

Developing a Knowledge Based Group Decision Support System With Reference to Cognitive Analysis in India

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Abstract- This research considers the cognitive psychology of individual decision-makers and such persons who are all involved in group-decision making. Users are interacting within the GDSS through an agent communication language KQML [1]. Knowledge bases assessing the decision makers vary in nature and then according to that, it supplies the models to solve the problem. Consequently, this study paper winds up with the fact that the suit of a particular knowledge to the state and correlation of it with the unique characteristics of the decision maker and people like them is an important issue that has to be concentrated while developing a knowledge based decision support system. Also, the system has to adapt itself to the different decision maker's unique mental compositions that are usually depending on the emotional quotient of the individual. It should not aid the possessor always but dynamically adapt itself to whom so ever exploits it.

I. INTRODUCTION

The impact of computer technology on organizations and society is increasing as new technologies evolve and existing technologies expand. Interaction and cooperation between people and machines are rapidly growing to cover more and more aspects of organizational activities.

Knowledge workers include not only information technology professionals but also management staff such as brokers, urban planners, design engineers, production coordinators, travel agents, marketing executives, etc. Anyone who makes decisions for business, government, military or medical purposes is a potential group decision support system (GDSS) user [2]. Computer experts develop most of the DSS, which are used by managerial people.

Applications involving computers are moving from transaction processing and monitoring activities to problem analysis and solution applications. Concepts like data access; online analytical processing and use of the internet and intranets for decision support are becoming the cornerstones of modern management. There is a trend towards providing managers with systems that would assist them directly in their most important task vise making decisions.

A computer based interactive decision support system may be needed for various reasons which are speedy computations at low cost, increased productivity of staff members and analysts, technical support for complex computations, quality support for choice of best among alternatives, competitive edge to adapt to revolutionary

changes and overcoming cognitive limits in processing in storage and organizations widely spread across the globe.

Most of the managerial decisions are taken by groups of responsible managers. This is because, nowadays, due to the information revolution, any business system in the global scenario is solving complex decision problems frequently[3]. However, there is a need to take quick and efficient decisions in a rapidly changing competitive world. Some of the problems associated with this are difficulties in determining the most effective solution, varied nature of decision-makers' domains, decision makers are generally not very comfortable using intelligent systems and large number of mathematical and statistical calculations, selection procedures and methodologies.

In this research work we

- develop a knowledge based decision support system tailored to person's unique mental composition
- address various issues related to distributed data management in group decision support system
- analyses the decision support system user's satisfaction and behavioral patterns of users software companies in and around Chennai, India.

And hence, this research paper tries to satisfy all the above stated issues of the various approaches that exist today, to group decision support systems. This system fulfills to cope up with the mental behavior of the decision maker by calculating the most needed factor "Emotional Quotient" and aspects like "Emotional Empathy", "Affiliative Tendency" by the application of "Mehrabian Theory" [4]. Thus, taking into consideration numerous aspects of these approaches, including the technical as well as the business side, this arrives at an optimum solution to the implementation of such GDSS in small to medium-size organizations. This solution involves the partitioning of a decision support system into two constituents and keeping the front-end traditional, while applying distributed concepts to the back-end which will ultimately result in the organization exploiting the benefits of fully distributed DSS, while still maintaining their original configuration to a large extent. This approach is not only simpler to implement but also a cost-saving measure that will cut considerable expenditure of the organization.

II. BEHAVIORAL MODELS OF THE DECISION MAKER

The way a person examines a problem and makes a decision can be described from several different viewpoints depending on the assumption made. There is classical economic model of decision maker and administrative model of decision maker or descriptive model.

The normative model of the decision makers has the following assumptions:

- All alternatives and all concerns are completely known
- The decision maker seeks to maximize profit and
- The decision maker is infinitely sensitive to difference in utility amongst teams.

The Classical economic model of a prescriptive model of the decision maker is completely rational having complete information, always choosing the “best” alternative. It describes how a person should make a decision but, in fact, all criteria of the model are rarely met in a decision situation. Many methods for selecting among alternatives assume complete rationally provided mechanism for identifying the optimal choice.

According to Simon, the administrative model views the decision as taking place in a complex and partially unknown environment. The decision maker is assumed not to be completely rational but rather to display rationality only in them limits imposed by background, perception of alternatives, ability to handle a decision model etc., The Administrative model assumes that the decision maker:

- Does not know all alternatives
- Makes a limited search to discover a few satisfactory alternatives and
- Makes a decision, which satisfies his/her aspiration level.

Most Problem-Solving strategies are based on heuristics or rules of thumb rather than explicit decision rules. This has implications for the design of decision models; they should provide appropriate data and allow decision makers to explore alternatives using their own heuristics.

III. KNOWLEDGE-BASED COGNITIVE ANALYSIS

Humans display a variety of responses on decision-making. Some are related to individual differences such as cognitive style. Others are related to expectations. Some of these responses occur in decision making under psychological stress. The role of expectation in decision-making can be partially explained by the theory of cognitive dissonance, commitment theory and the theory of anticipatory regret.

The system will be able to determine the nature of the decision-maker and by factoring that into its knowledge base, be able to deliver a most effective solution with the aid of various theories and values of different cognitive characteristics.

Emotional intelligence is one known character increasingly relevant to organizational development and developing people, because the EQ principles provide a new way to understand and assess people's behaviors, management styles, attitudes, interpersonal skills and potential. Emotional Intelligence is an important

consideration in human resource planning, job profiling, recruitment interviewing and selection, management development, customer relations and customer service and more. The concept of emotional intelligence or emotional quotient (EQ or EI) has been used to supplement general intelligence (i.e., IQ), because IQ does not seem to adequately explain individual differences in life success. Other traits relating to emotional functioning are needed for a better explanation of individual differences in achieving life success.

Typically, “emotional intelligence” is defined in terms of emotional empathy, attention to and discrimination of one's emotions, accurate recognition of one's own and others' moods, mood management or control over emotions, response with appropriate (adaptive) emotions and behaviors in various life situations, especially to stress and difficult situations, balancing of honest expression of emotions against courtesy, consideration and respect (i.e., possession of good social skills and communication skills). Additional qualities, though less often mentioned, include selection of work that is emotionally rewarding to avoid procrastination, self-doubt and low achievement (i.e., good self-motivation and goal management) and a balance between work, home and recreational life.

The general emotional intelligence scale (GEIS) tests for a broad set of individual characteristics associated with emotional intelligence and supplies a single summary score that represents an overall estimate of the emotional intelligence of each individual tested. Persons with higher general emotional intelligence scale (GEIS) scores, compared with those with lower scores, have been found to show:

- Higher self-esteem
- Higher optimism
- Lower trait anxiety
- Lower depression
- Lower emotional thinking
- Higher achievement and success orientation
- Highly disciplined goal orientation
- Higher affiliation, sociability and friendliness
- Higher social competence
- Higher self-actualization
- Higher integrity and honesty
- Higher IQ (general intelligence)

IV. EMOTIONAL INTELLIGENCE TEST SOFTWARE

Software for administering and evaluating the general emotional intelligence scale (GEIS) is available. It runs on IBM-compatible computers and provides total GEIS score, equivalent percentile score and brief interpretation of these scores for each person tested. The software also allows the user to output an ASCII file containing GEIS total scores for each individual tested. The software is easy to use and is password protected so that the administrator can control access to the database of results. In this way, individuals being tested cannot have access to the results, unless the administrator chooses to report such results to them. A common problem in personality testing is that some respondents attempt to slant their answers to make good

impressions and, as a result, test results become misleading. When respondents slant answers, scores on socially desirable traits become inflated or greater than they would have been in the absence of response slanting. The software for the GEIS includes a built-in feature to help detect when such response slanting/faking occurs and warns the tester when results become "unacceptable." The latter data on response slanting are also part of the ASCII file of all test results that can be output from the program.

V. MEASURES FOR VARIOUS ASPECTS OF EMOTIONAL INTELLIGENCE

The various aspects of emotional intelligence as measured by Mehrabian's(2000) approach are:

- Emotional empathy and affiliative tendency
- Achieving tendency & disciplined goal orientation
- Emotional thinking
- Relaxed temperament

Emotional empathy and affiliative tendency

Two positively intercorrelated measures of pro-social orientation deal with major facets of emotional intelligence and are particularly relevant to success in interpersonal relationships. The first of these tests is the Balanced Emotional Empathy Scale (BEES) and measures individual differences in the tendency to feel and vicariously experience the emotional experiences (both positive and negative) of others. The BEES is a completely new scale published in 1996.

The second of these tests is the Affiliative Tendency Scale (MAFF). Affiliative persons are friendly, sociable, helpful and skillful in dealing with people and open about their feelings. They make good companions because they are pleasant and agreeable. Others feel comfortable with them and like them. In other words, affiliative persons have superior emotional and social skills in dealing with others, derive gratification and reward from their interpersonal contacts and tend to be a source of happiness to others. Affiliative Tendency is understandably important in achieving success in relationships and can be an asset generally in other settings.

A combination of the BEES and the MAFF can be calculated as follows to conclude the psychological characteristics of the decision maker. First, two separate scores (one for the BEES and a second for the MAFF) for each of the participants in the study are obtained. Then, correlation of both these scores, separately, with any other test or criterion measure employed in the study is done. Also testing of relations of both scales to the criterion measure using regression analysis is performed, as follows:

$$CM = a * BEES + b * MAFF$$

where 'a' and 'b' are regression beta weights. A user not familiar with regression analysis can simply use correlations of the BEES and of the MAFF with any other measure they use in their study.

Achieving Tendency and Disciplined Goal Orientation

The Achieving Tendency Scale (Mehrabian, 1968, 1969, 1994-95) has been used for over three decades to predict individual differences in general levels of achievement, particularly achievement or success at work. In recent works, the Achieving Tendency Scale has been augmented by a related (i.e., positively correlated) scale dealing more directly with individual characteristics associated with goal setting and adherence to a coherent plan to achieve one's goals. Together, the Achieving Tendency and Disciplined Goal Orientation scales have been found to be highly relevant for predicting life success in general and, in particular, the level of success a person is likely to achieve at work and in his / her career and finances.

With reference to the conventional definition of emotional intelligence, these two scales relate to emotional control, impulse control, goal management and self-motivation. In short, whether viewed primarily in terms of their relevance to life success or in terms of the conventional definition of emotional intelligence, achieving tendency and disciplined goal orientation are deemed to be highly relevant for assessing emotional intelligence.

Emotional thinking

"Emotional thinking" refers to the impact of emotions on thinking and action and relates to low emotional control or inadequate mood regulation – key concepts in the conventional definition of emotional intelligence. Specifically, "emotional thinking" is defined as excessive influence of emotions on thought processes that can result in selective, imbalanced, or distorted cognition of situations and relationships. Emotional thinking refers to a generalized inability to distinguish emotions and thoughts. For some, strong emotions tend to interfere with balanced and realistic thought processes and can result in distorted views of situations and relationships. The emotional thinking scale (ETS) is a completely new and improved version of the globality-differentiation scale (Mehrabian, Stefl, & Mullen, 1997). Reliability and validity data on the Emotional Thinking Scale were provided by Mehrabian (2000), showing that Emotional Thinking is a highly relevant negative predictor of life success. With reference to the conventional definition of emotional intelligence, Emotional Thinking relates to low emotional control, inability to manage stress and life difficulties, inadequate communication skills due to distorted perceptions of others and low impulse control.

Relaxed temperament

"Relaxed temperament" refers to a generalized emotional predisposition to be relaxed and dominant (or high internal control). Within Mehrabian's temperament models, a relaxed temperament is the healthiest variant of temperament (or personality) constellation, because it provides an inbuilt resilience to stress and everyday life difficulties. Relaxed temperament facilitates a person's ability to deal with (or

manage) stress, to exercise control over his/her emotions, to have a positive and constructive attitude toward life and to have accurate and realistic perceptions and expectations in various life situations.

VI. EMOTIONAL INTELLIGENCE QUOTIENT

John D. Mayer and Peter Salovey showed that the ability to direct one's emotions, as well as understanding and influencing other people's emotional responses, go a long way towards effective adaptation to an environment. The Mayer-Salovey model defines emotional intelligence as the capacity to understand emotional information and to reason with emotions. More specifically, they divide emotional intelligence abilities into five areas:

1. The capacity to accurately perceive emotions (Self-awareness)
2. The capacity to use emotions to facilitate thinking (Self-motivation)
3. The capacity to understand emotional meanings (Empathy)
4. The capacity to manage our emotions (Self-regulation)
5. The capacity to manage other people's emotions (Social skill)

These five abilities are assessed by ability-based tests.

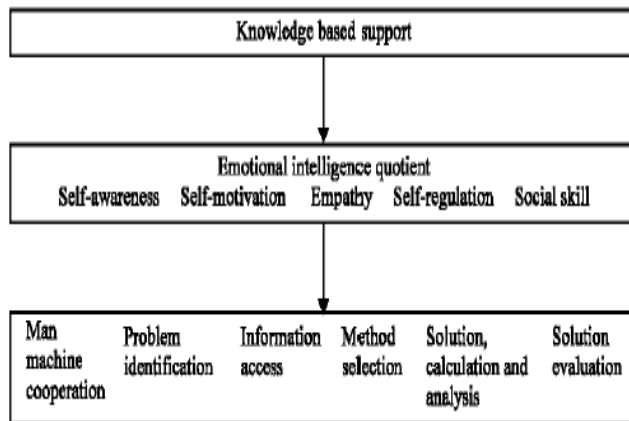


Fig. 1. Functional architectural framework of knowledge based cognitive psychology

Chilean biologist Humberto Maturana[5] sees emotions as “predispositions of the body to certain kinds of actions and not others”. He notes, for instance, that the actions available to an angry person differ from those available to a non-angry person. The trick then becomes how to enter into emotional states that enhance and enrich the range of effective actions. He also sees strong two-way connections between emotions and language; in particular, the kind of talk we allegedly constantly use to address ourselves.

VII. ENABLING EQI IN DSS

The last definition is precisely tapped by our proposed system, in delivering tailor-made solutions. The system will be able to determine the nature of the decision-maker and by factoring that into its knowledge base, be able to deliver a most effective solution.

This knowledge-based DSS includes not only a knowledge management component, but also an Emotional Quotient Base, which stores and manages a new class of emerging AI tools such as machine learning and case-based reasoning (CBR) and learning. These tools can obtain knowledge from prior data, decisions and examples (cases) and contribute to the creation of DSS to support repetitive, complex real-time decision-making. Machine learning refers to computational methods/tools of a computer system to learn from experience (past solutions), data and observations and consequently alter its behaviour, triggered by a modification in the stored knowledge.

The role of the knowledge-based DSS should be to allow experts to broaden and expand their expertise, not to narrow it down, and hence it will incorporate an assembly of sporadic tests, which will tend to decide the level of EQI associated with the user. Then, not only will the nature of the decision/solution be dependent on the EQI levels, but also the precise wording of the solution, which, as shown, will have a tangible effect on the levels of acceptance to the user.

These tests are done for a broad set of individual characteristics associated with emotional intelligence and supply a single summary score that represents an overall estimate of the emotional intelligence of each individual tested.

Economic value of the EQI approach

Ultimately, the success of any approach to DSS depends upon its value to organizations. Additionally, acceptance of emotional intelligence concepts and programs by academicians, professionals and organizations will ultimately depend on their demonstrated validity and utility.

The commercial adequacy of this approach may be quite simply evaluated by the following steps:

- o Performance criterion is defined
- o Business case is developed
- o The economic value of the problem is calculated
- o The difference that can be made by non-machine (e.g, H.R) usage is estimated
- o A course and evaluation system for the EQI data gathering are designed
- o The system is monitored
- o Effects of training are evaluated

VIII. DSS USER'S PERCEPTION AND SATISFACTION

Analysis of data

Analysis of the data is the most skilled task of all the stages of the research. It is a task calling for the researcher's own judgement and skill. Proper analysis requires a familiarity with the background of the survey and with all its

stages, the analysis does not necessarily be statistical one. Both quantitative and non quantitative methods can be used. Part of analysis is a matter of working out statistical distribution, constructing of diagrams and calculating simple measures like averages, measures of dispersion, percentages correlation etc., the simplest form of the representing research findings is the frequency distribution or tabulation.

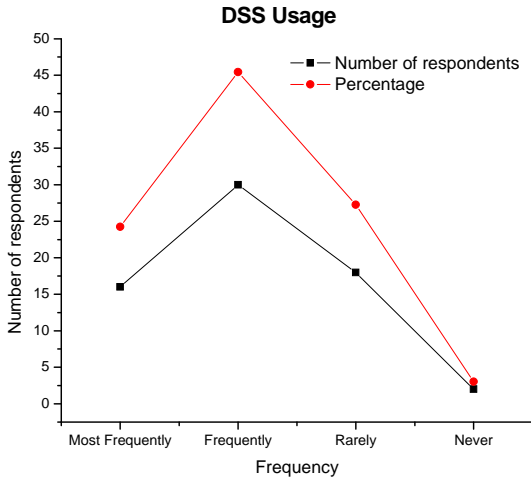


Fig. 2. DSS Usage Frequency

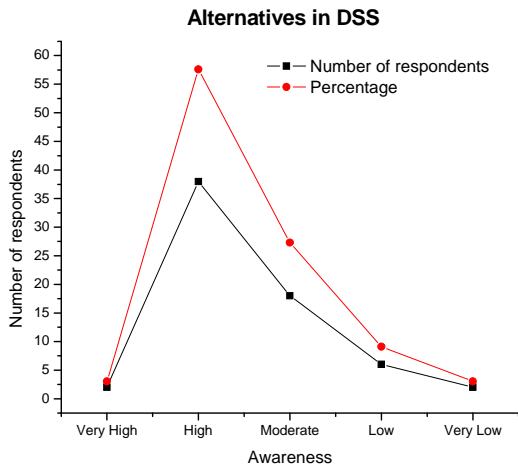


Fig. 3. Awareness of the alternatives in DSS

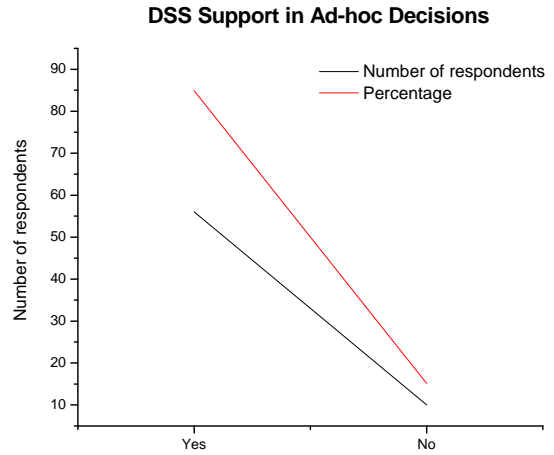


Fig. 4. DSS support in Ad-hoc decisions

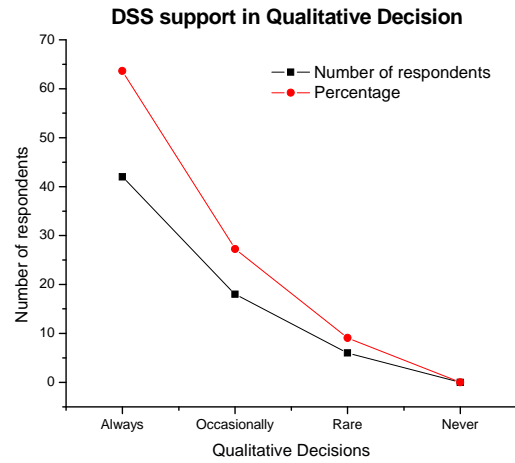


Fig. 5. DSS support in Qualitative Decisions

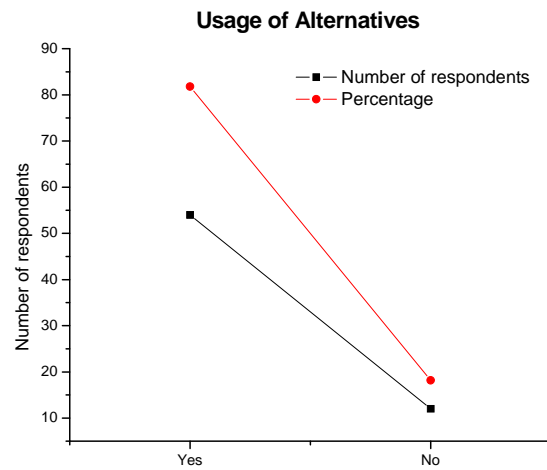


Fig. 6. Usages of Alternatives

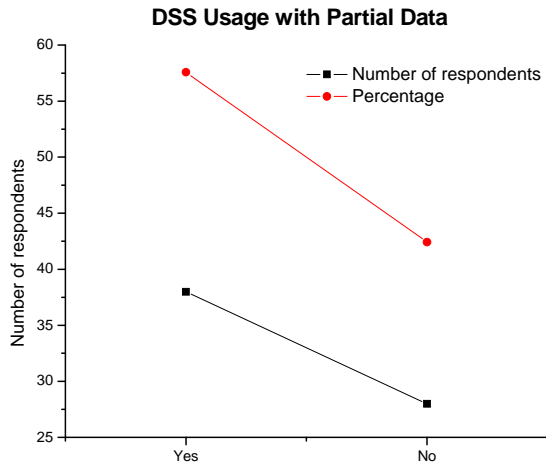


Fig. 7. DSS usage with partial data

X. FINDINGS

- 45.5 % of the respondents are using DSS frequently.
- 57.6% of the respondents are highly aware of the alternatives available in DSS.
- 55% of the respondents are says DSS alternatives are reliable.
- 85% of the respondents say the levels of satisfaction during the usage of DSS are effective.
- 45.5% of the respondents are says highly compatible and 40% of the respondents are compatible during the decision making.
- 45.5% of the respondents are occasionally taking ad-hoc decisions.
- 85% of the respondents say DSS supports very much during the ad-hoc decision making.
- 64% of the respondents tell that the DSS always support to arrived qualitative decisions.
- 82% of the respondents are using available alternatives in DSS. It shows they are belongs to classical economical decision makers model.
- 58% of the respondents say even they are using DSS with partial data.
- 67% of the respondents are having experience of using GDSS.
- 50% of the decision makers frequently using GDSS.
- 64% of the decision makers say GDSS highly effective and 5 of them say it is in effective because of technical and networking problems.
- The frequency of taking ad-hoc decision does not depend on the experience of the employees.
- The compatibility of DSS usage does not depend on the experience of the employees.
- The usage of DSS alternatives for decision making depends on the experience of the employees.

XI. CONCLUSIONS

The framework of knowledge-based decision support system suitable to the unique characteristics of decision maker is detailed. The factors related to emotional intelligence enhancing the group decision-making and emotional quotient of the decision maker, which plays a major role during the development of KBDSS, is investigated. A system that will dynamically adapt itself, not to a member of the organization, but instead to all the person exploiting it and a system that will be able to identify the nature of the decision-maker currently involved in the process, and provide him/her with solutions specifically tailored to that particular person's unique mental composition is developed. Also, the importance of communication between agents and the decision makers involved in group decision making from different domains, from different geographical locations using the same GDSS [6, 7] is considered. As such, maintaining large data and model bases for such systems is very inefficient. This research also addresses various issues related to distributed data management during the group decision making. Finally, a survey is conducted among the decision support system users to know their satisfaction, user-friendliness, perception, etc in relation to the DSS.

XII. FUTURE RESEARCH

This could be extended to worldwide spread organizations, which will have virtual decision rooms connected through web enabled wire/wireless networks in the future. Also, the increasing rate of mobile technologies will pave a way for the system to engage them in its research.

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