition Behavior (i.e., Correlation Coefficients Exceeding 0.85).*

| | Novices <i>n</i> =18 | | | Junior Loan Officers <i>n</i> =19 | | | Senior Loan Officers <i>n</i> =21 | | |
|----------------------------|-------------------------|------|--------------|--------------------------------------|------|--------------|--------------------------------------|------|--------------|
| | Medi- an | SD | Pass- ive | Medi- an | SD | Pass- ive | Medi- an | SD | Pass- ive |
| Proposition 1 | | | | | | | | | |
| Balance sheet | -0.13 | 0.70 | 4 | 1.00 | 0.62 | 12 | 0.72 | 0.58 | 10 |
| Income/cost report | a 1.00 | 0.45 | 18 | 1.00 | 0.41 | 19 | 1.00 | 0.29 | 21 |
| Financial ratios | 0.42 | 0.51 | 11 | 0.80 | 0.56 | 14 | a 0.32 | 0.55 | 16 |
| Qualitative information | 0.73 | 0.30 | 18 | 1.00 | 0.40 | 19 | 0.96 | 0.24 | 21 |
| Proposition 2 | | | | | | | | | |
| Balance sheet | a 0.02 | 0.66 | 5 | 0.88 | 0.66 | 12 | 1.00 | 0.40 | 12 |
| Income/cost report | 0.99 | 0.49 | 18 | 1.00 | 0.50 | 19 | 1.00 | 0.41 | 21 |
| Financial ratios | 0.39 | 0.52 | 13 | b 0.81 | 0.60 | 14 | a 0.82 | 0.42 | 19 |
| Qualitative information | 0.93 | 0.45 | 18 | 0.99 | 0.43 | 19 | 0.96 | 0.28 | 21 |

Note. Order effect was calculated by correlating the sequence of acquired cues for each subject with the order the available cues appeared within each information category.

a = one missing value due to a subject not acquiring any cues in that information category.

b = two missing values due to two subjects not acquiring any cues in that information category.

Hypothesis 2. The second hypothesis predicted that the less experience the more passive manner to acquire information. Passive manner implies that a participant acquires cues in the same order as the cues appear on the individual screen. Simply put, passive manner involves order effects. Order effect of each information category was measured by correlating the sequence of how a participant had acquired cues within a category with a variable representing the order in which the cues were presented on the screen. See Table 2. For each participant this procedure was repeated within each information category. Participants having strong order effects ($r_s > 0.85$) were assumed to have employed a passive information acquisition strategy. Senior and junior loan officers were, in particular, apt to rely on such a passive strategy, but this tendency was not significantly different from the novices' tendency. Thus, the second hypothesis was rejected.

Hypothesis 3. The third hypothesis predicted that experienced decision-makers would acquire information consistently. Internal consistency (i.e., within-subjects agreement) was calculated by correlating (Spearman's rank correlation) the sequence in which a participant had acquired cues in the first proposition with his/her corresponding acquisition behavior in the second proposition.⁸ In order, the mean values of internal consistency for novices, junior loan officers, and senior loan officers were 0.57, 0.66, and 0.64 ($SDs = 0.49, 0.40, \text{ and } 0.42$, respectively). The observed levels imply good consistency, but the junior and senior loan officers were similar to the students, so the third hypothesis was rejected.

Hypothesis 4. In accordance with the behavioral view on experts, the fourth hypothesis predicted that more experience would generate a greater level of consensus. For each loan proposition, consensus (between-subject agreement) was calculated by correlating (Spearman's rank correlation) the cue acquisition sequence across each participant group.⁹ For the first proposition, little consensus was found among novices ($M = 0.05, SD = 0.12$), among junior loan officers ($M = 0.19, SD = 0.12$), and among senior loan officers ($M = 0.15, SD = 0.16$). As regards the second proposition, little consensus was also found among novices ($M = 0.18, SD = 0.10$), among junior loan officers ($M = 0.17, SD = 0.15$), and among senior loan officers ($M = 0.19, SD = 0.22$). No significant differences were found among the groups as shown by a repeated-measures ANOVA model where dependent measure was consensus. The fourth hypothesis was rejected.

Decision processes. Recall that the participants were asked by a pop-up window to state their concurrent judgments, which appeared on the screen at intervals of every two minutes. This procedure made it possible to capture the participants' decision processes with respect to how the decisions unfolded. To be more specific, it was possible to accumulate the total amount of acquired information at certain time periods (e.g., 2, 4, 6, 8 etc. minutes) and investigate

how the acquired amount of information influenced the participants' judgment and decision-making.

Figures 1, 2, 3, and 4 illustrate the three participant groups' median decision processes concerning the first and the second loan proposition, respectively. Consider, for instance, Figure 1. After six minutes the majority of the rejecting novices ($n=8$) and of the rejecting junior loan officers ($n=8$) stated that they would deny the loan proposition, whereas the majority of the rejecting senior loan officers ($n=10$) remained uncertain. After eight (ten) minutes the tendency was more evident: nine (seven) senior loan officers were still uncertain whereas only three (two) novices and only three (one) junior loan officer(s) stated that they were indifferent.

In other words, Figures 1, 2, 3, and 4 indicate tentatively that, novices tended to form judgments a bit faster with less amount of information than junior and senior loan officers, who in contrast were inclined to be dubious and apt to acquire a substantial amount of information before making statements about the propositions.

This tentative conclusion was tested using the following procedure.¹⁰ For each loan proposition two new variables were created: (i) a variable denoting the time period when the participants were (individually) somewhat sure about their judgments (i.e., they had marked "deny probably" or "grant probably") and (ii) a variable representing each participant's accumulated amount of acquired information regarding that time period. To be specific, those two variables included the number of seconds and the accumulated proportion of acquired cues to totally available cues, respectively, that had occurred until the participants had formed probable judgments. Two separate repeated measures ANOVA models were then run. Both models had the same between-subjects factor (the three levels of experience), the same within-subjects factor (the two propositions), and the interaction of those factors, but were different with respect to the dependent measure that either included the aforementioned time-variable or information-variable.

Those ANOVA models resulted in significant between-subjects effect concerning time ($MS=466961.497$, $F(2, 53) = 7.779$, $p=0.001$) and information ($MS=0.459$, $F(2, 53) = 4.756$, $p=0.01$) and a significant within-subjects effects regarding time ($MS = 274664.31$, $F(1, 53) = 4,819$, $p=0.03$). The other within-subjects effects and the interaction effects were not significant. Tamhane's conservative post-hoc test indicated the following significant observation: In comparison to senior loan officers, novices took less time (mean difference was -221.69 , $p=0.001$) and acquired less amount of information (mean difference was -0.22 , $p=0.02$) before they formed probable judgments. Adding covariate variables representing the made decisions did not lead to any substantial change of the ANOVA models' results.

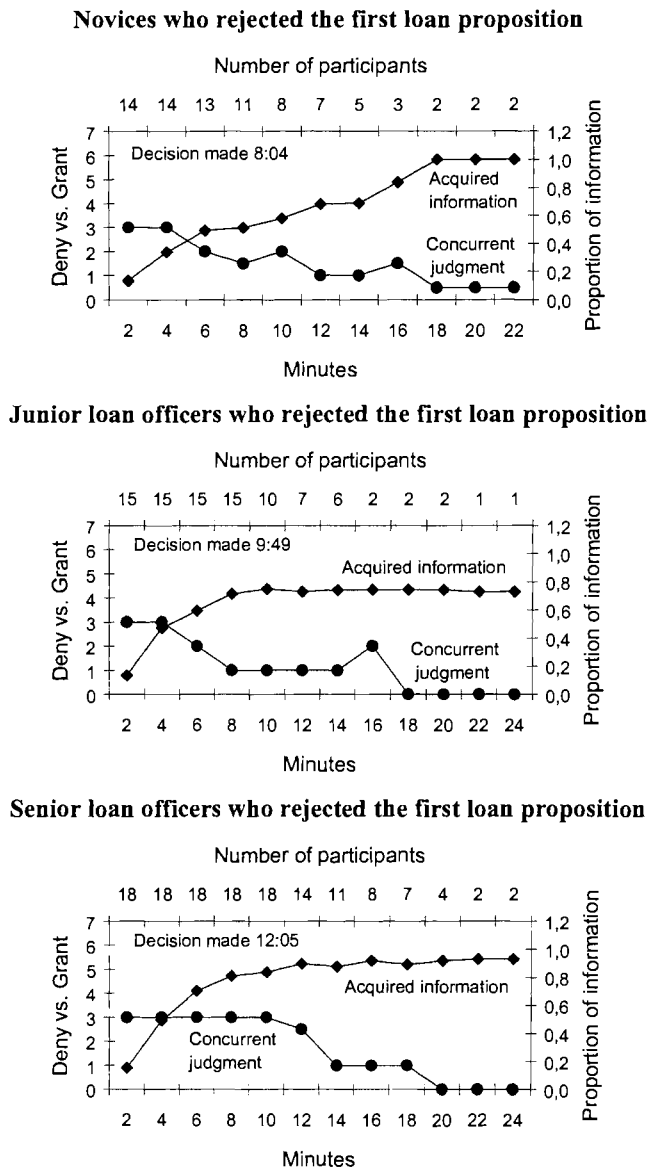


Figure 1. Decision processes concerning the rejecting decision about the first loan proposition by the three participant groups. Median values for concurrent judgment and amount of acquired information. Concurrent judgment is measured on the left vertical axis, which ranges from “deny absolutely” (0) to “grant absolutely” (6). The midpoint (3) of this axis corresponds to “dubious”. The right vertical axis measures the accumulated amount of acquired information. There are two horizontal axes. The lower axis points out minutes, whereas the upper axis indicates the number of participants included in each observation.

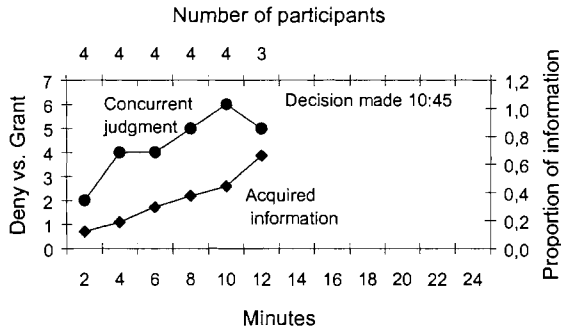
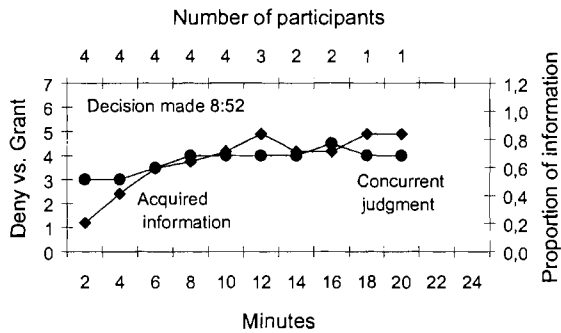
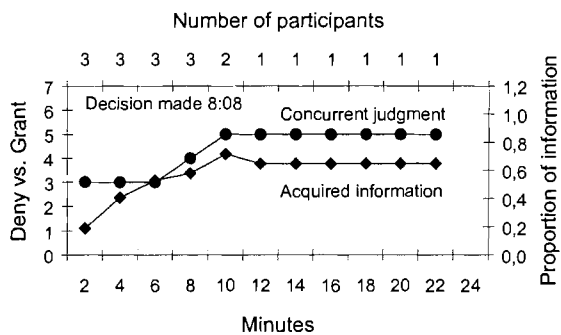
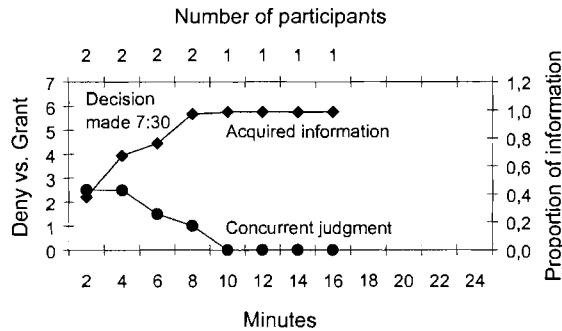
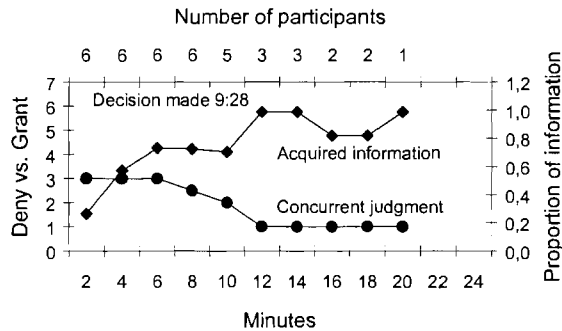
Novices who granted the first loan proposition**Junior loan officers who granted the first loan proposition****Senior loan officers who granted the first loan proposition**

Figure 2. Decision processes concerning the granting decision about the first loan proposition by the three participant groups. Median values for concurrent judgment and amount of acquired information. Concurrent judgment is measured on the left vertical axis, which ranges from “deny absolutely” (0) to “grant absolutely” (6). The midpoint (3) of this axis corresponds to “dubious”. The right vertical axis measures the accumulated amount of acquired information. There are two horizontal axes. The lower axis points out minutes, whereas the upper axis indicates the number of participants included in each observation.

Novices who rejected the second loan proposition



Junior loan officers who rejected the second loan proposition



Senior loan officers who rejected the second loan proposition

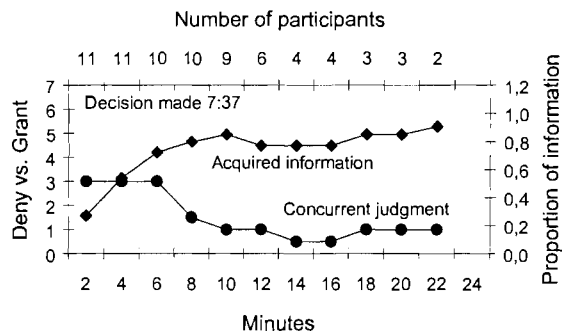


Figure 3. Decision processes concerning the rejecting decision about the second loan proposition by the three participant groups. Median values for concurrent judgment and amount of acquired information. Concurrent judgment is measured on the left vertical axis, which ranges from “deny absolutely” (0) to “grant absolutely” (6). The midpoint (3) of this axis corresponds to “dubious”. The right vertical axis measures the accumulated amount of acquired information. There are two horizontal axes. The lower axis points out minutes, whereas the upper axis indicates the number of participants included in each observation.

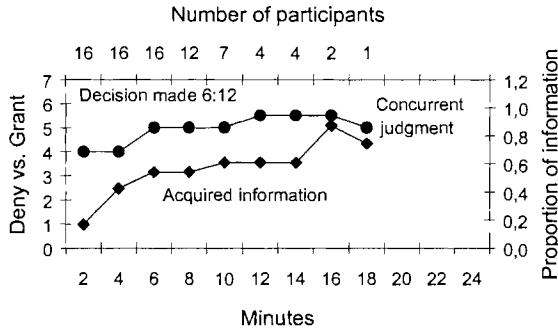
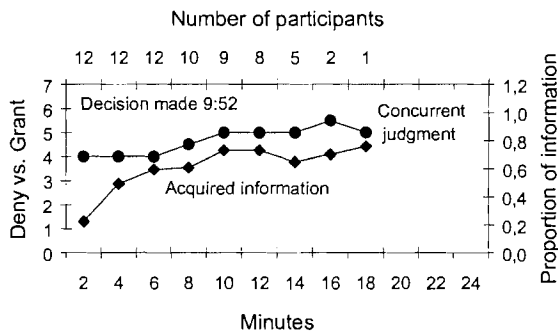
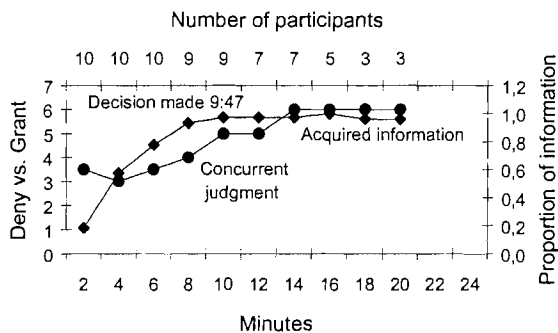
Novices who granted the second loan proposition**Junior loan officers who granted the second loan proposition****Senior loan officers who granted the second loan proposition**

Figure 4. Decision processes concerning the granting decision about the second loan proposition by the three participant groups. Median values for concurrent judgment and amount of acquired information. Concurrent judgment is measured on the left vertical axis, which ranges from “deny absolutely” (0) to “grant absolutely” (6). The midpoint (3) of this axis corresponds to “dubious”. The right vertical axis measures the accumulated amount of acquired information. There are two horizontal axes. The lower axis points out minutes, whereas the upper axis indicates the number of participants included in each observation.

Thus, the tentative observation appearing in Figures 1, 2, 3, and 4 had statistical support implying that novices tended to plunge into judgment and decision-making, whereas senior loan officers were more careful and preferred to acquire more information before making statements. Junior loan officers had decision processes that were somewhere in between these two kinds of decision behavior, although they appeared to behave more like the senior loan officers than like the novices.

Analyses of each participant's decision processes show that the majority of the participants did not change their leaning during the acquisition of information, which implies a straightforward manner of judgment and decision-making. As regards the first proposition (the second proposition in parenthesis), 44.4% (16.7%) of the novices, 31.6% (16.7%) of the junior loan officers, and 28.6% (23.8%) of the senior loan officers changed their judgments either from grant to deny or from deny to grant. Few participants remained uncertain throughout their acquisition of information and then hastily made their decisions. To be specific, in the first proposition (the second proposition in parenthesis), two (2) novices, four (1) junior loan officers, and four (3) senior loan officers had such decision behavior.¹¹ No significant association with type of decision was found.

Furthermore, novices spent less time viewing the loan proposition screens, which briefly described the conditions for the individual proposition, compared to the junior loan officers and the experts. In order, mean seconds across the two loan propositions for novices, junior and senior loan officers were 31.57, 41.97, and 45.08 ($SDs=10.94$, 16.08 , and 13.22). A repeated measures ANOVA model with one between-subject variable and one within-subject variable, and the interaction of those variables showed that the groups differed significantly ($MS=1909.14$, $F(2, 52) = 5.16$, $p=0.01$). Tamhane's test showed that experts differed significantly from novices (mean difference was -12.75 , $p=0.005$) but not from junior loan officers, who were significantly different from novices (mean difference was 11.19 , $p=0.06$).

What Decisions Were Made?

Hypothesis 5. This hypothesis assumed that the more experience the more agreement in the made decision. An overwhelming majority of the novices (77.7%), the junior (79.0%) and the senior loan officers (90.5%) rejected the first proposition. The majority of the novices (88.9%) and the junior loan officers (66.7%) granted the second proposition. Senior loan officers disagreed about the second proposition (i.e., 50% granted). Thus, the fifth hypothesis was rejected.

Tests by Cramér's V were performed to investigate a possible association between the decisions and the three participant groups. No such association could be found as regards the first proposition, but there was a slight association between the groups and the decision ($V = 0.35$, $p = 0.03$) implying that novices were prone to grant the second proposal. As indicated by a binomial test, the senior loan officers tended to be significantly ($p = 0.03$) biased towards rejecting (30 rejecting decisions out of a total of 44 decisions) whereas novices and junior loan officers had not this tendency.

As the fate of the firms in the propositions was known, it was possible to evaluate the accuracy of the participants. Only four participants, one junior loan officer and three senior loan officers, were completely accurate: They granted and rejected the first and the second proposition respectively. On the other hand, twelve students, ten junior loan officers, and ten senior loan officers were completely inaccurate.

Participants were also asked to state their confidence in their decision. No significant differences were found between the groups, the propositions or those participants who rejected or granted the propositions. On the average and across the propositions, the participants were fairly sure about their decisions (i.e., $M=3.98$, $SD=1.33$).

As regards interest rates and years of amortization, there were no differences between the groups and the propositions. Across the groups and the propositions, mean values for those measures were, in order, 7.91 and 6.38 ($SDs=1.77$ and 2.96).¹²

Observations from the Follow-Up Questionnaire

The debriefing of the participants resulted in the following observations (see Appendix). First, the three participant groups indicated that they were motivated to participate in the experiments. The junior loan officers and the novices stated that their motivation increased during the experiment. The motivation of the senior loan officers remained unchanged. Second, junior and senior loan officers believed that the loan propositions included sufficient information and were realistic but not easy to assess. This observation implies that the possibility of unrealistic loan propositions and insufficient information could be ruled out. Interestingly, the novices gave responses almost identical to those of the loan officers. Third, all participants stated that they relied on analytical reasoning rather than on intuition. Fourth, the groups believed that their decisions agreed to some extent with those of the other participants. Recall that there was consensus among the participants to reject the first proposition and among the novices to grant the second proposition, but the senior and junior loan officers disagreed about the second proposition. It follows that the senior and junior loan officers predicted poorly the judgment of their peers.

Moreover, the majority of participants wrote down comments. The most frequent comment from the junior and senior loan officers was that they lacked the encounter with the clients as such an encounter would have provided them with additional information and enabled them to direct questions.

Discussion

This study has provided several important insights into how experience influences judgment and decision-making behavior has regards lending to small firms. Those insights are discussed below.

Amount of Acquired Information

It was noted that senior loan officers acquired more cues than junior loan officers and novices. This result contradicts the vast body of research on experienced decision-makers showing that experts rely on less information (Davis, 1996; Camerer & Johnson, 1991; Shanteau, 1992b), but agrees with common sense assuming that experts should consider greater amount of information than non-experts (cf. Shanteau, 1992b). The observed tendency that experienced loan officers acquired an extensive amount of information should be viewed with respect to the task characteristics; that is, whether the multiple cues were inter-correlated, redundant, compensating, or non-compensating (cf., Cooksey, 1996; Gigerenzer et al., 1999).

On the one hand, given (almost) orthogonal and non-compensating cues the tendency may point out that experts are more able to extract value from a large amount of information than are non-experts. Apart from the qualitative information, this interpretation might be valid for the cues in the balance sheet and income/cost report. The fact that the experienced loan officers spent more time pondering the motives behind the propositions and took more time making decisions may also give additional support for this interpretation.

On the other hand, given highly inter-correlated and redundant cues the tendency might indicate that experts have difficulties in distinguishing relevant and important cues from irrelevant and unimportant cues. Research shows that financial ratios are highly inter-correlated (e.g., see Altman, 1983) and that five financial ratios seem to be the sufficient level of information load (cf. Hwang & Lin, 1999). In the present study, it was found that senior loan officers acquired (on the average) 20 out of 25 financial ratios; a number that substantially exceeded those of junior loan officers and novices. The interpretation of this extensive acquisition of ratios may indicate that senior loan officers lack the ability to select the most diagnostic and relevant information. An implication may be that efforts should be put on developing on-the-job-training programs

aiming at teaching loan officers to develop efficient information processing strategies so that they in the future only consider to the most diagnostic and relevant financial ratios. For instance, Gaeth and Shanteau (1984) found that teaching agricultural judges about irrelevant information and training them to neglect such cues improved the accuracy of their judgments.

Moreover, the acquisition of a large amount of information may indicate risk aversive behavior. Apart from this tendency, senior loan officers were inclined to reject if they perceived the loan propositions to be vague. Combining those two propensities suggests that more experienced loan officers seemed more risk averse: After all, erroneous rejection does not have the same evident consequences as those credit losses by erroneous granting (cf. Deakins & Hussain, 1994).

Passive Ways to Acquire Information

In contrast to earlier research showing that experienced decision-makers relied on active information acquisition strategies (Choo, 1989), the present study found that despite instructions to only acquire the relevant and necessary cues, senior and junior loan officers acquired information passively by considering multiple cues in the same sequence as the cues were displayed on the screens. In their defense, it should be noted, as discussed later, that the loan officers might have been exposed to an unfamiliar way of making credit assessments; compare Beach's (1992) discussion on why some research shows that experts perform poorly.

This argument may only concern loan officers' acquisition of the qualitative information which although somewhat realistic was in a standardized and artificial form. In real life, such information is reported in a rather unorganized way. The argument should not apply to the financial cues that were reported in the very same form as they are in real life. Given the fact that the participating senior loan officers, on the average, had analyzed financial information from at least 1,200 firms, it was reasonable to expect that they would have developed more active ways to acquire cues rather than simply taking them in the order as they appeared.

Variants of Decision Processes

The following observations on decision processes were made: (i) the novices tended to acquire relatively few cues and then quickly leaned towards a decision alternative (i.e., grant or deny), (ii) the senior loan officers were conservative by acquiring numerous cues before forming such judgments, (iii) the junior loan officers behaved almost like senior loan officers, (iv) the majority of the participants did not change their leaning once they had formed a judgment

despite acquiring additional information, and (v) few participants remained uncertain throughout the acquisition of information.

These observations may be explained in view of some research projects on decision processes. Montgomery (1989) argued that the decision process implies a search for a dominance structure where an option dominates the other options and Svenson (1992) claimed that the decision process follows two stages in which the options are differentiated and the chosen option is consolidated. Applying those theories to the present results, this suggests that novices arrived to the dominance-structure quicker than the junior officers and, in particular, senior loan officers, who in turn spent more time differentiating and consolidating their decisions. This tendency of senior loan officers may be due to experts' ability to extract additional values from more information and to perceive patterns invisible to others (Shanteau, 1992b; Klein, 1999).

One can also speculate whether the finding that most participants did not change their judgment while acquiring information indicates the presence of pre-decisional distortion (Russo et al., 2000). At least, it would be compatible with such distortion to support the currently or the first leading option despite the acquisition of additional cues.

In connection with the present observations of the novices' propensities, parallels may also be drawn to Edman (2000). He found that business students playing business games tended to be very self-confident as regards their decision strategies despite the fact that their strategies had proved to be less successful.

Contradictory Judgment and Decision-Making

The idea that experts should converge did not gain any empirical support from the present study. On the other hand, the observed disagreement among the senior loan officers connects to Shanteau's (1997) claim that experts should diverge for the reasons that there exists no unique truth, that the reality faced by experts is a "moving target", and that total agreement would make experts redundant. The disagreement among the participating loan officers is also consistent with the quasi-experimental findings by Deakins and Hussain (1994) and Fletcher (1996).

One might speculate that in the world of unique truth senior loan officers would be the gatekeepers who have the power to decide which small firms should be started, expanded, and liquidated. Some researchers on small firm finance like Cressy (1994) argue that this in fact is the case. Once a senior loan officer has turned down a loan proposition, there is no use to further request credit from other loan officers. However, the empirical evidence on disagreement in the present study suggests that entrepreneurs should in the case of a rejection decision turn to another loan officer, because it is likely that the

other officer might grant the loan proposition. This may be particularly the case if he/she is not so experienced.

Strengths and Weaknesses of the Study

Like all research, this study has strengths and weaknesses. There were some shortcomings, but they must be regarded with respect to the fact that the study involved a realistic task and skilled decision-makers as participants. In addition, the task was based on real materials (i.e., accounting and non-accounting information concerning two small firms) and included substantially more cues (74) than the number (12) in the process-tracing studies reviewed by Ford et al. (1989).

The shortcomings concern mainly the experimental procedure. First, as mentioned above the participants may have been exposed to an unfamiliar way to make decisions shaping them to be passive information collectors. To be specific, the loan officers were unfamiliar with activating hidden cues presented on screens by a software program, which was the only source of available information, and they were not used to being unable to acquire additional information by using other sources such as encounters with the clients. Accordingly, most loan officers emphasized that they lacked the encounter with the clients, because such encounters might have resulted in more useful information. However, their belief that interviews would be beneficial must be viewed in light of the vast body of research (e.g., Garb, 1998) showing that, apart from marginal addition of diagnostic information, interviews might be severely misleading unless they are well structured.

Second, no information about the risk and the return concerning the loan propositions was given. Such information is important because credit would not be granted if the loan officers, or rather the bank, do not gain something in return. It is doubtful whether the lack of such returns in the present design had any substantial significance. None of the loan officers emphasized that they lacked measures of return. Moreover, the employed software program had been designed on the basis of materials concerning real life granting decisions about loan propositions from small firms and on the basis of discussions with highly experienced loan officers (other than those participating in the present study). Neither the materials nor those loan officers mentioned expected return.

Future Research

In this study, participants interacted with a software program that controlled the available information. Future research projects may ask participants to think-aloud while performing the decision tasks in the present software. In an attempt to adjust for the presumed lack of additional information in terms of encounters with the clients, a variant of conversation-based process-tracing (cf. Raynard & Williamson, 2000) might also be employed. In that approach, the participants would be asked to state exactly what additional information they would like to receive from the clients. Such a research project would demand tedious efforts to design the experimental settings and analyze data. It is not evident that those efforts would lead to complementary insights into experienced loan officers' decision behavior.

In order to test the accuracy of participants' judgment, future research may include more loan propositions in the software program so that a linear model could be fitted. Such an approach would make it possible to determine the predictive power of the individual cues (cf. Cooksey, 1996). However, it is unlikely that the approach could be implemented because it would require at least ten cases per cue (Cooksey, 1996), implying that participants would have to judge about 740 loan propositions; a task that would take a participant about 185 hours (15 minutes per case) to perform.

In conclusion, this study has contributed to our understanding about experienced decision-makers in business life by providing mixed evidence on their superior decision behavior. The study, of course, does not imply that banks in the future should make less experienced loan officers accountable for all credit assessments. Instead, the study suggests that arguments about experienced decision-makers' superior decision behavior must be viewed with some skepticism; that is, given that the empirical findings can be replicated with several new loan propositions and a larger group of loan officers.

Notes

1. I am indebted to Sparbankerna's Research Foundation and Ruben Rausing's Foundation for New Firm Venture and Innovations for financing this research project. I would like to thank the members of my thesis committee, professors Lennart Sjöberg, Henry Montgomery, and Ingolf Ståhl, for their encouragement and suggestions. Helpful comments by professors Jay Russo and Bo Ekehammar, and anonymous workshop participants are gratefully acknowledged. Many thanks to Mr. Magnus Dahlberg and Mr. Åke Andersson for their assistance in the experimental sessions.
2. Originally, the intention was that the novice group would consist of business students from this advanced course in managerial finance. Despite an incentive (i.e., a gift voucher on a cinema ticket which equals a value of around USD 8 (70 SEK) and potential learning possibilities, it was not possible to recruit more students. Some of the participating business students stated that the main reason for the low participation was that the business students did not have the time to participate in experiments.
3. Due to a minor computer error, observations concerning one novice and two senior loan officers had to be disregarded. Two senior loan officers representing outlining observations were also disregarded, but this had minor impact on the analyses.
4. There was only one overlap in the years of experience among the three groups. That is, the junior loan officers had at the most five years of practice and there was a senior loan officer with four years of practice.
5. The variable denoting total amount of acquired cues and a continuous measure of years of experience were significantly but modestly correlated ($r=0.35$ and 0.40 , $p<0.05$).
6. Correlating the continuous measure denoting years of experience with the four depth variables resulted in (Pearson) correlation coefficients ranging from 0.22 to 0.38.
7. Information acquisition behavior was not associated with gender or education. It can be argued that the reported effect on information acquisition behavior are in fact due to age rather than years of experience as the novice group is significantly younger than the other participant groups. To evaluate this argument, I made a comparison between novices of the age 28 – 32 ($n=7$) and junior and senior loan officers with the corresponding age ($n=16$ and 10). Given the few and unequal numbers of participants, such a comparison resulted in non-significant differences, so the age effect cannot with certainty be ruled out. Nevertheless, the differences pointed in the same direction as the reported impacts.

8. Internal consistency can also be measured with respect to content; that is, what cues were acquired (and not) in the two propositions regardless of the order in which those cues were acquired. To test for such consistency, I transformed the variables representing the sequences of acquisition into measures consisting of binary values (0 = cue not being acquired; 1 = cue being acquired). This procedure showed that 5 novices, 6 junior loan officers, and 11 senior loan officers had no variation in their information acquisition behavior, because, in order, they acquired (on the average) 61.4, 72, and 61.5 identical cues. Cohen's Kappa was then calculated for those participants with variations in their acquisition behavior. In order, the mean values of that measurement as regards the remaining novices, junior loan officers, and senior loan officers were 0.54, 0.53, and 0.52. No statistical differences were found between the groups.
9. Of course, consensus may also be measured with respect to content and Cohen's Kappa. No such analysis was performed, because the aforementioned sequence- and the content-based measures of internal consistency agreed fairly well.
10. An alternative way to formally test that indication would be to perform separate ANOVA models for each time period. For instance, the Kruskal-Wallis non-parametric ANOVA would indicate that this observation had only weak significance levels as regards the first proposition in the fourth (8 minutes) and the fifth (10 minutes) period (mean rank for novices = 20.77 and 16.29, for junior loan officers = 28.21 and 22.93, for senior loan officers = 32.98 and 28.23, and $p=0.08$ and $p<0.05$). However, this approach was deemed inappropriate as there would only be a sufficient number of observations in the periods 1 to 4.
11. If those participants were disregarded, the repeated measures ANOVA models testing whether novices plunged into judgment and decision-making would result in similar solutions except for the non-significant between-subject effects factor concerning information.
12. At the time for writing the paper, the bank lending interest rate in Sweden was on the average about 6 %.

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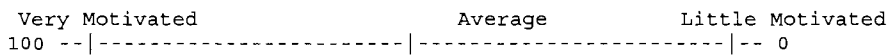
Appendix A: Follow-up questionnaire and responses (translated from Swedish).

1. Did you feel that you were motivated to participate in the experiment?

a) Verbally anchored Likert-scale.

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|-----------------------------|------------------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers N=5 | Senior loan officers N=10 |
| 1 | 2 | 3 | 4 | 5 | 4 | 5 | 5 |

b) Rating scale used by Edman (2000).



Junior loan officers N=14: 52.50 Senior loan officers N=9: 90.00

Note. In order to make the responses comparable, the responses of the scales were standardized. Kruskal-Wallis' test indicated that senior loan officers (mean rank=33.45) tended to be significantly more motivated (chi-square=9.07, df, 2, $p<0.01$) than junior loan officers (19.58) and novices (22.29).

2. How did your motivation change during the experiment?

| Anchored Points in the Scale | | | Median Responses | | |
|------------------------------|-----------|-----------|------------------|----------------------|----------------------|
| Decreased | Unchanged | Increased | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 3 | 3 | 2 |

Note. Kruskal-Wallis showed that the responses from the senior loan officers (mean rank 19.45) were significantly lower (chi-square= 6.98, df=2, $p<0.05$) than those of the novices (30.50) and junior loan officers (28.39).

3. How do you perceive the loan applications in the experiment?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|----------------------|-----------------------------------|--------------------|----------------|------------------|----------------------|----------------------|
| Very unrealistic | Somewhat unrealistic | Neither unrealistic nor realistic | Somewhat realistic | Very realistic | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 4 | 4 |

4. Did the loan applications contain sufficient information for you to be able to assess them and make a decision?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|----------------------|----------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 3 | 4 |

Note: Kruskal-Wallis showed that the responses from the novices (32.83) tended to be significantly higher (chi-square= 7.26, df=2, $p<0.05$) than those of the junior loan officers (19.50) and senior loan officers (25.26).

5. What do you think about the loan application concerning Firm 1?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|-------------------------|----------------------------|--------------------|----------------|------------------|----------------------|----------------------|
| Very easy to assess | Somewhat easy to assess | Neither easy nor difficult | Somewhat difficult | Very difficult | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 3 | 4 |

6. What do you think about the loan application concerning Firm 2?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|-------------------------|----------------------------|--------------------|----------------|------------------|----------------------|----------------------|
| Very easy to assess | Somewhat easy to assess | Neither easy nor difficult | Somewhat difficult | Very difficult | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 3 | 4 | 3 |

7. Do you believe that you to a large extent relied on intuition rather than analytic reasoning when you assessed the loan applications?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|----------------------|----------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 2.5 | 3 | 3 |

8. Do you believe that your decisions agree with other participants' decisions?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|----------------------|----------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 4 | 4 |

9. Would you have any use of the software program to improve your ability to assess and make decisions about loan applications to small businesses?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|----------------------|----------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 3 | 3 |

Note: Kruskal-Wallis showed that the responses from the novices (34.67) tended to be significantly higher (chi-square= 10.03, df=2, $p<0.01$) than those of the junior loan officers (22.94) and senior loan officers (19.47).

10. Do you believe that other credit analysts would have any use of the software program to improve their ability to assess and make decisions about applications to small businesses?

| Anchored Points in the Scale | | | | | Median Responses | | |
|------------------------------|------------------------|----------|---------------------|-----------------|------------------|----------------------|----------------------|
| No, absolutely not | No, to some extent not | Doubtful | Yes, to some extent | Yes, absolutely | Novices | Junior loan officers | Senior loan officers |
| 1 | 2 | 3 | 4 | 5 | 4 | 3 | 3 |

Note: Kruskal-Wallis showed that the responses from the novices (32.33) tended to be significantly higher (chi-square= 6.05, df=2, $p<0.05$) than those of the junior loan officers (22.21) and senior loan officers (21.61).

Study 4.

Risk Attitude and Acquisition of Information in
Credit Risk Assessment: A Survey Study among
Credit Managers in Swedish Supplying Companies

RISK ATTITUDE AND ACQUISITION OF INFORMATION IN CREDIT RISK ASSESSMENT: A SURVEY STUDY AMONG CREDIT MANAGERS IN SWEDISH SUPPLYING COMPANIES

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics, Sweden

*This revised study was included in my licentiate thesis. An earlier version entitled Does risk attitude influence the information use by credit managers? A survey study among credit managers in Swedish suppliers appears in Drottz-Sjöberg, B-M. (Ed.). (1997). *SRA Europe: New risk frontiers* (pp. 423-432). Stockholm: Stockholm School of Economics.*

Abstract

The goal of the paper was to establish the relation between risk attitude and information acquisition, the relation between experience and risk attitude, and the relation between experience and information acquisition. A theoretical framework and an empirical investigation are presented. Experienced credit managers ($N=165$) in Swedish supplying companies participated in a nation-wide survey.

No relation between risk attitude and information acquisition could be established, but there was a tendency among experienced credit managers to be risk takers. Differences in information acquisition regarding experience were also reported. A regression model accounting for 10.0 per cent of the variance in the information variable was estimated. The independent variables were experience, risk attitude, and gender. Besides the contributions to risk research, the findings also have relevance to financial decision making, management, and expert judgment.

Keywords: credit management, decision-making, information, lending, professionals, risk attitude, risk research

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Introduction

Granting trade-credit has a significant role in business life and may be defined as selling goods or services without immediate payment. Due to imperfect information about the customer's economic viability and intention to pay, there is uncertainty about if and when a customer will pay for the obtained goods. The terms of credit vary; in Sweden they vary between 10 to 90 days depending on industrial practice, but the terms of credit are usually 30 days. In other words, supplying companies more or less put their turnover at stake and delayed payments decrease cashflow and return on investment.

It may be argued that the uncertainties of failed payments could be eliminated if goods and services were delivered for ready cash. Yet, that would be quite expensive due to increased transaction costs (Kim & Atkins, 1978). In addition, credit is a recognized custom in business life. If a credit applicant appears to have insufficient economic viability, there is of course the possibility to demand securities (also known as collateral). But demanding securities might obstruct business.

To reduce the uncertainties of failed payments, credit managers of the supplying companies perform credit risk assessments, which involve financial ratios and non-financial information. Financial ratios have been reported as reliable predictors of corporate failure (for a review see Altman, 1983), but the value of financial ratios should not be exaggerated. Argenti (1976) argued that financial ratios are merely symptoms of business failure and therefore cannot yield insights into the cause of the business failure. Furthermore, financial ratios are likely to become less reliable as failure indicators due to manipulative accounting performed by the failing company's management in an attempt to hide the poor financial condition from investors and creditors. Manipulative accounting reduces the predictive power of financial ratios, and thus increases the importance of non-financial symptoms. Examples of such symptoms are reporting lags, audit qualifications, changes in boards of directors, changes of auditor, and the existence of pledged assets due to loans (Argenti, 1976). The personality traits of the representatives from the credit applying company may also have great importance (cf. Hedelin & Sjöberg, 1995). Furthermore, credit rating agencies provide additional information such as ratings, industry statistics, and comments of payments. To sum up, credit managers face a vast amount of different types of information.

Credit analyses aim at making the uncertainty of successful and failed payments computable. Fundamentally, credit decision making implies taking the risk of failed repayment from a customer or the risk of denying credit to a prospective successful repayment customer. Thus, credit managers face either the risk of making *Type I error* or the risk of making *Type II error* (Altman, 1983).

Consequently, both granting and denying credit involve taking risks. Managerial risk taking propensities have been reported in earlier studies. MacCrimmon and Wehrung (1990) found that executives in large banks were significantly more risk averse than managers in other industries, successful executives regarded themselves as more risk taking than other managers, and experienced managers were consistently risk averters. A corresponding relation between risk aversion and experience was not found among Swedish bankers (Hedelin & Sjöberg, 1995). March and Shapira (1990) concluded that managers took risks and exhibited risk preferences. However, instead of using advice from handbooks of decision-making managers look for alternatives that can be managed to meet targets, rather than think in probabilities and expected values. In addition, managers made distinctions between risk taking and gambling and held a belief of beating the odds (March & Shapira, 1990).

Mullen and Roth (1990) argued that risk takers tend to take the information at face value, whereas risk averters tend to demand more information. Besides the influences of heuristics and biases (Kahneman, Slovic, & Tversky, 1982), a decision-maker may also take into account that search for information is associated with costs (Stigler, 1960). Shoemaker (1990) investigated the issue of how people value information in order to reduce uncertainties. He found that information was often undervalued on small ranges of probability, except when large losses were at stake. He also argued that risk attitudes generally did not correlate significantly with preferences for information. In their paper on group and individual performance in a price-searching experiment, Davis and Harless (1996) did not find any relation between revealed risk attitudes and price searching behavior; a finding that supports Shoemaker (1990). On the other hand, Hedelin and Sjöberg (1995) investigated bank officers' decision behavior regarding loan applicants for new ventures. Their evidence suggested that risk prone officers tended to search for less information while the risk averse ones tended to search for more information. Hence, there seem to be ambiguous research findings on how risk attitudes affect information acquisition.

Credit managers are of course in a sense experts and there are different suggestions of how much information an expert uses.¹ According to the Information-Use-Hypothesis, the amount of information, as measured by a number of significant cues, should be greater for experts than for non-experts (Shanteau, 1992). On the contrary, it may be stated that a higher level of familiarity results in a reduced search for information and consequently an expert uses less information (Johnson & Russo, 1984). Evidence from studies of experts in auditing supports the last suggestion by proposing that judgements of experts and non-experts are based on limited amounts of information and that there is a tendency for non-experts to rely on as many cues as or more cues than experts (Ettenson, Shanteau, & Krogstad, 1987). However, what distinguishes

experts from non-experts is the ability to discriminate relevant information from irrelevant information (Shanteau, 1996).

One strand of research on experts assumes that experts should acquire and use similar information as well as weigh the items of information in a similar manner (cf. Bedard & Chi, 1993). This idea was originally put forward by Einhorn (1976). The level of agreement is commonly referred to as inter-rater reliability. Reviews of studies suggest that experts in the field of finance exhibit higher levels of agreement ($0.68 < r < 0.83$) compared to experts in other domains ($0.40 < r < 0.55$). For further details, see work by Shanteau (1996, 1997).

These considerations motivated the purpose of the present paper, which is to describe and analyze information acquisition behavior by experienced credit managers. In particular, the paper addresses the following questions:

- How is information acquisition behavior related to risk attitude?
- How is experience related to risk attitude?
- How is experience related to information acquisition behavior?

Method

Experienced credit managers ($N=165$) in Swedish supplying companies were selected by the Swedish Credit Managers' Association to participate in a nationwide survey. This association asserted that the sample could be considered as representative of Swedish credit managers in supplying companies. Although the large number of items (see below) may have influenced the tendency to respond, the response rate was high, 61%. Due to incomplete questionnaires and novice credit managers, 19% of the returned forms could not be used. This means that this paper includes a total of 81 respondents.

To determine whether non-respondents differed from respondents in a systematic way, the non-respondents were telephoned. Only fourteen persons considered themselves not to be appropriate for the investigation due to mainly two reasons; the company was too small or they no longer worked as credit managers. Nine persons had quit or changed appointment. The remaining non-respondents actually worked as credit managers in supplying companies. Of those, 15 persons refused to participate.

To learn more about the processes of trade-credit decision-making, preliminary in-depth interviews were performed with 18 experienced credit managers. The interviews were taped and summarized. Grounded theory (Glaser & Strauss, 1967) was used to analyze the summaries and then a questionnaire was constructed. The questionnaire included 357 questions or items about risk attitude, the use of information and cues, characteristics of the firm, what personal factors were considered important for expert credit analysts, questions

about securities and decision support systems, and what characteristics credit managers associated with successful and unsuccessful credit decisions. In this paper only the questions related to risk attitudes, information type acquisition, and background data will be reported. The background data are experience, gender, and age. Some basic facts about the respondents are reported in Table 1.

The credit managers' attitude towards risk was measured with an instrument developed by Hedelin and Sjöberg (1995). According to this instrument, risk attitude, or risk propensity, is calculated by averaging the responses to different questions about the credit risks involved in granting credit and some more general risk items. The questions were measured by a five points and verbally anchored scale. Due to the differences between loan and credit granting, the instrument was slightly modified with the result that the risk variable in the present paper included 22 items compared to 28 items used by Hedelin and Sjöberg (1995). Table 7 in the Appendix describes the 22 items. The risk variable in the present paper showed a reasonably good Cronbach's alpha coefficient of 0.74 (cf. Peterson, 1994).

Table 1. *Some Basic Facts about the Respondents, their Office, and their Companies (N=81).*

| | |
|------------------------|--|
| The respondents | <ul style="list-style-type: none"> • 70% were male • mean age was 47 years • 40% had higher academic education (university or similar), 31% had colleges of further education • mean experience in credit decision making: 13 years • 45% made the final decision on an application alone (median limit SEK 450,000) • the median number of trade-credit decisions they made during a month was 35 • 57% were reasonably confident and 38% very confident in their judgments and decisions • in defining the concept of risk, the credit managers most often agreed to probability; the second most common definition was a combination of probability and consequence |
| Their office | <ul style="list-style-type: none"> • 30% had no collaborator, 26% had one collaborator, and 20% had two collaborators • subordinated to financial departments |
| Their company | <ul style="list-style-type: none"> • 30% worked in manufacturing industries and 33% in wholesale dealers • median turnover was SEK 517 million • median income before extraordinary items was SEK 17 million • median contribution margin was 11 - 25% |

The credit managers were asked to indicate on a seven-point category and verbally anchored scale how often they acquired different types of information. The 15 items included financial and non-financial information. Like Hedelin and Sjöberg's (1995) study, averaging the ratings of frequency of types of information formed the construct. The information variable in the present paper showed a very good Cronbach's alpha (0.86) (cf. Peterson, 1994). It was assumed that this variable reflected the respondents' information acquisition behavior.

Results

Analyses of the interviews showed that 15 types of information were generally acquired in credit risk assessments. Most types of information may be obvious, but a description to distinguish between ordinary and detailed credit reports is needed. The former reports include very brief details about the client, whereas the latter are more extensive and have up-dated details. Ordinary credit reports are stored on CD-ROMs and updated four times a year. (The subscription costs about USD 3,125 per year. Detailed credit reports are delivered on-line and cost around USD 37.5 per report.) For more details about the information types, see Table 4 in the Appendix.

Figure 1 describes the mean ratings of how often these types of information were used by the respondents. According to research on sequential decision making (cf. Einhorn & Hogarth, 1980), it can be argued that credit managers acquire these types of information in a sequence that corresponds to Figure 1 and Table 4 in the Appendix. The three most acquired types of information were: (i) financial statements ($M=4.49$, $SD=1.30$), (ii) detailed credit reports ($M=4.10$, $SD=1.40$), and (iii) track records ($M=3.72$, $SD=1.64$). The three least acquired types were: (i) written business concepts ($M=1.58$, $SD=1.31$), (ii) environmental aspects ($M=1.51$, $SD=1.47$), and (ii) clients' backlog of orders ($M=1.32$, $SD=1.55$).

The information variable was constructed by averaging the frequency of the 15 types of information. This variable was assumed to reflect the respondents' information acquisition behavior. As can be seen in Table 2, on average the participating credit managers did not acquire information extensively. If the mean value is related to the maximum theoretical value of the scale, it can be shown that credit managers on average reported that they acquire 49% percent of the available types of information as they appear in the measurement. Due to the low level of inter-rater reliability (Kendall's $W = 0.38$), it seems that the credit managers disagreed rather than agreed on the use of the information types.

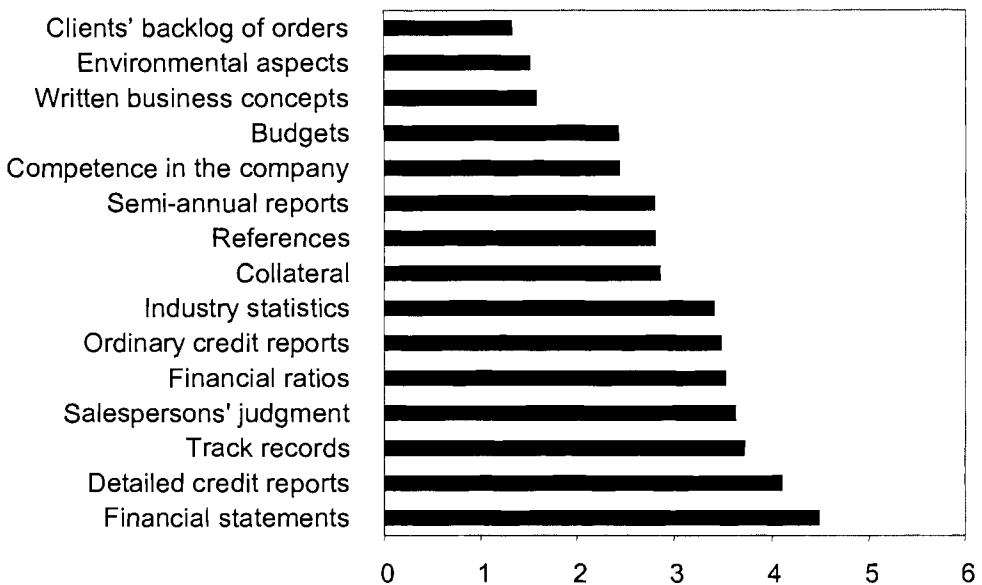


Figure 1. Mean ratings of how often various types of information were used by credit managers in their trade-credit decision-making. The seven-point scale ranged from never (0) to always (6).

A benchmark for what types of information should at least be acquired can be obtained if consideration is taken to the credit managers who acquired least information. The information variable was categorized in the following way: One standard deviation below (above) the mean value implied information acquisition to a lesser (larger) extent. This categorization resulted in three groups: (a) low levels of acquired information ($n = 13$), (b) moderate levels of acquired information ($n = 60$), and (c) high levels of acquired information ($n = 8$). With regard to the stated behavior by the first group, the following three types of information appear to be important: (i) financial statement, (ii) detailed credit reports, and (iii) ordinary credit reports.

Kruskal-Wallis non-parametric test was used to investigate possible differences with regard to acquisition of the different types of information.² The method was used due to the benefit of studying hypotheses without imposing the assumption of normality of the population distribution. Table 5 in the appendix describes the result from these analyses.

To investigate whether risk taking propensity influenced information acquisition, the risk variable was categorized into three groups: (a) those who displayed risk aversion ($n_{ra}=27$), (b) those who were regarded as risk indifferent ($n_{ri}=25$), and (c) those who were risk takers ($n_{rt}=29$). The hypothesis that the

three groups of different levels of risk-taking propensity would use the same types of information was then tested. No significant differences were detected.

Table 2. *Descriptive Statistics regarding the Information Variable (N=81).*

| Variable | Mean | SD | Minimum | Maximum | Kendall's W |
|-------------|------|------|---------|---------|-------------|
| Information | 2.94 | 0.93 | 0.93 | 5.00 | 0.38 |

Note. Theoretically, the information variable can assume values between 0 and 6, where 0 denotes never and 6 always.

To investigate whether different levels of experience implied different levels of risk attitude, experience was divided into three categories: (i) credit managers with 3 to 8 years of experience ($n_1=29$), (ii) credit managers with 9 to 14 years of experience ($n_2=18$), and (iii) credit managers with more than 14 years of experience ($n_3=34$). The three categories were labeled less experienced, more experienced, and most experienced respectively. The null hypothesis test that the population risk attitude was the same for the three types of categories (mean ranks 33.45, 43.44, and 46.15) could be rejected at $p=0.09$ (chi-square = 4.82).³

Although no significant difference in the information variable was discovered (mean rank 47.81, 34.42, and 38.68, chi-square = 4.18, $p=0.12$), there seems to be a tendency that less experienced credit managers use more information. This tendency is made clearer when risk attitude is correlated to the information variable ($r = -0.34$, $p < 0.01$). It was also found that less experienced credit managers to a greater extent used industry statistics (mean rank 48.57, 39.22, and 35.49, chi-square = 5.15, $p=0.08$). Less experienced credit managers were also more eager to find information about the possibilities to demand securities (mean rank 50.17, 30.94, and 38.50, chi-square = 8.40, $p=0.02$).

The null hypothesis that male ($n_m=57$) and female credit managers ($n_f=24$) had the same amount of practice (mean rank 44.46 and 32.77) could be rejected at $p=0.04$ (chi-square = 4.21). No significant gender differences in risk attitude were found. Some gender differences regarding the use of the different types of information were discovered: (i) female credit managers examined to a greater extent the written business concept (mean rank 38.20 and 47.65, chi-square = 2.89, $p=0.09$) and (ii) female credit managers regarded more extensively environmental aspects (mean rank 38.13 and 47.81, chi-square = 3.05, $p=0.08$).

In an attempt to explain information acquisition behavior, a linear regression model was estimated with the information variable as dependent variable. The independent variables were experience, risk attitude, and gender. Whereas the

former two variables were more or less continuous, gender was coded as a binary variable (male=0 and female=1). No severe problems with multicollinearity, normality, heteroscedasticity, and auto-correlated errors were detected. The multiple regression model is reported in Table 3. A correlation matrix of the variables included in the regression model appears in the Appendix.

Table 3. *A Multiple Regression Analysis with the Information Variable as Dependent Measure and Experience, Risk Attitude, and Gender as Independent Variables (N=81).*

| Variables | Beta Weight | Standard Error | Standardized Beta Weight |
|-------------------------|-------------|----------------|--------------------------|
| (Constant) | 2.450** | 0.838 | |
| Experience | -0.036** | 0.012 | -0.345** |
| Risk attitude | 0.295 | 0.240 | 0.133 |
| Gender | 0.082 | 0.201 | 0.045 |
| Adjusted R ² | | | 0.100 |

Note. Experience and risk attitude were regarded to be continuous variables, whereas the gender variable was coded as a binary variable (male=0 and female=1). ** $p < 0.01$

Discussion

The purpose of the present paper was to analyze and investigate information acquisition by experienced credit managers in Swedish supplying companies. In particular, the paper explored the following issues: (i) the relation between risk attitude and information acquisition, (ii) the relation between experience and risk attitude, and (iii) the relation between experience and information acquisition.

How is Information Acquisition Behavior Related to Risk Attitude?

The first research question concerned whether information acquisition relates to risk attitude. It was found that there was no significant relation and this finding corresponds to the findings of Shoemaker (1990) and Davis and Harless (1996). As was reported earlier, Hedelin and Sjöberg (1995) observed a tendency that risk prone bankers used less information than the risk avert bankers. Such a tendency was not observed in the present paper and this may be due to the fact that the participating credit managers were asked to rate the frequency of their

general information acquisition and not their information acquisitions in a particular case.

The picture might have been different if the respondents had been asked to have a particular case in mind, but it is not evident that a positive risk-taking propensity would imply less information use. Risk takers might instead have used more information, as they do not want to rule out the possibility to grant credit and therefore they search for more information.

The finding does not rule out the impact of risk attitude on information acquisition. A risk-averse manager might use more information to convince him- or herself of the prosperity of a project, but consider less information when a project seems deficient. On the contrary, the risk seeker would consider less information to evaluate a project's prosperity and more information to assess a project's deficiency. Hence, summing-up the frequencies of information use might not relate to risk attitude. Risk attitude's impact on information use would, therefore, be observed in two fundamentally different situations: evaluating prosperity of projects and evaluating dubious projects. Of course, the argument has some similarities to how decision situations are framed and if they are regarded as gains or losses (cf. Kahneman & Tversky, 1984). Given stronger risk-seeking for losses than risk-aversion for gains, expected utility predicts a stronger preference for additional information on the loss side than on the gain side, although the empirical evidence is ambiguous (Shoemaker, 1990).

How is Experience Related to Risk Attitude?

The second research question concerned the relation between experience and risk-taking propensity. Contrary to MacCrimmon and Wehrung (1990), it was found that experienced credit managers tended to display a positive risk-taking attitude. A plausible explanation is that years of practice give credit managers knowledge in terms of a large number of cases, which enable them to better discriminate paying customers from non-paying ones. This explanation corresponds to the result of the preliminary interviews, where one of the interviewed credit managers stated that experienced credit managers have a high risk propensity although it is limited by the company's policy and because of that they require more "stop lights to deny credit".

It is assumed there are parallels to de Groot's (as cited in Ericsson & Smith, 1991) finding that chess grand masters perceived and recognized the characteristics of chess positions and evaluated possible moves by relying on their extensive experience rather than by calculation and evaluation of move possibilities.

The risk-taking attitude among experienced credit managers may also be due to increased understanding of the conditions of business life. Although credit risk assessment may be viewed as a defense against credit losses, the major

purpose is to facilitate sales and, more importantly, to increase profits. As the interviewed credit managers claimed, when evaluating a credit loss, one must relate the loss to the sales associated with this customer. It is also likely that the inexperienced credit managers were influenced by the serious crisis in Sweden in the beginning of the 1990s.

The finding that experience implies a positive risk-taking attitude suggests a mechanism of learning in risk-taking behavior. For instance, March (1996) showed that experimental learning in domains of gains, where expected returns of alternatives are positive, leads to behavior that is decidedly more risk averse compared to learning in loss domains. However, the observed risk averse tendency in the present paper may be due to the lack of understanding of business as a matter of risk taking and rather than not thoroughly developed competence in credit assessment. In order to develop a well-balanced risk taking attitude, the importance of doing business in times of prosperity and of depression should be stated.

How is Experience Related to Information Acquisition Behavior?

Conflicting evidence was found to support the third research question, which asked whether experienced credit managers acquired lesser amount of information than inexperienced ones. However, there was a significant tendency ($r = -0.34$) that less experienced credit managers acquired more information. That may support the assumption that prior knowledge implies search for less information (Johnson & Russo, 1984).

Differences regarding various types of information were found. Less experienced managers tended to a greater extent to rely on industry statistics and were more eager to look at the possibilities to demand securities. The former observation may be related to the earlier discussion of experienced credit managers' practice with a large number of cases. The latter observation was supported by the results of the interviews. The interviewed credit managers believed that if possible one should avoid demanding securities, as they presumably hamper the customers' growth ability.

Other Observations

On average, the participating credit managers stated that they did not extensively acquire all types of information. Financial statement was the most frequently acquired type of information. Thus, there was some support for the argument that experts acquire (and use) less information.

Due to the low level of inter-rater reliability, the managers appeared to disagree about what and how often certain types of information should be acquired. In other words, there were more than one way to acquire the different types of information. This finding is inconsistent with earlier experimental research on experts in the financial area. Three possible explanations emerge.

First, the participating credit managers were not experts and therefore it was expected that they would disagree. However, the Swedish Credit Managers' Association, which provided the sample, asserted that the managers were some kinds of experts in their fields. Their extensive experience ($M = 13$ years) also indicates that this was the case. It is presumed to take about ten years of extensive practice to master a domain (cf. Ericsson & Smith, 1991). Hence, the first explanation seems to be doubtful.

Second, the measurement in the present paper may be questionable, as it measured self-reported behavior in general. For instance, the measurement might be affected by the well-known availability-heuristic (cf. Kahneman, Slovic, & Tversky, 1982). This heuristic assumes that subjects judge the frequency or probability of an event after how available it appears. Applied to the measurement, the respondents may have used the latest credit case that was judged rather than the accumulation of credit cases.

Third, it might be the case that experienced decision-makers in the field of credit risk assessment should actually disagree. Earlier studies, which have reported high levels of consensus between experts, have been based on controlled experiments (see Shanteau, 1996, 1997). On the contrary, the reality faced by experts may be characterized as a "moving target", which requires continuously new methods (Shanteau, 1997). In addition, the credit managers might deal with fundamentally different tasks, which require fundamentally different approaches to the acquisition of information. Table 1 provides support for this view. These two considerations imply low consensus. Although the second explanation cannot be ruled out, the third explanation seems more plausible.

Gender differences were found concerning experience and information acquisition. Credit management has traditionally been a man's job, but the dominance of male credit managers seems to be fading. For instance, one of the interviewed credit managers emphasized that female credit managers often have advantages in dialogues with their clients. Female credit managers' tendency to more frequently examine written business concepts might be due to their relative

inexperience; they have not yet built up a mental database of cases. The emphasis on environmental aspects seems plausible, since women generally rate environmental values higher than men do. No significant gender difference in risk taking attitude was discovered; a finding that is consistent with Johnson and Powell (1994).

Future Work

Research on credit decision making invites future work. One way is to apply it to the theory of adaptive decision-making (Payne, Bettman, & Johnson, 1993). This theory assumes that the decision-making process is a function of personal, task, and environmental characteristics. When people are to make a decision, they adapt to requirements motivated by the task and the environment. Some experimental studies on loan officers have been performed in accordance with the theory of adaptive decision making. For instance, Biggs, Bedard, Gaber, and Linsmeier (1985) found that loan officers acquired few items of information when they were faced with more information in terms of number of loan candidates and number of cues per candidates. It has also been shown that venture capitalists tended to find more about the client's managerial capacity as well as market, but less about historical financial statements than loan officers did (Rosman & O'Neill, 1993).

Accordingly, it may be argued that there would be differences due to contrasting factors such as special characteristics in terms of business performance and conditions, organizations, authority, and the number of hours designed to credit decisions. Preliminary analyses show that these factors do not have any major impact on risk attitude and information acquisition. However, these factors will be further analyzed.

As mentioned earlier, one of the interviewed credit managers stated that the firm's policy was the limit for the credit manager's risk propensity. One research direction emerges from that statement: To investigate how organizational risk philosophy can improve the processes of trade-credit decision-making. Samson (1987) showed, for instance, how a corporate risk philosophy defined as a utility function enabled co-ordination of risk management and decision support. The relationship between organizational risk attitudes and the individual credit manager's attitude may also be of interest and relates to Morgan's (1986) image of organizations as cultures. The issue can be investigated through the theoretical framework of principal/agent as has been suggested by van Ackere (1993).

Notes

1. There is an important distinction between information use and information acquisition (Biggs, Rosman, & Sergenian, 1996). A person's use of certain information implies that this information has really influenced the judgment or the decision-making. On the other hand, a person's acquisition of certain information does not imply that this information will influence the judgment/decision making.
2. Alternatively, Spearman's coefficients of correlation might have been used. This method generated basically the same findings as those in Table 5 in the Appendix. Some significant but low correlations were also obtained.
3. However, according to Table 6 in the Appendix the correlation coefficient was insignificant and weak ($r=0.16$). The reason why the two methods generated different levels of significance may be due to the categorization of the risk variable as well as the different assumptions, which the two methods rest upon. Nevertheless, both methods indicate that experienced credit managers tended to display a positive risk-taking attitude.

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Appendix

Table 4. *Descriptive Statistics for the items in the Information Variable (N=81).*

| Type of Information | Description | Order | Mean | SD |
|----------------------------|---|-------|------|------|
| Financial statements | Accounting records reported annually. | 1 | 4.49 | 1.30 |
| Detailed credit reports | Extensive and updated report supplied by credit agencies. Price is around USD 37.5. Includes rating, accounting records, and financial ratios. | 6 | 4.10 | 1.40 |
| Track records | Earlier payment behavior. | 14 | 3.72 | 1.64 |
| Salespersons' judgment | The salesperson's judgment about the client's creditworthiness. | 11 | 3.63 | 1.36 |
| Financial ratios | E.g., equity ratio, liquidity ratio, etc. | 10 | 3.53 | 1.61 |
| Ordinary credit reports | Simple report supplied by credit agencies. Includes rating, some accounting records, and some financial ratios. Stored on CD-ROM. Update four times per year. Subscription price is about USD 3,125 per year. | 5 | 3.48 | 1.70 |
| Industry statistics | Statistics on conditions (e.g., financial ratios) in different lines of business. | 2 | 3.41 | 1.77 |
| Collateral | A way for creditors to secure their claims. | 13 | 2.85 | 1.58 |
| References | Testimonials respecting a client's credit worthiness. | 12 | 2.80 | 1.44 |
| Semi-annual reports | Accounting records reported at least four times per year. | 4 | 2.79 | 1.43 |
| Competence in the company | The client's know-how. | 8 | 2.43 | 1.67 |
| Budgets | Estimation of future incomes and costs. | 3 | 2.42 | 1.54 |
| Written business concepts | A document stating the client's business idea and strategy. | 15 | 1.58 | 1.31 |
| Environmental aspects | The client's concern about the environment as regards production and consumption. | 9 | 1.51 | 1.47 |
| Clients' backlog of orders | The client's sales. | 7 | 1.32 | 1.55 |

Note. Order denotes the sequence of the items in the measurement.

Table 5. Mean Values regarding the Items in the Information Variable. The Influences by Risk Propensity, Experience, and Gender. Tests by Kruskal-Wallis Non-Parametric Method (N=81).

| Type of Information | Risk Propensity | | | Experience | | | Gender | |
|----------------------------|-----------------|-----------|-----------|------------|-----------|-----------|--------------|----------------|
| | A n=27 | B n=25 | C n=29 | D n=29 | E n=18 | F n=34 | Male n=57 | Female n=24 |
| Financial statements | 4.67 | 4.16 | 4.62 | 4.76 | 4.39 | 4.32 | 4.44 | 4.63 |
| Detailed credit reports | 4.37 | 4.08 | 3.86 | 4.52 | 3.78 | 3.91 | 4.09 | 4.13 |
| Track records | 3.63 | 4.04 | 3.52 | 3.97 | 3.67 | 3.53 | 3.70 | 3.75 |
| Salesperson's judgment | 3.56 | 3.56 | 3.76 | 4.03 | 3.22 | 3.50 | 3.51 | 3.92 |
| Financial ratios | 3.48 | 3.40 | 3.69 | 3.90 | 3.39 | 3.29 | 3.49 | 3.63 |
| Ordinary credit reports | 3.37 | 3.44 | 3.62 | 3.44 | 3.33 | 3.68 | 3.44 | 3.58 |
| Industry statistics | 3.04 | 3.40 | 3.76 | 4.00 | 3.11 | 3.06 * | 3.21 | 3.88 |
| Collateral | 2.93 | 3.16 | 2.52 | 3.45 | 2.17 | 2.71 ** | 2.89 | 2.75 |
| References | 3.00 | 2.64 | 2.76 | 3.10 | 2.50 | 2.71 | 2.65 | 3.17 |
| Semi-annual reports | 2.93 | 2.76 | 2.69 | 3.03 | 2.50 | 2.74 | 2.79 | 2.79 |
| Competence in the company | 2.48 | 2.52 | 2.31 | 2.66 | 1.78 | 2.59 | 2.47 | 2.33 |
| Budgets | 1.96 | 2.52 | 2.76 | 2.76 | 1.89 | 2.41 | 2.37 | 2.54 |
| Written business concepts | 1.59 | 1.52 | 1.62 | 1.76 | 1.22 | 1.62 | 1.42 | 1.96 * |
| Environmental aspects | 1.26 | 1.44 | 1.79 | 1.90 | 1.11 | 1.38 | 1.35 | 1.88 * |
| Clients' backlog of orders | 1.59 | 1.32 | 1.07 | 1.48 | 1.39 | 1.15 | 1.30 | 1.38 |

Note. A = risk averse credit managers, B = risk neutral credit managers, C = risk taking credit managers. D = 3 to 8 years of experience, E = 9 to 14 years of experience, F = more than 14 years of experience * $p < 0.10$ ** $p < 0.05$

Table 6. Pearson Correlation Matrix of Variables Included in the Regression Model.

| | 1 | 2 | 3 | 4 |
|------------------------|--------|--------|---------|-------|
| 1.Information variable | 1.000 | | | |
| 2.Experience | -0.336 | ** | 1.000 | |
| | | * | | |
| 3.Risk attitude | 0.082 | 0.155 | 1.000 | |
| 4.Gender | 0.145 | -0.263 | * 0.070 | 1.000 |
| | | | * | |

Notes. ** $p < 0.05$ *** $p < 0.01$

Table 7. *The 22 Items Included in the Risk Attitude Measurement.*

| Statements | Statements |
|--|--|
| 1. If one is not willing to take calculated risks in business, one cannot make any large profits. ^{RP} | 12. One can only take risks when small amounts are at stake. ^{RA} |
| 2. Risk-taking as regards business is always a bad thing. ^{RA} | 13. Many times it is unnecessary to check the applicant's creditworthiness. ^{RP} |
| 3. My philosophy when it comes to risks in business is simply: I never take any. ^{RA} | 14. I do everything to make sure that the risks for the firm are as low as possible. ^{RA} |
| 4. To take a businesslike risk is acceptable if one has carefully analyzed the situation. ^{RP} | 15. If more credit analysts were willing to take certain risks, the economy of the country would be in a better state. ^{RP} |
| 5. To take a risk is not so hazardous – it is a necessary moment in credit risk assessment. ^{RP} | 16. I never hesitate about an application for credit for the reason that it implies a risk – I think of other aspects. ^{RP} |
| 6. Skillful credit analysts never take any risks. ^{RA} | 17. One should not ponder much when faced with a risky decision. ^{RP} |
| 7. Risks and credits are incompatible concepts. ^{RA} | 18. Risk-taking is nothing for me – other people can deal with that. ^{RA} |
| 8. The hazard with risk-taking in credit granting is generally overestimated. ^{RP} | 19. The importance of risks is generally overestimated when credit granting is discussed. ^{RP} |
| 9. When I have taken risks, the outcomes have almost always been positive. ^{RP} | 20. There is a moment of gaming and excitement associated with risk-taking. ^{RP} |
| 10. It is quite all right that the firm takes a risk given that it has balanced it against a high return or demanded collateral. ^{RP} | 21. In general, one should dare to risk a couple of percent of the turnover. ^{RP} |
| 11. One should not be afraid of taking risks. ^{RP} | 22. It is quite all right that the firm takes a risk if it has balanced it against a credit insurance. ^{RP} |

Note. The statements were rated on a five point verbally anchored scale ranging from “disagree completely” (1) to “agree completely” (5). The midpoint (3) was anchored “dubious”. The statements that are denoted with RA are assumed to express risk aversion and the responses to those were reversed. The other statements are assumed to express risk-taking propensity (RP).

Study 5.

Business Decisions Aided by Information Technology:

A Survey Study of Attitudes towards

Decision Support Systems by Credit Managers

in Swedish Supplying Companies

**BUSINESS DECISIONS AIDED BY INFORMATION TECHNOLOGY:
A SURVEY STUDY OF ATTITUDES TOWARDS DECISION SUPPORT
SYSTEMS BY CREDIT MANAGERS IN SWEDISH SUPPLYING
COMPANIES**

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics, Sweden

This revised paper was included in my licentiate thesis. An preliminary version of the paper was presented at the British Academy of Management Annual Conference held in London, September, 1997.

Abstract

The purpose of this paper was to investigate managerial attitude to use decision support systems (DSS) aiding the granting of trade-credit. On the basis of Fishbein and Ajzen's theory of reasoned action, the attitude to DSS was measured. Risk taking attitude as well as degree of intuitive decision approach was also measured. Experienced credit managers (N=165) in major Swedish supplying companies participated in a nation-wide survey.

On the average, the managers displayed a moderately positive attitude to use DSS. No significant differences were found between experienced and less experienced managers or between risk averters and risk takers. Female managers as well as managers using an intuitive decision approach seemed to have a significantly less favorable attitude. A regression model accounting for 37.9 per cent of the variance in attitude to use DSS was estimated. The model included six independent variables: intuition, source of motivation, use of special decision aids, number of collaborators, and items from a risk taking attitude scale.

Keywords: credit management, decision support system, information technology, managers, risk attitude, theory of reasoned action

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Introduction

This study concerns how managers perceive decision support systems (henceforth DSS) that aid business decisions. DSS are computer based information systems designed to help managers in semi-structured as well as in unstructured tasks and may be contrasted to other decision aiding tools such as management information systems and expert systems (Bigdoli, 1989). However, these systems are used for identical reasons, i.e. to facilitate managerial decision making, and as more powerful systems are being developed the distinction is getting blurred (O'Keefe, 1989). This paper regards DSS simply as tools supplied by information technology to assist managerial decision making.

An illustration of business decisions where DSS aid managers is the granting or denying of credit to customers. Fundamentally, such decisions are associated with the risk of failed repayments (type I error) as well as the risk of denying credit to a prospective successful customer (type II error).¹ Information technology and new scoring techniques have refined the DSS to provide more accurate and reliable credit assessments (cf. Wahl, 1997) and made instantaneous credit assessments possible. Increase in processor capacity has made it possible to take more information into account in the credit-scoring model. In addition, societies like Sweden with easy access to public archives provide a vast amount of adequate information, which credit rating agencies of course have made the best out of in the improvement of DSS. Swedish credit managers can, therefore, obtain much reliable information about the applicant such as payment remarks, personal information on corporate board members, and annual financial reports. Thus, the credit DSS consider accounting records as well as non-financial variables, such as submission lag, number of current directors, and audit qualifications (Keasey & Watson, 1987).

Designers of the sophisticated DSS have at times suggested that it would be possible more or less to automatize the granting of trade-credit. Credit decision-making can also be decentralized. Sales personnel may to a certain extent grant credit to their customers. Because DSS produce restrictive decisions, fully automatized credit decision-making would imply increased risk of type II error and, thus, be perceived as risky or dubious. Using DSS exclusively implies reduced working hours spent on credit analysis, but at the cost of limited control of credit decisions. A decrease in workload could result in more time spent on improvement of the portfolio of clients (cf. Healy & Sgromo, 1993) and client prospecting, which is facilitated by CD-ROM. Other managerial implications are the partial elimination of human judgment as well as reduction of administrative staff. The authority on credit granting issues available in certain organizations, that is the credit manager, will perhaps in the long run be replaced and the responsibility for these transferred to financial managers.

An important managerial implication is the interaction between credit manager and DSS. Because the manager often obtains additional information about customers and some managers tend to rely more or less on their "gut feeling", the judgment by DSS may differ from the judgment by the manager. Suppose they do differ, what decisions are expected to be made; the decision supported by the DSS or by the manager?

| Judgment made by the credit manager | Judgment made by DSS | |
|--|----------------------|-------------|
| | Grant credit | Deny credit |
| Grant credit | Grant | ? |
| Deny credit | ? | Deny |

Figure 1. The problem of the interaction between credit manager and DSS: What decision will be made, if the credit manager's judgment and the DSS' judgment disagree?

Because attitude often reflects behavior (e.g. Kraus, 1995), the question can be answered by exploring the attitude to DSS. A negative attitude would suggest that managers are restrictive in their use of DSS and consequently rely more on their own judgment, a positive one would imply extensive use and consequently more trust in DSS. Those extreme viewpoints may respectively infer increased risk of credit losses or risk of failed sales. A balanced attitude would suggest a satisfying use of DSS regarding the risk-taking of denying credit to a prospective successful customer as well as of granting credit to a failed customer. Thus, it is essential to investigate managerial attitudes to DSS aiding business decisions.

According to databases such as SSCI, EconLit, and ABI Global more than 3,500 articles have been published on DSS over the last ten years, but there are few articles dealing with managerial attitudes. The low number may result from the argument that attitudes are regarded to provide limited data for future development and are most appropriate for evaluating systems with many users (O'Keefe, 1989). The only available study is Udo & Guimaraes' (1994) investigation of the relationship between DSS benefits and background characteristics, which included user attitude together with attributes of industry, of organization, of systems, and of users. Two hundred and one US business managers participated in the study. The result showed that attitude explained at most 11% of the variances of the different benefit ratings, but the more important variables were industrial strategic position, organizational support,

and completeness of the system output. However, no attempt to explain the attitude was made.

Udo and Guimares (1994) measured attitude on a one item rating scale, but such a direct self reporting approach does not really measure attitude (Fishbein & Ajzen, 1975) and may have low reliability (c.f. Pieters, 1988). An attitude may be defined as a tendency to evaluate something as good or bad. The psychological tendency refers to an individual's internal state and evaluation refers to overt, covert, cognitive, affective, or behavioral response (Eagly & Chaiken, 1993). A theory that provides insight into these psychological processes generating attitudes is the theory of reasoned action (Fishbein & Ajzen, 1975), which has been useful in various contexts; for instance, in studies of computer use (Gardner, Dukes, & Discenza, 1993) and ethical consideration in computer use (Loch & Conger, 1996). Instead of suggesting that behavior to an object can be predicted by a person's attitude to the object, the theory assumes that voluntary behavior can be predicted by a person's behavioral intention to perform that behavior. In accordance with the theory, behavioral intention is a function of attitude and social norms. Individual beliefs and evaluations of an object's properties compose attitude. Normative beliefs and motivation to comply with those determine social norms. The assumption that attitude is such a function allows insight into what properties really matter, but that insight may not be provided with the one item rating scale used by Udo and Guimares (1994). Hence, an investigation of managerial attitude needs to use more elaborate measures rather than a single direct measure.

The studies that evaluate DSS often aim to analyze the implementation process rather than individual user attitude. Critical factors for implementation are managerial and organizational support, business benefits, and a problem that calls for immediate actions (e.g., Duchessi & O'Keefe, 1995; Nandhakumar, 1996). Essential for designing DSS is that the decision maker's confidence in a decision aided by DSS reflects the actual quality of that decision (Kasper, 1996) and that the judgmental biases of the decision makers (e.g. Kahneman, Slovic, & Tversky, 1982) are reduced by the use of DSS. For instance, Hoch and Schkade (1996) demonstrated how credit assessment in a less predictive environment improved significantly when the participants were supplied with a database and a simple linear model. The database provided representative cases that allowed the participants to use pattern recognition as well as to consider so-called broken leg cues, which are rare but highly diagnostic evidence (Camerer & Johnson, 1991). In trade-credit granting, a broken leg cue can be inside information, such as a client has obtained contracts to deliver products to large companies. On the other hand, the linear model, although taking no consideration to broken leg cues, guaranteed consistency of judgment (c.f. Dawes, 1982).

Intuition is the easiest and fastest but not the most reliable decision-making approach and managers are, therefore, advised to use more accurate methods in order to improve their decision-making (Shoemaker & Russo, 1993). Whereas intuitive people are assumed to prefer general views and solve problems by hunches, people using logic reasoning are regarded as preferring details and calculation (Taggart & Valenzi, 1990). Because DSS may facilitate rational decision-making (c.f. Bidgoli, 1989), attitude towards them might be influenced by the degree of intuition a manager uses in his/her decision approach.

DSS are pedagogical. Novices in a domain can increase their performance with the aid of DSS and the learning effects seemed to continue even after the DSS have been removed (Fedorowicz, Oz, & Berger, 1992). Will (1993) reported that less experienced decision-makers seemed to consider DSS more useful than experts and were, consequently, more positive. His tentative explanation for experts being less positive was that they considered DSS devaluating the expert's authority and problem-solving capability. However, the theory of expert competence assumes that experts rely on decision aids enabling them to use a variety of decision strategies to overcome cognitive limitations (Shanteau, 1992). Ability to use a variety of decision strategies is regarded as important for expertise.²

Managerial attitudes to use DSS connect to human-computer interaction, which investigates perception of computers. Although computers have been around for a while, there still seems to be a gender difference in the perception of computers. Whitley (1996) reported, for instance, that women have more computer anxiety as well as negative views of social impact with computers compared to men, but that no gender differences exist regarding the positive views.

As mentioned earlier, granting or denying credit means taking risks. Decision-makers' risk taking propensities are probably reflected in their risk attitudes. People tend to avoid (take) risks when gains (losses) are at stake (Kahneman & Tversky, 1979), but these two tendencies are weakly correlated suggesting that the loss domain is psychologically more complex (Shoemaker, 1990). People prefer to bet on their own judgments in domains where they feel competent (Heath & Tversky, 1991). Individuals having greater self-efficacy consider more opportunities in a risky choice and take more risks (Kreuger & Dickson, 1994). Although managers exhibit risk propensity, they do not think in terms of probabilities and expected values but rather look for alternatives that can be managed to meet targets (March & Shapira, 1990). Thus, it seems plausible that risk attitude might influence the attitude to DSS.

To sum up, it is argued that managerial attitudes to DSS need further examination and it is particularly assumed that managerial attitudes to DSS facilitating credit assessments may be influenced by risk propensity, gender, experience, and intuition. Moreover, it is assumed that attitudes towards DSS

reflect use of DSS and correlate with organizational characteristics and with business performance. These considerations motivated the purpose of the paper: To investigate and explain attitude to DSS aiding the granting of trade credit.

The following four hypotheses were stated as starting points.

- H1. Managers who are prone to avoid risk have more positive attitudes to DSS than their risk-taking colleagues, because DSS decrease uncertainty.*
- H2. Less experienced managers display more positive attitudes than more experienced ones, because DSS provide suggestions for decisions and may validate individual decisions.*
- H3. Female managers display less favorable attitudes, due to their generally negative attitudes to computers.*
- H4. Intuitive managers display less favorable attitudes than analytic managers, as DSS reduce the importance of human judgment.*

Method

Participants

One hundred and sixty-five experienced credit managers in Swedish supplying companies were selected by the Swedish Credit Managers' Association to participate in a nation-wide survey. The association asserted that this sample was representative of Swedish credit managers in supplying companies. Although the large number of items may have influenced the tendency to respond, the response rate was reasonably high, 61.2%. Due to incompleting questionnaires and novice credit managers, 10% of the returned forms were disregarded; leaving a total of 92 respondents. Facts about the respondents are reported in Table 1.

To determine whether non-respondents differed in a systematic way, the non-respondents were contacted by telephone. Fourteen persons considered themselves not to be appropriate for the investigation mainly due to two reasons: the company was too small or they no longer worked as credit managers. Nine persons had quit or changed their appointment. The remaining non-respondents worked as credit managers in supplying companies, and of these, 15 persons refused to participate, mainly due to shortage of time.

Table 1. *Facts about the Respondents, their Office, and their Companies (N=92).*

| | |
|------------------------|---|
| The respondents | <ul style="list-style-type: none"> • 72 % were male • mean age was 46 years • 39% had higher academic education (university or similar), 30% had colleges of further education • mean experience in credit decision making: 13 years • 77% made the final decision on an application alone (median limit SEK 500,000, 1 USD = 8.00 SEK) • the median number of credit decisions they made during a month was 35 • 59% stated use of analytic decision process and 24% intuition (others were uncertain) • 57% were reasonably confident and 38% very confident in their judgments and decisions • main sources for work motivation was: responsibility, interesting tasks, and work independence • when defining the concept of risk, the respondents most often agreed to probability-definition; the second most common definition was a combination of probability and consequence |
| Their office | <ul style="list-style-type: none"> • 32% had no collaborator, 23% one collaborator, and 20% two collaborators • often subordinated to financial departments |
| Their company | <ul style="list-style-type: none"> • 26% worked in manufacturing industries and 19% in wholesale dealers • median turnover was SEK 517 million • median income before extraordinary items was SEK 19 million • median contribution margin was 11 - 25% |

Questionnaires

To learn more about the process of credit decision-making in supplying companies, preliminary in-depth interviews were performed with 18 experienced credit managers (three females) who were specially selected by the Swedish Credit Managers' Association. They were asked about a large number of issues; for instance, how a typical credit decision was made, use of DSS and attitudes to DSS, information use and organization of the credit department. The interviews were taped and summarized. A qualitative method (Glaser & Strauss, 1967) was used to analyze the summaries, on which a questionnaire was constructed.

The questionnaire included 357 questions or items about risk attitude, the use of information, questions about use of DSS and attitude to DSS and collateral, factors considered desirable for expert credit analysts, and what

characteristics credit managers associated with successful and unsuccessful credit decisions. Background facts were also obtained by questions regarding the respondents (e.g. age, experience, education, gender, confidence in decision making, motivation), the organization of the credit department (e.g. independence, number of collaborators), and the company (e.g. line of business, turnover, income before extra ordinary items). The current paper concentrates on the questions related to attitude to and use of DSS, risk attitude and the background data. Previously, the data were used in a study on the relations between risk attitude, experience, and information use (Andersson, 1997: see Study 4).

Measurements

Some measurements are described in the Appendix. Attitude to use DSS was measured by an instrument based on the theory of reasoned action (Fishbein & Ajzen, 1975). The interviews produced ten DSS properties, which were rated on a seven point and verbally anchored scale with respect to the belief about and the evaluation of them. After one item had been removed, the Cronbach's alpha coefficients were 0.47 and 0.61 respectively. The low values of the coefficients may indicate low reliability (cf. Peterson, 1994).

In accordance to the theory of reasoned action, the behavioral intention to use DSS in the job and the attitude to this behavioral intention were also measured. The latter variable consisted of the average of three scale items measuring the attitude to the intention to use DSS on three seven point and verbally anchored scales.

Risk propensity was measured using an instrument developed by Hedelin and Sjöberg (1995) in their study of bank loan officers. According to this instrument, the risk attitude was calculated by averaging the response to different items about the credit risks involved in trade-credit granting and some more general risk items. The items were measured by a five point and verbal anchored scale. Due to the differences between loan and credit granting, the instrument was slightly modified with regard to the questions that expressed risk aversion and risk taking. A decreased number of items was also used; in the present paper, the risk variable had 21 items compared to 28 items used by Hedelin and Sjöberg (1995). The current risk variable showed a reasonably good Cronbach's alpha coefficient (0.74).

Intuition was measured as follows: On a seven point and verbally anchored scale, participants were asked to indicate to what extent their decisions to grant trade-credit to new clients as well as to existing clients were made in an intuitive or analytic manner. Average value of intuition was then calculated and the Cronbach's alpha was reasonably good (i.e., 0.73). Hedelin and Sjöberg (1995) had used a similar approach.

Adopted from research on willingness to work (Sjöberg & Lind, 1993; Björklund, 1996) a measurement, in which participants specified the main sources of motivation with respect to their work, was employed.

Table 2. *Mean Values and Standard Deviations for Beliefs, Evaluations, and Belief * Evaluation Products (N=92).*

| DSS Properties | Belief (b) | | Evaluation (e) | | b * e product | |
|---|------------|------|----------------|------|---------------|------|
| | Mean | SD | Mean | SD | Mean | SD |
| Supply all required information. | 0.13 | 1.78 | 0.46 | 1.60 | 1.99 | 2.54 |
| Fast indication whether credit can be granted. | 1.79 | 1.07 | 1.73 | 1.02 | 3.80 | 2.65 |
| Possible to adapt completely without credit losses or failed sales. | -0.60 | 1.75 | -0.21 | 1.70 | 2.06 | 3.20 |
| Allowing verification of judgments or decisions. | 1.36 | 1.08 | 1.27 | 0.98 | 2.34 | 2.50 |
| Time saving. | 1.89 | 0.93 | 1.74 | 0.90 | 3.87 | 2.70 |
| Eliminate human judgment. | -0.65 | 0.83 | -0.27 | 1.70 | 1.88 | 3.40 |
| Based on partly out of date information. | 1.55 | 1.35 | -1.01 | 1.62 | -1.69 | 4.13 |
| Easy to be blinded. | 0.97 | 1.20 | -0.79 | 1.30 | -0.91 | 2.66 |
| Lacking intuition that is important for credit assessment. | 1.08 | 1.37 | -0.61 | 1.46 | -0.95 | 3.35 |

Notes. Belief and evaluation were measured on a scale that ranged from -3 to +3 implying that positive (negative) numbers represent likely (unlikely) outcomes and favorable (unfavorable) evaluations. Concerning the belief times evaluation products, a positive (negative) number suggests a positive (negative) attitude and a number near zero means an indifferent attitude.

Result

A contrasting picture emerged from the preliminary in-depth interviews. The respondents regarded DSS as slightly negative or as slightly positive, but quantitative analyses did not find any particular pattern with regard to respondent, organization, line of business, or company performance. Using data from the questionnaire, those issues will be further investigated in this section.

First of all, it should be stated that all responding managers had access to and used DSS. The attitude to DSS was calculated in accordance to the theory of reasoned action (i.e., the belief times evaluation products were aggregated). In all, the credit managers seemed to be moderately positive towards DSS ($M=12.07$, $SD=12.39$). Descriptive statistics regarding the present application of the theory of reasoned action are reported in Table 2.

The average behavioral intention and average attitude to behavioral intention were 5.62 ($SD=1.10$) and 2.21 ($SD=0.71$) respectively. The relationships between attitude to DSS, intention to use DSS, and the attitude to the behavioral intention were investigated.³

- A weak correlation between attitude towards DSS and the behavioral intention ($r_s = 0.32$, $p < 0.01$).
- A weak correlation between attitude towards DSS and the attitude to the behavioral intention ($r_s = 0.30$, $p < 0.01$).
- A strong correlation between the behavioral intention and the attitude to the behavioral intention ($r_s = 0.65$, $p < 0.01$).

Testing the Four Hypotheses

Some cases had missing values, so the sample was reduced to include 71 respondents. For three of the hypotheses, the Kruskal-Wallis test was used to investigate the hypothesis due to its benefit of analyzing data without imposing the assumption of normality of the population distribution (Newbold, 1995).⁴ Spearman's coefficients of correlation were used to test the fourth hypothesis, because a categorization of the sample would have resulted in problems with imbalance between the two groups.

The first hypothesis implied that risk averse managers display more positive attitudes to DSS than their risk taking colleagues. The risk variable was categorized into three different groups: (a) those who displayed risk aversion ($n_{ra}=24$), (b) those who were regarded as risk neutral ($n_r=22$), and (c) those who were risk takers ($n_{rt}=25$). The three groups did not differ significantly with respect to attitude to DSS ($M=9.67$, 13.09, and 13.48), but some significant differences among the three groups were found. Risk averse managers agreed

more than their risk neutral and risk prone colleagues that DSS could be adapted completely without any credit losses or any failed sales. This tendency existed in belief (mean ranks = 45.83, 31.09, and 30.88, chi-square=8.48, $p<0.05$) and evaluation (mean ranks 44.65, 31.91, and 31.30, chi-square = 6.56, $p<0.05$), but no significant difference ($p>0.05$) was found in the belief times evaluation product. In addition, there was a significant difference with regard to the belief that DSS is based partly on old information. Apparently, risk neutral managers were more inclined to agree with the statement (mean ranks = 27.40, 44.30, and 36.96, chi-square = 8.38, $p<0.05$). However, no significant differences were detected with respect to the attitudes towards DSS, the behavioral intention to use DSS, and the attitude to this behavioral intention.

To further test the first hypothesis, tests were also performed when the category of risk neutral managers had been ignored. Besides the differences mentioned earlier, there were no significant differences regarding attitude, beliefs, evaluations, or belief times evaluation products. Moreover, the behavioral intention and attitude to behavioral intention did not contrast significantly. In all, the first hypothesis was rejected.

The second hypothesis stated that less experienced managers display more positive attitudes than more experienced managers. Experience was divided into three categories: (i) credit managers with 3 to 8 years of experience ($n_1=26$), (ii) credit managers with 9 to 14 years of experience ($n_2=15$), and (iii) credit managers with more than 14 years of experience ($n_3=30$). The three categories were labeled less experienced, more experienced, and most experienced respectively. However, the three categories did not contrast regarding attitude, behavioral intention or attitude to behavioral intention. Analyses of beliefs, evaluations, and belief times evaluation products indicate homogenous categories apart from the single exception of belief in the second statement. More experienced managers tended to agree more than their less experienced and most experienced colleagues that DSS could produce fast indications for trade-credit granting (mean ranks = 34.92, 46.77, and 31.55, chi-square=6.44, $p<0.05$). Tests where more experienced managers had been disregarded did not reveal any significant differences, so the second hypothesis was rejected.

The third hypothesis stated that female managers display less favorable attitudes. Gender differences were detected in the attitude to DSS: Male managers ($n_m=51$) were more favorably disposed to DSS ($M=13.8$ vs. 7.65, mean ranks = 39.26 vs. 27.67, chi-square = 4.54, $p<0.05$). The belief times evaluation product in the first statement was also found to differ and it seems that female managers ($n_f=20$) were more reluctant to conform to the statement that DSS supply all information required for credit granting (mean ranks = 39.10 vs. 28.10, chi-square = 4.25, $p<0.05$). Apart from these two differences, male and female managers held the similar behavioral intention as well as attitude to behavioral intention. Thus, the third hypothesis was accepted.

The fourth hypothesis was that intuitive managers display less favorable attitudes to DSS than analytic managers do. Spearman correlation coefficients suggested that the intuition variable was significantly correlated with attitudes ($r_s = -0.38$, $p < 0.001$), so the hypothesis was accepted. Concerning behavioral intention and attitude to the behavioral intention, non-significant correlations were found ($r_s = -0.15$ and -0.13). Intuition was significantly correlated with the belief that DSS supply all required information ($r_s = -0.36$, $p < 0.01$) and with the evaluation of the statement that DSS are based partly on out-of-date information ($r_s = -0.27$, $p < 0.06$). Moreover, significant correlations were found with the belief-evaluation product for the following attributes: (i) elimination of human judgment ($r_s = -0.24$, $p < 0.05$), (ii) based partly on information that is out of date ($r_s = -0.27$, $p < 0.05$), (iii) easy to be blinded ($r_s = -0.27$, $p < 0.05$), and (iv) lack of intuition ($r_s = -0.28$, $p < 0.05$).

Explaining Attitude to Decision Support Systems

To explain credit managers' attitude to DSS, a linear regression model was estimated with attitude as the dependent variable. The model included a large number of independent variables such as degree of intuition in decision making, sources of motivation, various characteristics of the respondent, of their office and of their companies, and scale items from the risk variable. It can be argued that there existed scale items in the risk variable that might correlate with the dependent variable. As a consequence, the risk variable was split into the 21 different scale items in a further attempt to study the influence of the risk propensity. The two variables, behavioral intention to use DSS and the attitude to behavioral intention, were not put into the regression model. Due to missing values the analysis of variance above included 71 observations. However, in the regression analysis the missing values were replaced with mean values implying that the sample size was increased to include 92 observations. Although replacement of missing values may be questioned, it was used to raise the power of the model.

The benefit of initially having all variables in the model and sequential removal (Draper & Smith, 1966) motivated the backward elimination as the method to reduce the independent variables. Moreover, this paper's explorative purpose motivated this approach. Backward elimination resulted in a regression model that accounted for 37.9% of the variance and involved six independent variables: intuition, existence of tailor-made decision aid (i.e., a tool especially developed for a particular organization's credit granting), responsibility as source of motivation, number of collaborators, and two scale items from the risk variable. Two of these variables were coded as dummy variables: responsibility (responsibility motivates = 1 and responsibility does not motivate = 0) and tailor-made decision aid (existence = 1 and non-existence = 0). See Table 3.⁵

Multicollinearity, normality, heteroscedasticity, and autocorrelated errors were controlled by tests suggested by Newbold (1995) and the SPSS manual (Norusis, 1992; 1993), but no severe problem was detected. A correlation matrix of the variables included in the regression model appears in the Appendix.

Table 3. *A Multiple Regression Analysis with Attitude to DSS as Dependent Variable (N=92).*

| Variables | Beta Weight | Standard Error | Standardized Beta Weight |
|--|-------------|----------------|--------------------------|
| Constant | 6.994 | 7.974 | |
| Intuition | -3.392 | 0.727 | -0.390 *** |
| Existence of tailor-made decision aids | 6.199 | 2.033 | 0.263 ** |
| Sources of motivation: Responsibility | 8.405 | 2.185 | 0.322 *** |
| Number of collaborators | 1.068 | 0.400 | 0.227 ** |
| Risk item 9: Positive experiences with risk taking | 4.026 | 1.366 | 0.252 ** |
| Risk item 7: Risk is incompatible with credit | -2.514 | 1.316 | -0.163 |
| Adjusted R ² | | | 0.379 |

Notes. Tailor-made decision aids and responsibility were coded as dummy variables: Existence of tailor-made decision aid and responsibility as a source of motivation equaled one or otherwise zero. * p<0.06 ** p<0.01 *** p<0.001

Discussion

The purpose of the present paper was to investigate and explain attitude towards DSS aiding the granting of trade credit. In all, the managers seemed to have moderately positive attitudes to DSS. Two of the four hypotheses were accepted; it was found that female managers and managers relying on intuition tended to appreciate DSS less. A regression model was estimated and the model accounted for 37.9 per cent of the variance of the attitude to DSS. In this section, implications of the findings will be discussed.

On the basis of the significant positive correlations between the moderate attitude to DSS, behavioral intention, and attitude to behavioral intention, some tentative suggestions can be made concerning the credit managers use of DSS. Consequently, it can be suggested that the average credit manager does not rely entirely on DSS in his/her decision-making but also considers his/her own judgment and additional obtained information. This proposition implies that the credit manager might utilize the DSS effectively with respect to combining pattern recognition with statistical models. This combination has proved to improve performance (cf. Hoch & Schkade, 1996). In a sense the proposition harmonizes with Blattberg and Hoch's (1990) finding that the combination 50% model and 50% manager produced the best performance, but statistical models are seldom out performed by expert judgment and by broken leg cues (e.g. Dawes, Faust, & Meehl, 1989). Although broken leg cues may occur in the granting of trade-credit, additional information that is not included in the DSS is more common. Additional information may be obtained from sales personnel and, perhaps more importantly, from accounting ledgers. Such information may be exemplified by facts about the clients' factory and the track record of payments and orders. Nevertheless, broken leg cues do occur; for instance, one of the interviewed managers described how he had begun to suspect a client of fraud due to the change of purchase pattern, and while the DSS did not indicate fraud his suspicion was right. On the whole, it can be asserted that the average manager's use of DSS is well-balanced risk-taking.

It can be argued that the credit managers' attitude to DSS, behavioral intention to use DSS, and attitude to behavioral intention could be correlated with the performance of their companies. Such a correlation would demonstrate implicitly whether the use of DSS has any influence on business performance, because attitudes are assumed to reflect actual behavior although previous findings suggest conflicting evidence (e.g. Pieters, 1988). In the questionnaire the respondents were asked to report indications of business performance, like turnover, income before extra ordinary items, and the ratio credit losses of the turnover from the last three years. The mean of the credit loss ratios was calculated. In order to eliminate the effects of outliers, Spearman correlation coefficients were run. The following non-significant weak correlations were found:

- The average credit loss ratio had weak correlation with DSS attitude ($r_s=0.15$) and attitude to behavioral intention ($r_s=0.11$).
- Turnover had weak correlation with DSS attitude ($r_s=0.16$), attitude to behavioral intention ($r_s=0.17$) and behavioral intention ($r_s=0.13$).
- Income before extra ordinary items had weak correlation with attitude ($r_s=0.13$), and behavioral intention ($r_s=0.11$).

Apparently, there seemed to be little support for the idea that there would be an influence on business performance, but on the other hand business performance might influence attitude and behavior to DSS. The lack of significant influence in those particular performance measurements may be due to the fact that apart from credit losses the credit assessment is mainly reflected in financial ratios measuring liquidity and cashflow. Good (bad) paying customers will result in increased (decreased) liquidity as well as cashflow. Nevertheless, the difficulties in measuring the performance of a credit manager must be emphasized. The results of granting trade-credit, which ends up in losses are relatively easy to observe, whereas the denials of credit resulting in failed sales are more complex to measure.

Implications of the Result of the Hypotheses

The first hypothesis was rejected implying that attitude to DSS and risk propensity are not related. This finding may harmonize with Shoemaker's (1993) argument that risk attitude plays a minor role in explaining risk-taking behavior whereas other determinants, such as definition of problem, perception, decision process, and portfolio effects, are assumed to have more influence. Nevertheless, risk averse and risk prone managers differed in the way that the latter ones stated it was more unlikely that DSS could be adapted completely without credit losses or failed sales.

This phenomenon may be explained by the risk prone managers' assumed tendency to require more information for decisions concerning denials of credit, because they do not want to rule out potential business. Highhouse and Yüce (1996) noted that opportunity-framed problems tended to result in more risk taking than problems perceived as threats. Consequently, risk prone managers tend to perceive business as a possibility to increase sales rather than as a threat to increase credit losses. They might also believe that credit losses should be related to the total amount of sales that the failed customers had generated before ending up in bankruptcy; a view supported by the majority of the interviewed managers.

The second hypothesis was also rejected. Although it has been argued that novices regard DSS as more beneficial than experts (e.g. Will, 1993), the present results suggest that the three categories of experience held the same attitude to DSS. This result may correspond to Shanteau's (1992) argument that experts do rely on decision aids in their judgment. The observed difference in the belief that DSS produced fast indication for trade-credit granting, might be due to the fact that more experienced managers have had more practice using DSS than less experienced ones and are more used to computer technology than the most experienced ones. It seems remarkable that the three categories have almost the

same beliefs and evaluations. This implies that all DSS users in trade-credit granting are equally aware of the benefits as well as the disadvantages.

The third hypothesis was accepted. Female managers were less prone to assess DSS as favorable. This observation seemed plausible with reference to Whitley's (1996) finding that women consider computers more distressful than men do. It may also be argued that the present observation is due to a female tendency to rely on intuition, but the present data do not suggest any significant association with gender and use of intuitive judgment.

The fourth hypothesis was also accepted. Intuition prone managers displayed more negative attitudes to DSS than analysis-prone managers. The observation seemed plausible with respect to the fact that intuitive managers may perceive credit risk assessment as a process for "gut feeling" rather than a purely automatized rational process, because firms are unique and dynamic that exist in interactive and ever-changing environments. This point of view is supported by the interview summaries which reported that the credit assessment might be automatized for small amounts of trade credit (e.g. 50,000 SEK), rather than for some types of firms or lines of business, but that there will always be a need for manual assessment. Some of the interviewed managers also emphasized the importance of having working experience that cannot be put into a model. For instance, one manager stated that it was possible to predict the performance of road carriers by exploring the number of trucks parked in the backyard: Fewer parked trucks suggested more orders and prospering business. His argument reflects the notion of pattern recognition and broken leg cues. That is, years of practice yield knowledge in a large number of cases making managers more able to recognize a prospective failed customer from a non-failed customer on the basis of intuition rather than by extensive analyses of the accounting records.

In a sense, the argument resembles de Groot's (as cited by Ericsson & Smith, 1991) finding of how chess grandmasters perceive and evaluate chess positions and possible moves; they rely on their extensive experience rather than on calculation and evaluation of move possibilities. Although the task characteristics of trade-credit granting (e.g., static stimuli, available feedback, and repetitive tasks) may facilitate good performance (cf. Shanteau, 1992) there is doubts whether the credit managers are able to draw conclusions about relationships or merely observe events. Research has shown that people tend to search for evidence that confirm their judgment rather than falsifies it, and this prevents learning from experience (e.g., Brehmer, 1980). Nevertheless, DSS may provide consistency to the credit managers' decision-making.

Implications of the Regression Model

A regression model was estimated with attitude to DSS as dependent variable and six independent variables: intuition, use of special decision aids, responsibility as motivational source, number of collaborators, and two risk scale items. Intuition variable was negatively related to the dependent variable, which suggests that the more intuition that the managers stated they used in their decision processes the more negative the attitude towards DSS was. Managers, who stated responsibility as the main source of motivation, were more inclined to evaluate DSS as advantageous. The same tendency was valid for managers that used special decision aiding systems in their decision making. Special decision aiding systems are systems that have been made especially for a specific company. Taylor (1995) suggested that accountability reinforces uncertainty and, as a consequence, increases the individual's propensity to choose the predetermined option. The suggestions may be applicable to interpretations of the two positive beta weights. In this case, the DSS would supply judgments comparable to predetermined options and the responsibility-motivated credit manager would, therefore, appreciate DSS.

The number of collaborators seemed to influence attitude: Managers with collaborators appeared to be more positive towards DSS than managers working single-handedly. This tendency may be explained by the circumstance that it is important for a manager to appreciate the implemented DSS, because one influential factor for the success of DSS is argued to be employees' perception of the manager's perception of the DSS (c.f. Duchessi & O'Keefe, 1995). In addition, since the manager is accountable for his/her collaborators, it is likely that he/she demands clear arguments based on analyses from them rather than doubtful hunches based on intuition.

Two items from the risk variable were included in the regression model. The first risk item concerns positive experience when a risk has been taken deliberately and was regarded as a measure of risk taking propensity (Hedelin & Sjöberg, 1995). The second risk item deals with the statement that risk is compatible with credit granting and was assumed to reflect risk-avoiding tendency (Hedelin & Sjöberg, 1995). In the model these items have positive and negative beta weights, respectively. Positive weight suggests that the more positive experience of risk taking the more positive attitude. Negative weight infers that the more doubts about the statement that risk and credit granting are incompatible concepts, the more negative attitude. The interpretation of these risk items seemed to be confusing, because on one hand risk taking propensity leads to a positive attitude towards DSS and on the other hand it means a negative attitude. However, these variables were weakly correlated with the attitude ($r=-0.14$ and 0.18). This can imply that the risk items are suppressor variables. Such variables have zero or close to zero correlation to the dependent

variable, but correlate with one or several of the independent variables; the incorporation of suppressor variables in the analysis increases the explained variance since they suppress irrelevant variance (Pedhazur, 1982). The confusion of interpretation may be clearer using a notion of suppressor variables stated by Pedhazur (1982, p.105): "people who are high on the suppressor variable are penalized, so to speak, for being high, whereas those who are low on the suppressor variable are compensated for being low".

The risk items involved in the regression model deserve further attention. It can be claimed that it is unlikely that credit managers having taken risks that have resulted in disaster would still be in business. The available data suggested that 21% of the respondents disagreed or were not sure that their risk taking had had positive outcomes. In addition, from a theoretical point of view, the granting of trade-credit involves risk and although the majority (86 %) of the respondents agreed with this view, there were some respondents who disagreed or were uncertain. Thus, even though those two risk items may at first sight appear evident, those respondents did not think so.

To test whether those minorities differed systematically, the coefficient of contingency was used. The first risk item (i.e., positive experience of risk taking) was not associated with gender or experience, while the second risk item (i.e., risk-credit compatibility), though not related to gender, was related to experience ($r=0.748$, $p<0.01$). The latter association indicates that less experienced credit managers were uncertain whether risk and credit were compatible concepts.

Concluding Remarks

Questions about reliability and validity may arise, because two scales with comparatively low Cronbach's alpha coefficients (cf. Peterson, 1994) measured attitudes towards DSS.

It may be asserted that the different scale items reflected attitudes to certain properties of DSS rather than attitudes to DSS in general. To test this assertion, a factor analysis was run. It was found that the possibilities for factor analyses were middling (cf. Norusis, 1992) and that the scale items could be explained by three factors accounting for 60.4% of variance. The first factor included three items (i.e., fast indication for credit granting, provide verifications, and time saving), which were assumed to relate to operative benefits. In the second factor, three other items (i.e., supply all required information, ensue completely without credit losses or failed sales, and eliminate human judgment) were involved and they were supposed to indicate principal benefits. The third factor had the remaining items (i.e., based partly on out-of-date information, easy to be blinded, and lack of intuition), which expressed the drawbacks associated with DSS. Factors number one and two differed in the sense that the first one

manifested benefits that were detected by practice whereas the other one had general benefits that could be detected almost without any practice. However, the current paper focused on general attitude to DSS rather than components of attitudes to elements of DSS and from a theoretical point of view it seemed adequate to simply add the different items together (cf. Fishbein & Ajzen, 1975).

In the present paper, the participating credit managers stated their perceived level of intuition/emotions (or logic/analytic reasoning) applied in the decision-making. It can be argued that such a self-reported measurement does not really measure the manager's cognitive style and, consequently, has low reliability. Cognitive style can also be estimated by psychometric measurements, like the Myers-Briggs Type Indicator by Myers (1962) or the Cognitive Style Index by Allinson and Hayes (1996). The latter indicator might be argued to be more appropriate in management studies, since it involves few items (Allinson & Hayes, 1996). Future research projects regarding DSS (i.e., attitude, intention, and use) and cognitive style may apply psychometric measurement.

Further research is justified as approximately 37.9% of the variance of managerial attitude to DSS could be explained. Assuming that attitude to DSS can be created by psychological processes comparable to the theories of effects of reinforcement on preceding behavior, use of Rotter's (1966) locus of control scale may be motivated. In this particular context, credit managers who perceive the outcome of credit decisions as a result of their own actions might have a different attitude to DSS than credit managers perceiving credit decisions as independent from their action.

Moreover, if it was found that the average credit manager considers credit granting as action independent, this would perhaps motivate the argument that credit decision-processes can be (or has been for that matter) fully automatized. The managerial implication may be that business decisions like the granting of trade credit could be made without credit managers.

Notes

1. It may be argued that the uncertainties of failed payments can be eliminated if goods and services were delivered for ready cash. That would be quite expensive due to increased transaction costs (cf. Kim & Atkins, 1978). Credit is also a recognized custom in business life. If a credit applicant appears to have insufficient economical viability, there is of course the possibility to demand collateral, but this might obstruct business.
2. Other essential factors are domain knowledge, psychological traits, cognitive skills, and task characteristics (cf. Shanteau, 1992).
3. The Pearson coefficients of correlation were similar. Spearman tests were preferred since it is a non-parametric method.
4. Pearson's and Spearman's coefficients of correlation generated similar results.
5. The stability of this regression model was tested by randomly dividing the sample into two parts. This model was then run on each part. From these two separate analyses it was found that: (i) the adjusted R^2 varied (0.29-0.36), (ii) most independent variables (intuition, existence of tailor-made decision aid, sources of motivation and risk item 9) remained significant ($p < 0.05$) in both analyses, (iii) one independent variable (number of collaborators) was significant in one analysis, and (iv) one independent variable (risk item 7) was insignificant in both analyses. It should be mentioned that the two parts of the sample were relatively small compared to the number of the independent variables.

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Appendix

Table 4. *Measurement for Attitude towards DSS as Translated from Swedish.*

| The following properties were rated with respect to | a) belief on a seven point and verbally anchored scale (alpha=0.47) | b) evaluation on a seven point and verbally anchored scale (alpha=0.61) |
|---|---|---|
| DSS supply all information required | | |
| DSS give fast indication if credit can be granted | - 3 extremely unlikely | - 3 extremely bad |
| DSS can be adapted completely without credit losses or failed sales | -2 quite unlikely | -2 quite bad |
| DSS allow verification of judgments or decisions | -1 slightly unlikely | -1 slightly bad |
| DSS save time | 0 neither | 0 neither |
| DSS eliminate human judgment | 1 slightly likely | 1 slightly good |
| DSS is based on partly out of date information | 2 quite likely | 2 quite good |
| It is easy to be blinded by DSS | 3 extremely likely | 3 extremely good |
| DSS lack intuition which is important for credit assessment | | |

Table 5. *Measurement for Behavioral Intention to Use DSS (BI) and Attitude towards this Behavioral Intention (ABI) as Translated from Swedish.*

| Statement | Measurement |
|--|---|
| BI: In my work as a credit manager, I rely on decision support systems, i.e. credit agencies and special software for credit assessment. | On a seven point verbal scale ranging from always (7) to never (1) |
| ABI: Relying on decision support system is: (alpha=0.92) | On three seven point verbally anchored scale ranging from extremely bad (1) to extremely good (7), ranging from extremely unwise (1) to extremely wise (7), and ranging from extremely inadequate (1) to extremely adequate (7) |
| bad vs. good | |
| unwise vs. wise | |
| inadequate vs. adequate | |

Table 6. *Measurement for Intuitive vs. Analytic Manner (Alpha=0.73) as Translated from Swedish.*

| Statements | Measurement |
|--|--|
| Do you think that you rely more on intuition/emotions than logic/analytic reasoning when you are about to decide on credit to a <u>new</u> client? | On a seven point verbal scale ranging from utterly no (1) to utterly yes (7) |
| Do you think that you rely more on intuition/emotions than logic/analytic reasoning when you are about to decide on credit to an <u>existing</u> client. | On a seven point verbal scale ranging from utterly no=1 to utterly yes (7) |

Table 7. *Pearson Correlation Matrix of Variables Included in the Regression Model.*

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|----------|--------|---------|-------|--------|------|------|
| Attitude to DSS | 1.00 | | | | | | |
| Intuition | -0.35*** | 1.00 | | | | | |
| Special decision aid | 0.24** | -0.046 | 1.00 | | | | |
| Source of motivation: Responsibility | 0.31*** | 0.125 | 0.01 | 1.00 | | | |
| Number of collaborators | 0.24** | 0.04 | 0.13 | 0.04 | 1.00 | | |
| Risk item 9. Positive experiences with risk taking | 0.18* | 0.07 | -0.24** | 0.05 | 0.03 | 1.00 | |
| Risk item 7. Risk is incompatible with credit | -0.14 | 0.09 | 0.11 | -0.07 | 0.19** | 0.05 | 1.00 |

Notes. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

Study 6.

Collateral in Lending:

Attitudes, Intentions and Behavior

COLLATERAL IN LENDING: ATTITUDES, INTENTIONS AND BEHAVIOR¹

Patric Andersson
Center for Economic Psychology
Stockholm School of Economics, Sweden

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Abstract

The present paper is an empirical investigation of how collateral is used and perceived by experienced credit managers. In particular, managers' attitudes, intentions, and behavior were investigated. The empirical material was based on in-depth interviews as well as a nation-wide survey. It was found that the average attitude of the participating managers was one of constraint and that collateral was requested only in about two out of ten trade-credit cases. A weak negative correlation between risk propensity and attitudes towards collateral was found. It was not possible to find any particular type of business, performance, or other characteristics associated with any particular attitudes, intentions, and behavior. The findings are relevant to researchers in the field of business studies, economic psychology, finance, law, and risk research.

Keywords: collateral, credit management, law, lending, risk attitude, theory of reasoned action

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Introduction

Collateral is a central concept in trade-credit granting as well as other kinds of lending. It is a way for creditors to secure their claims. There seems to be little empirical research on how creditors use and perceive collateral (cf. Rosman & Bedard, 1997; Mann 1997). The present paper aims to fill up this gap. In particular, the purpose of the paper is to shed light on experienced credit managers' attitudes, intentions, and behavior regarding various types of collateral. The chosen research design and analytical methods are based on findings from economic psychology, risk research and earlier studies in the area. The present paper is restricted to granting credit to domestic firms.

Trade-credit granting involves uncertainty regarding the customers' ability and intention to pay for products and services being delivered without immediate payment. One way to diminish the risk of default payments is to grant credit against collateral (also known as security or guarantee). Having collateral implies that the supplying company has secured its claim in the event of insolvency. The company is a preferential and prioritized creditor. In other words, the company is ensured to get compensation to an amount corresponding to (hopefully) the claim in case of the customer's insolvency.

There are four major types of collateral used in credit granting: (i) bank guarantees, (ii) guarantees of surety, (iii) floating charges, and (iv) pledges. A detailed description of these concepts is beyond the purpose of the paper, but very briefly it can be said that:

- A bank guarantee means that the customer's bank guarantees the payment up to a pre-decided amount during a fixed time period.
- A guarantee of surety implies that a natural or legal person accepts responsibility for the customer's debts.
- A floating charge is a kind of mortgage and implies that the customer surrenders to the creditor the right to certain assets (e.g., stock and claims). The term mortgages will be used to refer to floating charges in this paper.
- A pledge means that certain assets of the customer are at the creditor's disposal in the event of defaulted payment.

Furthermore, there are other forms of collateral such as ownership reservation. For a thorough description regarding collateral, see Håstad (1990).

When granting credit, the credit manager makes a choice between two alternatives. On one hand, the credit can be granted without collateral but with the risk of defaulted payment (see A below). On the other hand, the credit can be granted with a request for collateral but with the risk of the customer turning to another supplier (see B below). To the second alternative the risk of the value of the underlying asset being reduced can be added. Both alternatives also include

cost as well as interest caused by the payment being withheld. The size of these costs can of course be different in the two alternatives. In the terminology of decision theory, the situation for granting credit with and without collateral can be illustrated as follows:

$$\begin{array}{ll} \text{(A)} & f_A(x, c, p, q, r) \\ \text{(B)} & f_B(x, c, p, r, s, y) \end{array} \quad (1)$$

x = the amount of the claim

c = cost

p = likelihood of insolvency, $0 < p < 1$

q = size of payment in the case of insolvency in percentage of debt, $0 < q < 1$

r = interest rate

s = likelihood of no business, $0 < r < 1$

y = size of payment in the case of insolvency in percentage of debt, $0 < y < 1$

If the expected value of alternative A exceeds the expected value of alternative B, then alternative A should be chosen.

It is a well-known fact that supplying companies get little compensation for debts in bankruptcies. Green (1985) found that payment to not prioritized creditors, the group suppliers usually belong to, made up on average 2% of the debts. An inquiry by the Swedish government reported that the corresponding figure was on average 3.6% of the debts (Insolvensutredningen, 1992). Later investigations have confirmed the weak position of suppliers concerning compensations in bankruptcies.

Using a sample of 350 failed small companies, Thorburn (1998) investigated the size of compensations in bankruptcy. Creditors without collateral had the largest claims (on average 4.3 Million SEK), but received the lowest level of compensations (on average 1%). On average, creditors with mortgages demanded 4 Million SEK and received 62% of their demands. Creditors having pledges had significantly lower amounts of claims (on average 0.9 Million SEK), but obtained significantly higher levels of compensations (on average 76%). As regards bank and credit guarantees, no figures were reported.

The slim chance of receiving payment for claims without collateral (in other words a low q in the equation above), should mean that credit managers in supplying companies would be inclined to request collateral when granting trade credit.

Studies of bankers' lending decision processes have shown that bankers put great emphasis on accounting data (Beaulieu, 1994, 1996) as well as on characteristics of the entrepreneur applying for credit (Hedelin & Sjöberg, 1993), but little weight on collateral. Hedelin and Sjöberg (1994) found that no credit managers in development funds and county councils believed that

collateral had an influence on credit decisions. Rosman and Bedard (1997) found that loan officers who used effortless decision processes (i.e., evaluating few items of information) were prone to demand collateral. The authors also explored the relationship between demanding collateral and risk attitude, but no correlation ($r=0.08$) was found.

Dernroth (1993) investigated credit managers in Swedish supplying companies and reported that 67% of the participating 68 credit managers seldom or never used the possibility of demanding collateral. A number of questions were left unanswered: What corresponded to "seldom" or "never" quantitatively, for instance expressed as the relation between the number of credit cases where collateral is demanded and the total number of credit cases? Could collateral requests be related to individual as well as company characteristics? What was the reason for such low degree of requesting collateral by credit managers?

The explanation that Dernroth (1993) put forward for why credit managers requested collateral in so few cases was the worry that the sale would not take place if this request was made. It is possible to imagine some other explanations. One pragmatic explanation could be that demanding collateral is not possible, since the customer has none to provide. However, it may be argued that in most credit cases collateral is in fact available, but credit managers do not request it. In these situations, plausible explanations may be found from a psychological perspective. To be specific, the credit manager's behavior is most likely a reflection of his/her attitudes and intentions towards requesting collateral.

Explaining human behavior is a complicated matter. Extensive research has proved that an individual's behavior is reflected in his/her attitude to that behavior (e.g., Eagley & Chaiken, 1993). For instance, Whitley (1996) found that positive attitudes towards computers were positively related to possessing a computer. Accordingly, a credit manager who frequently requests collateral probably has a more positive attitude towards this than has the manager who seldom requests any. There may of course be other reasons than a more positive attitude, such as type of business, customer, presence (absence) of collateral, the influences of superiors, and debate in society. All these elements might influence attitude and, therefore, also behavior.

An attitude can be described as the tendency to evaluate an object or activity as positive or negative (Eagley & Chaiken, 1993). Tendency refers to the individual's internal state and evaluation refers to explicit, implicit, cognitive, emotional or behavioral responses. It is assumed that attitudes are formed through a learning process, where the individual through direct or indirect experiences collects information about a type of behavior or an object (Eagley & Chaiken, 1993). Direct experience means a credit manager getting insight into the advantages and disadvantages of requiring or not requiring collateral him/herself. Indirect experience refers to a credit manager being informed about advantages and disadvantages. Therefore, the more experienced a credit

manager is the wider understanding he/she will have regarding collateral. As a result, more experienced credit managers should exhibit stronger positive or negative attitudes to requesting collateral. It can also be assumed that a credit manager with experience of granting credit during both trading booms and recessions has a wider understanding about advantages and disadvantages of collateral (cf. Larr, 1996).

Fishbein and Ajzen (1975) have developed the theory of reasoned action, which describes these psychological processes. This theory has been successfully used in different contexts, for example to investigate the use of computers and ethical attitudes when using computers (Loch & Conger, 1996). Instead of predicting and describing behavior (i.e., by asking for collateral), the theory stems from the intention to act (i.e., the intention to ask for collateral).

This intention can be seen as a function of social norms and attitudes. Social norms are determined by normative convictions and reasons to follow these. Attitude is determined by the individual's beliefs and evaluations of events, which are connected with the behavior or the object. A formula describes the components of attitude:

$$A_B = \sum_{i=1}^n b_i * e_i \quad (2)$$

where b_i expresses the individual's beliefs that the behavior results in a particular consequence and e_i expresses the individual's evaluation of that consequence. In other words, the attitude is a function of subjective assessments of the advantages and disadvantages associated with the behavior. In the case with attitude towards collateral, the attitude is made up of the credit manager's beliefs that collateral implies particular consequences, for example guaranteed payment, and how likely these consequences are. The attitude model has similarities to expected utility theories, see Pieters (1988).

Credit granting implies taking two kinds of risk: (i) the risk of granting credit to non-paying customers as well as (ii) the risk of denying credit to paying customers. Erroneous granting of credit implies credit losses, while erroneous denying of credit may result in losses of sales. The first risk can be reduced or eliminated by credit risk assessment and/or requesting collateral. Since no records are kept of refused customers, the second risk is difficult to measure.

Risk is an ambiguous concept that can mean the probability that an event will occur, the event's consequences, or an association of probability and consequence. Drottz-Sjöberg (1991) found that individuals who judged risk from a risk-based standpoint based on probabilities tended to judge the risk smaller than those individuals who used a risk definition based on consequences did.

Three individual differences are presumed to determine risk behavior: risk perception, risk preference, and risk propensity. Risk perception is based on how the decision-maker perceives the present risk. This perception may depend on four factors: (i) how he/she judges the severity of the consequences, (ii) what the probability of the risk occurring is, (iii) how the risk can be controlled and (iv) how the decision-maker judges the certainty of the probability.

Risk preferences can be illustrated by how a decision-maker, who likes the challenge of taking risks, is more likely to take greater risks than other decision-makers are. Risk propensity can be defined as the decision-maker's tendency to either take or avoid a risk. Consistent patterns in risk propensity may be influenced by how the risks are evaluated and what risks are judged as acceptable. Risk propensity can vary from one situation to another. People who are careful when making decisions about business investments can be risk seeking when it comes to their own private economy.

Risk propensity is argued to be reflected in decision-makers' risk attitude. So what influence does the risk attitude have? MacCrimmon and Wehrung (1990) found that experienced (measured by years in practice as well as senior position) business executives were more unlikely to take risks than less experienced executives. In a study about bankers' credit risk assessment of entrepreneurs, Hedelin and Sjöberg (1993) noted two groups of bankers: risk-takers and risk-aversers. Risk taking bankers tended to acquire less information than their risk aversive colleagues. A corresponding connection has, however, not been noted in other studies of the relationship between risk attitude and information acquisition behavior. See for example Shoemaker's (1989) investigation into how people evaluate information when aiming to reduce probabilities, Davis & Harless' (1989) investigation of how people look for prices, or Andersson's (1997a: Study 4) study of credit managers' use of information. As mentioned above, Rosman and Bedard (1997) found no correlation between risk attitude and requesting collateral. Thus, different findings exist as regards the effect of risk attitude.

In conclusion, it can be maintained that more knowledge is needed of the attitudes amongst credit managers in Swedish supplying companies regarding the request for collateral. Empirically based knowledge is of great interest to all actors who work with lending decisions, questions related to bankruptcy as well as insolvency, to credit rating agencies and branch organizations, as well as to professionals.

The purpose of the present paper is to describe and analyze experienced credit managers' attitudes, intentions, and behavior with regard to requesting collateral. More specifically, the paper addresses the following questions:

- To what extent do credit managers ask for collateral?
- Do the attitudes and the intentions differ between branches with respect to requesting collateral?
- In what way can the attitudes, intentions and behavior be linked to risk propensity, experience and gender?
- In what ways are attitudes, intentions and behavior related to business performance?

The remainder of the paper is divided into three parts. First follows a description of research methods and the measuring instruments used. In the second part the results are reported and the paper ends with a discussion about possible future research.

Method

In-Depth Interviews

As a basis for understanding how supplying companies grant trade-credit, in-depth interviews were conducted with especially selected credit managers in supplying companies in the Stockholm region. The Swedish Credit Managers' Association was asked to select a number of credit managers who with regard to experience and type of business could give a thorough and complete picture of credit granting and credit risk assessment. Twenty credit managers were contacted with a request for interviews and eighteen agreed. The two who declined stated lack of time as the reason. Only three of the interviewees were women and they were fairly new in their positions. The eighteen who took part in the interviews had solid experience of granting credit and credit risk assessment. Their average experience was 14.5 years and they worked with relatively large companies with an annual turnover between 250 Million SEK and 4400 Million SEK. Credit losses in relation to turnover were on average 0.20%.

The interviewees were asked about a number of different events. The events were among other things: (i) information acquisition, (ii) attitudes to decision aids and collateral, (iii) experiences of credit events that had gone better or worse than expected, and (iv) desirable personal characteristics associated with skilled credit analysts. The present study concentrates on attitudes to requesting collateral. The eighteen managers taking part in the interviews were asked about their attitude to requesting collateral, and advantages and disadvantages with this request. The ten most frequent pros and cons were then used as a basis to form the attitude measurement in a questionnaire.

A fairly structured and standardized telephone interview was carried out. The remaining interviews were semi-structured and semi-standardized. The reason for this was an intention to get more balanced answers from the interviewees and create an atmosphere where the answers could be penetrated in order to get insight into more complicated phenomena. This interview technique might, however, result in the interviewing person and the interviewee influencing each other. In other words, there may be an interviewer effect. An explorative purpose and the interviewees' roles as experts motivated the chosen method (cf. Andersen, 1994). All interviews were recorded on tape and decoded in a summary, which was sent to the interviewees for control and possible additions. Glaser and Strauss' (1967) qualitative method was used to analyze the summaries. Their method implies that the qualitative data are categorized into clusters. The results from the interviews constituted the basis for a questionnaire.

Questionnaire

One hundred and sixty-five experienced credit managers in supplying companies were selected by the Swedish Credit Managers' Association to take part in a nationwide survey. According to the association, the selection was representative of credit managers in Swedish supplying companies and included very skilled credit managers.²

The questionnaire included questions regarding (i) risk attitudes, (ii) acquisition of information, (iii) attitudes to the use of decision-making aids as well as to requesting collateral, (iv) personal attributes of expert credit analysts, (v) and characteristics of good and poor credit decisions. In addition, there were questions regarding background information such as age, education, gender, position, experience, the organization of the credit department, routines for decision-making and tasks within the company. The questionnaire consisted of altogether 357 questions and items.³

Apart from attitudes to requesting collateral, the present paper also concentrated on questions relating to the use of collateral. Data have been used in earlier studies about the relation between the information acquisition and attitude to risk (Andersson, 1997a: Study 4) and credit managers' attitude to use decision aids in work (Andersson, 1997b: Study 5).

After a telephone reminder, 61.2% of potential answers were obtained. Considering the large number of questions and that the respondents did not receive any kind of remuneration for their participation, this percentage of answers must be considered as good. It took an average of 56 minutes ($SD = 30$) to answer the questionnaire. Comments from the respondents also showed that they thought it very interesting to take part in the survey; for instance, 75% (less than 5%) stated that the survey was relevant (irrelevant) and only 28% stated

that they thought answering the survey was tedious.⁴ Due to incomplete answers, eleven questionnaires were excluded; leaving a total of 90 respondents. Background information about these respondents is shown in Table 5 in the Appendix.

Totally there were 64 persons who did not answer the questionnaire. In order to find out if they in any relevant way differed from those persons who had responded and to find out why they had not answered the questionnaire, they were contacted by telephone. Fourteen of these stated that they did not feel suitable for taking part in the survey as their companies were either too small or they no longer worked with credit granting. Nine persons had quit or changed their jobs. The rest of the non-respondents worked with trade-credit granting, but stated that they did not have the time to spend on responding to the questionnaire.

Instruments

Using Fishbein and Ajzen's (1975) theory and the results of the in-depth interviews as a starting point, an instrument was created to measure attitudes towards requesting collateral. The in-depth interviews resulted in ten different statements, or rather four advantages and six disadvantages of requesting collateral. The respondents were asked to evaluate these statements using two seven-point scales. The first scale (Table 6 in the Appendix) was used to measure the probability of the different statements and ranged from *very likely* to *very unlikely*. The second scale (Table 7 in the Appendix) aimed to evaluate the statements and ranged from *very negative* to *very positive*. To find out if the respondents answered the different statements in a consistent manner, Cronbach's alpha coefficients were calculated. The coefficients were 0.71 and 0.63 respectively. These values can be seen as fairly good and acceptable (Peterson, 1994).

The intention to carry out an action is also included in Fishbein and Ajzen's theory. Accordingly, a tool was created to measure the intention to request collateral when granting credit. The tool consisted of a way of ranking intentions on a seven-point scale, see Table 1.

To measure risk attitude a variant of Hedelin and Sjöberg's (1993) instrument was used. Their instrument measured the risk attitude by taking the average of the responses to a number of questions about credit-related risks. There were questions that indicate risk taking and risk aversion. The respondents stated degree of agreement to the different statements on a five-point scale and a verbally anchored scale. The Cronbach's alpha coefficient was 0.74, which is relatively good (Peterson, 1994).

Business performance (see below) and a self-reflecting method were used in order to measure the presentations of the respondents. The respondents were asked to judge their own work performance on a five-point scale (from very bad to very good) and how superior managers might perceive this. In addition, the respondents were asked to judge their confidence in decision-making. For this judgment an eight-point scale was used (from absolutely uncertain to absolutely certain).

Business Data

Too many questions would probably have resulted in a lower response rate and therefore the respondents were asked only a few questions about their firms. Financial ratios regarding the achievement by granting trade-credit were calculated by using business data. A CD-ROM disk from Dun & Bradstreet Sweden AB provided these data. Calculated ratios were credit period, cashflow in relation to total debts (from now on simply referred to as cashflow), and the profit percentage. These estimates reflect the achievement of a company's credit management. Through the CD-ROM disk the SNI-codes were obtained for the respondents' companies, which made it easier to categorize the participating companies.

Results

To What Extent is Collateral Requested in Trade-Credit Decision-Making?

In accordance with Fishbein and Ajzen's theory (1975), the respondents were asked about intentions to request collateral when they felt uncertain about the customer's ability to pay for supplied products or services. The distribution of answers is shown in Table 1. On average the respondents stated they used collateral *sometimes* and 36.7% of the respondents stated that they *always*, *almost always* or *often* requested collateral. This number corresponds fairly well with Dernroth's (1993) study, which reported that 33% of respondents often or always requested collateral. Responses to the question below will be referred as the construct of intentions.

Table 1. *Distribution of Answers to the Question: "In My Work as a Credit Manager, I Request Collateral when I Am Unsure about the Customer's Financial Position."* (N=90)

| Always | Almost always | Often | Some- times | Sel- dom | Almost never | Never | Mean SD |
|--------|------------------|-------|----------------|-------------|-----------------|-------|--------------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| 7.8% | 7.8% | 21.1% | 40.0% | 11.1% | 10.0% | 2.2% | 4.23 1.38 |

A question that can be asked is what the term *sometimes* means. The answer to this question can be estimated by relating the number of credit cases where collateral is requested to the total number of evaluated cases. The respondents were asked about the number of credit cases per month and how many resulted in refusals and how many in requests for collateral. On the average, circa 129 cases were evaluated per month out of which 9% were refusals and 20% were requests for collateral. In other words, 71% of the credit cases were granted credit without restrictions. As a result, the expression *sometimes* can be estimated to include circa 26 credit cases where collateral was requested. It should be emphasized that the value of the questions varied considerably; for example the number of cases where collateral was requested varied anywhere between 0 and 95%.

On the other hand, if the median value is considered, collateral was requested in one out of ten credit cases and less than one out of ten credit cases got a refusal. It was not possible to distinguish that any particular type of business or size of business (as measured as turnover, results and cashflow) would be more (or less) likely to request collateral.

Those credit managers who said that a large (circa 80-95%) or a small number (circa 0-5%) of credit cases involved collateral did not exhibit any particular characteristics with respect to background information. One exception was credit managers in shipping companies who requested for collateral less often. The result was normal if it is considered that shipping companies have deposit rights in delivered goods. Furthermore, as shipping companies traditionally allow ten days of trade-credit, credit managers employed in such companies obtain early indications of a possible occurring insolvency situation. They can, therefore, control credit better compared with colleagues in businesses with longer credit periods. However, respondents employed in shipping companies had a slightly higher ratio between credit losses and turnover than had the sample average, (i.e., 0.33% compared with 0.27%), but the difference was non-significant. One explanation for this higher ratio might be as follows: One interviewed credit manager employed in a shipping company reported that

he tested new customers' ability to pay by granting them credit for about 2,000 SEK without guarantees.

The variable "credit cases with collateral in relation to total number of evaluated credit cases" is argued to correspond to the behavior by the responding credit managers. More specifically, this variable represents self-reported behavior, but will be simply referred as behavior.

The probability of insolvency is supposed to be higher with new customers than with established ones. Analyses by Wilcoxon's rank test noted that the respondents tended to request for collateral to a greater extent when credit was granted to new customers than to existing ones ($Z=-3.03$ and $p<0.001$). This tendency was also valid for financial information ($Z=-5.0$ and $p<0.001$). In contrast to new customers, the business relationship is emphasized when granting credit to existing customers ($Z=-5.4$ and $p<0.001$). Hence, the business relationship matters.

The collateral most often requested was bank guarantees: 65.6% of the respondents stated they usually requested bank guarantees. In addition, 30.0% requested credit guarantees, 2.2% mortgages, and 4.4% right of pledge. These percentages do not add up to 100, because there were respondents who used more than one type of collateral. Kruskal-Wallis non-parametric analysis of variance and Spearman's rank coefficient of correlation were used to explore the occurrence of relationships between requested collateral and background data (i.e., experience, gender, age, or business data). No such relationships could be established. Furthermore, risk attitude was unrelated to the type of requested collateral.

Reported Advantages and Disadvantages with Requesting Collateral

In-depth interviews. The interviewed credit managers were asked what advantages and disadvantages they regarded with requesting collateral. Amongst the most common advantages was the possibility of securing claims, selling more to the customers, and eliminating the risk of non-payments. Only one credit manager pointed out the importance of considering the underlying value of the collateral and the difficulty to verify this value. Thus, it seems that the interviewed managers had great trust in the collateral as a guarantee of payment.

One credit manager in a large wholesale company in the IT business said that mortgages often lacked significant value apart from making his firm a prioritized creditor. In that way the credit manager would be contacted early if problems with payment occurred. He would also be able to more actively take part in any discussion with official receivers and other prioritized creditors. As a result he could make demands and also make reservations against suggestions about writing down the claims (i.e., compositions of percentage). Moreover, he emphasized the importance of accepting the percentage only after a thorough

investigation, because a quick acceptance may give signals to other customers, who are on the verge of insolvency, to apply for such suggestions of writing down claims. In other words, an expectation may be created amongst customers regarding the supplier's behavior.

The three most common disadvantages that were mentioned were as follows: (i) administrative problems and high costs, (ii) the restriction of the customer's future credit applications, and (iii) feeling uncomfortable about requesting collateral and that it may jeopardize the business relationship, resulting in loss of sales. The first disadvantage seemed to be motivated by various formalities implying that collateral must be verified. A number of the interviewees stated that banks were not always willing to give out information about the priority order of collateral. Restriction of a customer's ability to apply for further credit was regarded as very negative, since this could have an adverse effect on the sales and growth prospects of the customer. Those credit managers who mentioned this may be viewed as aggressive and creative in their trade-credit granting (cf. Neufeld, 1988).

Regarding the unpleasantness of requesting collateral, one credit manager in a petroleum company stated that many customers perceive having to provide collateral as offensive. "It is perceived as an intrusion by the customer" he said and meant that it takes a certain amount of confidence and personal status to dare request for collateral from customers.

Questionnaire. The ten most common statements regarding pros and cons of requesting collateral made up the basis for the attitude measurement in the questionnaire. Respondents were first asked to answer the question:

"Evaluate the following advantages and disadvantages related with collateral, that is bank guarantees, guarantees of surety, mortgages, and pledges. How likely are the advantages and disadvantages?"

Table 6 in the Appendix shows the distribution of the answers to this question. (Answers to the question correspond with b_i in equation 2.) Approximately 78% and 73% of the respondents rated the statements "a guarantee of surety forces customers to pay" and "collateral secures payment" as *quite likely* and *extremely likely*. This shows unanimity of the respondents' evaluations. On average, the respondents judged the statement that requesting collateral eliminates credit losses to some extent as *slightly likely*. The same was true with the disadvantages "it is difficult for suppliers to obtain collateral" and "collateral restricts the financial space of the customer". In contrast to the results of the in-depth interviews, there were few respondents who stated it *quite likely* and *extremely likely* that a request for collateral would imply loss of business, damage business relationships, or cause uneasiness.

The respondents were also asked to answer the question:

“Please judge once more the advantages and disadvantages related with collateral, that is bank guarantees, guarantees of surety, mortgages, and pledges. How positive or negative are the advantages and disadvantages?”

Table 7 in the Appendix shows the distribution of the respondents' answers. (The answers to the question correspond with e_i in equation 2.) Three of the advantages achieved relatively high averages and small dispersions across the judgments. That collateral ensures repayments was judged as *quite good* and *very good* by 81% of the respondents. That collateral can eliminate credit losses and that guarantees of surety put pressure on the customer was judged as *quite good* and *very good* by 77% and 72% of the respondents. Hence, a large majority of the answers were clustered at the extremes of the scale. This was, however, not true for the rest of the statements.

It was notable that some respondents evaluated disadvantages as positive and advantages as negative. One explanation to this could be that these judgments were made from the point of view of the respondents' own experiences. A more plausible explanation is that the respondents misunderstood the questions and answered as they had done on the previous question (i.e., evaluation with respect to propability). A control showed that nine respondents had given the same answers to these two types of questions.⁵

Could the answers to the two questions be related to background data regarding the respondents? There were only three links that could be statistically proven. Two of these links concerned age and the evaluation of the statement that a request for collateral can eliminate credit losses. There was a tendency for older credit managers to evaluate this statement as more likely and more positive. This tendency was shown by a strong correlation between the answers to the statement and age ($r_s=0.42$, $p<0.001$, and $r_s=0.31$, $p<0.01$).

The only difference between male and female credit managers that could be statistically established was a statement that to request collateral would imply a feeling of unease. A non-parametric analysis of variance (Kruskal-Wallis) showed that women were more likely to judge the disadvantage 'to request collateral implies feelings of unease' as negative (mean ranks for men and women 48.90 and 36.04 respectively, chi-square = 5.03, and $p<0.05$).

The answers to the two questions were also put in relation to risk attitude. Regarding the question how probable the advantages and the disadvantages were, it was noted that the statements "collateral secures payment" and "requests for collateral are administratively cumbersome" were positively correlated to risk attitude ($r_s=0.25$, $p<0.05$, and $r_s=0.20$, $p<0.10$). In other words, it seemed that credit managers who were willing to take risks were also more willing to

judge these statements as probable. This would be reasonable as the risk averse credit manager might have a large amount of experience of requesting collateral and therefore does not judge this as administratively cumbersome.

Regarding the question how positive or negative collateral is, it was noted that all the statements that expressed disadvantages associated with collateral (statements 5, 6, 7, 8, 9 and 10) were negatively correlated with risk attitude. The following correlations with risk attitude were noted for Statements 5 to 10: $r_s = -0.14$, $r_s = -0.22$, $r_s = -0.21$, $r_s = -0.19$, $r_s = -0.20$, and $r_s = -0.19$. The levels of significance were between 5% and 10%.

The negative but weak correlations indicated that risk taking credit managers also tended to judge a higher degree of disadvantages as negative. This observation seems to be reasonable, because a risk-averse credit manager should be more positively inclined to collateral and therefore hardly consider possible disadvantages. This argument might imply that statements expressing advantages should be negatively correlated with risk attitude. But only two significant correlations were found: (i) statements about collateral can result in increased sales and (ii) guarantees of surety put pressure on customers. These statements were slightly positively correlated to risk attitude ($r_s = 0.26$ and $r_s = 0.22$ with $p < 0.05$ in both cases). Thus, these positive correlations contradict the assumption that risk averse credit managers would appreciate collateral more than their risk-taking colleagues would.

Attitudes to Request Collateral

In-depth interviews: The interviewed credit managers could be divided into two groups by considering their attitudes: those who were positive to requesting collateral when granting credit and those who were negative. The grouping was based partly on explicitly expressed opinions that collateral was good or bad respectively, and partly on the number of advantages versus disadvantages that were stated. This kind of categorizing is recommended when analyzing quantitative data. Two examples of the kinds of opinions that were used to demonstrate a positive opinion are:

“I feel basically there are only advantages with collateral.”

“I can’t see any disadvantages.”

Examples of explicit views indicating a negative point of view can be illustrated by the following:

“Collateral is a necessary evil one should not have to deal with. Instead the relationship with customers should be such that one can trust them.”

"I am not keen to request collateral, because if everyone did radio retailers would not survive."

Statistical tests (e.g., analyses of variance) were run attempting to test if the categories of attitude to request guarantees were related to experience and business performance such as turn-over and credit losses. The results of these tests showed no significant relations, but it should be noted that 18 observations might not be an adequate sample size. In addition, the categorization of the interviewees was coarse and did not allow for different shades of attitude about collateral.

Questionnaire: An attitude measurement was created in accordance with Fishbein and Ajzen's theory of reasoned action. The attitude measurement was made up by eight of the ten statements regarding collateral. Two statements were discarded: (i) a guarantee of surety forces customers to pay and (ii) requesting more collateral increases the sales. The former statement was excluded because it was seen as too specific, whereas the latter one was excluded due to its reduction of the alpha coefficients. For the remaining eight statements, the alpha-coefficients were 0.74 and 0.73 respectively and these values can be considered as good (Peterson, 1994).

On a theoretical scale between -72 and 72 this attitude measurement was on average 6.17 ($SD=13.49$), indicating that credit managers on average showed a restrained attitude to requesting collateral. The correlation between attitude measurement and intention to request collateral was calculated, by using Spearman's correlation coefficient, to $r_s=0.32$ ($p<0.01$). The correlation between attitude measurement and behavior (i.e., number of cases requiring collateral) was $r_s=0.24$ ($p<0.05$), and the correlation between behavior and intention was $r_s=0.27$ ($p<0.03$). These correlation coefficients lie close to the average correlation coefficient, which Kraus (1995) found in his review of studies relating attitude and behavior. It can be surmised that attitude reflects to some extent a manager's intention to request collateral and the resulting behavior.

In what way was the attitude measurement related to the respondent's attitude to risk, experience and gender? As shown in Table 2, there were weak correlations between on the one side attitude to risk, experience and gender, and on the other side attitude measurement, intention to request collateral, and behavior. For this reason, the calculation of a multiple regression equation was disregarded.⁶ Attitude measurement and risk attitude had a significant but weak negative correlation, which meant that a credit manager who were risk-averse tended to have a positive attitude to collateral. It should, however, be noted that the correlation was weak ($r_s=0.18$) and showed that only about 3.3% of the variance in the attitude measurement could be explained by the risk attitude. This is a very weak explanation value. A corresponding correlation was not found when it came to intention and behavior.

Table 2. *Attitude Measurement, Intention, and (Self-Reported) Behavior Correlated to Risk Attitude, Experience and Gender. Spearman Correlation Coefficients.*

| | Attitude Measurement | Intention to Request Collateral | Behavior |
|---------------|-------------------------|---------------------------------------|----------|
| Risk attitude | -0.181* | 0.016 | -0.017 |
| Experience | 0.043 | -0.108 | -0.124 |
| Gender | -0.080 | -0.034 | -0.007 |

Note. Behavior defined as credit cases with collateral in relation to total number of credit cases. * $p < 0.10$

An attitude measurement based merely on the statement expressing disadvantages of collateral yielded a somewhat higher degree of correlation with risk attitude ($r_s = 0.22$, $p < 0.05$). The explained variance increased a little (4.9%) but was still small. The correlation between attitude measurement and intention to request collateral became less ($r_s = 0.22$). A measurement of attitude only made up by statements expressing advantages with collateral caused no significant changes in the correlations between the attitude measurement and risk attitude: They remained unrelated.

Regardless of how the attitude measurement was calculated, it was not possible to confirm that the attitude measurement was related to organizational issues such as number of collaborators, independence, and line of business. As has been reported earlier, the same was true for intention to request collateral and for behavior. It was, therefore, not possible to find any particular type of business or other characteristics that showed a more positive or negative attitude to collateral among the respondents. A corresponding result was also found with regards to intention and behavior.

Attitude, Intention and Behavior Related to Specific Collateral

One of the respondents pointed out:

“Collateral consists of wildly different things and of different values. By combining all collateral the answers become general.”

What he pointed out was that different collateral should carry different attitudes, intentions and behavior. This question was tested using Kruskal-Wallis non-parametric analysis of variance. It was noted that the group of credit managers who used bank guarantees had a stronger intention to request collateral than the group who did not use such guarantees (mean ranks 34.43 and 51.32 respectively, chi-square = 9.21, $p < 0.021$). The same tendency was also noted for those who used guarantees of surety when granting trade-credit (mean ranks 38.68 and 61.41, chi-square = 5.49, $p = 0.001$) and those who requested mortgages (mean ranks 43.19 and 62.09, chi-square = 5.47, $p = 0.01$). This was, however, not true for the attitude measurement or behavior.

It is, therefore, possible to examine what collateral the respondents had as a starting point when they answered the statements, which made up the basis for the attitude measurement. As no significant differences were observed between the groups using the four types of collateral (i.e., bank guarantee, guarantees of surety, mortgages, and pledges) and the attitude measurement, it seemed that the respondents had not been influenced by their experiences. This supports the assumption that the attitude measurement was of a general nature.

How are Attitudes, Intentions and Behavior Related to Performance?

Credit managers are accountable for the credit management in an organization. According to the textbooks in corporate finance the achievement of credit management is reflected by, among other things, the following financial ratios: cash-flow, average number of credit periods, credit losses in relation to turnover, together with the discrepancy between actual and real periods of credit. By assuming that the credit managers can actively influence those ratios through his/her work, the measures being the topic for the present paper should be reflected in those financial ratios.

That such a relation exists may be expressed by the fact that each year the Swedish Credit Managers' Association selects a credit manager of the year. The major criterion is that the person has improved the credit management of his/her organization. One of the interviewed managers had won this title earlier. The motivation was that he had purposefully worked to significantly reduce his company's credit periods, credit risks, and credit losses. By shortening the credit period with about ten days the cashflow was improved with around 50 to 60

million SEK. "A reasonable profit from this means a decent annual profit in many companies", he said.

Table 3 illustrates the links between financial ratios, attitude measurement, intention to request collateral, and behavior. The correlations were weak and insignificant as can be seen in the table. It is worth noticing that the direction of the correlations was ambiguous. For example, the average amount of credit was positively correlated with intention but negatively correlated with behavior. One explanation is that intention and behavior did not correlate strongly, as has been shown earlier.

Table 3. *Correlations between Financial Ratio and Attitude Measurement, Intention, and Behavior. Spearman Correlation Coefficients.*

| | Attitude Measurement | Intention to Request Collateral | Behavior |
|--|-------------------------|---------------------------------------|----------|
| Cashflow/debts ¹ | -0.009 | 0.138 | -0.108 |
| Length of credit period ¹ | -0.075 | -0.051 | -0.065 |
| Credit losses in relation to turnover ¹ | 0.102 | -0.028 | -0.008 |
| Number of customers | -0.058 | -0.006 | -0.158 |
| Average sum of credit | 0.006 | -0.110 | 0.110 |
| Discrepancy between actual and normal credit period | 0.202* | -0.016 | -0.056 |

Note. ¹ Measured as the mean value of figures over the last three years, that is 1994, 1995, and 1996. *p < 0.10

It should be noted that there was a positive but weak link between attitude and discrepancy between actual and normal credit periods. In other words, credit managers seemed to be more positive towards collateral when there was a large discrepancy. The discrepancy was, however, not correlated to intentions and behavior. Perhaps this is an expression of the difference between intended methods and behavior (Kaplan, 1964), or what Brunson (1993) meant by inconsistencies between ideas and actions.

The weak links in Table 3 may be explained by the assumption that the financial ratios depend on external circumstances (e.g., customer payments), rather than the results of the credit manager's work. These ratios might, therefore, not be the right tools to describe credit managers' achievements. An alternative would be to allow the credit manager to evaluate his/her own achievement, how he/she feels the executive management assesses this

achievement, together with his/her stated confidence in his/her decision-making. Accordingly, the questionnaire included such questions, see Table 4.

On average the self-reported achievement was seen as rather satisfactory. The same was true for the assessed achievement. The correlation between these two variables was strong ($r_s=0.64$, $p<0.001$). The relationship between these two variables and confidence was $r_s=0.32$ ($p=0.01$). Table 4 shows that these three measurements also had weak correlations with the attitude measurement, intention and behavior. It is notable that behavior was related negatively with achievement as assessed by executive management. One explanation of this link might be that a credit manager who was inclined to request collateral perceived his/her efforts to be undervalued by the executive management.

Table 4. *Correlations between Self-Reported and Assessed Achievement, Confidence, and Attitude Measurement, Intention and Behavior. Spearman Correlation Coefficients.*

| | Attitude Measurement | Intention to Request Collateral | Behavior |
|--|---------------------------------|--|-----------------|
| Self-reported achievement | -0.168 | 0.067 | 0.186 |
| Achievement as judged by executive management | -0.032 | 0.091 | -0.225* |
| Confidence in decision-making | -0.011 | 0.086 | -0.116 |

Note. * $p < 0.10$

It can be said in conclusion that the attitude towards collateral had little connection with the performance of credit management as measured by financial ratios or self-reported measurements. With a few exceptions mentioned above, this was true regardless of if the variable was expressed as attitudes, intentions, or behavior.

Discussion

The aim of the present paper was to investigate attitudes, intentions and behavior with regard to collateral when making trade-credit decisions amongst credit managers in Swedish supplying companies. Interviewed credit managers and those who responded to the questionnaire study generally showed an attitude of constraint. Since attitudes are presumed to predict behavior, this finding means that credit managers in Swedish supplying companies do not request collateral to a large extent. The respondents whose intention was to request collateral in about two out of ten credit cases also confirmed this. The finding is consistent with earlier studies (e.g. Beaulieu, 1994, 1996; Hedelin & Sjöberg, 1993, 1994; Dernroth, 1993).

There was some support for the hypothesis that risk averse credit managers were more inclined to have a positive attitude towards requesting collateral. This finding is inconsistent with the study by Rosman and Bedard (1997). However, a corresponding link was found in the sense that there was no relationship between risk attitude and intention to request collateral, and that there was no relationship between risk attitude and behavior (i.e., number of credit cases where collateral was requested). This agrees with Shoemaker's (1993) argument that risk attitude has little value to explain risk taking. Instead there are more important variables such as definition of problems, framing, decision-making process, and financial strategies, for example portfolio planning. Accordingly, the individual's risk attitude can be suppressed by the organization through its credit policy. In that way the individual has no opportunity to make decisions regarding collateral in accordance with his/her personal attitude to risk taking.

The majority of the participating credit managers stated that the risk (i.e., probability) of losing business as a result of requesting collateral was low. Therefore, the decision rule in the introductory equation can be simplified to only considering the risk of insolvency and the percentage of repayment to be expected in such event. It follows that credit managers to a much higher degree can request collateral as the risk of the customer taking his/her business elsewhere as a result is small. That risk exists, however, if business relations between the supplier and the customer are asymmetric and to the customer's advantage.

The result of the study shows that suppliers to a limited degree request collateral. It can be discussed to what degree this limited use is to be seen as rational or irrational from an economic and psychological point of view; compare Simon's (1986) argument about economic rationality (i.e., to make rational choices) versus psychological rationality (i.e., to process information rationally). The complex situation of credit granting and credit risk assessment must be considered in any such discussion. Consideration must be given to the fact that suppliers continuously grant trade-credit to a relatively slow-moving

and heterogeneous group of customers. Moreover, there exists an established customer relationship, which - thanks to internal customer registers with their customers' history of payments and purchasing patterns - makes it easier for the suppliers to gain better information about the customers' ability and intention to pay. The present study also found that credit managers put less importance on collateral when granting trade-credit to already established customers than when granting trade-credit to new ones.

Furthermore, a discussion about rationality regarding the use of collateral in credit granting must consider that suppliers are in different positions for predicting insolvency. For example, petroleum suppliers can easily predict that when shipping agents do not pay for the delivered propellants, it is likely that they are insolvent. Deliveries of propellants are absolutely vital for shipping agents and if these deliveries are cancelled the business will ultimately fail. For this reason, suppliers of frequently needed goods and services are in a very strong position to assess customers. As a result, such suppliers may use collateral to a lesser extent when granting trade-credit. The interviews and the questionnaire also confirmed this.

The concept of reciprocity is perhaps a more serious problem for those who claim that a restrictive use of collateral by suppliers is questionable from a rational point of view. Reciprocity means that humans tend to repay services that they have received. Cialdini (1988) asserted that reciprocity is a vital notion, which influences attitudes and behavior. When the customer has received some goods or service, he/she would feel the need to reciprocate by paying for it. In addition, the supplier's granting of credit can be compared to a repeated game taking place over more than one period (e.g., see Camerer & Weigelt's (1988) abstract lending game). Should a customer fail to pay over a period, he/she would find difficulties in getting (trade) credit in the future, and he or she would, therefore, choose to pay.

The suppliers' restrictive use of collateral may raise a question whether credit sales are really needed. In the interviews some suggestions were put forward how the disadvantages (e.g., transaction costs) with cash sales could be solved. One suggestion was that the customer could have a kind of bank account with the supplier, who could then withdraw an amount corresponding to the purchase from this account. Another suggestion was the use of electronic money. Although a number of problems, such as delivery of faulty goods and established working traditions, would remain, the possibility of reducing credit sales should not be disregarded. Information technology could play an important role in solving these problems.

The present paper has some limitations. Since mainly large supplying companies took part in the nation-wide questionnaire, it is difficult to generalize the results to smaller supplying companies as well as to international corporations. It is likely that the credit managers or corresponding persons in

small business enterprises would show more restraint in requesting collateral, because business on this level is to a large extent governed by trust (Sanner, 1997). Small business enterprises are more sensitive to losses of sales as well as to credit losses: An unpaid claim often has serious consequences for a smaller company (cf. Suneson, 1996).

It was not possible to point to any particular branch or size of business where credit managers' attitudes, intentions and behavior indicated a relatively greater or smaller propensity to request collateral. A reason for this could be that the sample size was small, so that not an adequate number of branches and businesses were represented. The requirements for a systematic analysis of branch and business differences were, therefore, not completely fulfilled.

It should be emphasized that the questionnaire was carried out in times of prosperity and a declining frequency of bankruptcies. In times of recession, attitude and intention could perhaps be different and it might have been possible to find stronger links between for example risk attitude and behavior.

However, the results presented in this paper are interesting to several actors. Business can be compared to a game between different actors, and the paper gives some guidance to how supplying companies act when granting credit. This knowledge should be of interest to other lenders, but also to customers. These players might adapt their own behavior, so that they will gain more benefits (compare Camerer & Weigelt, 1988). On the one hand, customers might improve their financial position by taking a tougher line against suppliers, so that collateral is only given to important lenders. On the other hand, lenders might improve their own terms by requesting collateral to a greater extent as well as by taking a tougher line against suppliers.

Future research may investigate whether attitudes, intentions and behavior differ between branches, between different size businesses, or between Swedish and foreign business. In these kinds of studies the measurements in the Appendix might be usable.

Notes

1. This study was supported by grants from Sparbankernas Research Foundation.
2. It can be argued that the results of the questionnaire were biased as only members of the Swedish Credit Managers' Association participated. However, it was judged appropriate to use the membership register as no other register of credit managers in supplying companies exists. It is, therefore, likely that there are a number of unknown credit managers, and, consequently, the degree of representativeness can be questioned. The true number of credit managers in supplying companies in Sweden is unknown, but there is at least one way to estimate this number. This way assumes that each of the limited companies with turnovers exceeding 100 Million SEK have a position which more or less corresponds to the position as credit manager. According to the Swedish business and credit-rating agency UC, there are about 4,000 limited companies (in the same branches that were present in the survey) having turnovers of more than 100 Million SEK. It can be presumed, accordingly, that there are about 4,000 credit managers in Sweden.
3. Certainly, it can be argued that the great number of questions might influence the result of the survey. However, in their investigation of bankers, Hedelin and Sjöberg (1993) used a questionnaire consisting of 388 questions or items. Considering the fact that their response rate was very high (78%) and that the respondents seemed to be very motivated to participate in the study, the large number of questions may not have influenced the results. The present questionnaire was inspired by that observation.
4. Their comments might also be viewed in the light of theories of social influence. For instance, the cognitive dissonance theory by Leon Festinger may apply. This theory assumes that people perceive discomfort with inconsistencies in their minds, so they aim to cancel these differences by distorting facts (cf. Zimbardo & Leippe, 1991). Accordingly, even though a manager would believe the survey to be irrelevant, the fact that he/she has answered makes him/her state the survey as relevant. However, since the respondents are experts they are assumed to have an intrinsic motivation to participate, so their statements may in fact be truthful (cf. Shanteau & Stewart, 1992).
5. The occurrence of misunderstandings regarding the questions agrees with the criticism of attitude measurements constructed from probabilities and consequences. This criticism is twofold (cf. Pieters, 1988). First, the measurement of attitudes may not relate to human behavior because multiplying probabilities with consequences is a complex cognitive process and few people are able to do that without a pocket calculator. Second, the attitude measurement may not be able to measure what actually happened between input and output.
6. Results from various regression analyses (using stepwise methods) indicated that it was inappropriate to estimate regression models, because adjusted explained variance was near and sometimes below zero. In addition, the independent variables were not significant. Hence, univariate statistics were used.

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Appendix

Table 5. *Background Information regarding the Respondents, Credit Department and Business Performance (N=90).*

| Respondents | |
|--|---|
| <ul style="list-style-type: none"> • 70% were men. • Average age was 46. • 42% had university education, 29% had some other form of further education but not university education. • 48% were credit managers, 19% economic- finance- and marketing managers or executive directors, 33% responsible for credit or similar. • The average experience of working with credit granting was 12 years. • 77% had sole responsibility for making decisions (median limitation was 500 000 SEK). • 79% said their decision could be changed by above all the executive director. It was unusual for decisions to be changed, 90% said their decision was always or nearly always followed. | <ul style="list-style-type: none"> • The number of trade-credit decisions in a month varied between just a few and 4000 (the average was 35 decisions). • 59% said they used analytical decision-making and 24% intuition (the rest were uncertain how to categorize their decision-making). • 63% and 33% were rather certain and very certain respectively that their evaluations and decisions were correct. • The main motivational sources were responsibility, interesting working tasks, and independence in the work. • Risk was defined from the point of probability or as a combination of consequence and probability. |
| Credit department | |
| <ul style="list-style-type: none"> • 34% had no collaborator, 21% had one collaborator and 23% had three collaborators doing the same kind of job. • 35% of the collaborators had 3- or 4- years of higher education, 25% had university education. | <ul style="list-style-type: none"> • The collaborators had on average 7 years experience. • On the average, collaborators were responsible for credit decisions below 50,000 SEK. • The credit department was as a rule part of the finance department. |
| Business performance | |
| <ul style="list-style-type: none"> • 34% were wholesaler dealers and distribution companies, 26% were production companies. • 40% were wholesalers and retail dealers. • Average turnover was 517 M SEK • Net Profit was on average 17 M SEK. • Average losses were 0.23 % of turnover. | <ul style="list-style-type: none"> • Average contribution margin was between 11 and 25%. • Average for cashflow in relation to total debts was 19.2%. • Average actual credit period were 48 days. • Average profits were 4.9%. |

Note. As is reported in Table 1 about half of the respondents stated that they were credit managers. Nevertheless, the rest of the respondents were in fact accountable for credit risk assessment and, thus, those respondents will be referred to as credit managers.

Table 6. *Distribution of the Answers to the Question (Translated from Swedish): "Evaluate the Following Advantages and Disadvantages Related with Collateral, that is Bank Guarantees, Guarantees of Surety, Mortgages, and Pledges. How Likely Are the Advantages and Disadvantages?" (Alpha=0.71; Kendall's $W=0.29$ And $P<0.001$)*

| Statement | Extre- mely Unlikely | Quite Unlikely | Slightly Unlikely | Neither Likely Nor Unlikely | Slightly Likely | Quite Likely | Extre- mely Likely | Mean SD |
|--|----------------------------|-------------------|----------------------|--------------------------------------|--------------------|-----------------|--------------------------|--------------|
| | -3 | -2 | -1 | 0 | 1 | 2 | 3 | |
| 1. Collateral secures payment. | 1.1 | 1.1 | 4.5 | 5.6 | 14.6 | 48.3 | 24.7 | 1.75 1.20 |
| 2. Demanding more collateral increases the sales. | 2.2 | 8.9 | 4.4 | 27.8 | 22.2 | 22.2 | 12.2 | 0.74 1.51 |
| 3. Collateral eliminates credit losses. | 2.2 | 6.7 | 4.5 | 2.2 | 24.7 | 38.2 | 21.3 | 1.40 1.50 |
| 4. A guarantee of surety forces customer to pay. | 1.1 | 1.1 | 1.1 | 5.6 | 13.5 | 46.1 | 31.5 | 1.93 1.12 |
| 5. It is difficult for suppliers to obtain collateral. | 2.2 | 2.2 | 6.7 | 17.8 | 28.9 | 25.6 | 16.7 | 1.12 1.39 |
| 6. Collateral restricts the financial space of the customer. | 1.1 | 2.2 | 7.8 | 12.2 | 26.7 | 32.2 | 17.8 | 1.29 1.33 |
| 7. Requests for collateral are administratively cumbersome. | 2.2 | 8.9 | 13.3 | 18.9 | 32.2 | 17.8 | 6.7 | 0.50 1.49 |
| 8. Requests for collateral imply loss of business. | 3.3 | 4.4 | 14.4 | 16.7 | 51.1 | 6.7 | 3.3 | 0.41 1.24 |
| 9. Requests for collateral damage the business relationship. | 3.3 | 11.1 | 13.6 | 31.1 | 32.2 | 6.7 | 2.2 | 0.07 1.30 |
| 10. Requests for collateral cause uneasiness. | 1.1 | 16.7 | 11.1 | 35.6 | 25.6 | 7.8 | 2.2 | 0.00 1.29 |

Table 7. *Distribution of the Answers to the Question (Translated from Swedish): "Please Judge Once More the Advantages and Disadvantages Related with Collateral, that is Bank Guarantees, Guarantees of Surety, Mortgages, and Pledges. How Good or Bad are the Advantages and Disadvantages?" (Alpha=0.63; Kendall's $W=0.56$ And $P<0.001$)*

| Statement | Extre- mely Bad -3 | Quite Bad -2 | Slightly Bad -1 | Neither Good Nor Bad 0 | Slightly Good 1 | Quite Good 2 | Extre- mely Good 3 | Mean SD |
|--|-----------------------------|--------------------|-----------------------|---------------------------------|-----------------------|--------------------|-----------------------------|----------------|
| 1. Collateral secures payment. | 1.1 | | 3.4 | 2.2 | 12.4 | 37.1 | 43.8 | 2.11 1.11 |
| 2. Demanding more collateral increases the sales. | 1.1 | 1.1 | 4.5 | 24.7 | 22.5 | 22.5 | 23.6 | 1.28 1.35 |
| 3. Collateral eliminates credit losses. | 3.3 | 1.1 | 1.1 | 5.6 | 12.2 | 36.7 | 40.0 | 1.92 1.37 |
| 4. A guarantee of surety forces customer to pay. | 1.1 | 2.2 | 1.1 | 5.6 | 18.0 | 39.3 | 32.6 | 1.85 1.21 |
| 5. It is difficult for suppliers to obtain collateral. | 12.4 | 27.0 | 23.6 | 22.5 | 10.1 | 2.2 | 2.2 | -0.93 1.41 |
| 6. Collateral restricts the financial space of the customer. | 6.7 | 20.0 | 34.4 | 25.6 | 4.4 | 7.8 | 1.1 | -0.71 1.309 |
| 7. Requests for collateral are administratively cumbersome. | 6.7 | 23.3 | 31.1 | 23.3 | 11.1 | 3.3 | 1.1 | -0.77 1.28 |
| 8. Requests for collateral imply loss of business. | 20.0 | 20.0 | 31.1 | 17.8 | 8.9 | 2.2 | | -1.18 1.31 |
| 9. Requests for collateral damage the business relationship. | 11.2 | 21.3 | 32.6 | 24.7 | 9.0 | 1.1 | | -0.98 1.18 |
| 10. Requests for collateral cause uneasiness. | 10.1 | 22.5 | 33.7 | 28.1 | 3.4 | 1.1 | 1.1 | -1.00 1.16 |

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