

SELECTIVE ATTENTION IN PROBLEM FINDING

by

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1 INTRODUCTION

Almost any human activity may be seen as involving some kind of problem solving activity. Problem solving is one of the most recurrent and pervasive human activities, and the literature on problem solving is vast. A countless number of contributors from a variety of disciplines have engaged in portraying and prescribing human problem solving. Yet it seems hard to find an answer to the simple question: *What is a problem?* The term *problem* is so commonly used, in everyday language as well as in the literature, that it is ordinarily taken for granted that everyone knows its meaning (Getzels, 1982). When examining the literature, however, it appears that a number of different phenomena have been subsumed under the term *problem*, and that alternative, metaphorical conceptions of problems are exhibited.

In everyday language, the term *problem* is most commonly used with reference to states of *difficulty* or external conditions that cause dissatisfaction. Within the problem solving literature, problems tend to be viewed as *discrepancies*, i.e. as differences between some existing or anticipated situation and some desired situation. In the decision making literature, in contrast, problems tend to be equated with *decision-problems*. Within philosophy, meta science, educational, and creativity research, in turn, problems are typically viewed as *questions* raised for inquiry.

Given the ambiguity surrounding the concept of a "problem", it is perhaps not surprising that the first processes of problem solving, the processes by which we become aware of and define problems, are the least understood (Simon et al., 1987). Problem solving is normally seen to occur via multiple stages. For example, Mitroff et al. (1974) see the problem solving process from a normative viewpoint as composed of four stages: Conceptualization, Modeling, Problem Solving, and Implementation. Mintzberg, Raisinghani, and Théorêt (1976) identify three stages of problem solving from a descriptive point of view: Identification, Development, and Selection.

One may divide the different activities or stages of the problem solving process according to their inherent focus. When in the stages of Conceptualization or Identification, attention is directed toward the *problem* at hand, i.e. toward "the problem of the problem" (Getzels, 1982). These activities represent the *problem oriented phase* of problem solving. In this phase, the existence of a problem is brought to one's attention and subsequently formulated or defined. While in the latter stages (i.e. Modeling, Problem Solving, and Implementation in Mitroff et al.'s terms, or Development and Selection in Mintzberg et al.'s terms), in contrast, focus shifts from the problem to its solution, i.e. from "the problem of the problem" to "the problem of the solution" (Getzels, 1982). This latter phase may be termed the *solution oriented phase* of problem solving.

While there is a vast body of studies addressing the solution oriented phase of problem solving, there are considerably few systematic studies of the same nature addressing the problem oriented phase (Dillon, 1982; Getzels, 1982). The difference in attention drawn to the two phases may be associated with the common view that problems are somehow self-evident, or *thrusting* themselves upon us (Eden and Sims, 1979). Following this view, which reflects a *reactive* approach to problem solving, it appears more important to solve problems than to find them.

Several contributors have, however, drawn distinctions between problem solving and problem finding, and highlighted the importance of the problem oriented phase of problem solving (e.g., Dillon, 1982; Getzels, 1982). The problem oriented phase is as important as the solution oriented phase, as it represents the initiator of subsequent activities. The outcome of the problem oriented phase in terms of problems chosen for attention, their definition, and formulation form crucial determinants of the adequacy and possible success of subsequent problem solving attempts. The key to effective and inventive solutions is often the ability to identify where problems lie and to find interesting problems (Getzels, 1975).

Problem finding represents the very first stage in the problem oriented phase of problem solving and embodies the processes by which we become *aware* of a problem. Problem finding is a critical activity, as it determines which aspects of the environment will be attended to through problem solving efforts and, hence, the allocation of limited resources. Problems represent important activators of action in organizations, and problem finding may be seen as a necessary precondition for managerial activity directed toward organizational adaption (Kiesler and Sproull, 1982; Lyles and Mitroff, 1980; Pounds, 1969). In this light, problem solving should be approached in a *proactive*, as well as reactive, manner.

So far, contributions addressing problem finding are scarce, and no integrated body of theory or common conceptual framework has been developed (Dillon, 1982). In particular, there is a lack of knowledge concerning *managerial problem finding*, i.e. problem finding in the organizational context. The literature on managerial cognition emphasizes the latter, solution oriented phases of decision making and problem solving, whereas initial, problem oriented activities have been under-researched (cf., Porac and Thomas, 1989; Smith 1988). As a consequence, there is a considerable research gap with respect to the critical issue of managerial problem finding, and there is a continued and pressing need to develop better understanding of the initial phases of problem solving in general, and in the organizational context in particular. The processes and mechanisms underlying problem finding need to be explored in order to arrive at a more comprehensive and inclusive body of knowledge on problem solving.

Purpose of the Study

The aim of the present study is twofold. The first aim is to contribute to a clarification of the related concepts and phenomena *problem* and *problem finding*. The perspective chosen is from the point of view of the individual problem finder. Special attention will be devoted to the objectivist-subjectivist dilemma concerning *the reality of a problem*. Furthermore, we

will discuss critical determinants, modes, and dimensions of problem finding, as well as alternative metaphorical conceptions of problems.

The second aim is to conduct an empirical investigation of the impact of alternative conceptions of problems on managerial problem finding. Due to the small body of research addressing managerial problem finding and alternative conceptions of problems, the investigation is exploratory in orientation and aims at theory generation and development of propositions for further research, rather than rigorous theory testing.

Plan of the report

The report consists of six chapters and four appendices and is organized as follows: Chapter two reviews the existing literature and develops a conceptual framework in which different classes, modes, and dimensions of problem finding are distinguished. Chapter three presents and discusses five metaphorical conceptions of problems and concludes with the formulation of four research questions for empirical investigation. The methodological framework chosen and the research design developed for the empirical investigation is presented in Chapter four. Chapter five reports the procedures employed for data analysis and the obtained results. Findings and their possible implications are discussed in Chapter six.

2 PROBLEM FINDING

2.1 INTRODUCTION

Problem finding constitutes the very first activity or stage encompassed in the problem solving process, and may be conceptualized as the processes by which we become *aware* of a problem. Problem finding is to be distinguished from problem formulation, which entails activities such as defining and diagnosing the problem, and generating and selecting among alternatives for solution. In comparison with problem finding, problem formulation has received considerably more attention in the literature (e.g., Lyles, 1981,1987; Lyles and Mitroff, 1980; Lyles and Thomas, 1988; Ramaprasad and Mitroff, 1984; Schwenk and Thomas, 1983; Taylor, 1974; Thomas, 1988; Volkema, 1986). Some contributors do not, however, explicitly distinguish between problem finding and problem formulation (e.g., Cowan, 1988), while others view problem finding as the first stage in problem formulation (e.g., Herden and Lyles, 1981; Thomas, 1988).

There has been a considerable increase in the attention drawn to problem finding during the last decade, and problem finding as a research issue appears to be on the rise. Problem finding represents, like problem solving in general, a most pervasive and interdisciplinary issue, which has been examined by a variety of disciplines, e.g. management, organizational decision making, business policy, creativity research, educational research, psychology, psychiatry, and sociology. It is therefore not surprising that the study of problem finding is rife with competing vocabularies and perspectives. Besides the term *problem finding*, which still appears infrequently in the problem solving literature, a variety of terms have been used with reference to the very first phase of the problem solving process; e.g. *problem sensing* (Allender, 1969; Kaufmann, 1989), *problem identification* (Boland and Greenberg, 1988; Dearborn and Simon, 1958; Herden and Lyles, 1981; Walsh, 1988), *problem recognition* (Bonge, 1972; Cowan, 1986), *problem discovery* (Bass, 1983; Getzels, 1975,1979), *problem*

assertion (Agre, 1982), *problem formation* (Watzlawick, Weakland, and Fisch, 1974), and *problem construction* (Hewitt and Hall, 1973; Kaufmann, 1989).

The meanings attached to the various terms differ, however, often reflecting differences in the conceptualization of *problems*, and hence, of problem finding. Problem finding may, for example, be seen as the first component of human inquiry (Allender, 1969), as question raising (Arlin, 1975-76; Artley et al., 1980), as the process of identifying undesired discrepancies (Bass, 1983; Bonge, 1972; Cowan, 1986; Pounds, 1969), as problem definition, based on the notion that problems are defined rather than identified or discovered (Dery, 1984), as a component of creativity (Dillon, 1982; Getzels, 1973, 1975, 1979, 1982; Getzels and Csikszentmihalyi, 1967), as the cognitive processes of noticing and constructing meaning about environmental change as a basis for organizational action (Kiesler and Sproull, 1982), or as the detection of the need for a new program by comparing existing and expected future programs (Mackworth, 1965).

It is important to note thus, that the choice of the term *problem finding* here is not rooted in any conceptual precedence in the literature, as no such precedence so far has been established. The term problem finding has, however, been used by a number of contributors (e.g., Arlin, 1975-76; Artley et al., 1980; Dillon, 1982; Getzels, 1973, 1975, 1979, 1982; Getzels and Csikszentmihalyi, 1967, 1976; Jones, 1982; Mackworth, 1965; Malhotra, 1974; Pounds, 1969; and Subotnik, 1985), however with varying meanings.

The presence of a variety of constructs and approaches may seem unavoidable, as it reflects paradigmatic differences between contributors whose disciplinary background and training diverge (cf., Astley, 1985). Nevertheless, the variety of vocabularies and perspectives makes attempts to undertake a review and conceptual integration of contributions an intricate enterprise. Hence, rather than attempting to standardize terms, we will seek to explore some of the underlying differences between contributions, which serves the purpose of contributing to a more unified

conceptual foundation for the study of problem finding. This implies that the review of contributions cannot be separated from the inquiry into the constructs employed and the approaches chosen.

Table 2.1 gives an overview of central contributions addressing problem finding, the primary constructs employed with reference to problem finding, and the discipline from which problem finding has been approached. The list is not exhaustive, but attempts to cover the major contributions addressing either: (1) the concept of a problem; (2) the processes underlying problem finding; or (3) the factors affecting problem finding. Both theoretical and empirical contributions are included. (Contributions primarily addressing the succeeding processes of problem formulation are not included.)

Table 2.1. Contributions addressing Problem Finding

Contribution	Constructs employed	Discipline
<i>Empirical contributions</i>		
<i>Allender, 1969</i>	<i>Problem Sensing</i>	<i>Educational Research</i>
<i>Arlin, 1975-76</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Artley et al., 1980</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Boland & Greenberg, 1988</i>	<i>Problem Identification</i>	<i>Management</i>
<i>Dearborn & Simon, 1958</i>	<i>Problem Identification</i>	<i>Management</i>
<i>Getzels & Csikszentmihalyi, 1976</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Herden & Lyles, 1981</i>	<i>Problem Identification</i>	<i>Management</i>
<i>Ims, 1987</i>	<i>Problem Seeking</i>	<i>Management</i>
<i>Ivany, 1969</i>	<i>Problem Identification</i>	<i>Educational Research</i>
<i>Jones, 1982</i>	<i>Problem Finding</i>	<i>Management</i>
<i>Pounds, 1969</i>	<i>Problem Finding</i>	<i>Management</i>
<i>Shulman, 1965</i>	<i>Problem Sensing</i>	<i>Educational Research</i>
<i>Subotnik, 1985</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Walsh, 1988</i>	<i>Problem Identification</i>	<i>Management</i>

(Continued)

Table 2.1. (cont.)

Contribution	Constructs employed	Discipline
<i>Theoretical contributions</i>		
<i>Agre, 1982</i>	<i>Problem Assertion</i>	<i>Educational Research</i>
<i>Bass, 1983</i>	<i>Problem Discovery and Diagnosis</i>	<i>Organizational Decision Making</i>
<i>Bonge, 1972</i>	<i>Problem Recognition and Diagnosis</i>	<i>Business Policy</i>
<i>Cowan, 1986</i>	<i>Problem Recognition</i>	<i>Management</i>
<i>Dery, 1984</i>	<i>Problem Definition</i>	<i>Public Policy Analysis</i>
<i>Dillon, 1982</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Getzels, 1973,1975, 1979,1982</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Getzels & Csikszentmihalyi, 1967</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Hewitt & Hall, 1973</i>	<i>Problem Definition and Construction</i>	<i>Sociology</i>
<i>Kaufmann, 1989</i>	<i>Problem Sensing and Constructing</i>	<i>Psychology</i>
<i>Kiesler & Sproull, 1982</i>	<i>Problem Sensing</i>	<i>Management</i>
<i>Mackworth, 1965</i>	<i>Problem Finding</i>	<i>Creativity Research</i>
<i>Malhotra, 1974</i>	<i>Problem Finding</i>	<i>Management</i>
<i>Raaheim, 1961</i>	<i>Problem Conception</i>	<i>Psychology</i>
<i>Skinner, 1984</i>	<i>(Problem Solving)</i>	<i>Psychology</i>
<i>Watzlawick, Weakland and Fisch, 1974</i>	<i>Problem Formation</i>	<i>Psychiatry</i>

2.2 ON THE REALITY OF PROBLEMS : THE OBJECTIVIST-SUBJECTIVIST DILEMMA

The question "*What is a problem?*" may be approached at several levels. At the most fundamental level, it refers to core assumptions about the *reality of problems*. Existing contributions on problem finding seem to reflect a not yet resolved dilemma with respect to this issue. The dilemma is formed by the conflict between what we will term the "objectivist" conception of problems on the one hand, and the "subjectivist" conception on the other. The objectivist-subjectivist controversy is not unique to the study of problem finding, but represents a longstanding debate within the social sciences in which the idealized objectivistic paradigm has been prevailing (cf., Lakoff, 1987; Morgan and Smircich, 1980).

2.2.1 THE OBJECTIVIST CONCEPTION OF PROBLEMS

The objectivist conception of problems reflects the view that reality is a concrete structure in which problems represent *objective* entities with an existence independent of the observer (cf., Morgan and Smircich, 1980). The environment is seen as teeming with problems that thrust themselves upon us (cf., Getzels, 1982). According to this view, humans are responders to the environment, rather than active creators of the environment. The objectivist conception of problems is reflected in the way the term *problem* tends to be used in everyday language and in the management literature on problem solving. For example, Kilmann and Mitroff (1979) and Yadav and Korukonda (1985) argue that more emphasis should be directed towards minimizing the Type III error, defined as the probability of solving "*the wrong problem*". Kiesler and Sproull (1982) refer to situations in which managers fail to notice or misinterpret information about "*the existence of a problem*". Clinton and Torrance (1986) claim that "*accurate identification*" of a problem is a prerequisite for efficient problem solving. Skinner's (1984) "operant analysis" of problem solving, in which he centers on the

contingency-shaped behaviors of problem solving, also demonstrates this view.

The ideas above demonstrate the objectivist conviction that problems "*exist*", that "*right*" and "*wrong*" problems may be identified, and that there are "*accurate*" versus "*inaccurate*" descriptions of problems. They reflect what seems to be a common, basic assumption; that an objective self-contained reality exists, and that "objective knowledge" may be acquired. Phrased differently, that certain beliefs, assumptions and convictions reflect the environment more correctly than others (cf., Popper, 1972; Watzlawick, 1984).

2.2.2 THE SUBJECTIVIST CONCEPTION OF PROBLEMS

According to the subjectivist conception of problems, in contrast, problems are not objects in the world to be discovered, but labels we assign to given situations. Problems are viewed as mentally projected categories of events or situations which cannot be seen isolated from a problem owner. Several findings support this view (e.g., Eden and Sims, 1979; Herden and Lyles, 1981; Ims, 1987). Eden and Sims (1979) found that in what appears to be the same situation, different persons perceive different problems. Herden and Lyles (1981) observed that based on different world views, attitudes, and personality, individuals arrive at very different conceptualizations of the same situation. Ims (1987) also identified significant differences in problem conceptualization among executives presented with the same events.

These findings, among others, demonstrate that the objectivist conception of problems implicitly ignores important psychological contributions by the problem owner. The concept of a *problem owner* implies that the phenomenon *problem* cannot be strictly externalized. Nadler (1983), for example, argues that problems exist solely because of human purposes and aspirations, whereas Eden and Sims (1979) propose that one may not talk

about problems meaningfully without ascribing owners to them. When different people see different problems in what seems to be the same situation, problems cannot necessarily be self-evident.

It is important to note, nonetheless, that problems tend to be experienced as self-evident by the perceiver, who sees a reality which is unique to him. What is to become the "*real problem*", depends on the perceiver and his or her way of experiencing and interacting with the environment (Eden and Sims, 1979). The experienced *problem*, thus, is a function of the situation and the interpretative system or frames of reference of the individual (Herden and Lyles, 1981). Accordingly, the subjectivist conception of problems focuses on a perceived world entailing perceived problems, and not a metaphysical world with objective problems independent of a perceiver (cf., Lakoff, 1987; Rosch, 1978; Watzlawick, 1984).

In line with this perspective, Agre (1982), Dery (1984), and Kaufmann (1984), among others, emphasize *the interventional and intentional aspects* of problem finding. In their view, a prerequisite for perceiving a given situation as problematic is that the perceiving individual in some way desires to change it, i.e. has intentions and purposes which are related to the experienced situation (Agre, 1982; Kaufmann, 1984).

2.2.3 RESOLVING THE DILEMMA

One way of resolving the dilemma which is composed of the two conflicting perspectives, is by viewing problems as perceptual phenomena with varying degrees of *stimulus dependence*. We may conceive of problems as varying along a dimension from extremely stimulus dependent to extremely stimulus independent. Apparently obvious and evident problems represent probable instances of problems with high stimulus dependence, whereas problems that seem to be created or invented represent problems with low stimulus dependence.

The degree of stimuli dependence in problem finding may be associated with two different, yet closely interrelated determinants of problem finding: (1) the environmental determinant, and (2) the psychological determinant.

The environmental determinant is composed of stimuli or cues as captured from the environment. The psychological determinant, in contrast, is represented by the observer's attention to and interpretation of stimuli. A similar distinction is made by Dillon (1982), who argues that problem finding has an existential and a psychological dimension.

One may argue that when problems are partly perceptual constructs, the two determinants of problem finding are inseparable and cannot be meaningfully distinguished. Yet, we will argue, a distinction between the two determinants is of importance. A perceived *problem* reflects both environmental aspects as well as psychological ones. Moreover, the two determinants do not only influence the degree to which problem finding is likely to occur; their relative influence reflects the mode of problem finding involved. Consequently, we will make an attempt to conceptually distinguish between the two determinants, based on which we will differentiate between disparate modes of problem finding and classes of problems.

2.2.4 THE ENVIRONMENTAL DETERMINANT

No real life *problem* exists in complete isolation (Ackoff, 1974). Problem finding occurs based on the interpretation of stimuli about a situation, i.e. in a context. Any situation may be characterized as *potentially problematic*. A potentially problematic situation may be conceptualized as a situation in which there are several imbedded potentially problematic elements, each of which may produce problem finding.

Potentially problematic situations are characterized by a varying degree of *tension*. The degree of tension in the situation reflects whether signals are strong or weak with respect to a potential problem's existence. To be

noticed, signals not only need to be available to the observer, but also need to be of a minimum strength to exceed certain thresholds in human perception. Information processing theories of human cognition suggest that people tend to notice *salient information*, i.e. information which is unpleasant, deviant, extreme, intense, or unusual (Kiesler and Sproull, 1982). Salient information demands attention, and several contributors addressing problem finding have focused on the role of saliences of the types of discrepancies as an important class of environmental triggers to problem finding (e.g., Bass, 1983; Bonge, 1972; Cowan, 1986; Pounds, 1969). It has been argued that the information which is sufficiently discrepant to capture attention, but not as discrepant as to seem irrelevant, will be best conceived, rather than discounted or forgotten (Kiesler and Sproull, 1982). *Relevance* of information, however, is an aspect of the environmental determinant which clearly cannot be viewed as detached from the problem owner. The quality of relevance is a function of the situation and the perceiver (cf., Churchman, 1971).

What is often neglected in the literature, is that in the context of a potentially problematic situation, problem finding involves not only the interpretation of elements as problematic, but also the *selection* among perceived problematic elements. Phrased differently, problem finding comprises a sensitivity dimension as well as a selectivity dimension. Any given situation may entail a number of potentially problematic elements which may be interrelated and form an experienced system or "mess" of problems (Ackoff, 1974). An individual will rarely be able to fully comprehend the problematic situation as a whole, let alone try and approach it as a whole (Ackoff, op.cit.). He or she may experience several interrelated problems, but the complexity of functional and causal relationships may encourage decomposition and generation of simplified representations rather than holistic solution attempts (Ackoff, 1974; Salancik and Porac 1986). Solving problems "one at a time" generally seems easier than "solving them all at once", and a selection process occurs in which some perceived problematic elements are selected for attention and solution attempts, rather than others (Ackoff, 1974).

The selection of problems from problematic situations is an aspect of problem finding which has rarely been subject to investigation (exceptions include, Boland and Greenberg, 1988; Dearborn and Simon, 1958; Shulman, 1965; and Walsh, 1988). Studies of problem solving tend to employ carefully constructed experimental situations in which a specific *problem* is presented as a problem-for-solution (Shulman, 1965). These experimental situations differ from "natural" problematic situations in many respects. In a natural environment, individuals will be exposed to a continuous series of stimulus situations which are potentially problematic in varying degrees, and based on which problems need to be selected. No situation alone, however, qualifies as the sufficient basis for problem finding. The situation may provide the potentially problematic elements, but the degree to which these, in fact, are experienced as *problematic* and produce problem finding resides in the combination of the situation and the interpreting observer (cf., Churchman, 1971).

2.2.5 THE PSYCHOLOGICAL DETERMINANT

The psychological determinant of problem finding lies in the observer's selective interpretation of cues about problems from the environment. One of the most central aspects of human cognition is *selectivity* in perception and attention. Selective attention and perception has typically has been attributed to presumed limitations in human information processing capacity (cf., Allport, 1989; Neisser, 1967; Posner, 1982; Simon, 1957). Information processing theories of human cognition assume that people operate on mental representations of the environment which serve as means for selectivity in attention (Cantor, Mischel, and Schwartz, 1982; Minsky, 1977; Tversky and Hemenway, 1983). Situations are perceived and interpreted based on mental representations of *generic types of situations* which typically include assumptions and anticipations about what elements are to be included in the situation, what sequence of events is to take place, as well as causal relationships between elements and events included in the situation (cf., Anderson, 1983; Gioia and Poole 1984; Lord and Foti, 1986;

Salancik and Porac, 1986). Mental representations of situations also entail intrinsic representations of needs, interests, and values which form a *frame of reference* which selectively directs attention through anticipations and perceptual readiness for stimuli (Bruner, 1957). The degree of perceptual readiness is critical, as it determines whether a given cue from the environment is captured, noticed and attended to, and hence, the degree to which potentially problematic elements are perceived and attended to.

In light of problem finding, mental frames of reference play an important role at two levels. At one level, they affect the framing of potentially problematic situations, and at the other level, they affect the framing of problems. The framing of a potentially problematic situation and its impact on problem finding have received little attention in the problem solving literature (exceptions include Boland and Greenberg, 1988; Dearborn and Simon, 1958; and Walsh, 1988). Theories of social cognition suggest, however, that frames of reference affect both which aspects of a situation are perceived and attended to, as well as which aspects are left unattended or ignored. People tend to seek information that is consistent with their own frames or views, and ignore, downplay or disregard conflicting information (Hogarth, 1987). Frames of reference also affect which elements are conceived of as most critical and important (Neisser, 1976). Perceived importance is of apparent importance to problem finding, as for an element to be experienced as a problem, it needs to be seen as somehow important - it has to matter, otherwise it is not a problem. The proposed intentional and interventional aspect of problem finding (Agre, 1982; Kaufmann, 1984; Nadler, 1983), is also supported by theories of social perception, which suggest that perception is guided by opportunities for *action* in the environment (Showers and Cantor, 1985). This suggests that the ways in which the observer's goals, purposes, interests, values and intentions are represented affect the degree to which elements are interpreted as problems and the selection and perceived preeminence of problems.

One of the few studies which explicitly address the framing of a potentially problematic situation in problem finding is Boland and Greenberg's (1988) investigation of the impact of *organizational metaphors*. Their results indicate that when introduced to different organizational metaphors (the mechanistic or the organic metaphor, cf., Morgan, 1986), subjects saw the same situation quite differently and identified different problems. Accordingly, Boland and Greenberg (1988) argue for the stronger position of the role of metaphorical frames of reference in research on problem finding, and request further attempts of identifying such metaphors and of exploring their impact.

Given a situation in which the perceiver experiences one or several problems, however, each problem may be framed in alternative ways. Alternative ways of framing the problem result in different representations of the problem and its characteristics. *Problem framing* has been subject to extensive investigation, and the importance and effects of problem framing have been demonstrated in numerous studies. The framing of problems has been found to influence, for example, the degree of risk-aversion, perceived certainty, choice behavior, and perceived value of time (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981). One of the major implications of the literature on problem framing is that how a person represents a *problem* in his or her mind represents a critical determinant of the adequacy of subsequent problem solving efforts (Hogarth, 1987; Kaufmann, 1989; Simon and Hayes, 1979). Stated differently, various problem representations differ with respect to the degree to which they facilitate problem solving. The discovery of isomorphic relationships between problems, for example, may facilitate problem solving and reduce problem solving difficulty (Simon and Hayes, 1979). Imposing problem analogies when novel solutions are called for, in contrast, may inhibit problem solving (Kaufmann, 1989).

The mental framing of situations and problems depends on several psychological aspects. Empirical studies demonstrate that people tend to frame situations and problems differently depending on their *experience*

(Hogarth, 1987). Experience generate frames of reference which guide selective attention, and has been found to affect the selection of problems from a situation in which many potential problems are imbedded (Dearborn and Simon, 1958; Walsh, 1988).

Framing may also depend on stimuli related factors; one of which is data presentation. The order in which information is presented as well as the mode of presentation has been found to affect framing, perceived importance, information search and the focus on various information types (Simon, 1979).

Besides framing, problem finding has been related to a number of psychological factors, for example, creativity and cognitive style (Artley et al., 1980), education, intelligence, and theoretical and aesthetical values (Getzels and Csikszentmihalyi, 1967), and individual attributes (Herden and Lyles, 1981).

An interesting finding which clearly demonstrates the critical importance of the psychological determinant in problem finding is the observation that children engage spontaneously in independent problem finding where no specific problems are given to be solved and without any available feedback (Allender, 1969).

2.3 MODES OF PROBLEM FINDING

The distinction between the environmental and psychological determinant of problem finding form basis for differentiating between alternative modes of problem finding. First, one may draw a distinction between generic modes of problem finding dependent on the degree to which the processes involved are automatic or effortful. Secondly, one may discern modes of problem finding contingent on the generic class of problems involved.

2.3.1 DIRECTED SEARCH VERSUS AUTOMATIC SCANNING

Two generic modes of problem finding may be acknowledged: directed search and automatic scanning (Kiesler and Sproull, 1982). Directed search may be conceptualized as a *proactive* mode of problem finding which is directly based on intentions and objectives, and which involves deliberate inspection of the environment in order to identify problems. Directed problem finding is largely guided by anticipations, and may often be associated with repetitive or routine problem finding aimed at the identification of instances of known classes of problems. Directed search may, however, be exploratory in nature and not directed towards any particular class of problems (Aguilar, 1967; ElSawy and Pauchant, 1988).

Automatic scanning, in contrast, represents a direct perceptual process which is assumed relatively unaffected by intentions, learning, and practice (Kiesler and Sproull, 1982). Individuals engage in automatic scanning through continuous information processing and without conscious awareness. Automatic scanning may therefore be conceptualized as a more *reactive* mode of problem finding, in which automatic categorization and matching processes play an important role. Problem finding may, for example, occur through the automatic categorization of events and situations based on salient information, frequency of information, and imbedded frames of reference.

In everyday life, it seems reasonable to assume that most problem finding is conducted through a combination of the two polar modes. Automatic scanning influence inferential, effortful processes (Kiesler and Sproull, 1982). Although we rarely label our activities "problem finding", there are many situations in which we deliberately search for problems. For example, we may search for obstacles to planned activities, such as going for a vacation or introducing a new product; or scrutinize financial accounts and income prospects in order to identify possible liquidity problems or opportunities for new investments.

2.3.2 CLASSES OF PROBLEMS

Alternative modes of problem finding may also be discerned dependent on the generic class of problems involved. Many attempts have been made at developing a classification framework for organizational and managerial problems (e.g., Acar, 1984; Ackoff and Rivett, 1963; Cowan, 1988,1990; Dearborn and Simon, 1958; Dillon, 1990; Maier and Hoffman, 1964; Nadler, 1983; Smith, 1988; Taylor, 1974; Walsh, 1988), but only a few systematic attempts have been made to develop *a generic, domain independent taxonomy of problems* (e.g., Dillon, 1982; Getzels, 1975,1979,1982; Getzels and Csikszentmihalyi, 1976; Kaufmann, 1989).

Getzels (1975,1979), who approaches problem finding from creativity research, distinguishes between three classes of problems at the most general level: *presented* problems, *discovered* problems and *created* problems. In Getzels' terms, presented problems are propounded to the problem solver by others who know the problem's formulation, the method of solution, and its solution. Discovered problems, on the other hand, are envisaged by the problem solver, and may or may not have a known formulation, a known method of solution, or a known solution. A created problem, in contrast, does not exist until someone invents or creates it. It has no previously known formulation, method of solution, nor a known solution. Between these three categories, however, one may find a number of problems that differ with respect to what is known and unknown, by the individual faced by the problem or by others presenting the problem (Getzels, 1975,1979).

Kaufmann (1989), on the other hand, who addresses problem finding from psychology, distinguishes between *presented* problems, *foreseen* problems, and *constructed* problems. According to his taxonomy, the individual is faced with a difficulty that has to be handled in the case of a presented problem. In the case of a foreseen problem, in contrast, the individual *anticipates* that a problem will be the result if action is not taken to prevent a certain trend of development. The case of the constructed problem differs

from the former two, however, in the way that the initial conditions here are experienced as satisfactory; there is no inherent tension in the situation. A problem may be constructed, nevertheless, by comparing the experienced situation with an imagined, desirable situation in the future (Kaufmann, 1989).

Dillon (1982), in turn, who approaches problem finding from creativity research, suggests an alternative classification of problems, in which he distinguishes between *evident* problems, *implicit* problems and *potential* problems. Dillon explicitly links the three classes of problems to an existential and a psychological dimension of problem finding. These roughly correspond to the environmental and psychological determinants of problem finding as conceptualized here. Based on the two dimensions, Dillon associates the three classes of problems with three different modes of problem finding; problem recognition, problem discovery, and problem creation, respectively.

A comparison of the three taxonomies reveals both similarities and differences which need to be considered in the light of problem finding. First, Getzels (1975,1979) and Kaufmann (1989) attach different meanings to the labels "presented" and "constructed" (created) problems. Getzels conceptualizes presented problems as problems *propounded* by others, whereas Kaufmann view of presented problems corresponds to what Dillon (1982) terms *evident* problems. In our view, what is labelled presented problems by Getzels (1975,1979), best reflect what may be termed *constructed problem situations* - not to be confused with constructed problems. In a constructed problem situation there is no genuine or authentic problem owner. When the problem's formulation, method of solution, and solution is known by others, the presumed problem no longer represents the focus of attention. In contrast, it is the *skill of problem solving* which constitutes the focus and which is at the test. Hence, constructed problem situations are best associated with contexts in which the simulated problem owner undertakes problem solving training, and have little relevance in the context of real life situations.

Problems may, however, be presented by others who *do not know* their most appropriate formulation, method of solution, or solution. Problem presentation, in this sense, occurs frequently in organizational settings in which the means of solution may be possessed by someone else than the initial problem finder. In this case, the problem may appear evident to the propounder, but it may or may not be seen as evident by the person to whom it is presented; the person to whom it is propounded may dispute its existence. This notion of problem presentation, however, raises a series of intriguing questions associated with the ambiguity of problem ownership and legitimization in organizations (cf., Bartunek, 1984; Cohen, March and Olsen, 1972; Dery, 1984; Dutton, Fahey, and Narayanan, 1983; Eden and Sims, 1979; Jones, 1984; Lyles, 1981; Stafford and Warr, 1985; Volkema, 1986).

Secondly, it's worth noting the main criteria based on which Kaufmann (1989) distinguishes between presented and foreseen problems reflects whether the problem is experienced at the *present* or anticipated in the *future*. We will question the necessity of this distinction in light of problem finding. When viewing problems as the products of the environmental and psychological determinants, a problem "appears" in the mind of the problem owner at the time when cues are noticed and interpreted as problematic. Problem finding, hence, may refer to events in the past, present, or future. Actions taken in order to prevent certain developments are based on presently perceived cues about a problem, and represent attempts directed at avoiding further, future manifestations. Problems may also be identified in retrospect. In this case, the individual becomes aware of a problem which has been neglected or disregarded in the past, and for which appropriate solutions are presumed no longer available. The mechanisms involved in retrospective problem finding may, however, often be associated with hindsight (cf., Elster, 1983; Hogarth, 1987).

Another issue of importance is the ways in which *constructed problems* are conceptualized, i.e. the presumed role of the environmental and psychological determinant. Kaufmann (1989) asserts that problem

construction is based upon situations in which there is "*no inherent tension*". One may question the degree to which it is meaningful to talk about situations with no inherent tension. In our view, any realistic situation conveys a minimum degree of tension, and may thus, be conceptualized as potentially problematic. Given the absence of tension, the situation or set of cues will be neglected and ignored by the perceiver. The degree to which the tension is strong and apparent, however, may vary. Consequently, we will suggest that problem creation best is associated with situations in which there is no *apparent* tension.

In summary, Getzels (1975,1979), Kaufmann (1989), and Dillon (1982) utilize dissimilar criteria in order to discern different generic classes of problems. We believe, however, that in order to meaningfully distinguish between generic classes of problems, the two determinants of problem finding need to be taken explicitly into account. A slightly modified version of Dillon's (1982) framework is adopted for this purpose.

Table 2.2 illustrates the adopted taxonomy.

Table 2.2 Taxonomy of Problems and Modes of Problem Finding

<i>Class of Problems</i>	<i>Commensurable Constructs</i>	<i>Mode of Problem Finding</i>	<i>Activity</i>
Evident	Presented	Problem Recognition	Perceiving the Situation
Implicit	Discovered	Problem Discovery	Probing the Situation
Potential	Created Constructed	Problem Creation	Inventing the Problem

Evident Problems

Evident problems stem from strong environmental tension and situations in which there is little ambiguity in interpreting elements as problematic. Hence, the signals which lead to problem recognition are clear and unconfusing. Examples of problem recognition are the detection of unexpected declines in sales or a sudden negative cash flow in the case of a private enterprise. In the case of an individual, the refusal of an anticipated education grant or an unexpected, high expense may represent evident problems to be recognized.

Implicit Problems

Implicit problems are discovered based on weak, conflicting or discontinuous environmental cues. Hence, implicit problems are not evident, but emerge from probing the situation, which may take the form of directed search for problems. Examples of implicit problems at the organizational level are an eroding market share or customer misuse of a product discovered through careful market analyses.

Created Problems

Problem creation involves active invention of a problem based on no apparent tension in the situation. Here, the psychological determinants of problem finding are of crucial importance. Problem creation may be conceptualized as *inventive framing* of a situation, for which intentions and experiences may constitute important psychological aspects. In the organizational context, problem creation may occur as, for example, the search for a new product to satisfy invented or imagined needs of customers, not yet fulfilled by existing products. Many technical developments directed toward the consumer market are the products of problem creation, rather than the outcome of attempts to solve evident problems. Examples are products presented to satisfy needs which potential customers never realized they had, e.g. "the walk-man" and "the personal computer".

It is important to note, however, that the boundaries between evident, implicit, and potential problems are fuzzy rather than clear-cut. The relative influence of the environmental and psychological determinants of problem finding cannot be categorized into three clear intervals, but vary along a continuum. Figure 2.A. illustrates the positioning of each mode of problem finding according to the relative influence of the two determinants.

Figure 2.A. The Environmental and Psychological Determinant in Problem Finding

*The Environmental
Determinant*

High

Problem Recognition
(Evident Problems)

Problem Discovery
(Implicit Problems)

Problem Creation
(Potential Problems)

Low

Low

High

*The Psychological
Determinant*

2.3.3 CONTRIBUTIONS ADDRESSING DIFFERENT MODES OF PROBLEM FINDING

In the literature, distinctions between the three modes of problem finding are rarely explicit. In particular, there is a common lack of distinction between problem recognition and discovery. As a result, contributions are not easily classified according to the three modes, and the following classifications are suggestive and indicative.

It appears, however, that the class of problems and the mode of problem finding addressed vary dependent on the discipline from which problem finding is approached. Contributions from the management sciences have typically centered on problem recognition and discovery, rather than creation. Contributions from educational research, in contrast, tend to focus on problem discovery, whereas problem creation has received the most attention from the field of creativity research. In the following, we will briefly review some of the contributions.

Problem Recognition

Theoretical contributions addressing problem recognition include Kiesler and Sproull's (1982) examination of managerial problem sensing from the perspective of social psychology; Cowan's (1986) descriptive process model of problem recognition; and the discussion by Bass (1983) of problem recognition from the perspective of organizational decision making.

Pounds' (1969) investigation, which represents one of the earliest and most well-cited studies of problem finding, address problem discovery. Pounds defines problems as discrepancies between "*what is*" and "*what ought to be*". Based on observation and interviews of managers, Pounds propose that five classes of problems are employed for problem finding: historic models, planning models, other people's models, extra-organizational models, and theoretical models.

The five classes of models proposed by Pounds (1969) do not comprise a coherent taxonomy, however, as some models may represent instances of others. For example, other persons may induce historic models, planning models, extra-organizational models, and theoretical models - hence representing "other peoples models" in Pounds' terms. Planning models, in turn, might be theoretical in nature or generated by comparison with other organizations (extra-organizational models). Hence, the set of models proposed by Pounds reflects a lack of distinction between two inherent

dimensions. The first dimension concerns whether the comparison performed is internally as opposed to externally oriented, whereas the latter relates to the source of the model selected for comparison. Internally oriented comparison implies that the present performance of the organization is contrasted with previous or planned performance. Externally oriented comparison, in contrast, signifies that the (previous or expected) performance of the organization is contrasted with another organization or with selected theoretical models. The source of such models, in turn, represents a dimension associated with model selection. Yet, from the perspective of the problem finder (the manager), other people's models do not represent genuine or legitimate sources of problem finding unless, in fact, adopted by the manager him or herself.

Problem Discovery

Many of the contributions addressing problem discovery stem from educational research (e.g., Allender, 1969; Ivany, 1969; Shulman, 1965). Within these disciplines, problem finding tends to be seen as a component of human inquiry and conceptualized in terms of *probing information about a situation*. For example, Ivany (1969) investigated the effect of varying the amount and kind of information on the strategy of inquiry. Allender (1969) studied a group of children who were presented with the role game "I am the Mayor", and measured problem discovery through various scores for requests for additional information. Shulman (1965), in turn, observed differences among individuals in their patterns of inquiry based on personality, motivational, and intellectual differences.

Several of the investigations of managerial problem finding adopt a situation-probing perspective which might reflect that problem finding is conceptualized in terms of discovery rather than recognition. For example, Dearborn and Simon (1958) investigated *departmental affiliation* as a contributing factor to selective attention in the problem finding of executives. The results suggest that problem finding is selectively directed

towards the activities and goals of the department to which the executive is affiliated. Yet, it may be objected that important nuances in the data are neglected as a result of the simplistic data categorization procedures employed.

Walsh (1988) proclaims to conceptually replicate and extend Dearborn and Simon's (1958) investigation by exploring the effects of "*belief structures*", not only on problem finding, but also on the use and request for information about the situation presented. The operations and classification framework employed, however, appear ambiguous and arbitrary, and based on the obtained results one may question the degree to which authentic belief structures are revealed. Moreover, despite attempts at contesting Dearborn and Simon's (1958) results, more similarity than dissimilarity is revealed. The results from Dearborn and Simon's (1958) and Walsh's (1988) investigations, nevertheless, suggest that executives tend to direct their attention toward areas with which they are familiar - however not at the cost of overlooking other areas.

Boland and Greenberg (1988), in turn, focused on the impact of different organizational metaphors (the organic and mechanistic metaphor). Their findings indicate that when presented with different metaphorical frameworks for analyzing a situation, subjects emphasized different aspects of the situation, discovered different problems, and proposed different solutions. A critical limitation of this study, however, is the reactivity threats associated with the techniques employed for eliciting response, in which subjects' attention was rigorously directed toward explicit features of the metaphors rather than toward the case material presented.

Problem Creation

Contributions addressing problem creation tend to stem from creativity research, in which problem creation is conceptualized as an element of human creativity. Theoretical discussions of problem creation include Dillon

(1982), Mackworth (1965), and Getzels (1973, 1982). Among others, Arlin (1975-76), Artley et al. (1980), and Getzels and Csikszentmihalyi (1976) have addressed problem creation empirically.

Arlin (1975-76) and Artley et al. (1980) presented a group of subjects with a set of common objects and instructed them to ask questions about them, singly or in combination. Arlin (1975-76) observed relationships between problem creation quality and quantity. She concluded that the "successful" problem creator is characterized by adaptive flexibility, elaboration, and formal operational thinking. Artley et al. (1980) observed that problem creation ability (quantity) was positively correlated with verbal creativity and negatively correlated with the quality of created problems (measured as the weighted average of questions according to various intellectual products categories, cf., Guilford, 1959,1965,1967,1971). Getzels and Csikszentmihalyi (1976) explored problem creation in art students, and observed that several problem creation characteristics, such as manipulation, exploration and unusualness, were correlated with the long term artistic success of the art students.

Although these studies shed light on crucial, cognitive aspects underlying creativity, the findings have limited merit in understanding the fundamental processes underlying and triggering problem creation in the context of managerial problem finding. In light of managerial problem finding, it is of interest to explore the conditions under which problem creation most likely occurs and the processes involved in managerial problem creation. Furthermore, one would have to carefully evaluate the criteria based on which problem finding "success" and "quality" should be evaluated.

Conclusions

The review of contributions, although not exhaustive, indicates that there are sizeable gaps in the research literature addressing managerial problem finding. Most contributions addressing managerial problem finding exclude explicit distinctions between the three modes, and further research efforts are required with respect to any of the modes of problem finding. Of special importance, we will argue, are attempts to explore problem finding in contexts in which problems are not presumably apparent due to strong stimulus dependence, and in which the psychological determinant of problem finding is critical. The studies by Dearborn and Simon (1958), Walsh (1988), and Boland and Greenberg (1988) offer some important indications of the role of background knowledge and frames of reference in explaining differences in problem finding. These studies need be further replicated and extended by including additional, carefully selected factors which may account for systematic differences in problem finding.

2.4 DIMENSIONS OF PROBLEM FINDING

Problem finding represents a multi-faceted process which entails several dimensions. We will propose that three different, yet closely interrelated dimensions of problem finding should be conceptually distinguished: (1) *problem sensitivity*, reflecting the amount or number of problems perceived; (2) *the locus of attention*, reflecting the allocation of attention between the internal and external environment; and (3) *the pattern of inquiry*, reflecting the allocation of attention over different domains. The first dimension refers to the degree of sensitivity and selectivity in problem finding, whereas the two latter refer to the areas from which problems are selected.

2.4.1 PROBLEM SENSITIVITY

Problem sensitivity represents a *quantitative dimension* of problem finding, and refers to the degree to which cues about potentially problematic elements are interpreted as problems. In the literature, problem sensitivity has typically been addressed in a "one problem at the time" manner (e.g., Pounds, 1969; Kiesler and Sproull, 1982; Cowan, 1986), i.e. in terms of whether or not cues to problems result in problem finding.

Real life problems do not, however, present themselves in a consecutive manner. As individuals we are faced with situations entailing series of potentially problematic elements, based on which selection must occur. Accordingly, problem sensitivity needs to be addressed in the context of *simultaneous exposure to multiple potentially problematic elements*. In this context, problem sensitivity is of crucial importance due to the limited problem handling capacity of individuals and organizations. Given limitations in the capacity of handling problems, it is vital to attain an "*optimal*" level of problem sensitivity, based on which the potentially most relevant problems are identified and attended to. If the sensitivity of problems is very low, important cues to problems may be overlooked or ignored. Very high problem sensitivity, in contrast, may result in "*problem overload*", i.e. situations in which the number and magnitude of problems found exceed the handling capacity of the individual and organization. A situation of problem overload, in turn, may result in "*inaction*".

Problem sensitivity has received the most attention from contributors addressing problem finding from educational and creativity research. Shulman (1965, p.261) defines problem sensitivity as "the number of imbedded potentially problematic elements to which the subject reacted in the inquiry situation". His findings suggest that problem sensitivity is affected by the *strategies of inquiry* employed; dialectical inquirers exhibit higher problem sensitivity, employ a wider range of information and exhibit more flexible and reflective inquiry strategies than do didactic inquirers (Shulman, 1965, p.259).

Arlin (1975-76) and Artley et al. (1980) related problem sensitivity to the *quality of problems* found (measured in terms of intellectual products categories, cf., Guilford, 1967), and observed a negative correlation; The subjects who exhibited low problem sensitivity, identified problems of high quality, and vice versa. The measure of problem quality employed is assumed to reflect the degree to which the problems sensed approach the "generic" or "general" problem, rather than surface characteristics associated with the problem.

Of the contributions addressing managerial problem finding, very few explicitly address problem sensitivity as conceptualized here. For example, Dearborn and Simon (1958) excluded problem sensitivity by instructing the subjects to specify the perceived most important problem only. The investigations by Walsh (1988) and Boland and Greenberg (1988), in contrast, reveal factors that influence problem sensitivity. Walsh's (1988) findings suggest, although not noted explicitly, that managers with a "marketing" *belief structure* identified a higher number of problems in average, than did managers with "human relations", "accounting", or "generalist" belief structures.

Boland and Greenberg (1988) observed that problem sensitivity was affected by the *organizational metaphor* employed. The organistic metaphor resulted in an increase of approximately 29% in problem sensitivity as compared to the mechanistic metaphor, and an increase of approximately 50% as compared to the decision metaphor, which was employed as a control condition. These findings demonstrate that several psychological aspects influence the degree to which we sense problems.

2.4.2 LOCUS OF ATTENTION

Individuals and organization operate in a context, and the allocation of attention between the internal and external environment may be of crucial importance to the ability to identify relevant and important problems. The distinction between the external and internal environment is particularly apparent in the organizational context, where one may distinguish between the environment in which the firm operates and its internal functions and activities. The distinction applies to the individual level as well, at which one may draw a distinction between the external environment, including other persons, and the internal factors such as the actions, behavior and dispositions of the individual.

Based on the notion of stimulus dependence in problem finding, problems may be internally as well as externally induced. Theories of causal attribution (e.g., Kelley, 1967; Heider, 1958) highlight the tendency to attribute unpleasant and negative events to the environment, whereas positive and desired outcomes and events tend to be attributed to own behavior, actions, or personality traits. Findings indicate, however, that we tend to observe other people's behavior more readily than our own, and hence, see others as more causal than ourselves (Kiesler and Sproull, 1982). These findings might indicate that we are inclined to search for and attribute problems to the environment, and to downplay or ignore our own dispositions and actions as important sources of problems.

In the organizational context, the importance of the locus of attention is highlighted in a recent investigation by D'Aveni and MacMillan (1990), who uncovered significant differences in the locus of attention of managers in surviving and failing firms. Their findings suggest that under normal circumstances, managers of surviving firms pay equal attention to the internal and external environment. When faced with an externally induced crisis, however, managers of surviving firms allocated more attention to the external environment than did the managers of failing firms. While the successful firms focused on the critical aspects of the environment, failing

firms engaged in maladaptive crisis denial. These findings are consistent with the crisis denial theory (e.g., Billings, Milburn and Schaalman, 1980; Schwartz, 1987; Shrivastava and Mitroff, 1987; Reilly, 1987; Starbuck, Greve and Hedberg, 1978) and the normative strategy literature, which suggest that managers of failing firms are insensitive to changing external conditions and focus on internal methods that were successful in the past, rather than on the need to change and adapt.

D'Aveni and MacMillan (1990) focus on externally induced crises, however, and it is important to note that internally induced crises plausibly call for a different locus of attention. Their focus is in line with contributions addressing crisis denial behavior, which also emphasize externally induced crises. It seems reasonable to assume, however, that the findings that managers will not change their focus of attention in response to a crisis will apply to internally induced crises as well. What is highlighted by D'Aveni and MacMillan (1990) and by the crises denial theory (e.g., Billings et al. 1980; Schwartz, 1987; Shrivastava and Mitroff, 1987; Reilly, 1987; Starbuck, Greve and Hedberg, 1978), hence, is the need to adapt the locus of attention in response to changing internal and external conditions.

Very few investigations have been conducted of managerial problem finding in which external and internal cues about problems were presented *simultaneously*. Exceptions include Boland and Greenberg (1988), Dearborn and Simon (1958), and Walsh (1988). Boland and Greenberg (1988) observed that the locus of attention in problem finding differed dependent on the organizational metaphor introduced. Their findings suggest that while the organic metaphor focused attention on the environment, the mechanic metaphor directed attention to the internal processes of the organization.

Dearborn and Simon (1958) do not explicitly address the locus of attention in problem finding. Yet, their data (reproduced in appendix, op.cit.) suggest that executives affiliated with sales departments identified problems more

closely associated with the external environment, than did executives from other departments (production, accounting, and others).

Walsh (1988) explicitly distinguishes between internal and external management problems by adding these categories to the traditional functional categories. We consider this procedure highly ambiguous and disputable, however, as problems within the other domains may be classified accordingly. Hence, the two categories are better employed as alternatives to the traditional functional categories. Their findings suggest, nevertheless, that executives with "marketing" belief structures identified a significantly ($p < .05$) higher number of external management problems, than did executives with "human relations", "accounting-finance", or "generalist" belief structures.

In summary, the literature highlights the importance of the locus of attention in problem finding and reveals a few factors which may affect this dimension of problem finding.

2.4.3 PATTERN OF INQUIRY

The pattern of inquiry in problem finding reflects the specific areas from which problems are selected for attention. The crucial importance of this dimension is demonstrated by, among others, Boland and Greenberg (1988), who observed that the pattern of inquiry in problem finding affected the range of solutions considered, and hence, the possibilities of success in solution attempts.

Several factors which affect the pattern of inquiry in problem finding have been revealed. Dearborn and Simon's (1958) suggest that the departmental affiliation of executives affect the areas in which they perceive the most important problem. Walsh (1988) suggests that managers tend to focus on their own areas of concern, but do not overlook other domains. Boland and

Greenberg (1988), in turn, observed differences in the pattern of inquiry in problem finding dependent on the organizational metaphor induced.

In summary, only a limited number of contributions address managerial problem finding along the dimensions proposed. Hence, there is a continued need for research aimed at identifying and exploring factors that may account for systematic differences.

2.5 SUMMARY

Despite the efforts of a number of contributors, the initial phases of problem solving remain the least understood. The absence of an integrated theory of problem finding partly stems from the variety of *disciplines* from which problem finding has been approached. Contributors have applied various *constructs* with varying meanings to address problem finding, often due to paradigmatic differences in approach. Furthermore, they have focused not only on different *classes of problems*, and different *modes of problem finding*, but also on different *dimensions* inherent in problem finding.

We have proposed a conceptual framework, based on which the various contributions may be distinguished and classified. First, we have suggested a resolution to the objectivist-subjectivist dilemma with respect to the reality of problems by introducing the notion of *stimulus dependence*. The idea of stimulus dependence implies that two determinants of problem finding are distinguished: *the environmental* and *the psychological determinant*. The relative importance of the two in the particular problematic situation determines the degree of stimuli dependence in problem finding.

Secondly, based on the relative influence of the two determinants, three classes of problems and three modes of problem finding may be differentiated: (1) *evident problems*, which are *recognized*; (2) *implicit problems*, which are *discovered*; and (3) *potential problems*, which are created.

Thirdly, we have proposed three inherent dimensions of problem finding: *problem sensitivity*, reflecting a quantitative aspect of problem finding; *the locus of attention*, reflecting the allocation of attention between the internal and external environment; and *the pattern of inquiry*, reflecting the allocation of attention over different domains. Whereas the first dimension refers to the degree of sensitivity and selectivity in problem finding, the two latter refer to the areas and domains from which we select problems. Although scarce, the literature highlights the importance of the three dimensions and strongly signifies the need for further investigations.

In summary, the conceptual framework proposed attempts to provide a structure for meaningfully classifying and integrating existing contributions according to the aspects, modes, and dimensions of problem finding addressed. The classification of contributions also serves the purpose of identifying gaps in the research literature, and thus, areas in which continued research is called for. The review of contributions reveals that the specific approach chosen and the phenomena addressed need be made more explicit in order to arrive at an integrated and comprehensive theory of problem finding.

3 ALTERNATIVE PROBLEM CONCEPTIONS

3.1 INTRODUCTION

Most contributions addressing problem solving seem to be based on the implicit and unquestioned assumption that people hold a common conception of problems, and that problems can be understood as unitary phenomena. The term problem tends to be used non-reflectively and non-consciously (Agre, 1982). The answer to the question "What is a problem?" is assumed self-evident, and very few explicit attempts have been made at providing an answer. Yet, when reviewing the literature, different generic conceptions of problems are reflected, some of which may be seen as instances of others. The conceptions of problems most frequently exhibited in the literature are: (1) the *discrepancy* conception, (2) the *difficulty* conception, (3) the *decision* conception, (4) the *question* conception, and (5) the conception of problems as *opportunities* for improvement.

The presence of alternative conceptions of problems is of importance to our understanding of problem finding, as these reflect different assumptions about "*what is a problem*" - as opposed to "*what is the specific problem*". Alternative conceptions of problems, hence, reflect different "generic images" of problems, which, in turn, may stem from paradigmatic differences between contributors and disciplines.

Table 3.1 gives an overview of the five conceptions of problems, examples of conceptual definitions of problems according to each of these, as well as examples of disciplines in which the specific conceptions are demonstrated.

Table 3.1 Alternative Problem Conceptions

Problem Conception	Example of definition	Demonstrated in discipline(s)
Discrepancy	Problems defined as the difference between some existing situation and some desired situation.	Management, Psychology.
Difficulty	Problems defined as states of discomfort or undesirable conditions where there is no ready response.	Every-day language, Psychology, Management
Decision	Problems defined as situations in which one or several choices have to be made.	Decision Sciences
Question	Problems defined as questions raised for inquiry and consideration	Educational & Creativity Research, Philosophy & Science
Opportunities	Problems defined as perceived opportunities for improvement.	Policy Analysis

The presence of alternative, generic conceptions of problems indicates that the events and situations labelled problems represent a *fuzzy category*, i.e. a category with unclear boundaries and gradations of membership (Lakoff 1987). The different problem conceptions also depict problems metaphorically and may be conceptualized as alternative *problem metaphors*. It has been argued that human cognition is largely metaphorically structured (e.g., Lakoff and Johnson, 1980), and considering Boland and Greenberg's (1988) and Schön's (1979) promotion of the role of metaphors in problem finding and solution, it is intriguing to note that different problem metaphors have not yet been subject to systematic investigation, nor attracted more explicit attention. The only extensive, systematic discussion related to generic problem metaphors is Dery's (1984) examination of some of the common meanings attached to the term problem.

The five conceptions of problems differ, yet they are not mutually exclusive. Each of the five conceptions embodies central aspects characterizing any problematic situation. Discrepancies, difficulties, decisions, questions, and opportunities for improvement may be conceptualized as *central properties* of the category of events and situations labelled problems, or as necessary, *defining characteristics* of problems (cf., Lakoff, 1987). For example, Agre (1982) argues that to point to a problem implies evaluating a situation or elements of a situation as in need of change, i.e. that there is a discrepancy between what is and what should be from the point of view of the perceiver. Given a perceived discrepancy between the experienced and desired situation, an opportunity for improvement is envisioned through resolution of the discrepancy (Dery, 1984). Furthermore, a situation needs to be characterized by difficulty to be labelled a problem, either in terms of finding a solution or defining the problem (Agre, 1982). Questions may be raised with respect to the problem at hand, and with respect to possible solutions and actions. The defining and solution processes, in turn, require decisions to be made among alternative interpretations and attempts of solution (Dery, 1984).

Metaphors systematically affect comprehension by highlighting and directing focus toward certain aspects of the situation, and by hiding or down-playing other aspects (Lakoff and Johnson, 1980). Accordingly, we will view alternative conceptions of problems as frames of reference through which a potentially problematic situation may be approached and interpreted. Alternative problem conceptions may be transposed into *inquiry frames* through which directed search for problems is performed. In this sense, the different metaphorical conceptions induce different *observational goals* which motivate strategies for inquiry (Cohen and Ebbesen, 1979; Showers and Cantor, 1985). An observational goal specifies the motivation of inquiry and affects the encoding, retrieval, and interpretation of information (Showers and Cantor, 1985). Instances of any of the conceptions might be evoked at any time. The conditions that favor the evocation of a specific conception in a given situation, however, are not yet known.

Alternative problem conceptions also attach "linguistic descriptors" to problems. As problems constitute ambiguous and equivocal phenomena, their *labels* represent powerful devices for the framing of a situation or event. Interpretation and selectivity in attention is assumed to be centrally tied to language and labels (Dutton, 1988), and the labels attached to each of the conceptions activate the prompting of a situation for some qualities rather than others. The importance of labelling is demonstrated by among others Dutton (1988), who observed that managers skillfully and deliberately applied labels to issues in order to attract issue involvement.

In the following, we will elaborate on each of the alternative conceptions of problems and suggest some implications for our understanding of problem finding.

3.2 PROBLEMS AS DISCREPANCIES

- The conception of problems most frequently exhibited in the literature is the one of problems as *discrepancies* (Dery, 1984), and the defining quality of a problem most contributors will agree on is likely to be the one of a discrepancy. The discrepancy conception is demonstrated in numerous studies on problem finding and solution (e.g., Billings et al., 1980; Bonge, 1972; Cowan, 1986; Kaufmann, 1989; Kilmann and Mitroff, 1979; Merton, 1961; Pounds, 1969; Smith, 1988; Thomas, 1988).

Pounds (1969) defines a problem as the difference between some existing situation and some expected or desired situation. Bonge (1972) defines the general nature of problems as the failure to attain some value or standard which indicates that goals are not being achieved or that opportunities are being missed. Raaheim (1964) suggests that a problem situation may be conceived of as a deviating member of a series of situations with which the individual has previous experience and has classified as similar. Bass (1983) suggests that "*a problem exists when something is not as it should be*". Another instance of the discrepancy conception is the one of problems as the difference between an initial state and a goal state, which represents a common conception within the psychological literature on problem solving (e.g., Anderson, 1985).

Instances of the discrepancy conception differ with respect to the inherent view of the reality of problems. On the one hand we have the extreme objectivist conception in which the discrepancy itself is considered the problem. This implies that the discrepancy as such is equated with the problem and, thus, externalized. It should be noted that in this case the conception is no longer metaphorical, but literal (cf., Ortony, 1986). Pounds' (1969) process model of problem finding demonstrates this view. Pounds proposes that managers identify problems by comparing models of expected or desired outcomes with models of the current state of the firm and its environment. In his view, model selection represents the key issue to

understand problem finding. This view implies that problems are structurally predefined, and that problem finding is a strict routine operation performed by comparison of selected models (Dery, 1984). Accordingly, any detected discrepancy constitutes a problem. Although Pounds include the phase labelled "discrepancy selection" in his process model, this phase is not conceptualized as the process of distinguishing "problems" from "not problems". In contrast, discrepancy selection is seen as an issue of problem priority.

In most discrepancy conceptions of problems, however, a less extreme position is taken in which the psychological contribution of the problem owner is stressed (e.g., Kaufmann, 1989; Kiesler and Sproull, 1982; Thomas, 1988). This implies that a given discrepancy in itself is not seen as constituting a problem. Discrepancies which attract attention and are experienced as somehow important due to the observer's goals, values, expectations and preferences, however, constitute potential problems. It may appear as if Pounds (1969) takes these psychological factors into account by highlighting the importance of model selection. In his terms, however, the selection of models for comparison form an explicit activity preceding the initial awareness of a discrepancy. Hence, his model does not include the notion of a *potential problem*, e.g. the "spontaneous" identification of discrepancies which meaning and relevance are experienced as ambiguous by the observer.

Although the psychological determinant tends to be taken into account, it seems that the discrepancy conception reflects an orientation toward the environmental determinant of problem finding - and that the discrepancy itself typically is conceptualized as the problem (e.g., Cowan, 1986, Pounds, 1969). This may imply that the discrepancy conception of problems best relates to evident and implicit problems, rather than to potential problems; and to problem recognition and discovery, rather than to problem creation. This assumption is supported by Kiesler and Sproull's (1982) finding that discrepancies are likely to be identified by recognition of evident saliences.

As stressed by Kaufmann (1989), however, perceived discrepancies may also represent created (potential) problems which derive from the comparison of an existing situation and an imagined goal state in the future.

3.3 PROBLEMS AS DIFFICULTIES

The term problem originates from the Greek word *problema* which meant bulwark, shield, or impediment to action (Hattiangadi, 1978). The conception of problems as *difficulties* captures the original meaning of the term problem, and represents a common conceptualization of problems which is frequently reflected in everyday language as well as in the management and psychological literature on problem solving (Dery, 1984).

Two instances of the conception of problems as difficulties should be distinguished. On the one hand, we have the notion of "*a difficulty*" as a noun, and on the other hand we have the notion of the quality "*difficult*". The conception of problems as difficulties may refer to either of these: i.e. to a difficulty, or to a situation or event characterized by difficulty. In the first instance, the noun difficulty may be equated with an undesirable condition or event, which, in turn, may be conceptualized in terms of one or several discrepancies. This may imply that the discrepancy and difficulty conceptions of problems should be equated. No study to date, however, has tested this assumption empirically.

Following Agre (1982), an undesirable situation which has nothing difficult connected with it is not a problem. Stated differently, to qualify as a problem the processes of formulation and solution have to be judged as somewhat difficult (Agre, 1982). This latter notion of "being difficult" represents a defining characteristic of a problem, rather than a structural definition of a problem as an undesirable situation.

The quality of "being difficult" has been associated with *lack of structure*. Mintzberg et al. (1976) classify problems along a dimension from "well structured" to "ill structured", reflecting various degrees of difficulty. Kaufmann (1989) suggests that ill-structuredness is composed of the three independent dimensions novelty, complexity and ambiguity, which may vary independently of each other. Following Kaufmann (op.cit.), *novelty* stems from the absence of relevant knowledge or experience (i.e. perceived lack of familiarity); *complexity* relates to limited capacity of handling large amounts of information; and *ambiguity* refers to the difficulties of handling conflicting information, such as preferences and alternatives of action.

Based on this notion of difficulty, it seems apparent that the psychological determinant plays a major role. The issues of novelty, complexity, and ambiguity, as defined by Kaufmann, are all closely associated with the interpretations and cognitive capabilities of the problem owner. Hence, a novel problem may be transformed into a familiar one by *analogy* and by discovering *problem isomorphs* (Simon and Hayes, 1979); a complex problem may be simplified by utilizing *bounding strategies* limiting the scope of information considered (cf., El Sawy and Pauchant, 1988); and a problem characterized by ambiguity may become less ambiguous by limiting the types of information considered and by resolution of conflict.

The notion of difficulty as a defining characteristic of problems is not shared by all. For example, Skinner (1984) argues, in a response to the open peer commentary on his operant analysis of problem solving, that "*there are easy problems and there are hard ones, and they are both problems*" (p.609). We will suggest, however, that problems are characterized by varying degrees of difficulty. An "easy" problem is characterized by a low degree of difficulty, whereas a "hard" problem is characterized by a high degree of difficulty. Accordingly, given the absence of perceived difficulty, what is labelled a problem better corresponds to an unambiguous "task" or standard operation procedure.

It seems reasonable to assume that we rarely explicitly distinguish between "a difficulty" and "something difficult" in our daily use of these terms. Yet they may be usefully differentiated at the conceptual level. Perhaps most importantly, it appears that the idea of "a difficulty" primarily points to perceived structural properties of the environment, whereas the idea of "something difficult" rather seems to refer to the observer's capabilities of handling and resolving the perceived difficulty. Stated differently, it seems that the notion of "a difficulty" best refers to "the problem of the problem", whereas the concept "difficult" better relates to "the problem of the solution".

In both instances, the conception of problems as difficulties has a negative connotation. We do not normally wish to face barriers or impediments to action. We may, nevertheless, overestimate the actual barriers to a solution, i.e. "make a big problem out of something", or downplay the difficulty of a solution, i.e. view the difficulty as "not much of a problem" (Agre, 1982). When taking the negative connotation of "a difficulty" into account, it seems that the difficulty conception of problems best is associated with problem recognition and discovery, rather than creation. When incorporating the quality of "difficulty" into this conception, however, difficulties may be created, as well as recognized and discovered, by the deliberate imposition of novelty, complexity, and ambiguity (cf., Kaufmann, 1989).

3.4 PROBLEMS AS DECISIONS

The conception of problems as situations calling for a *decision* is another common problem conception. In the decision making literature, we rarely find any explicit distinctions between "problems" on the one hand and "decision problems" on the other; problem solving and decision making tend

to be equated (Dery, 1984; Smith, 1988; cf., Mintzberg, Raisinghani, and Théorêt, 1976; Taylor, 1975).

The lack of a clear distinction between the two concepts is understandable. Both concepts refer to thought processes, and the cognitive referents of the two concepts largely overlap. Cognitive activities such as generating alternatives and performing choices may be seen as part of either "decision making" or "problem solving" (Smith, 1988).

Several contributors have, however, drawn a distinction between decision making and problem solving. Simon et al. (1987) suggest that the term problem solving tends to be used with reference to the activities of fixing agendas, setting goals, and designing actions, whereas the term decision making tends to be employed with reference to the activities of evaluating and choosing among alternative actions. Smith (1988, pp.1489-1490) argues that "*decision making implies that a choice will be made, suggesting that alternatives exist or will be identified (...)* In contrast, *problem solving is directed at the resolution of a problem*". Starbuck (1983) proposes that problem solving is defined by its origin - a problem, whereas decision making is defined by its ending - a decision. A similar view is adapted by Dery (1984, p.23), who asserts that "*a problem is not the equivalent of a decision problem; only a defined problem is*".

When making decisions, the fundamental question may be thought of as "*which alternative should be chosen?*", while the question facing the problem solver is "*how can I solve the problem?*" (cf., Smith, 1988, p. 1490). This view is supported by the observation that decision making not always involves problem solution (Cohen et al., 1972). Decisions are often based on choice opportunities without any problems solved - except for the problem of the solution. The decision maker may perceive a decision when an action is taken, even when this action does not solve a problem (Starbuck, 1983). Decision making may also be motivated by other types of ambiguous stimuli for action (Mintzberg et al., 1976), such as crises and standard operation procedures.

Ackoff (1974) suggests that decision making involves problem solving whenever the decision maker is in doubt about which choice to make. This implies that problem solving is seen as embedded in decision making. The opposite viewpoint may seem just as appropriate. Decision making constitutes a crucial component of any problem solving process. Problems cannot be solved without decision making at several stages throughout the problem solving process. During problem solving, choices have to be made with respect to whether the identified problem should be attended to or ignored; how it should be defined or formulated; who should be involved in the problem solving process; which information should be gathered; which alternatives should be considered; and finally, which alternatives for action should be chosen. Hence, the problem solving process generates a subclass of problems - "*choice problems*", which are not to be confused with the problem initiating the solution process, and which is attempted solved.

The conception of problems as decisions, nevertheless, implies that choice activities of the problem solving process are emphasized. This may suggest an inherent solution orientation rather than problem orientation, i.e. that "the problem of the solution" rather than "the problem of the problem" is focused. This orientation, in turn, may result in premature generation and evaluation of alternatives for solution, which may affect the possible success of solution attempts.

The conception of problems as decisions may be related to all the three modes of problem finding. Situations calling for a decision may be evident, implicit, as well as potential. A distinction should be made, however, between repetitive and non-repetitive decisions. In the case of repetitive decision problems, standard operation procedures are often applied which specify the line of actions involved in the decision making process, as well as appropriate solutions (cf., Gioia and Poole, 1984). In this instance, one may question the degree to which genuine problem solving is involved, or whether the standard operation procedures rule out the elements of problem solving by eliminating the "difficulty" originally associated with the decision problem (cf., Ackoff, 1974).

In the case of a non-repetitive decision problem, in contrast, no standard operation procedures are pre-established. Hence, the decision maker faces the true "decision problem" of what choice to make.

3.5 PROBLEMS AS QUESTIONS

Any given problem may be seen as a question to which we search for an answer. Webster's (1968, p.1807) defines a problem as "*a question raised or to be raised for inquiry, consideration, discussion, decision or solution*" (quoted by Getzels, 1982). The conception of problems as questions is demonstrated in philosophy and science, as well as within educational research and creativity research (e.g., Allender, 1969; Arlin, 1975-76; Artley et al., 1980; Getzels, 1982; Mackworth, 1965). Within philosophy and science, problems are often posed as questions for theoretical speculation and empirical investigation. Here, problems are not seen as obstacles or undesirable conditions to be avoided, but goals in themselves (Getzels, 1982). The processes of answering a question, however, has to be associated with a certain degree of difficulty. A question to which there is a self-evident and obvious answer does not constitute a genuine question.

Problems do not present themselves as questions, but for any situation in which a given problem is perceived, several questions may be posed representing alternative ways of comprehending the problem. The specific type and structure of the question formulated has implications for subsequent problem solving activities. In Getzels' (1982, p.38) terms: "*The question that is asked is the forerunner of the quality of the solution that will be attained*".

Getzels (1982, pp.38-39) demonstrates this through the following example:

"An automobile is travelling on a deserted country road and blows a tire. The occupants of the automobile go to the trunk and discover that there is no jack. They define their dilemma by posing the problem : "Where can we get a jack ?". They look about, see some empty barns but no habitation, and recall that, several miles back they had passed a service station. While they are gone, an automobile coming from the other direction also blows a tire. The occupants of this automobile go to the trunk and discover that there is no jack. They define their dilemma by posing the problem: "How can we raise the automobile ?" They look about and see, adjacent to the road, a barn with a pulley for lifting bales of hay to the loft. They move the automobile to the barn, raise it on the pulley, change the tire, and drive off, while the occupants of the first car are still trudging toward the service station. The causal comment could be, "What a clever solution!" The more fundamental observation would be, "What a clever question!"

Different questions, hence, represent alternative ways of posing the problem. A problem initially stated as "we are facing declining sales", may be posed as "why are sales declining?", "how can the sales decline be reduced?", or in a more solution oriented manner; "in what way can marketing efforts be improved to increase sales?". While the first question directs attention toward identifying the *causes* of the experienced decline in sales, the second question directs attention toward the generation of plausible *means* of increasing sales, independent of actual causes. The last question, in contrast, implies that failed marketing efforts are seen as the probable cause of declined sales, consequently narrowing the scope of attended solutions.

When conceptualizing problems as questions, it becomes clear that problems are relative to the problem owner and have no ontologically independent existence as such. Questions are constructed and posed by individuals based on their perception of the environment and reflect their desires for inquiry and intervention.

We do not become "aware" of questions; questions are the products of conceptualization. Questions are implicit or potential, rather than evident. Thus, it seems that the conception of problems as questions best is associated with problem creation and problem discovery, rather than problem recognition. This assumption is offered support by examining the literature in which the question conception of problems is reflected. Most empirical studies based on the question conception of problems have studied problem discovery and creation. For example, Allender (1969) studied problem discovery, while Arlin (1975-76), Artley et al. (1980), and Getzels and Csikszentmihalyi (1971,1976) investigated problem creation. Questions may, nevertheless, be of a repetitive nature, thus reflecting problem recognition.

3.6 PROBLEMS AS OPPORTUNITIES

Problems and opportunities tend to be conceived of as opposites or different types of entities (e.g., Mintzberg et al., 1976; Cowan, 1986). While problems typically are conceived of as negative and involving possible loss, opportunities tend to be conceived of as positive, controllable and involving potential gain (Jackson and Dutton, 1988). Dery (1984) makes an interesting twist to the distinction between problem and opportunities by introducing the conception of problems as opportunities for improvement. In his view, problem finding implies pointing to an opportunity, or what is interpreted as an opportunity. (Dery 1984, p.10). Thus, problems and opportunities may be conceived of as complementary concepts.

Jackson and Dutton's (1988) findings support this notion. Opportunities and threats have several perceptual features in common; they are both typically perceived of as urgent and stressful and characterized by difficulty, conflict of resolution, and perceived pressure to act (op.cit.). Moreover, like problems, opportunities are perceived and have owners.

Following Dery (1984), most problems, if not all, may be framed as opportunities for improvement, and most opportunities may be framed as problems. Perceived problems point to opportunities for improvement, whereas opportunities point to possibilities of deterioration.

The idea of reciprocity between the two concepts, however, does not apply to all instances of problems and opportunities. For example, it appears less meaningful to label the problems of over-population and environmental pollution opportunities, although the recognition of these problems may represent a prerequisite for possible improvements. Similarly, it appears less appropriate to label the opening of a new market a problem rather than an opportunity, although the activities necessary for entering the new market may call for extensive problem solving.

Nevertheless, in many instances problems may be framed as opportunities for improvement. Of possible importance here, is that the opportunity conception has a clear *positive connotation*. Although opportunities may be externally as well as internally induced, however, the dominant conception of opportunities seems to be that they are inherent in or presented by the environment, rather than actively created. Hence, in retrospect one may conceive of opportunities that have been missed. The idea of missed opportunities may seem legitimate, but is often the result of hindsight rather than the recognition of "objectively existent" opportunities in the past (cf., Elster, 1983; Hogarth, 1987).

We may conceive of two instances of opportunity perception. First, opportunities for improvement may be identified by deliberately reframing a problem. Secondly, opportunities may be identified where there is no apparent problem. Kaufmann's (1989) conception of problems as the difference between some existing situation and some future, imagined and desired state of affairs corresponds to the latter instance of opportunity perception. In this case, opportunity perception is often the result of the identification of new alternatives for action. This might imply that opportunity perception is closely related to problem creation.

3.7 SUMMARY AND RESEARCH QUESTIONS

Although most contributors addressing problem finding and solution tend to assume that people hold a common conception of problems, the literature reveals that alternative, generic conceptions of problems are exhibited. The five conceptions which appear most frequently in the literature are: the discrepancy conception, the difficulty conception, the decision conception, the question conception, and the opportunity conception.

We have argued that although the five problem conceptions differ, they are not mutually exclusive, but reflect important aspects of most conceivable problematic situations. Hence, they represent alternative inquiry frames through which a potentially problematic situation may be interpreted.

The most apparent difference among the five problem conceptions relates to their inherent *connotation*. While the discrepancy and difficulty conceptions have a negative connotation, the opportunity conception has a positive connotation (cf., Jackson and Dutton, 1988). The conceptions of problems as decisions and questions, in contrast, appear to have a neutral connotation. Hence, if we position the five conceptions of problems along a positive-negative dimension, the conceptions of problems as discrepancies and difficulties represent one point of extremity, whereas the conception of problems as opportunities represents the other.

The differences in inherent connotation may have implications for problem finding along the three dimensions proposed. First, considering problem sensitivity, one may, in accordance with the crisis denial theory (Staw, Sandelands, and Dutton, 1981; Starbuck, Greve, and Hedberg, 1978), expect a tendency to avoid or ignore perceived negative elements compared to perceived positive elements. This might imply that the conceptions with a negative connotation may produce low problem sensitivity in comparison with the conceptions with a positive connotation.

Secondly, taking attribution theory into account (e.g., Kelley, 1967; Heider, 1958), one may expect that problem conceptions with a negative connotation promote an external rather than internal locus of attention, and vice versa. No studies to date, however, have systematically investigated these assumptions.

Another important aspect relates to the phases of the problem solving process to which the different problem conceptions best relate. It appears that while some of the conceptions reflect a problem orientation, other reflect a solution orientation. The discrepancy conception of problems seems to be the one most closely associated with the problem oriented phase. A discrepancy points to the existence of a potential problem, based on which we search for means of reducing or eliminating the discrepancy. The difficulty conception, in contrast, may be associated with both phases. A difficulty may point to a problem, whereas the quality of "difficulty" refers to the absence of a ready response. The decision conception of problems, in turn, directs attention toward the activities of choosing between alternative actions and solutions, i.e. toward the solution oriented phase of problem solving. The conceptions of problems as questions and opportunities, however, are not as readily positioned. Questions may refer to the nature of a perceived problem, alternatives for solution, as well as to the choice among alternatives for solution. Opportunities, in turn, may be associated with the reframing of a perceived problem, as well as with new options for action. It seems reasonable to assume, however, that due to these differences, among others, alternative conceptions of problems may affect problem finding.

Most importantly, the five problem conceptions reflect different metaphorical images of problems - although in some instances literal similarity or equation between phenomena is inferred. The presence of alternative, metaphorical problem conceptions has critical implications for our understanding of problem finding by providing different views of what is to be found through the enterprise of problem finding.

As a result, there is a need to investigate the degree to which and how alternative problem conceptions affect problem finding along the three dimensions proposed. No study to date has attempted this, so no precedents have been set. Due to insufficient theoretical and empirical foundation, it is therefore premature at this point to formulate rigorous hypotheses concerning the possible impact of different problem conceptions. It should be stressed here, thus, that the present empirical investigation is in "*the context of discovery*", rather than in "*the context of justification*" (cf., Nachmias and Nachmias, 1981). Accordingly, the investigation is highly explorative in orientation, and aimed at inductive theory generation and development of propositions for further research, as opposed to rigid hypothetical-deductive theory testing. } *

In line with the explorative orientation, we will propose a set of four general *research questions* addressing managerial problem finding as basis for the empirical investigation.

Research Questions

- (1) *Will alternative problem conceptions affect problem sensitivity? Phrased differently; will some problem conceptions be more generative than others and stimulate more numerous ideas about problems ?*
- (2) *Will alternative problem conceptions affect the allocation of attention between the internal and external environment, i.e. will some problem conceptions facilitate an external locus of attention, whereas other facilitate an internal locus of attention?*
- (3) *Will alternative problem conception affect the pattern of inquiry in problem finding, i.e. will some problem conceptions lead to increased focus on specific domains, whereas other domains are down-played or overlooked?*

- (4) *What is the relationship between alternative problem conceptions in terms of their impact on problem finding? Should some problem conceptions be conceptually equated? Do the different conceptions appear to form certain clusters with respect to the ways in which they affect problem finding along the three dimensions proposed?*

By exploring these questions, our intention is to shed light on a set of under-researched, not to say neglected, phenomena, and to contribute to a more unified and comprehensive theory of problem solving.

4 METHODOLOGY

4.1 INTRODUCTION

In order to explore the proposed research questions, several methodological requirements must be specified. First, the empirical design must encompass a *stimulus situation* which embodies a potentially problematic situation relevant to managerial problem finding. We have previously defined a potentially problematic situation as a situation in which several potentially problematic elements (possible cues to problems) are imbedded, each of which may result in problem finding. The stimulus situation represents the environmental determinant of problem finding, and in order to test for effects and perform valid comparisons, subjects should be presented with the same stimulus situation. Secondly, a sufficient number of eligible *subjects* are required. These need to be introduced to different *conceptions of problems* as basis of problem finding. Hence, a procedure for inducing different problem conceptions as metaphorical frames of inquiry has to be developed. Thirdly, there is a need for triggers to initiate problem finding based on the presented stimulus situation and problem conceptions. Finally, a method for *measuring* problem finding along the three dimensions is required.

4.2 OVERVIEW

An experimental study was performed in which a homogeneous group of subjects (200 undergraduate students in business administration) participated. The subjects were presented with a potentially problematic situation in the form of a written case description.

Subjects were told that they had just been hired as an internal consultant and advisor to the management of the firm depicted in the case material. Each subject was randomly assigned to two task instructions, each reflecting a given problem conception, based on which subjects made written accounts of important discrepancies, difficulties, decisions, questions, or opportunities. This procedure resulted in groups of approximately 80 subjects presented with any given problem conception. Detailed design features are elaborated in the following.

4.3 THE STIMULUS SITUATION

A prerequisite of problem finding is the presentation of situation in which a series of potentially problematic elements are imbedded (cf., section 2.2.1). In order to segregate the effects of different problem conceptions, each subject should be introduced to an identical stimulus situation. In order to control for the specific impact of the situation, however, two alternative stimulus situations were developed, out of which each subject was presented to one.

Stimulus situations were developed in the form of *written case descriptions* based on actual information about existing companies available from various business journals. One of the firms depicted represents one of Norway's major building contractors, whereas the other is a recently established firm offering personal computers and tailored software to the educational market. Each case description gives a depiction of the history and current situation of the firm as presented by two sources: the firm's management and an independent consultant. Attempts were made at presenting the information in a realistic manner in order to simulate the complexity of an organizational environment. Cues of problems with varying strength were encompassed in order to offer potential of recognition, discovery, as well as creation of problems. Specific names and other details suitable for

identification were changed to prevent recognition. Case descriptions were approximately four pages long.

4.4 SUBJECTS

In order to determine the required sample size, the following parameters were specified: (1) the *level of significance (alpha)*, which indicates the probability of error in rejecting the null hypothesis; (2) *the power of the test of significance (1 - beta)*, which indicates the probability of rejecting the null hypothesis when the alternative hypothesis is true; and (3) *the critical effect size*, which is given by "the effect of interest" divided by the standard deviation of dependent variables (Kraemer and Thiemann, 1987).

Although one may want to choose a level of significance at 0.01 and a power of the test of significance at 0.99, this is usually inappropriate as the required number of subjects will be prohibitive (Kraemer and Thiemann, 1987). By convention we have set *alpha* to 0.05. As the present research is primarily oriented towards revealing possible differences between groups, the power of the test of significance should be as high as possible, and *1-beta* is set to 0.99.

In order to specify the critical effect size, "the effect of interest" and standard deviations of dependent variables need to be specified. The effect of interest reflects the magnitude of effects required for the results to be of importance, interest, and perceived relevance (Kraemer and Thiemann, 1987). With respect to three dimensions of problem finding investigated, the effects of interest are not readily specified. Hence, we have based the specification on indications of *feasible effects* obtained from a pilot study in which ten subjects participated. The pilot study also served the purpose of providing indications of the standard deviations involved, based on which the required sample size may be specified.

The ten subjects who participated in the pilot study were post graduate students in Administration at the Norwegian School of Economics and Business Administration. The treatments and procedures employed correspond to the primary study.

Results obtained from the pilot study indicate that one may expect aggregated differences of up to approximately one problem statement between groups with respect to *problem sensitivity*. Hence, the effect of interest in problem sensitivity was specified to an average difference of one problem statement between groups. With respect to *the locus of attention* and *pattern of inquiry*, preliminary results indicate that groups differ with up to approximately 10% and 5%, respectively. The effects of interest in the locus of attention and pattern of inquiry was defined accordingly (measures are described in Section 4.7.)

The *critical effect size* (CES) is given by the effect of interest divided by the standard deviation obtained from preliminary results (Kraemer and Thiemann, 1987) and was estimated as follows :

Problem Sensitivity

$$CES = \frac{\text{Effect of interest}}{\text{Obs. St. Dev.}} = \frac{1}{2} = 0.50$$

Locus of Attention

$$CES = \frac{\text{Effect of interest}}{\text{Obs. St. Dev.}} = \frac{.10}{.18} = 0.55$$

Pattern of Inquiry

$$CES = \frac{\text{Effect of interest}}{\text{Obs. St. Dev.}} = \frac{.05}{.10} = 0.50$$

As the direction of effects is not pre-specified, two tailed tests are required. Based on specification of the critical effect size (CES), as reported above, the required sample size was assessed by tables prepared by Kraemer and Thiemann (1987). When setting *alpha* to 0.05 and *1-beta* to 0.99, groups of approximately 80 subjects are required in order to test for effects on the three dependent variables simultaneously. By letting each subject serve in two experimental groups, a total sample of approximately 200 subjects is required. The assignment of subjects to two experimental groups serves at the same time the purpose of controlling for differences between subjects which may represent threats to the statistical conclusion validity of results, cf. section 4.5.

Since there would be considerable obstacles to and efforts involved in attracting a total of 200 managers to participate in the study, a substitute sample of 200 undergraduate students in Business Administration at the Norwegian School of Economics and Business Administration was selected. The subjects had undertaken an average of three years of training in business administration at the time of the experiment. The age of subjects ranged between 20 and 33 years, with a mean of 23 years. Subjects had an average of 16,3 months of work experience. Of the 200 subjects 74 were women. One of the major advantages of the student sample, besides availability, is the *homogeneity of subjects*, which reduces threats associated with random heterogeneity of subjects (Cook and Campbell, 1979). As to obtain an indication of the external validity of results, however, the study was replicated with a sample of 29 executives attending a management development problem (cf., section 6.2.4).

4.5 TREATMENTS

The treatments developed attempt to *impose* specific metaphorical problem conceptions as frames of inquiry or observational goals in problem finding. Treatments were developed as task instructions which simultaneously imposed different problem conceptions and triggered problem finding. Subjects were told to assume the role of the new managerial advisor of the firm depicted in the case material and to prepare for the first meeting with its management by making explicit accounts of - dependent on the specific task instruction - important discrepancies, difficulties, decisions, questions, or opportunities.

The task instructions represent triggers to *directed search* for problems. This mode of problem finding was chosen for investigation, as it represents an explicit activity which is easily triggered by instructions. In order to investigate automatic scanning, in contrast, which represents an integrated, non-explicit activity with no conscious awareness, a different and non-directive methodological approach would be required. This would also be associated with a series of intractable methodological problems, which are not present when investigating directed search.

Table 4.1 gives an overview of the task instruction developed for each of the five problem conceptions.

Table 4.1 **Overview of Task Instructions**

<i>Problem Conception</i>	<i>Task Instruction</i>
<i>Discrepancy</i>	<i>Give an account of important discrepancies between the actual situation and the preferred situation of the firm, from your point of view.</i>
<i>Difficulty</i>	<i>Give an account of important difficulties facing the firm now and in the future, from your point of view.</i>
<i>Decision</i>	<i>Give an account of important decisions the management of the firm now faces with respect to its present and future business, from your point of view.</i>
<i>Question</i>	<i>Give an account of important questions which should be raised concerning the firm's present and future situation, from your point of view.</i>
<i>Opportunity</i>	<i>Give an account of important opportunities for the future business of the firm, from your point of view.</i>

As illustrated, the task instructions do not include the term *problem*. This approach is chosen in order to avoid any possible interference with what may be subjects' own conceptions of problems - if any. Thus, treatments are developed to impose specific conceptions of problems in a rigid and constricted manner, and by presenting the metaphorical label associated with each of the problem conceptions.

By letting each subject serve in two experimental groups, a between-subjects design is combined with a within-subject design. This approach reduces potential threats to statistical conclusion validity due to differences between subjects and serves the purpose of controlling for manipulation success (cf., section 5.2).

Based on a sample size of 200 subjects presented with two out of five possible treatments, the size of treatment groups averaged 80 subjects.

$$n_j = \frac{(n)(j)}{(J)} = \frac{(200)(2)}{(5)} = 80$$

- n_j - Average size of treatment groups
- n - total sample size
- j - number of treatments assigned per subject
- J - number of treatment groups

4.6 PROCEDURES

The experimental material presented to subjects was composed of the following elements:

- a) introduction text and task instructions (one and two)
- b) case description (stimulus situation), four pages
- c) response sheet for task instruction one
- d) response sheet for task instruction two
- e) background information form (to specify covariates sex, age and number of months work-experience)

The experimental material was assigned in a class setting after prior coordination with the professor in charge. Subjects were given general instructions about how to participate and asked not to discuss the material or in any other way cooperate during the experiment. Subjects were also informed that the material each subject received would be different, either in the case material presented or in the tasks required to be performed.

As each subject served in two treatment groups, there were a total of ten possible combinations of treatments.

$$J_j = \frac{J!}{j!(J-j)!} = \frac{5!}{2!(5-2)!} = 10$$

- J_j - number of possible combinations of treatments
- j - number of treatments assigned per subject
- J - number of treatment groups

All possible combinations of treatments were employed. After rotating the order in which treatments were presented over alternative stimulus situations, the total number of *experimental sets* totalled 40. Each experimental set represents one of the (20) possible combinations of treatments in combination with one of the two alternative stimulus situations.

$$J_{js} = \frac{J! (j) (s)}{j! (J - j)!} = \frac{5! (2) (2)}{2! (5-2)!} = 40$$

- J_{js} - number of experimental sets
 j - number of treatments assigned per subject
 J - number of treatment groups
 s - number of stimulus situations

The experimental material was distributed randomly after prior systematic shuffling of the different experimental sets in order to avoid giving subjects sitting close to each other similar material. This resulted in an even distribution of stimulus situations and task instruction combinations across sexes. Obtained treatment groups vary in size between 77 and 82 subjects. The experiment was completed during a 45 minutes class session.

4.7 DEVELOPMENT OF MEASURES

The dependent variables of interest are the three dimensions of problem finding to which the research questions refer: (1) problem sensitivity; (2) the locus of attention; and (3) the pattern of inquiry.

4.7.1 PROBLEM SENSITIVITY

Problem sensitivity was operationally defined as *the number of problem statements* generated by subjects. Problem statements represent one class of observable manifestations of problem finding, and have been employed as

measures of problem sensitivity by, among others, Boland and Greenberg (1988), Herden and Lyles (1981), and Walsh (1988).

The accounts produced by subjects comprise one or several problem statements. With very few exceptions, subjects produced orderly accounts in which each problem statement was easily discerned, e.g. by numbering. Most problem statements were composed of one or two sentences.

Two examples of problem statements based on the discrepancy treatment are :

"Sales have not been as high as expected";

"Turnover has increased, but net profits are reduced - hence, costs have increased."

In order to perform comparisons between groups, the *average number of problem statements* represent the employed measure of problem sensitivity.

4.7.2. LOCUS OF ATTENTION AND PATTERN OF INQUIRY

The dependent variables termed locus of attention and pattern of inquiry reflect two levels of the selectivity of attention. The locus of attention in problem finding represents an aggregated level which reflects the allocation of attention between the external and internal environment. Hence, the locus of attention in problem finding was operationally defined as the degree to which attention was directed toward the external environment as opposed to internal, functional activities. The pattern of inquiry in problem finding, in contrast, represents a lower level which refers to the allocation of attention to different domains. Here, a series of measures are called for, each reflecting the degree to which a specific domain of inquiry is attended

to. When investigating the pattern of inquiry, we have chosen to focus on the allocation of attention to different internal, functional domains.

As a basis for measurement, a classification structure was developed including a total of 19 external and internal domains of inquiry relevant to managerial problem finding and the context depicted in the case material (cf., Table 4.2). Six domains represent the macro environment, four domains represent the micro environment, whereas nine domains represent internal functional activities of the firm. The classification framework is based on Porter's (1985) overview of primary and support activities related to the value chain of the firm (internal domains), and the external domains included in an industry analysis (external domains). The classification also encompasses the major domains included in Dearborn and Simon's (1958) and Walsh's (1988) investigations, and Cowan's (1990) classification structure of organizational problems.

The accounts given by subjects were content analyzed, and constructs were extracted and classified according to the domain to which they best referred. This approach was chosen as it gives a nuanced measure of the allocation of attention in problem finding in comparison with direct classification of single problem statements. Single problem statements tended to include constructs with reference to more than one domain of inquiry, hence their classification appeared highly ambiguous.

Based on the developed classification structure, the locus of attention in problem finding was measured in terms of the proportion of constructs classified to the external (domain groups one and two) and internal domains (group three), respectively. The pattern of inquiry, in turn, was measured in terms of the proportion of constructs allocated to different internal domains.

Table 4.2 gives an overview of the domains employed in the classification. The classification form employed and examples of codings are reproduced in Appendices A and B.

Table 4.2. Classification Structure : Internal and External Domains of Inquiry

Group I : Macro environment

Demographic factors
Economic factors
Physical factors
Technical factors
Cultural factors
Political factors

Group II : Micro environment

Legislation
Market
Competition
Supply

Group III : Internal Functions

Human Resource Management
Organization
Strategy
Finance
Technology Development
Inbound Logistics
Production & Productline
Outbound Logistics
Marketing & Sales

4.8 TEST OF INTER RATER RELIABILITY

Due to the extensive amount of coding involved, test of inter-rater reliability was limited to a random sample of 10% of the total sample (20 subjects). The sample comprised approximately 160 problem statements and 280 constructs for classification. The co-rater was a female, post-graduate student and research assistant at the Norwegian School of Economics and Business Administration.

Test of inter-rater reliability was performed by estimating the frequency of identical ratings and by correlation analysis (Pearson Correlation Coefficient) between ratings. Conventional analysis of inter-rater reliability by the estimation of the coefficient *kappa* (Cohen, 1960) was considered inappropriate due to the classification procedures involved, in which the number of items eligible for categorization vary over observations and between raters.

With respect to the number of problem statements recorded, 92.14% of ratings were found identical. The majority of the remaining ratings differed with one unit. When comparing the classification of constructs to different domains of inquiry, 77.64% of ratings were found identical. The correlation between direct ratings across the 19 domains employed in the classification is estimated at .7726, whereas the correlation between the proportions of constructs allocated to different domains average approximately .89.

Although higher inter-rater agreement would have been preferred, the observed discrepancies between ratings may be explained in terms of the variability in the number of items (constructs) categorized (among subjects as well as between raters), as well as by the high number of possible categories (domains) to which a given construct might be categorized. Taking these aspects into account, the observed inter-rater agreement may be considered satisfactory.

5 ANALYSIS AND RESULTS

5.1 INTRODUCTION

The present chapter presents the procedures employed for analyzing data and the obtained results. First, analyses are performed in order to determine: (1) whether manipulations were successfully implemented, i.e. whether different treatments in fact produced significant differences in response, and (2) whether there were interaction effects between treatments beyond the separate effects of treatments. In subsequent sections, data are analyzed to explore the formulated research questions.

5.2 TEST OF MANIPULATION SUCCESS

In order to evaluate the success of manipulation, we need to test the statistical null-hypothesis that the population group means of the dependent variables are equal. In the present design, several quantitative (interval) variables are assumed dependent on one qualitative (categorical) variable, for which analysis of variance is eligible. Analysis of variance requires certain assumptions to be satisfied: (1) normal distribution of observations for the dependent variables, (2) homogeneity of variance across treatment groups, and (3) independence of error associated with any pair of observations.

The assumption of normality was tested by estimating the mean, standard deviation, kurtosis and skewness of distributions, as well as by the Kolmogorov-Smirnov Goodness of Fit Test (K-S). Results indicate only moderate departures from normality, which has been shown not to affect the statistically robust F-test in the analysis of variance (Cohen, 1969; Iversen and Norpoth, 1987; Scheffé, 1959).

Tests of homogeneity of variance (Cochran's C and the Bartlett-Box F) indicate that this assumption is satisfied ($p < .03$) for all dependent variables.

Results demonstrate significant differences between groups with respect to the dependent variables: (1) problem sensitivity, measured in terms of the number of problem statements ($F=10.145$, $Df.=4$, $p<.001$); (2) the locus of attention, measured in terms of the proportion of constructs classified to internal, functional domains ($F=12.451$, $Df.=4$, $p<.001$), and (3) the pattern of inquiry, measured in terms of the proportion of constructs allocated to different functional areas. Significant differences were identified with respect to the following domains : Organization ($F=11.496$, $Df.=4$, $p<.001$), Strategy ($F=10.144$, $Df.=4$, $p<.001$), Finance ($F=17.017$, $Df.=4$, $p<.001$), Technology Development ($F=4.373$, $Df.=4$, $p<.037$), and Production & Productline ($F=3.104$, $Df.=4$, $p<.032$). The presence of a series of significant differences between groups indicates that manipulations were successfully implemented.

5.3 TEST OF INTERACTION EFFECTS

Since each subject was assigned to two treatments simultaneously, we need to test for the effects over and beyond the separate effects of treatments (Iversen and Norpoth, 1987). Tests were performed by the ANOVA procedure employing a multi-variate data setup in which each case represented a given subject's response to each of the treatments. No interaction effects between the two treatments were detected with respect to any of the dependent variables at the 0.05 level of confidence. The absence of observed interaction effects indicate that subjects differentiated between treatments, and that the imposition of simultaneous treatments did not interfere with the response to separate treatments.

5.4 PROCEDURES AND RESULTS

In order to explore the research questions, we need to compare the group means of the dependent variables. Tests at the aggregated level (cf., previous section) indicate the presence of significant differences between groups. In order to explore the indicated differences, multiple comparisons between means is performed employing the Scheffé procedure (cf., Scheffé, 1959). Scheffé's test includes the F-test, and is a conservative procedure which allows for complicated comparisons. A multiple comparison procedure is chosen as we wish to detect differences *between* specific groups, rather than comparing group means to the grand mean. The advantage of multiple comparison procedures over traditional t-tests relates to an increase in the critical value k , indicating the probability of error in rejecting the statistical null-hypothesis associated with each of the pair-wise comparisons (cf., Iversen and Norpoth, 1987).

As moderate departures from normality in the observations were detected, results from the analysis of variance are verified by the nonparametric Chi-Square statistic (χ^2), which makes minimal assumptions about the underlying distributions. The primary requirement associated with the Chi-Square test is that there are at least five theoretical frequencies (observations) in each cell (cf., Cohen, 1969). This assumption is satisfied as the total number of observations for dependent variables is high. Two tailed tests for differences between means are employed, as the direction of possible effects is not pre-specified.

Results concerning each of the three dimensions of problem finding are reproduced in the following.

5.4.1 PROBLEM SENSITIVITY

Table 5.1 reports the mean number of problem statements over groups. Standard deviations are given in parentheses.

Table 5.1 Problem Sensitivity based on Alternative Problem Conceptions*

PROBLEM CONCEPTION	MEAN (ST.DEV.)	N
Discrepancy	3.6543 (1.558)	81
Difficulty	4.0649 (1.664)	77
Decision	4.6835 ^{(a)(e)} (1.971)	79
Question	5.0732 ^{(a)(b)(e)} (2.047)	82
Opportunity	3.7407 (1.358)	81

Total	4.2450 (1.817)	400

* $F = 10.145$, $Df. = 4$, $p < .001$

(a) Denotes that the group is found significantly different ($p < .05$) from the Discrepancy group (Scheffé's test)

(b) Denotes that the group is found significantly different ($p < .05$) from the Difficulty group (Scheffé's test)

(e) Denotes that the group is found significantly different ($p < .05$) from the Opportunity group (Scheffé's test)

The table shows that subjects produced an average of 4.24 problem statements. The question conception resulted in the highest overall problem sensitivity (mean 5.0732) of all groups, whereas the discrepancy conception resulted in the overall lowest problem sensitivity (mean 3.6543).

Results highlight that the conceptions of problems as decisions and questions resulted in higher problem sensitivity than the other problem conceptions. The Decision group produced a significantly higher number of problem statements than the Discrepancy, Difficulty, and Opportunity groups, whereas the Questions group produced a significantly higher number of problem statements than the Discrepancy and Difficulty groups.

Estimates of statistical association (cf., Hays, 1973) indicate that approximately 9.32% of the total variance is accounted for by different problem conceptions. Observed differences exceed or approximate the specified effect of interest with respect to all pairs of groups - except when comparing the decision and difficulty groups.

In summary, results indicate that the conceptions of problems employed significantly affect problem sensitivity.

5.4.2 LOCUS OF ATTENTION

The locus of attention in problem finding may be inspected by observing the aggregated proportion of constructs allocated to internal domains of inquiry. Table 5.2 reports the group means. Standard deviations are given in parentheses.

Table 5.2 The degree of Internal Locus of Attention based on Alternative Problem Conceptions*

PROBLEM CONCEPTION	MEAN (ST.DEV.)	N
Discrepancy	.7831 (.201)	81
Difficulty	.7560 (.200)	77
Decision	.9152 ^{(a)(b)(e)} (.108)	79
Question	.8723 ^{(a)(b)} (.119)	82
Opportunity	.8085 (.171)	81

Total	.8274 (.174)	400

* F = 12.451, Df. = 4, p < .001

(a) Denotes that the group is found significantly different (p<.05) from the Discrepancy group (Scheffé's test)

(b) Denotes that the group is found significantly different (p<.05) from the Difficulty group (Scheffé's test)

(e) Denotes that the group is found significantly different (p<.05) from the Opportunity group (Scheffé's test)

The table demonstrates that an average of 82.7% of constructs were classified to various internal functions, and that the locus of attention is internal, rather than external, for all groups. When examining the data, however, it appears that the *inclination* to attend functional areas is the highest based on the conceptions of problems as questions and decisions. Significant differences are detected between the Decision group and the Discrepancy, Difficulty, and Opportunity groups, respectively, and between the Question group and the Discrepancy and Difficulty groups, respectively.

Estimates of statistical association indicate that approximately 11% of the total variance is accounted for by different problem conceptions. Observed differences exceed the specified effect of interest with respect to the groups found significantly different - except when comparing the Question group with the Discrepancy group.

In summary, obtained results suggest that different conceptions of problems significantly affect to locus of attention in problem finding.

5.4.3 PATTERN OF INQUIRY

The analysis of data reveals significant differences between groups with respect to five internal domains of inquiry: Organization, Strategy, Finance, Technology Development, and Production & Productline. Table 5.3 reports observed means (proportion of constructs) for these domains, standard deviations, and the significance of findings. (Complete response profiles for each group are reproduced in Appendix D.)

Table 5.3 **The Pattern of Inquiry based on
Alternative Problem Conceptions**

PROBLEM CONCEPTION	ORGANI -ZATION*	STRATEGY**	N
Discrepancy	.0750 (.150)	.0712 (.130)	81
Difficulty	.1097 (.128)	.0726 (.116)	77
Decision	.2110 ^{(a)(b)} (.171)	.1910 ^{(a)(b)(e)} (.194)	79
Question	.1838 ^(a) (.141)	.1392 (.120)	82
Opportunity	.1407 (.127)	.1071 (.120)	81

Total	.1441 (.146)	.1163 (.127)	400

* F = 11.496, Df. = 4, p < .001

** F = 10.144, Df. = 4, p < .001

(a) Denotes that the group is found significantly different (p<.05) from the Discrepancy group (Scheffé's test)

(b) Denotes that the group is found significantly different (p<.05) from the Difficulty group (Scheffé's test)

(e) Denotes that the group is found significantly different (p<.05) from the Opportunity group (Scheffé's test)

Table 5.3 (cont.)

PROBLEM CONCEPTION	TECHNOL. DEV.*	PRODUCTION & PROD.LINE**	N
Discrepancy	.0239 (.071)	.0534 (.105)	81
Difficulty	.0175 (.044)	.0363 (.080)	77
Decision	.0221 (.057)	.0665 (.131)	79
Question	.0283 (.061)	.0546 (.074)	82
Opportunity	.0579 ^(b) (.097)	.0908 ^(b) (.108)	81

Total	.0301 (.070)	.0605 (.103)	400

* $F = 4.373$, Df. = 4, $p < .037$

** $F = 3.104$, Df. = 4, $p < .032$

^(b) Denotes that the group is found significantly different ($p < .05$) from the Difficulty group (Scheffé's test)

Table 5.3 (cont.)

PROBLEM CONCEPTION	FINANCE*	N
Discrepancy	.2765 ^{(c)(d)(e)} (.193)	81
Difficulty	.2046 ^(e) (.165)	77
Decision	.1603 (.173)	79
Question	.1372 (.122)	82
Opportunity	.0872 (.111)	81
Total	.1728 (.168)	400

* F = 17.017, Df. = 4, p < .001

(c) Denotes that the group is found significantly different (p < .05) from the Decision group (Scheffé's test)

(d) Denotes that the group is found significantly different (p < .05) from the Question group (Scheffé's test)

(e) Denotes that the group is found significantly different (p < .05) from the Opportunity group (Scheffé's test)

Table 5.3 highlights a series of significant differences between groups.

First, results indicate that the domains Organization and Strategy were attended the most based on the decision and question conceptions of problems. Estimates suggest that approximately 10.5% of the variance in the attention directed toward the domain Organization, and 9.3% of the variance in the attention directed toward the domain Strategy is explained by different problem conceptions.

Secondly, results suggest that the two domains Technology Development and Production & Productline were attended the most by the subjects who were presented with the opportunity conception of problems. Estimates of statistical association indicate that approximately 5% of the variance in attention directed toward Technology Development, and 3% of the variance in the attention directed toward Production & Productline is accounted for by different problem conceptions.

Thirdly, results highlight that the conception of problems as discrepancies and difficulties resulted in the highest inquiry into the Finance domain. Here, estimates indicate that approximately 14.7% of the variance is accounted for by different problem conceptions.

In summary, results suggest that the conception of problems employed in problem finding significantly affects the pattern of inquiry.

5.5 SUMMARY AND CONCLUSIONS

Results from the analyses, employing the Scheffé procedure and the Chi-Square statistic, provide indications of the impact of different problem conceptions at a high level of confidence. Results suggest that different conception of problems significantly affect the three dimensions of problem

finding investigated; problem sensitivity, the locus of attention, and the pattern of inquiry.

The results also reveal certain patterns in the direction of effects indicating underlying similarities and differences between alternative problem conceptions. First, it appears that the conceptions of problems as decisions and questions assemble one group or cluster. Subjects presented with any of these two problem conceptions, exhibited higher problem sensitivity and a stronger internal locus of attention than subjects presented with any of the other conceptions of problems. This group of subjects also directed their problem finding efforts more toward the domains Organization and Strategy in comparison with the other groups.

The discrepancy and difficulty conceptions of problems appear to form a second cluster. Subjects presented with any of these two conceptions of problems, exhibited comparatively low problem sensitivity, and an inclination toward higher external locus of attention. This group of subjects also attended the domain Finance to a higher extent than did the other groups.

Based on the conception of problems as opportunities, in turn, a different pattern is observed. The group of subjects presented with the opportunity conception exhibited comparatively low problem sensitivity, in combination with a relatively "balanced" locus of attention. With respect to the domain Finance, the inquiry is the lowest of all groups, whereas with respect to the domains Organization and Strategy, a comparatively average degree of inquiry is observed. Based on the opportunity conception, however, subjects inquired more into the domains Technology Development and Production & Productline than did any of the other groups.

Hence, it appears that the five conceptions of problems form three clusters in terms of their impact on the three dimensions of problem finding investigated. Table 5.4 gives a simplified illustration of the three clusters.

Table 5.4 Comparison of Problem Conceptions*

PROBLEM CONCEPT.	PROBLEM SENSITIVITY	LOCUS OF ATTENTION	INCREASED FOCUS ON
Discrepancy Difficulty	Low	External	Finance

Decision Question	High	Internal	Organization Strategy

Opportunity	Low	Balanced	Technology Development Production & Productline

* Problem Sensitivity and Locus of Attention are indicated in terms of comparative measures. The Domains Focused denotes the domains for which the problem conception produced a significant increase in attention.

6 DISCUSSION

6.1 INTRODUCTION

The findings suggest at a high level of confidence that the conception of problems employed affects problem finding along the three dimensions: problem sensitivity, locus of attention, and pattern of inquiry. Before discussing the findings, however, we will consider the validity of the present research along four dimensions: (1) *statistical conclusion validity*; (2) *internal validity*; (3) *construct validity of putative causes and effects*; and (4) *external validity*. The four dimensions of validity are closely interrelated. However, in the present research which is explorative in orientation and primarily directed toward inductive theory generation, statistical conclusion validity, internal validity, and construct validity are of higher importance than external validity (Carmines and Zeller, 1979; Cook and Campbell, 1979). After considering these critical dimensions of validity, we will return to discuss possible interpretations and implications of findings, as well as propose questions for further research.

6.2 VALIDITY

6.2.1 STATISTICAL CONCLUSION VALIDITY

Statistical conclusion validity refers to the approximate validity of results based on the sensitivity and statistical power of the performed analyses. Thus, it refers to whether it is reasonable to assume covariation between variables given a specified level of confidence and obtained variance between groups (Cook and Campbell, 1979). Two aspects are central in this respect: (1) whether variables (presumed causes and effects) covary, and (2) how strongly they covary.

Results lend empirical support to covariation between presumed causes and effects at a high level of confidence ($\alpha < .05$), and the procedure employed for multiple comparisons between groups, the Scheffé procedure, is conservative in comparison with other eligible techniques (cf., Scheffé, 1959).

The *strength* of covariation is determined by estimates of statistical association, which reflects the proportion of variance accounted for by the independent variable (Cohen, 1969; Hays, 1973). Results indicate that approximately 10-11% of the variance in problem sensitivity and the locus of attention in problem finding is accounted for by different treatments. With respect to the pattern of inquiry in problem finding, estimates indicate that from 3% to 15% of the variance is accounted for by treatments. In light of the complexity and subtlety of the phenomena here undertaken for investigation, and the explorative stage in which the present research is positioned, the indicated statistical association reflects the presence of effects at a considerable level of magnitude (cf., Cohen, 1969). The obtained effect sizes furthermore indicate that the power of the performed F-tests (reflecting the probability of rejecting the null hypotheses when in fact it should be rejected) meet the specified target level of 0.99.

In summary, procedures and estimates indicate that the statistical conclusion validity of results is high, and that covariation between the independent and dependent variables may be established.

6.2.2 INTERNAL VALIDITY

Although we have established that independent and dependent variables covary, it remains to be determined whether we can infer that the observed relationships are causal. Internal validity refers to the approximate validity with which we can infer *causal relationships* between variables irrespective of the constructs they are presumed to theoretically represent (Cook and Campbell, 1979). In addition to observed covariance, the presumed cause

needs to precede the assumed effects in time. In the present, experimental design, treatments were introduced as task instructions *prior* to the generation of responses. Hence, the direction of possible causal relationships is established.

Nevertheless, a number of design-related threats to internal validity may be identified. Random assignment of treatments as performed in the present study, rules out a number of these; e.g. threats due to selection and maturation. All subjects experienced the same testing conditions and research instruments, which, in turn, reduces threats due to variations in testing and instruments. Furthermore, as the employed design did not involve classical pre- and post-tests, threats related to history, learning, and differential mortality between groups may be ruled out. As a result, no major threats to the internal validity of results are detected.

6.2.3 CONSTRUCT VALIDITY OF PUTATIVE CAUSES AND EFFECTS

The construct validity of putative causes and effects refers to the approximate validity with which we can generalize from the employed research operations to the higher-order constructs of interest, i.e. to the fit between cause and effect operations and their referent constructs (Cook and Campbell, 1979). Following the advice of Cook and Campbell, efforts were made at achieving high construct validity by: (1) pre-experimental examination and differentiation of constructs in order to arrive at clear definitions which were in conformity with the literature; (2) estimating the success of treatment implementation, reflecting the degree to which the independent variable was manipulated; and (3) careful attempts to develop independent and dependent variables which measured the factors intended.

Despite these efforts, however, several threats may be identified. The first relates to *mono-operation* of independent and dependent variables. The present study employs only one type of operations (treatments) to induce different problem conceptions (the independent variable). Higher construct validity might have been achieved by multiple sets of operations of the independent variable, i.e. by alternative treatments based on each of the five instances of the dependent variable (problem conceptions). Multiple sets of treatments would, however, require dramatic increases in the sample size in order to sustain the level of significance specified.

With respect to the actual operations employed, it may be objected that these refer to presumed different, and independent phenomena, i.e. discrepancies, difficulties, decisions, opportunities, and questions, respectively. As a result, one may argue, the observed differences in response are plausible and inevitable. Similar to problems, however, these phenomena are abstract, perceptual constructs, rather than objective entities in their own right. Discrepancies, difficulties, decisions, opportunities, and questions are also labels we assign to situations, and fuzzy categories of events and situations as we perceive them. Hence, the employed operations are not as rigorous as they may seem. Furthermore, there is no theory to date which systematically explains or predicts differences in the selectivity of attention based on either of these. Yet, a more indirect way of imposing problem conceptions might have been employed. Boland and Greenberg (1988) attempt to induce a metaphorical framework through presenting subjects with a firm's imagined framework of analysis and philosophy. A similar procedure is feasible with respect to inducing different problem conceptions.

Multiple operations were employed, however, with respect to the *stimulus situation* (case material) presented to subjects as basis for problem finding. The stimulus situation reflects the environmental determinant of problem finding, and the alternation between two stimulus situations serves the purpose of controlling for consistency of effects over situations.

Another limitation of the employed operations is that they aim at only *one generic mode of problem finding*; directed search as opposed to automatic scanning for problems. In this generic mode, however, problem finding is not differentiated according to the three modes proposed previously: problem recognition, discovery, and creation. In contrast, the design involves presenting subjects with a stimulus situation in which multiple cues with varying degree of strength and ambiguity are imbedded. This approach is chosen in order to simulate a realistic and complex environment of problem finding, in which different modes of problem finding are likely to occur.

Another threat to the construct validity of causes and effects is the one of *mono-method bias*. The present research utilizes standardized presentations of manipulations and standardized means of recording responses across measures, which may represent irrelevancies whose influence is hard to dissociate from the influence of the independent variable (cf., Cook and Campbell, 1979). In particular, the present investigation involved written representations of the stimulus situation and treatments. Written representation of the stimulus situation may be conceptualized as an indirect medium of problem finding, as opposed to direct perception, which might lead to different results. Written information constitutes, however, a major medium of communication in organizations, and it has been argued that executives discover and interpret problems by information provided by others rather than through direct perception (Cowan, 1990).

A third plausible threat is the one of *interaction between treatments*. This threat is ruled out, however, as systematic, statistical analyses detect no interaction effects between treatments of any magnitude.

6.2.4 EXTERNAL VALIDITY

External validity refers to the degree to which we can *generalize* inferred relationships to and across different persons, settings, and times (Cook and Campbell, 1979). Three issues are of special importance to the degree to which findings are generalizable; (1) the specific content area addressed; (2) the sample of subjects employed; and (3) the level of findings considered.

The present investigation focuses on a specific *content area*; managerial problem finding. The content area addressed is further limited by the case material employed, in which private enterprises were depicted. Across to stimulus situations within this content area, however, different problem conceptions have been found to affect the three dimensions of problem finding investigated; the problem sensitivity, the locus of attention, and the pattern of inquiry. The present investigation provides strong indications of *the presence of effects* at a high level of confidence. Yet, when considering the *specific directions of effects* in the pattern of inquiry across domains, these refer specifically to the content area focused here, and cannot be generalized directly to other areas of content. Hence, the findings need be verified by further replications across different areas of content in which managerial problem finding may occur.

The choice of a homogeneous group of subjects also affects the external validity of findings, and the degree to which the findings may be generalized to the population of actual managers is of importance here. In order to obtain an indication, the experiment was replicated with a group of 29 executives who attended an executive development program (The Solstrand Program at the Center for Administrative Research, Bergen). The executives represented a variety of businesses, as well as public institutions, and state owned industries. They were between 33 and 57 years old, and had an average of 19 years of work experience. Results from the replication with the sample of executives are reproduced in Appendix C. Due to the insufficient sample size, however, no significant differences between groups can be established at a high level of confidence.

When considering *problem sensitivity* (cf., Table C.1), the results correspond to the previous findings in that the highest problem sensitivity resulted from the question conception of problems (mean 5.7500 problem statements), whereas the discrepancy and opportunity conceptions produced the lowest problem sensitivity (mean 4.4286 problem statements). However, the executives exhibited equally strong problem sensitivity based on the difficulty and decision problem conceptions. This similarity between findings is encouraging, yet the observed differences are smaller than in the primary sample.

Interestingly, however, results indicate that the executives exhibited higher problem sensitivity than the student subjects. The average executive stated 4.9 problems, in comparison to 4.2 problems by the average student subject. This may indicate that problem sensitivity is affected by *experience*.

When considering *the locus of attention* (cf., Table C.2), findings indicate that the conceptions of problems as decisions, questions, and opportunities resulted in a higher internal locus of attention than did the conceptions of problems as discrepancies and difficulties. The patterns of influence observed appear to approximate the primary sample, but observed differences are small. Yet, at the 0.10 level of confidence, significant differences are detected between the difficulty group and the question, decision, and opportunity group, respectively. Another interesting finding here, is the indication that the executives exhibited a stronger internal locus of attention than did the student subjects.

The *pattern of inquiry* in problem finding is reported with respect to the internal domains for which significant differences were detected in the primary sample (cf., Table C.3). The findings indicate that different conception of problems affects the degree to which these domains are attended. Although the findings do not entirely correspond with respect to differences between groups, many important similarities are revealed. First, results indicate that the discrepancy and difficulty conceptions resulted in the lowest inquiry into the domains Organization and Strategy.

Secondly, results suggest that the opportunity conception of problems resulted in the highest inquiry into the domains Technology Development and Production & Productline. Thirdly, results indicate that the conceptions of problems as discrepancies and difficulties produce the highest inquiry into the domain Finance.

In summary, findings from the replication with executives indicate that the results obtained with student subjects may be generalized to executives. The replication strongly suggests *the presence of differences*, as well as important *similarities in effects*. The need for increased confidence in generalization, however, calls for further replications across a larger sample of executives. The ultimate way in which the external validity of the results may be established, is by *multiple replications* across persons and stimulus situations. In the present research, replications were performed at the individual level by combining a between-subjects design with a within-subject design. Replications should also be performed across studies, to overcome limitations associated with mono-operation and mono-method biases.

6.3 FINDINGS AND THEIR INTERPRETATION

The present study investigated the impact of different conceptions of problems on managerial problem finding. Problem finding was defined as the processes by which we become aware of problems. Three dimensions of problem finding were proposed: (1) problem-sensitivity, reflecting a quantitative dimension of problem finding; (2) the locus of attention, reflecting the allocation of attention between external and internal domains ; and (3) the pattern of inquiry, reflecting the allocation of attention over different internal domains. Findings indicate that different conceptions of problems produce significant differences in problem finding along the three dimensions of problems finding investigated. As pointed out previously,

however, there is no solid theoretical or empirical basis for proposing reliable explanations to the observed differences. Yet, we may speculate around possible explanation and underlying dynamics.

First, the three clusters of problem conceptions formed differ with respect to their *inherent connotation*. The discrepancy-difficulty cluster has a negative connotation, the decision-question cluster has a neutral connotation, whereas the opportunity conception has a positive connotation. Based on this notion, the comparatively low problem sensitivity based on the discrepancy and difficulty conceptions appears to be in correspondence with crisis denial theory and threat rigidity theory (e.g., Starbuck, Greve, and Hedberg, 1978; Staw, Sandelands, and Dutton, 1981); which predicts that people tend to downplay or ignore perceived negative elements and events and to exhibit avoidance and denial behavior when faced with such.

Following this line of reasoning, however, one would expect the opportunity conception to result in comparatively high problem sensitivity. Opportunities are typically perceived positive elements or events, based on which we would expect no avoidance nor denial pattern. The findings suggest, nevertheless, that based on the opportunity conception, subjects exhibited comparatively low problem sensitivity.

Considering the decision-question cluster, in turn, findings indicate that the problem sensitivity is comparatively high. This might indicate that the conceptions of problems as decisions or questions are *generative* in Schön's (1979) terms, i.e. that they stimulate broader and more numerous ideas about problems (cf., Boland and Greenberg, 1988). In comparison with the other problem conceptions, which have a positive or negative connotation, the "neutral" problem conceptions appear to stimulate "less selective" problem finding. This might reflect that both positive and negative elements are attended to.

When considering the locus of attention in problem finding, in turn, all groups exhibit a strong internal locus of attention. Based on the crisis denial theory, however, one would expect a higher inclination to an internal rather than external locus of attention based on the problem conceptions with a negative connotation. Based on the discrepancy or difficulty conception, nevertheless, subjects exhibited an increased tendency to attend the external environment. This finding is intriguing. Yet, when taking attribution theory into account (cf., Kelly, 1967; Heider, 1958), the observed tendency may be explained in terms of an inclination to attribute perceived negative elements and events to the environment and to external conditions, rather than to own behavior and actions.

Based on the decision and question conceptions of problems, in contrast, a higher inclination toward an internal locus of attention is observed. The internal environment is generally more controllable and offers more means of solution under the control of the decision maker than the external environment. Hence, this findings might imply that subjects presented with the decision conception focus on the areas in which they may best exercise control by decision making. This assumption is in correspondence with the inherent solution orientation of the decision conception. Following this line of reasoning in terms of the question conception, results suggest that subjects tend to ask questions concerning possible actions, i.e. exhibit solution orientation, rather than about the nature of problems. Further inspection of the data offers support to this assumption.

Based on the opportunity conception, in turn, the locus of attention is comparatively "balanced". Hence, subjects searched for opportunities in the environment as well as within the organization, however focusing on the internal domains. This strongly implies that opportunities are viewed as created as well as imbedded in the environment.

Finally, when considering the pattern of inquiry in problem finding, it should be stressed that although subjects tended to demonstrate increased inquiry into specific domains based on different problem conceptions,

subjects did not overlook other domains (cf., complete response profiles reproduced in Appendix D). Of primary interest here, however, are the differences revealed. The observed increase in inquiry into the domain Finance based on the discrepancy and difficulty conceptions might imply that discrepancies and difficulties are particularly *salient* within this domain (cf., Kiesler and Sproull, 1982). Finance represents a domain in which models for comparison are readily available through quantitative, numeric information, e.g. historical models, planning models, and extra-organizational models (cf., Pounds, 1969). In the domain Finance, there might also be little ambiguity concerning the interpretation of elements as problematic. Discrepancies of importance to the firm's performance are easily identified in terms of financial data, yet there may be considerable difficulty associated with their diagnosis and solution.

The observed increase in attention directed towards the domains Organization and Strategy based on the decision and question conceptions, however, are puzzling and most demanding to interpret. Considering the opportunity conception, in contrast, based on which the domains Technology Development and Production & Productline attract comparatively high attention, findings appear more readily interpreted. The two domains mirror the uniqueness and potential of the firm; they reflect the primary, product related activities of the firm, and hence, the presumed legitimacy of the firm's existence and its competitive advantages. Uniqueness and novelty have been observed to represent central, perceptual characteristics of opportunities (Jackson and Dutton, 1988).

In summary, many of the findings are hard to interpret. Hence, we have attempted to speculate around possible interpretations, rather than to propose definite explanations. Further research is called for in order to explore the underlying dynamics accounting for the observed effects.

6.4 POSSIBLE IMPLICATIONS

In most real life contexts, problem finding is not a goal in itself, but must be seen in relation to succeeding problem solving activities, and to the overall problem solving performance of the individual or organization. The activities succeeding problem finding are not included in the present investigation. Yet we will attempt to relate the findings obtained to problem solving performance, and to propose some questions for further investigation.

First, one may question the degree to which *increased problem sensitivity* can be associated with improved overall problem solving performance. Problem sensitivity represents a quantitative dimension of problem finding, and increased problem sensitivity may be conceptualized as enhanced *pro-activity* towards problems (cf., Larson et al., 1986). Clearly, however, overall problem solving performance is not only associated with the quantity of problems found, but with their *quality* in terms of adequacy and relevance.

The issues of problem quantity and adequacy may be approached at several levels of analysis. At the *cognitive level of analysis*, a negative relationship has been observed between problem sensitivity and problem quality (Arlin, 1975-76; Artley et al., 1980). This finding might imply that subjects who exhibit low problem sensitivity better identify problems of high adequacy and relevance, than do subjects who exhibit high problem sensitivity. The measures of problem quality employed, however, are rooted in cognitive theory. At the *individual level of analysis*, problem adequacy can only be reliably assessed by the problem owner. The perceived adequacy of a problem may also be altered over time as a result of new knowledge about developments and outcomes of actions, as well as by the appearance of new problems.

In the *organizational context*, the assessment of a given problem's adequacy may be subject to conflict, and the time perspective on which to evaluate problem solving performance may be ambiguous. Given limited resources, however, it seems reasonable to assume that there will be a point at which the marginal value of a new problem perceived based on a specific situation becomes negative. Stated differently, increased problem sensitivity becomes dysfunctional at the point when the amount of resources required to handle the accumulated body of problems exceed the handling capacity of the organization. Hence, the degree to which increased problem sensitivity improves the overall organizational performance depends on the number, magnitude, and composition of problems already identified and legitimized in the organization. It remains to be explored, however, whether organizations characterized by high performance tend to identify and attend to a few problems of high magnitude, rather than a wide range of problems with varying magnitude.

A recent investigation by D'Aveni and MacMillan (1990) demonstrates that the *locus of attention* in managers may be related to organizational performance. The degree to which the locus of attention required is internal or external, however, is contingent on the situation. As some problem conceptions appear to facilitate an external locus of attention, whereas other facilitate an internal locus of attention, one may infer that in order to enlarge the capability of strategic adaption, managers should deliberately alternate between specific problem conceptions and perspectives.

The *pattern of inquiry* in problem finding, in turn, has been found to affect the range of solutions considered (Boland and Greenberg, 1988), and hence, the possibilities of problem solving success. One may object, however, that different problems require different solutions; for example, a finance problem calls for different solutions than a marketing problem. The validity of this argument, however, depends on the degree to which the locus of attention and the pattern of inquiry in problem finding reflect *selection* rather than *attribution* of problems. Due to the close interrelationship between the different internal and external domains in which a firm

operates, the classification of problems to single domains of inquiry tends to be ambiguous (cf., Cowan, 1990; Porter, 1980,1985). It may thus prove difficult to distinguish between *identifying a sales problem*, on the one hand, and *seeing a problem as a sales problem*, on the other. The ambiguity of this distinction is also associated with the strong interrelation between the processes of selection and interpretation (cf., Neisser, 1976). Nevertheless, when the same set of cues is interpreted as "a sales problem" by one person, as "a product problem" by another, and as "a strategy problem" by a third person, the range of solutions considered plausibly differ. Hence, it seems apparent that "the problem" identified affects the possibilities of problem solving success.

In summary, findings have plausible implications for overall problem solving performance. The specific implications, however, are contingent on the situation involved and call for further systematic investigation. Thus, as the present study has been explorative in orientation, it has generated more questions than answers.

6.5 FUTURE RESEARCH OPPORTUNITIES

A series of important research questions remain to be explored, and continued research directed at developing increased understanding of problem finding in different contexts and at different levels of analysis is called for. First, although the present research focuses on alternative problem conceptions reflected in the literature, it remains to be investigated whether people, in fact, hold different problem conceptions, and which are the most common. The degree to which specific conceptions of problems are stable across situations also needs to be explored. Results obtained from the present investigation suggest that people shift easily between different problem conceptions.

Given that people easily shift between problem conceptions, there is a need to identify factors which favor the choice of specific problem conceptions. We have previously suggested the importance of labelling effects (cf., Dutton and Jackson, 1987). Other plausible factors are scripts, institutional norms, and history.

Secondly, the results reveal certain patterns of influence, which suggest that some of the problem conceptions produce similar effects in problem finding and possible are interrelated. We have proposed that the inherent connotation of problem conceptions may represent one of the factors accounting for the observed similarities and differences, and the possible importance of connotation in metaphor and issue labelling should be subject to further, systematic investigation.

Thirdly, the present investigation should be extended by investigating the relationship between different problem conceptions and problem solving success over time. Of special interest here is the question of whether organizations characterized by high performance tend to employ one or some problem conceptions rather than others.

The level at which problem finding is approached constitutes another important issue. Very few empirical investigations have been conducted of organizational problem finding in "real-life" contexts. Managers' perception of the environment is generally assumed to form the basis for how the organization senses and understands its environment (Bartunek, 1984; Weick, 1979; Weick and Bougon, 1986). Among the important questions calling for conceptual clarification and empirical investigation are: Which are the modes of problem finding managers most typically involve in? Besides managers, who represent important problem finders in the organization? And what is the compository relationship between problem finding at the individual and organizational level of analysis?

Perhaps most importantly, there is a need to address the question of how organizations which perform successfully in conditions of high uncertainty sense problems. This question reflects one of the most promising research opportunities related to problem finding and problem solving performance. What are the processes involved? Do managers learn problem finding skills as they learn other types of skills? In order to investigate these questions one may draw on a variety of literature, including, for example, the literature on *strategic issue analysis* (e.g., Ansoff, 1980; Dutton, 1988; Dutton and Jackson, 1987; El Sawy and Pauchant, 1988; King, 1982), *organizational frames of reference* (e.g., Shrivastava, 1980; Shrivastava and Mitroff, 1983), and (organizational) *belief structures* (e.g. Walsh, 1988; Walsh and Fahey, 1986; Walsh et al., 1988).

6.6 SUMMARY AND CONCLUDING REMARKS

The very first processes of problem solving, the processes by which we become aware of problems, are the least understood (Simon et al., 1987), and the literature on problem finding is scarce. The point of departure for the present study was the identification of five alternative, generic conceptions of problems in the literature: problems as discrepancies, problems as difficulties, problems as decisions, problems as questions, and problems as opportunities for improvement. The explorative, empirical investigation reveals that problem finding is significantly affected by different problem conceptions along three important dimensions: problem sensitivity, the locus of attention, and the pattern of inquiry.

Among the factors which may possibly explain part of the observed effects are: (1) differences in the inherent connotation of problem conceptions; (2) differences among problem conceptions with respect to the degree to which they enhance solution versus problem orientation in problem finding, and (3) general mechanisms and patterns of attribution. Further research is

called for, however, in order to explore the underlying mechanisms accounting for observed effects.

The three dimensions of problem finding investigated have apparent, yet situation contingent, implications for problem solving performance. At a general level, however, findings suggest that multiple and alternating perspectives should be evoked when faced with a potentially problematic situation in order to "optimize" problem sensitivity and the allocation of attention over different domains of inquiry.

Due to the small body of relevant research, however, the present study has been exploratory in orientation, and more questions than answers have been generated. There is a continued and pressing need to address a series of research questions in order to provide a better understanding of the concept *problem* and the very initial and critical phases of the problem solving process. The findings of the present investigation and answers to the questions outlined may help provide a better understanding of the complex processes involved in problem finding at the individual and organizational level, which, in turn, may contribute to a more integrated *theory of problem solving*.

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CLASSIFICATION FORM			
SUBJECT #	CASE #	TREATMENT #	
GROUP / DOMAIN	# CONTRACTS	TOTAL	
I MACRO ENVIRONMENT			
ECONOMIC CONDITIONS			
PHYSICAL CONDITIONS			
TECHNICAL CONDITIONS			
CULTURAL CONDITIONS			
POLITICAL CONDITIONS			
II MICRO ENVIRONMENT			
REGULATIONS			
MARKET			
COMPETITION			
SUPPLY			
III INTERNAL FUNCTIONS			
PERSONNEL & MANAGEMENT			
ORGANIZATION			
STRATEGY			
ECONOMY			
R & D			
PURCHASE			
PRODUCTION/PRODUCT			
DISTRIBUTION			
MARKETING & SALES			
TOTAL # CONTRACTS			
# OF PROBLEM STATEMENTS			

An example of response based on the discrepancies treatment is reproduced below. The constructs elicited for coding are underlined. The classification of constructs is reproduced on the next page.

1. Sales have not been as high as expected.
2. Turnover has increased but net profits are reduced. Hence, costs have increased.
3. The firm has been unable to penetrate the commercial market, which, in turn, may strongly affect sales. Since products are developed for the commercial market, a major discrepancy is the one of not succeeding on this market.

CLASSIFICATION FORM		
SUBJECT # 19	CASE # 2	TREATMENT # 1
GROUP / DOMAIN	# CONTRACTS	TOTAL
I MACRO ENVIRONMENT		0
ECONOMIC CONDITIONS		
PHYSICAL CONDITIONS		
TECHNICAL CONDITIONS		
CULTURAL CONDITIONS		
POLITICAL CONDITIONS		
II MICRO ENVIRONMENT		2
REGULATIONS		
MARKET	2	
COMPETITION		
SUPPLY		
III INTERNAL FUNCTIONS		7
PERSONNEL & MANAGEMENT		
ORGANIZATION		
STRATEGY		
ECONOMY	2	
R & D	1	
PURCHASE		
PRODUCTION/PRODUCT	1	
DISTRIBUTION		
MARKETING & SALES	3	
TOTAL # CONTRACTS		9
# OF PROBLEM STATEMENTS		3

Tables C.1 through C.3 reproduce results from the sample of executives. For comparison with results from the primary sample, see Table 5.1 through 5.3 in Chapter five.

Table C.1 Problem Sensitivity based on Alternative Problem Conceptions

PROBLEM CONCEPTION	MEAN (ST.DEV.)	N
Discrepancy	4.4286 (1.452)	14
Difficulty	4.9000 (2.282)	11
Decision	4.9000 (1.370)	11
Question	5.7500 (1.602)	12
Opportunity	4.7273 (1.009)	10

Total	4.9298 (1.590)	58

mean
(st.dev.)

Table C.2 The degree of Internal Locus of Attention based on Alternative Problem Conceptions

PROBLEM CONCEPTION	MEAN (ST.DEV.)	N
Discrepancy	.8846 (.108)	14
Difficulty	.8175 (.211)	11
Decision	.9641 (.067)	11
Question	.9653 (.067)	12
Opportunity	.9607 (.086)	10

Total	.9185 (.127)	58

mean
(st.dev.)

**Table C.3 The Pattern of Inquiry based on
Alternative Problem Conceptions**

PROBLEM CONCEPTION	ORGANI -ZATION	STRATEGY	N
Discrepancy	.0817 (.130)	.0942 (.111)	14
Difficulty	.0377 (.091)	.1383 (.164)	11
Decision	.1010 (.145)	.2009 (.163)	11
Question	.1644 (.139)	.1628 (.140)	12
Opportunity	.1295 (.118)	.2348 (.136)	10

Total	.1035 (.130)	.1616 (.146)	58

mean
(st.dev.)

Table C.3 (cont.)

PROBLEM CONCEPTION	TECHNOL. DEV.	PRODUCTION N & PROD.LINE	
Discrepancy	.0000 (.000)	.0288 (.583)	14
Difficulty	.0091 (.028)	.0652 (.085)	11
Decision	.0100 (.031)	.1086 (.298)	11
Question	.0119 (.041)	.0905 (.167)	12
Opportunity	.0253 (.057)	.1086 (.104)	10
Total	.0107 (.035)	.0776 (.161)	58

mean
(st.dev.)

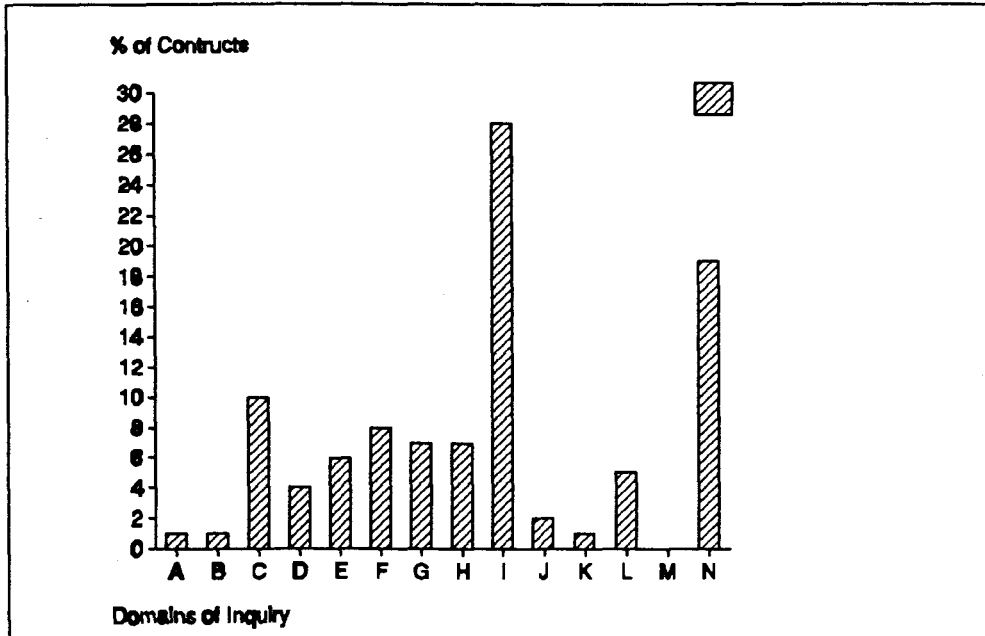
Table C.3 (cont.)

PROBLEM CONCEPTION	FINANCE	N
Discrepancy	.2703 (.193)	14
Difficulty	.2594 (.219)	11
Decision	.1221 (.122)	11
Question	.1821 (.125)	12
Opportunity	.1598 (.123)	10

Total	.2018 (.166)	58

mean
(st.dev.)

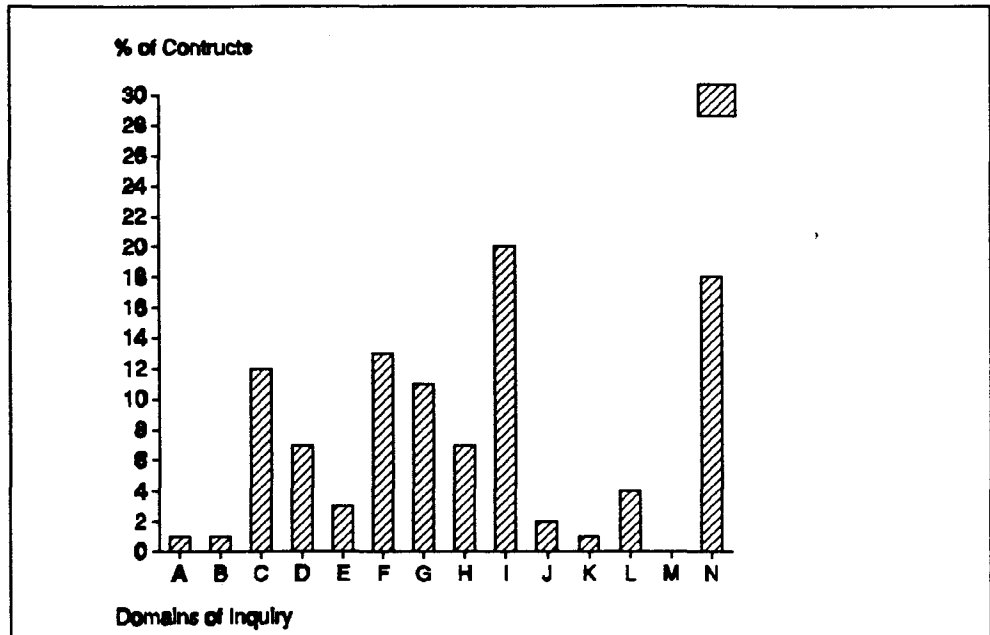
**Figure D.1 Response Profile based on the Discrepancy
Conception of Problems**



- | | |
|-----------------------------|-------------------------------|
| A - Macro Environment Group | F - Human Resource Management |
| B - Regulations (MI) | G - Organization |
| C - Market (MI) | H - Strategy |
| D - Competition (MI) | I - Finance |
| E - Supply (MI) | J - Technology Development |
| | K - Inbound Logistics |
| | L - Production & Productline |
| | M - Outbound Logistics |
| | N - Marketing & Sales |

n = 81

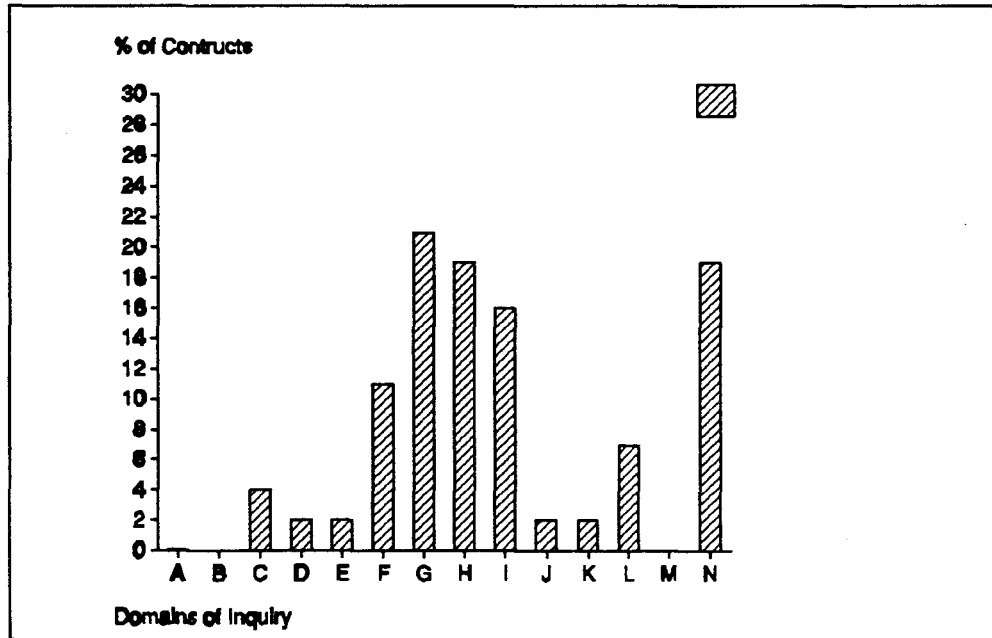
**Figure D.2 Response Profile based on the Difficulty
Conception of Problems**



- | | |
|-----------------------------|-------------------------------|
| A - Macro Environment Group | F - Human Resource Management |
| B - Regulations (MI) | G - Organization |
| C - Market (MI) | H - Strategy |
| D - Competition (MI) | I - Finance |
| E - Supply (MI) | J - Technology Development |
| | K - Inbound Logistics |
| | L - Production & Productline |
| | M - Outbound Logistics |
| | N - Marketing & Sales |

n = 77

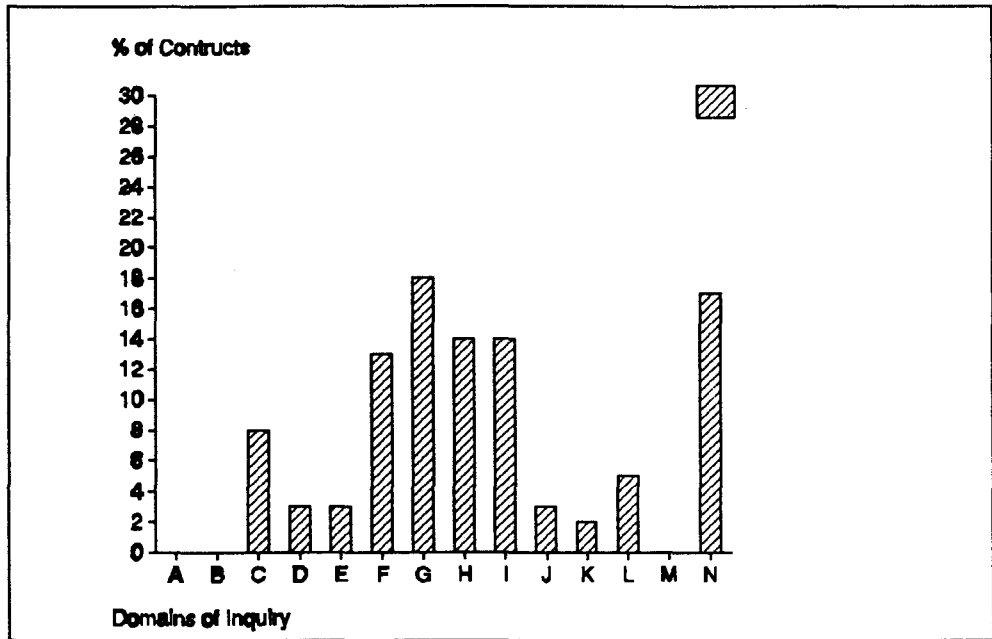
**Figure D.3 Response Profile based on the Decision
Conception of Problems**



- | | |
|-----------------------------|-------------------------------|
| A - Macro Environment Group | F - Human Resource Management |
| B - Regulations (MI) | G - Organization |
| C - Market (MI) | H - Strategy |
| D - Competition (MI) | I - Finance |
| E - Supply (MI) | J - Technology Development |
| | K - Inbound Logistics |
| | L - Production & Productline |
| | M - Outbound Logistics |
| | N - Marketing & Sales |

n = 79

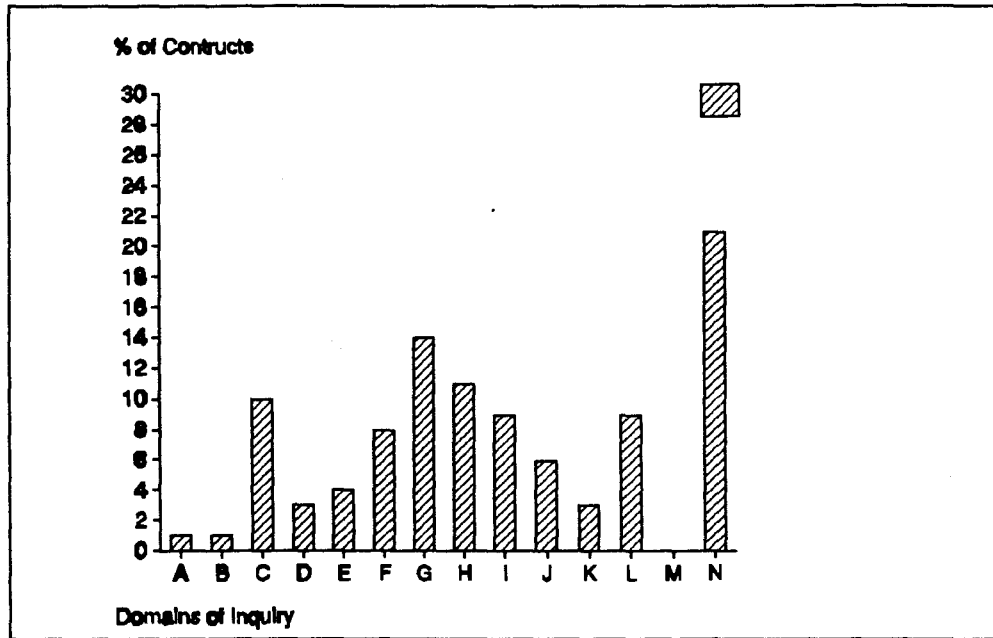
**Figure D.4 Response Profile based on the Question
Conception of Problems**



- | | |
|-----------------------------|-------------------------------|
| A - Macro Environment Group | F - Human Resource Management |
| B - Regulations (MI) | G - Organization |
| C - Market (MI) | H - Strategy |
| D - Competition (MI) | I - Finance |
| E - Supply (MI) | J - Technology Development |
| | K - Inbound Logistics |
| | L - Production & Productline |
| | M - Outbound Logistics |
| | N - Marketing & Sales |

n = 82

**Figure D.5 Response Profile based on the Opportunity
Conception of Problems**



- | | |
|-----------------------------|-------------------------------|
| A - Macro Environment Group | F - Human Resource Management |
| B - Regulations (MI) | G - Organization |
| C - Market (MI) | H - Strategy |
| D - Competition (MI) | I - Finance |
| E - Supply (MI) | J - Technology Development |
| | K - Inbound Logistics |
| | L - Production & Productline |
| | M - Outbound Logistics |
| | N - Marketing & Sales |

n = 81