Toward a holistic theory of strategic problem solving

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Abstract *To date, many of the models and theories that seek to explain problem solving and decision making, have tended to adopt an overly reductionist view of the processes involved. As a consequence, most theories and models have proved unsuitable in providing managers with a practical explanation of the dynamics that underpin problem solving. A substantial part of a manager's time is taken up with problem solving and decision making issues. The question of whether managers possess the necessary problem solving skills, or have access to "tools", which can be used to manage different types of problems, has become an issue of some importance for managers and organisations alike. This paper seeks to contribute to the current literature on problem solving and decision making, by presenting a conceptual model of problem solving, which is intended to assist managers in developing a more holistic framework for managing problem solving issues.*

Introduction

Considerable research has been undertaken which seeks to explain and/or predict both problem solving and decisionmaking (Van de Ven, 1980; Volkema, 1988; Smith, 1989, 1992; Barnard, 1992; Evans, 1992, 1997; McFadzean and Money, 1994; McFadzean, 1996a). The purpose of this article is to explore and evaluate some of the literature generated by this research, and offer an alternative view of the problem solving process. This paper suggests that current perspectives are overly "reductionist" in their conceptualisation of problem solving and decision making. In order to provide managers with the necessary tools to manage organisations into the "global" millennium, it is imperative that organisations embrace a more holistic, as well as multi-disciplinary approach, to problem solving. Therefore, presented at the end of this paper is a conceptual model, illustrating how organisations may be able to achieve greater efficiencies in terms of problem solving, through the adoption of more focused management techniques.

The model provides valuable insights into how the capabilities, needed for problem solving and decision making, should be structured in order to achieve maximum efficiencies. Evidence from a number of studies indicates that organisations, which fail to develop an "appropriate" structure, risk having the problem solving process degenerate into an ineffective "piecemeal" operation (Everwijn *et al.*, 1990; Nutt, 1992; Barnard, 1992; McFadzean and Money, 1994; McLeod *et al.*, 1995). The model is intended to address the problem of developing a suitable structure by focusing on the following issues:

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- Problem investigation and analysis.
- Idea generation and management.
- The identification and management of corresponding and non-corresponding information flows.
- Acting as an enabler, by encouraging managers to "think" in a more focused manner about different types of problems.
- Identification of some of the skills necessary to ask the "right" questions.

Todd and Benbasat (1992) have noted that a common failing among managers, was that they were often prepared to force a trade-off between the amount of effort employed in developing a solution, and the quality of the problem solving and decision making process. Van de Ven and Delbecq (1974) and Watson *et al.* (1988) similarly argue that this has had a number of important consequences for both managers and organisations. They cite evidence to show that, when a manager reduces the level of effort, there is a tendency for them to pass too quickly through the idea generation and solution search stages. The resultant effect is that many of the views expressed by other participants are excluded, which has the additional consequence of placing undue pressure on group members to conform to existing beliefs, rather than seeking to challenge the status quo.

It is, therefore, both of interest and significance that several studies report that conceptual models may offer a number of important benefits to managers during the planning and implementation stages of strategic problem solving (Todd and Benbasat, 1992; Smith, 1992; McFadzean and Money, 1994). They further contend that if properly executed conceptual models have the potential to act as a focusing device, increase the effort levels of participants, improve the quality of problem solving and decision making, as well as reduce the time taken to generate a solution.

Managers as problem solvers

A substantial part of a manager's time is taken up with problem solving and decision making issues. Some of these problems may be well structured, common and quantitative, some are ill-defined, unique and qualitative, while others are a mixture of both (McFadzean, 1996a). Furthermore, some problems may require accurate analyses while others demand the involvement of subjective preferences and bias.

The question of whether managers possess the necessary problem solving skills, or have access to "tools", which can be used to manage different types of problems, has become an issue of some importance for managers and organisations alike (Rickards, 1974; Evans, 1992; McFadzean and Money, 1994; McFadzean, 1996b; Amabile *et al.*, 1996; Amabile, 1997). However, in spite of an increasing awareness, evidence from a number of studies indicates that managers still lack many of the basic problem solving skills (Kharbanda and Stallworthy, 1990; Mintzberg, 1994; Gordon, 1997). Higgins (1996) and Massetti

(1996) argue that, this can, at least in part, be attributed to what they identify as "managerial apathy", where the development of coherent problem solving strategies are regarded as peripheral to an organisation's core functions. Higgins (1996, p. 370) cites evidence to show that organisations that either choose to ignore, or minimise the importance of problem solving, do so at their peril, and are very likely to, as he terms it, simply "…evaporate".

It has long been believed that research into problem solving will provide a better framework, from which managers can develop more efficient as well as competitive organisations (Newell and Simon, 1972; Weisberg, 1988; Higgins, 1996; McFadzean and Money, 1994; McFadzean, 1996a, 1997; Amabile, 1997). However, the acceptance of any direct correlation between problem solving as a technique, the role of managers and the functional aspects of the organisation have been extremely slow in coming. Delays in the wider acknowledgement of this relationship are, at least in part, due to the fact that much of the research has remained the preserve of the psychologist (Weisberg, 1988; Swan, 1995). Unsurprisingly perhaps, the subjective nature of the research conducted by management psychologists has prompted many questions about its validity, particularly as an explanation of the problem solving process. Swan (1995, p. 1247) suggests that this is possibly due to the fact that much of the research has, in the past, been based on "…observations of individuals who work in isolation on novel artificially constructed problems free from the influences of past experiences or social contact".

Structure of the paper

In spite of a somewhat controversial history, much of the literature on problem solving has tended to cluster around a number of theoretical perspectives:

- Cognitive processing – both problem solving and decision making are explained in terms of cognitive processes, which individuals use to help them solve a problem or make a decision.
- Individual traits – theorists believe that individual traits or dispositions may at certain times influence problem solving performance. Traits fall into a number of different categories: motivation, abilities, temperament and stylistic.
- Reasoned action perspective – focuses on the relationship between the intended behaviour during problem solving and the actual behaviour being observed.
- Decision theory – a process by which management chooses a solution to the problem from a range of alternatives using quantitative analysis.
- Organisational traits – are an attempt to explain organisational problem solving in terms of an organisation's physical attributes.
- Group problem solving – in many companies it has become common practice for problem solving to be conducted by groups.

This paper will review each of the aforementioned perspectives and will conclude that they show a reductionist view of decision making. Problem solving and decision making involve all of these perspectives. Consequently, a holistic model of problem solving is constructed and discussed at the end of the paper.

Cognitive processing

Cognitive processing is often associated with information processing theory and is used to explain how managers solve problems using their cognitive abilities. Cognitive theory is based upon the manager's own unique perceptions, previous experience as well as future expectations. The underlying assumption is that it is both possible and useful to classify managers according to how they use information, with a view towards designing information systems that are better suited to the individual decisionmaker. McFadzean (1996a, p.32) succinctly sums up the importance of cognitive processing's utility:

> Information processing theorists believe that feedback or knowledge on past behaviours help managers to learn and thereby modify, change or maintain future plans or behaviour.

Information processing is considered by some researchers to be an intermediate variable in the relationship between personality and behavioural outcomes (Glazer *et al.*, 1992). More importantly, marketing managers have long recognised the importance of cognition for processing information (Kimble and McLoughlin, 1995). The N. Cog variable, as it is known, is widely used to assist in setting budgets for advertising campaigns, identifying the type of coverage as well as saturation levels, and the locus for geographical distribution (McKenna, 1996). Its utilisation is based upon evidence suggesting that personalities with a high N. Cog factor appear to require less exposure to advertisements than those with low N. Cog attributes (McKenna, 1996). It is important to emphasise that the N. Cog variable is employed merely as a guide and does not constitute a definitive solution to market divisions.

Within cognitive processing there are a number of theories, which employ motivational stimuli in order to understand the problem solving process. The most important of these are goal setting, expectancy theory and equity theory.

(1) *Goal setting:* goals are mainly used for two purposes, as a motivational device and/or as a mechanism for controlling management behaviour. In both cases performance is measured against predicted goal attainment. The most serious limitation of this approach is the tendency for managers to either underestimate or overestimate likely goals, or fail to quantify them altogether.

(2) *Expectancy theory*: expounds the view that managers choose among alternative behaviours, anticipating possible outcomes by weighting or placing a value upon likely events. Expectancy theory is widely used by managers to establish performance criteria, measure and compare levels

of attainment, allocate rewards according to performance and provide feedback. Expectancy theory is a relatively complicated theory and does not readily lend itself to open testing. Furthermore, in reality it is questionable the extent to which managers are capable of making purely rational choices.

(3) *Equity theory*: is what is known as a "social comparative theory", and adopts a similar view to expectancy theory concerning the importance of underlying cognitive processes governing an individual's decision. Equity theory compares two indices "inputs" (such as education, experience, effort and skills) against "outputs" (for example, salary, increases in salary and other benefits). These are used to measure and make assessments about the levels of equity and inequity experienced during problem solving exercises. The prominent view in the research literature of equity theory is that it has unusually accurate predictive qualities (McKenna, 1996). However, in other areas of research, equity theory's usefulness has often been dismissed because of the tendency for some individuals to exhibit a greater sensitivity towards perceptions of inequity.

Although cognitive processing is a useful concept, as an explanatory tool it exhibits a number of important weaknesses. Firstly, certain abilities needed for problem solving, such as imagination and creativity, the ability to accurately recall past experiences and the skill of recognising significant stimuli have not been fully explained by psychologists (McFadzean and Money, 1994). Secondly, as already discussed the rational sequence of problem solving as devised by theorists may not occur in reality (Eierman *et al.*, 1995). Thirdly, due to the complexity of cognition, the number of interacting variables is enormous and many lie beyond the pale of experimental control (Swan, 1995). Leading on from this last point, one final criticism that is often levelled at cognitive research is that it is mainly laboratory-based (Swan, 1995). This is in part due to the complex nature of cognition as well as the researchers' desire to control many of the variables. This often results in a higher than normal level of artificiality, making any sort of explicit generalisation extremely difficult.

Individual traits

Individual traits are closely related to cognition and are believed to have a major impact upon an individual's performance during problem solving. Contesting this view, are several theorists who claim that the personality is irrelevant and situational factors give a greater understanding of how people both do and should respond (Davis-Blake and Pfeffer, 1989). Traits have been variously defined as distinctively individual characteristics, which have been inherited or acquired and are grounded in the way a person thinks, feels and acts (McKenna, 1996). Some theorists hold that analysing traits also provides a partial explanation of individualistic behaviour and the tendency to act or react in certain ways (Drever, 1964; McFadzean and Money, 1994).

Traits are believed to exist at two basic levels, surface and sub-surface. Surface traits are identifiable in the way they visibly manifest themselves on the surface of an individual's personality. A prime example is the visual relationship between the surface trait of happiness and a display of spirited behaviour. Sub-surface traits are more difficult to identify and require the observer to make inferences about potential or perceived behaviour. Trait analysis is complicated by the fact that simply because an individual exhibits certain traits does not mean that they will always behave in a particular way. Rather, it provides information about the propensity for a person to act or react in a certain way. Traits are commonly placed into a variety of categories:

- *Motive traits* are goals that guide the behaviour of the individual.
- *Ability traits* refer to the individual's general and specific capability and skills.
- *Temperament traits* include optimism, depression and various energetic tendencies.
- *Stylistic traits* refer to gestures and styles of behaviour unrelated to specific tactics to achieve a particular goal.

Considerable work has been conducted into the investigation of individual traits. The most influential of these are Allport's work on trait categories, and Cattell's PF16 test, which uses "factor analysis" to identify various traits (Allport, 1961; Cattell, 1965). Although the basis of their research differs with regard to type of techniques applied, Allport and Cattell's work are a clear attempt to systematically reduce personality traits to more manageable levels. Other attempts to measure personality and ascribe trait characteristics are Thurston and Edwards' Temperament Schedules, Myers-Briggs Type Indicators, Belbin's Team Roles and Saville and Holdsworth's Occupational Personality Questionnaire (OPQ) (Belbin, 1986, 1993; McKenna, 1996; Higgs, 1996).

Notwithstanding their popularity within industry, all of these personality assessments have, at one time or another, been subjected to considerable criticism as lacking in sufficient scientific rigour by over-simplifying the personality (George, 1992). In Cattell's case, the issues are complicated by the problem of enforced choice during questionnaire appraisal, which has led some analysts to dismissing the PF16 test as generating an overly distorted view of the personality (McKenna, 1996). As a consequence, many of the resultant findings have been undermined by their inability to accurately predict personality. More importantly, there is a lack of empirical evidence to show a clear relationship between problem solving and individual cognition (Gallupe *et al.*, 1992). It has also been variously argued that since people have a different combination of skills, they may not possess the necessary personal properties to unlock the problem in the first instance (McFadzean and Money, 1994). The dilemma surrounding assessments of the personality is poignantly summed up by Bentall (1993, p.307):

It is not yet clear whether personality research can contribute to the greater good. Certainly, a sensitivity to the ethical and political implications of personality research seems necessary. Personality research as it stands at present is unlikely to be of use to those who wish to apply psychology to help solve pressing human problems. It may be that these objections are not fatal.

Reasoned action perspective (RAP)

The relationship between the intention to behave and actual behaviour has been the subject of vigorous investigation and debate. Ajzeen and Fishbein have been credited with formalising the theory of reasoned action, which has since been modified to incorporate planned behaviour (Smith, 1992; Swan, 1995). They argue that people's actions are best predicted by their intentions, and that, a person's intentions are determined by their own attitudes, as well as potential expectations of outcomes as held by others. The theory defines an attitude, which is expressed as a belief about the consequences of behaviour. It is not concerned with general beliefs or feelings related to the object or subject matter of the attitude (McKenna, 1996). The theory has been reasonably successful in helping researchers to understand the relationship between action and behaviour. McFadzean and Money (1994) argue that RAP's success is largely based on the use of motivational factors to manage the problem, beliefs and values so that effective solutions can be constructed. They also suggest that RAP may help to explain the relationship between motivational problems and, what they term, "learned helplessness" during problem solving.

In spite of its success, RAP has been widely criticised both theoretically and empirically. The most serious problem centres on the difficulty of distinguishing between, for example, a person's attitude towards a particular problem and their attitude towards needing/wanting to solve the problem (Smith, 1992). In this instance, a person's intention to solve the problem is clearly dependent upon their assessment of whether they deem the solution to be "valuable" enough to implement. Fazio (1986) argues that it is the implicit relationship between a person's positive and negative experiences that complicate formal assessment. Difficulties of comparison have also led Eiser and Van Der Pligt (1988) to suggest that RAP is probably better suited to situations where people are deciding on a course of action for the first time.

Decision theory

Decision theory is closely related to information processing theory, and is frequently represented by a series of mathematical models. Management often uses quantitative techniques to review potential decision outcomes, as well as possible solutions to a problem. The most popular techniques are regression analysis; financial modelling; spreadsheets; statistical simulation and optimisation methods. Decision theorists tend toward a technical view of organisational change, believing that failure to achieve desired goals reflects a failure in technology, its implementation, or its delivery, rather than the decision process (DeSanctis and Poole, 1994).

Practitioners of decision theory perceive decision making as a relatively straightforward and uncomplicated process, and expect solutions to fall into one of two basic categories; those for programmed or structured problems and those for non-programmed or unstructured problems (McFadzean, 1996a, 1996b). Programmed or structured problems are characterised as being well defined, where the method for evaluating options remains explicit throughout, and little, or no, ambiguity exists during evaluation. Conversely, problems which do not fulfil the above criteria, and are unique and not of a routine nature are categorised as non-programmed or unstructured.

Two types of model are used to explain how managers investigate structured and unstructured problems. The first are descriptive models, which as the name implies essentially describe the processes involved in assessing problems, developing solutions and making choices. The most frequently cited models are: the decision cycle; econological models; bounded rationality and implicit favourites (Archer, 1980; Cooke and Slack, 1991; Simon, 1957; Simon and Newell, 1971; Cyert and March, 1992; Power and Aldag, 1985; Behling and Schriesheim, 1976). These models have become very popular among behavioural researchers. Due to the ambiguous nature of the processes they seek to explain prescriptive models are less well defined. They are essentially normative in character, seeking to impose those structures on decision makers that are reflected in the model (Extejt and Lynn, 1996).

The decision school has been at the forefront of investigations into group support systems (GSS) and other advanced technologies. Current approaches have, however, failed to produce consensus on how the systems should be designed or how they affect the people in organisations that use them (DeSanctis and Poole, 1994; Licker, 1997). Decision theory, as a theory of problem solving, is further constrained by a number of important limitations. These concern information overload and the dilution of critical or incomplete data, the exclusion of social processes and psychological issues, such as, for example, creativity, memory, resourcing and perception and the inflexibility of problem appraisal, in that most problems do not always fit "neatly" into single categories (McFadzean, 1996a, 1996b).

Organisational traits

Organisational traits are an attempt to explain organisational problem solving, in terms of the organisation's physical attributes, rather than through individual psychological determinants. The organisation is believed to possess structures and procedures that both direct and constrain the problem solving process (McFadzean and Money, 1994). At the core of this process is "rationality". Rationality is regarded as a necessary, purposeful and important organisational attribute, which has the potential to free senior executives from both the day-to-day and mundane management tasks, thereby allowing them to concentrate on more complex issues.

Historically, an organisation's activities have been characterised in terms of economic, political or bureaucratic structures (Mintzberg, 1979; Van Fleet, 1983;

McLellan, 1989; Held *et al.*, 1990; Silverman, 1995), while psychological traits were considered to play only a minor role. In essence, the organisation's structure is perceived as being greater than the sum of its parts, rather than existing in a complementary state, where its evolution is the result of the aggregation of the component parts.

More recently, however, research surrounding organisational traits has focused on explanations that synthesise the organisation's "structure" with the employee's "psychological" characteristics. The principal focus has been the development of "organic-structures", which exhibit a dynamism associated with "human" problem solving behaviour embedded within management (Vancouver, 1996). Within this framework management has a crucial role to play both as the guardian and creator of socio-technical systems that enable the development of efficient and effective problem solving techniques. Managers achieve this by embracing and encouraging interpersonal behaviour within the organisation. The management's main responsibilities are to manage the system, by ensuring that it reaches optimum levels, and to attain a suitable "fit" between the organisation's and the human "sub-system's" objectives.

There are a number of issues that impinge on the viability of organisational traits as a suitable explanation of the problem solving process. The majority of the theoretical perspectives and substantive issues, which have been used to define the organisation as an identifiable and viable field of research, seem to be the subject of considerable dispute and controversy. A number of influential management theorists have even gone as far as to question whether many of these "variables" exist in organisations (Peters and Waterman, 1982; Drucker, 1985; Mintzberg, 1994). The controversial nature of organisational analysis is poignantly summed up by Reed and Hughes (1992, p. ii) who assert that:

> …diversity, plurality, uncertainty and fragmentation seem to be the epithets which most easily and readily spring to mind when attempting to provide a general characterisation of the current state of play, in, and future prospects for organisational analysis.

Group decision making

It has long been recognised that groups are important to organisations "…because they are made up of individuals who possess differing skills, experiences and knowledge" (McFadzean, 1996a, p. 38). There exists, however, considerable controversy over a number of issues relating to groups. More specifically what actually constitutes a group, "if" and "how" they add value to an organisation, and whether the term "team" can/should be substituted for "group". While it is not the intention of this paper to become embroiled in logistical, or semantic arguments, some clarification about the role that groups fulfil is required.

While there are many different types of group formations, they can be classified into essentially three broad categories:

(1) *Interacting groups,* which involves members constantly interacting in the process of generating ideas about ways of tackling a problem.

(2) *Nominal groups,* where the members are physically present at the meeting but state their opinions independently with respect to the problem before discussion takes place.

(3) *Delphi groups,* which are similar to nominal groups except that the members do not meet face-to-face. Usually a questionnaire is circulated to each member, the results of which are then tabulated and re-circulated to each member for reassessment. Unlike nominal groups delphi groups do not have a forum for discussion and should not be used if a "quick" decision is required.

The blurred distinction between "group" and "team" formation can locate its origins in the organisational development literature (Leonard-Barton, 1992; Katzenbach and Smith, 1993; Travica and Cronin, 1995). This differentiation seems to have evolved, at least in part, from a desire on the part of both researchers and managers, to differentiate focused specialist functional groups, or "teams", established within the organisation, from groups formed elsewhere, both within the organisation, as well as external to it. The distinction could also be viewed as the difference between highly "structured" and organised groups, or teams, and groups that tend to have a much looser association. There is however, some disagreement as to whether this distinction encapsulates the quintessential dynamics of group formation (Katzenbach and Smith, 1993).

Previous studies of group decision making have largely focused on problem solving experiments, their performance usually being assessed in three ways (Pinsonneault and Kraemer, 1990; Vogel and Nunamaker, 1990; Milliken and Vollrath, 1991). The first is to use expert panels to examine the quality of one group's decisions with that of another. The second method has been to assess the extent to which a group's solutions improve on those of the individual. The final technique explores how often a group's solutions are better than the solution's of their best members (Rogelberg *et al.*, 1992; Dennis and Valacich, 1993).

Of greater importance are the dynamics that underpin a group's activities. Extensive research has focused on using groups in a problem solving environment suggesting that, when managed correctly groups exhibit the potential to both outperform and be more creative than individuals (Nemeth, 1997). Dennis and Valacich (1993) contend that there is evidence to show that many of the disadvantages associated with group dynamics can be substantially reduced or even negated when a group support system is used.

While experiments into group dynamics have concluded that groups have a major contribution to make, research has shown that there are a number of inherent weaknesses in using groups as problem solving bodies. Firstly, the extent to which group dynamics out-perform nominal problem solving techniques has proved difficult to measure. Dennis and Valacich (1993) cite evidence from more than 50 empirical studies, which show that a group's performance is "context specific" and, where formal assessment has taken place, many of the studies have proved inconclusive. They contend that this is

sufficient to raise serious doubts about the validity of some of the results obtained, as well as the chosen methodology for extracting the information.

Secondly, research has shown that under certain circumstances groups are susceptible to a process identified as "groupthink" (Janis, 1972). Groupthink is most likely to occur when groups become very tightly associated and consensus develops. At its most extreme groupthink involves the erosion of individual critical faculties, which impedes the "…efficient execution of members' abilities to test reality and preserve their judgement" (McKenna, 1996, p.328). Thirdly, groups are also prone to the polarisation of views. This has been identified as "risk shift", where groups take greater risks during problem solving and decision making and, "cautious shift" where groups exhibit an extremely conservative approach to problems (Nemeth, 1997). Finally, although on occasions omitted from group planning, the issue of "time" is frequently an important factor, and if not managed correctly unsolved problems can become exponentially costly. Furthermore, if time is the primary consideration, delphi groups would be the least efficient group formation for solving problems.

Problem solving – a conceptual model

To date, many of the models and theories that seek to explain problem solving and decision making have tended to adopt an overly reductionist view of the processes involved. As a consequence, most theories and models have proved unsuitable in providing a practical explanation of the dynamics that underpin problem solving. According to McFadzean and Money (1994) an approach that seeks to develop a more "holistic" view of problem solving is likely to be of greater benefit to organisations, particularly when investigating phenomena that embrace a number of different disciplines.

A conceptual model of problem solving and decision making is illustrated in Figure 1. Individual, group and organisational characteristics together with the problem attributes are the principal inputs of the process. The problem is examined and, if necessary, transformed using a variety of problem solving tools and techniques. The output from the process has been divided into those activities, solutions and concepts that an organisation can implement immediately, and those that it cannot, without some form of further investigation/examination.

Problem input

Problem solving and decision making can be influenced by individual and group attributes. Evidence from a number of studies suggests that during the information gathering and conceptualisation stages, personality, experiential knowledge, motivation, management skills and perception all play a fundamental role in configuring the problem solving process (McKenna, 1996; McFadzean, 1997). Similarly, group attributes, such as cohesiveness, size, structure, norms and communication also determine the parameters of the problem, as well as the processes to be applied (Dennis and Valacich, 1993).

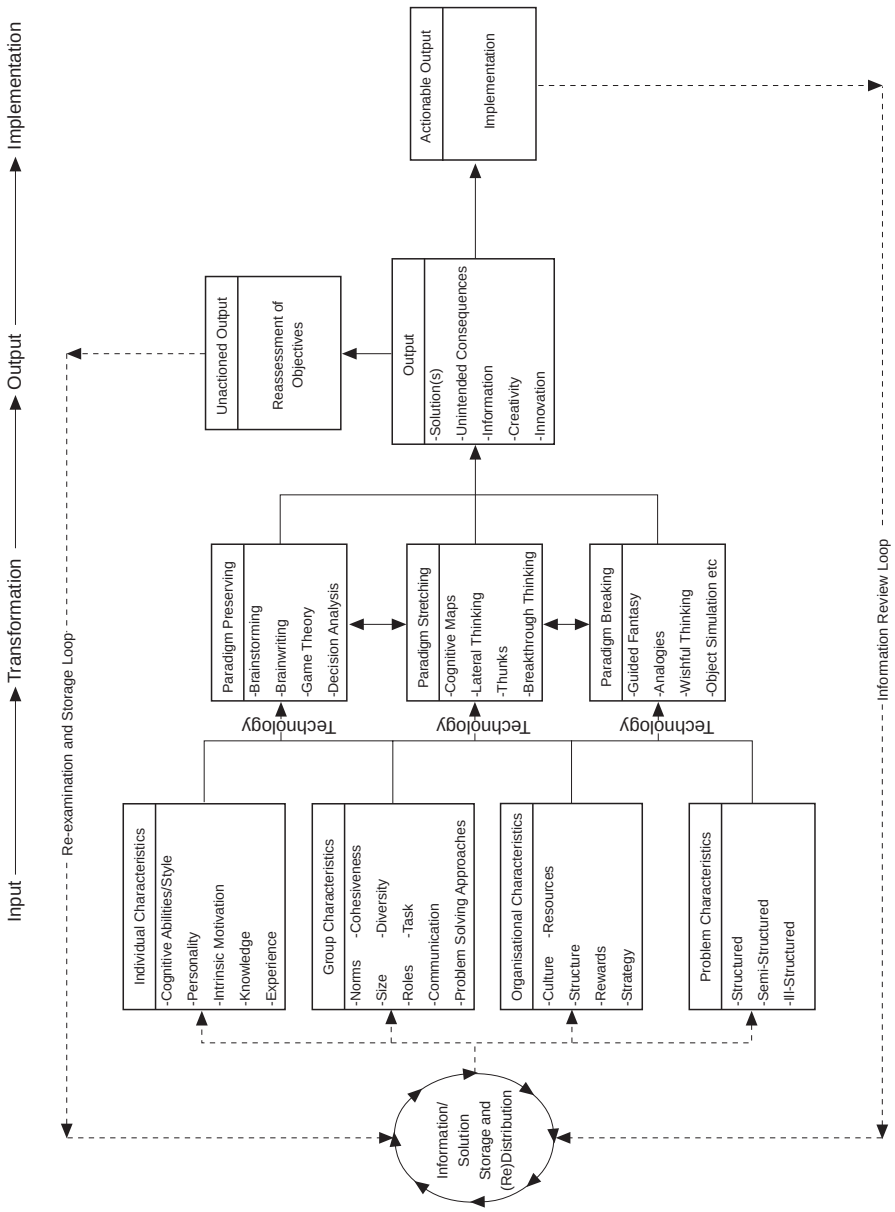

Figure 1.
A conceptual view of problem solving

The organisation's character is also a determining factor concerning both how, and ultimately whether, a problem is to be solved (Sitkin and Pablo, 1992). Many organisations now recognise that, in order to foster innovation and creativity, they must be prepared to embrace a more "flexible" culture (Amabile, 1997), one which is both supportive as well as non-threatening (Anderson *et al.*, 1990). For the majority of organisations cultural flexibility has evolved through a

combined system of trust and reward, where successful decisions are remunerated, and more importantly, employees are not punished or ostracised for producing ineffective or unsuccessful solutions (March and Shapira, 1987).

Finally, the problem itself may dictate how it is to be solved. For example, well-structured problems can be investigated through the application of standard operating procedures and/or programmed decisions. Conversely, semi-structured, and ill-structured problems may contain a number of unique elements that require the use of more creative techniques.

Transforming the problem

Glaister and Thwaites (1993, p.15) highlight what many researchers consider to be possibly the most intractable of problems for both organisations and managers when they state that "misreading the business environment may be due to personal biases in perception". Clearly, when faced with problems of bias and misperception, asking the "right" questions early on is critical. However, a number of researchers have forcefully argued that asking questions is not a "natural" process for many managers (Mintzberg, 1994; Gordon, 1997). Furthermore, implicit to asking the "right question" is a responsibility requiring managers to "think". But as Kharbanda and Stallworthy (1990) point out, although many organisations stipulate that the capacity to "think" is a core management competence, the majority of managers are neither trained, nor seldom expected to demonstrate this ability.

Vast amounts of knowledge and experience are embedded in organisations, their processes as well as their people (Leonard-Barton, 1992; Darling, 1996). To liberate and exploit this knowledge decisionmakers need to develop effective problem solving tools. These tools should act both as an enabling mechanism to encourage managers to "think" about the processes, as well as provide the means with which to ask the "right" questions.

The work of McFadzean and Money (1994) and McFadzean (1996a, 1997, 1998) provides the framework for the development of a set of management tools, which are intended to refocus the manager towards problem resolution, through the extraction and management of information. McFadzean (1996a, 1998) has categorised these techniques as paradigm preserving, paradigm stretching and paradigm breaking:

(1) *Paradigm preserving techniques* – are analytically oriented and do not require participants to operate outside the parameters of the problem.

(2) *Paradigm stretching techniques* – look at the problem from a variety of different perspectives, and participants are encouraged to diversify their thinking in order to form new connections and associations. However, links away from and back towards the problem tend to remain unbroken.

(3) *Paradigm breaking techniques* – although closely related to paradigm stretching techniques, requires that participants "break" with traditional problem solving processes and search for obscure patterns and relationships, which can then be used to explore the problem. The

principal objective is to encourage participants to change their perspective of the problem being investigated.

In Figure 1, the location of particular techniques is not exclusive to any individual paradigm, and allowance has been made for vertical interaction. Furthermore, several of the techniques may extend into either or both of the adjacent paradigms. For example, depending on the overall objective, as well as how the technique is applied, cognitive maps may be used as a paradigm preserving technique to re-enforce a position, or as a paradigm breaking technique to encourage participants to alter their perspective. Cognitive maps are but one of a number of techniques that possess this characteristic.

Problem transformation may also occur through the application of technology, such as, for example, spreadsheets, decision support systems, group support systems, or some other type of creativity software. The model in Figure 1 acknowledges an association between technology and the paradigms, but expresses it as discrete rather than explicit phenomena. The reason for representing technology as a discrete activity is mainly due to the fact that, although there have been a number of major advancements in computing power, many organisations still regard problem solving as essentially a "manual" activity (Barnard, 1992; McLeod *et al.*, 1995; Extejt and Lynn, 1996; Sutton and Hargadon, 1996).

The output

The data and information generated from the three paradigms has been termed "output". It is anticipated that more than just solutions will be produced when using particular techniques. For example, individual learning, greater group cohesion, the identification of corresponding and non-corresponding information and the improved management of information flows are all likely to be developed in conjunction with any solution. The output has been divided into those activities that can be acted upon immediately, and those that cannot without, for example, further investment in time and capital or changes in technology. The actionable output is forwarded for implementation, which is monitored and the information is fed back for redistribution and/or storage. The unactioned output is re-assessed in line with the primary objectives, and either sent back for redistribution and/or storage, or discarded altogether.

The implications for managers and organisations

The model has a number of important practical applications. Firstly, it provides a framework for problem solving, whereby both managers and organisations can analyse/review their respective activities. Secondly, the model is designed to show managers how they can alter/influence existing patterns of "thinking" through the application of any of the three paradigms during the transformation stage. Thirdly, through the paradigms the model highlights some of the tools necessary for problem solving. Finally, the model acts as a focusing device for both managers and organisations, by identifying the

various contributors to problem resolution, and shows that problem solving should be a continuous and interactive process, rather than an intermittent exercise.

The model also has important implications for management practice. It serves to highlight the issue that problem solving and decision making are neither homogenous nor isolated activities. Evidence from a number of studies suggests that management's seemingly incessant preoccupation with the need to enforce conformity and/or control certain business processes often results in a loss of critical thinking and objective evaluation (Allcorn, 1990; Bartlett and Ghoshal, 1995).

Glaister and Thwaites (1993) point out the biggest barrier to "outstanding" problem solving and decision making often rests solely with a manager's willingness to accept alternative perspectives. Although encouraging individuals and teams to deviate from "well-worn" paths can be an uncomfortable experience for any manager, understanding the processes that constitute the challenge to accepted norms is clearly an important step forward in developing a more responsive organisation. Consequently, the model is intended to provide managers with the tools necessary to structure and manage the problem solving and decision making processes, so that maximum efficiencies can be achieved, and skill levels continuously developed.

Summary

In summary, the problem solving and decision making processes are clearly influenced by the type of problem to be solved, as well as individual, group and organisational characteristics. Historically, however, managers and researchers have tended to focus on reductionist explanations of how people solve problems and make decisions. This paper has sought to illustrate some of the reasons why a more holistic approach may be more appropriate, as well as beneficial for both organisations and managers during problem solving.

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