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COMPUTER SUPPORTED GROUPS:

AN EXPERIMENT IN

INNOVATIVE

INFORMATION SYSTEM IDEA GENERATION

AND GENDER EFFECTS

by

Esther E. Klein

A dissertation submitted to the

Graduate Faculty in Computer Science

in partial fulfillment of the requirements for the degree of

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1996

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ABSTRACT

COMPUTER SUPPORTED GROUPS: AN EXPERIMENT IN INNOVATIVE INFORMATION SYSTEM IDEA GENERATION AND GENDER EFFECTS

by

Esther E. Klein

Adviser: Dr. Dorothy G. Dologite

This is interdisciplinary research on the impact of group support tools on information system idea generation by end-user groups. The goal is to explore the possibility of generating higher levels of creative and innovative solutions to information systems design challenges fostered by group support. This study further explores this issue in relation to the gender composition of the group. The research focus is on 3 "T's": tools, teams, and types of employees.

The purpose of this dissertation is to look at the role of group support tools and gender composition of the group in identifying innovative information systems ideas for competitive positioning of an organization. The following questions are posed:

- What support strategies are optimal for generating innovative information system ideas by groups?

- Is gender a factor when considering type of group support?

These questions were investigated in a 3 x 3 factorial design laboratory experiment with factors of: 1) group support tools; and 2) group gender composition. The group support tools include Creativity Support Software (such as Mind Link), Group Support System Software (like VisionQuest) and a control group using No Computer Software support utilized the Nominal Group Technique. Groups of all-male, all-female and mixed gender composition were studied.

In order to perform the experiment a realistic task involving an information system domain was used. The task required the proposal of a new system or an improvement to the current system at a restaurant like Denny's, Inc.

Information system solutions were evaluated for creativity and innovation by five independent expert judges. A thirteen item Creativity Evaluation Questionnaire was adapted from Lobert (1993) and Besemer and O'Quin (1987) to evaluate the generated ideas.

Using analyses of variance to test the hypotheses, it appears that when ideas are evaluated for novelty, computer group support is essential for mixed gender

groups for the generation of innovative information system ideas. Same gender groups performed best when No Computer Software support was present. Results also indicate than when ideas generated are evaluated for usefulness, performance of groups with No Computer Software support was equal to the performance of groups with Group Support System Software support. Groups with Creativity Support Software performed the worst.

DEDICATION

To my children,

Miriam,

Shaul,

and

Mendi.

ACKNOWLEDGEMENTS

A dissertation is a result of collaboration. I was fortunate to have had an outstanding committee consisting of Dorothy G. Dologite, Linda W. Friedman, Stanley Habib, and Brenda Massetti.

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always be grateful for their assistance.

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PART I. INTRODUCTION

Chapter 1

Introduction

In this introductory chapter the following items will be discussed: 1) importance of the research topic; 2) the research questions; and 3) organization of the dissertation.

1.1 Importance of the Research Topic

Information systems idea generation is a complex task involving creative and analytic thinking, usually executed by more than one person. To develop the innovative information system necessary for competitive positioning, it is essential that organizations involve teams of end-users in the requirements definition phase of the systems development process. Research has been done in different fields of behavioral science comparing individual versus group performance (Hare, 1976; Shaw, 1981). Empirical findings point to two directly conflicting results: on the one hand, it was found that "best members" perform better than a group (Campbell, 1968); however, on the other hand, a group's performance is better than individual's performance (Laughlin and Barth, 1981). The uncertainty in the research results

led to classifications of conditions in which group performance is superior or inferior to individual performance. According to Douglas (1983), groups produce more and better solutions to a problem increasing the potential for a creative and innovative solution.

A longstanding concern and need of organizations has been the optimization of group work and group decision making (DeSanctis and Gallupe, 1987). The free flow of communication creates a comfortable climate within the group. Several techniques have been proposed to facilitate group interaction and reduce conflict (Ulschack et al., 1981; Van Gundy, 1984). Techniques such as brainstorming and synectics are methods for creative idea generation, while the nominal group technique (NGT) and the Delphi technique are structured group management techniques. With the 1980's advances in microcomputer chip technology, graphics and local area networks have led to networked computer systems and environments that support group work. The various systems emphasize either collaboration or group processes or decision-making. The literature often refers to these systems as Group Support Systems (GSS) or Groupware, interchangeably.

Advances in telecommunications technology and workstation products permit and encourage end-users to participate in the application development process. A 1990 KPMG Peat Marwick (Peat Marwick, 1990) study predicted that 80 percent

of all applications will be developed by end-users by the end of the 1990s. User participation increases the effort applied to application development. No one has a keener insight into what makes an efficient and effective business application than the end-user. Also, it tends to reduce user frustration with the traditional application development group.

To date, information technology has largely focused on improvements, i.e., making business processes faster, more efficient, and better integrated. Effecting creative and radical change to realize order-of-magnitude improvements requires innovation (Davenport, 1993). Innovation is the development of practical products and processes that drive economic growth (McVicker, 1992). The question of what drives innovation in a society is a tough one that nobody has a definitive answer to. Innovation needs a supply of good ideas, plus an environment in which these ideas can develop.

Exploratory studies (Myers and Ragusa, 1992), point out that Joint Application Development tools and Group Support Systems tools will soon be integrated to produce an integrated application development environment. Experimental studies by Elam and Mead (1990), Lobert (1993) and Massetti (1994) preliminarily demonstrated that the creativity process (and therefore, innovation) may be enhanced, as well as undermined, through the use of software.

Unfortunately, there has been little empirical research in this area. More importantly, there has been no work to date evaluating the effectiveness of the various suggested techniques. A further shortcoming of the literature has been the failure to look at the role of the team using these techniques and the likely impact of the group gender composition on the solution developed through the use of any technique.

1.2 The Research Questions

Seeking to understand how teams identify innovative information systems applications for competitive positioning of an organization, three questions are of interest in designing the research study for this dissertation : 1). Does Creativity Support Software encourage production of innovative information system ideas by different gender groups? 2) Is Creativity Support Software at least as effective as Group Support System Software in producing innovative information system ideas in different gender groups? 3) Is Creativity Support Software at least as effective as Group Support System Software in producing innovative information system ideas?

1.3 Organization of the Dissertation

Having presented the importance of the topic, and identified the research questions, it is now appropriate to describe the organization of the balance of this dissertation, where a more detailed discussion of these items can be found.

Chapter 2 is a detailed review of the relevant literature streams supporting the research model and design. The literature reviewed includes the areas of: groups, collaborative work and computer support for groups; creativity, innovation and idea generation; and gender in groups, innovative idea generation, and technology.

Chapter 3 presents the research framework and the hypotheses to be tested.

Chapter 4 describes the research methodology for the research study. Details are provided on the research design, subjects, experimental task and experimental procedures used in this study. Sample size calculations are included.

Chapters 5 through 7 present the results and data analysis of various aspects of this study.

Chapter 5 presents the background information for the subjects. Descriptive statistics for demographic data, computer background, attitude toward group work and group history are provided.

Chapter 6 provides the results of the experimental study. Assessment of an innovative information system idea is discussed. The reliability of judges' ratings is tested. Statistical analyses of the hypotheses are described and the results reported.

Chapter 7 explores the subjects' post session feedback. Analysis of variance procedures were used to discover any difference among experimental subgroups experiences with the group process and experimental task.

Chapter 8 is a general discussion of the results, limitations of the study, and implications of the research.

Chapter 9 provides an overall summary of the study. Description of the problem investigated, methods of investigation, analysis and results, the implications of these findings, and conclusions made are discussed.

II. THEORETICAL FOUNDATIONS

Chapter 2

Review of Literature

This is an interdisciplinary study of the impact of group support tools on information system idea generation by end-user groups. The goal is to determine which, if any, of the group support tools fosters the highest level of innovative solutions to information systems design challenges. In addition, this study explores this issue in relation to the gender composition of the groups. Literature of previous research in the relevant areas of 1) groups and collaborative work, 2) creativity and innovation, and 3) gender in information system idea generation will be reviewed in this chapter.

2.1 Groups and Collaborative Work

The modern organization depends on the participation, and on the consensus, of its principals, employees, and interested others--all of whom are potential stakeholders in the innumerable business processes and decisions that create success (Post, 1992). The well-known Hawthorne studies, which began at Western Electric

in 1929, led engineers and scientists to ascribe much of the variance they observed in worker productivity to group behavior variables. Group work can provide several advantages (Hughes, 1963; Nunamaker et al., 1991):

- less technical frustration, since more information is available to the group;
- less individual responsibility;
- "cross-fertilization of ideas" and synergy of information;
- wider margins of error for individual, since members of the group compensate for each other;
- stimulation of individuals, since "creativity is contagious";
- more objective evaluation;
- learning from other group members.

Generally, researchers have also found that individuals working in groups generate more ideas than when they work alone.

Mosvick and Nelson's (1987) research indicates that professionals spend between twenty five and eighty five percent of their time in meetings. Yet, over fifty percent of the time is wasted.

Group meetings, in general, are unproductive (Shaw, 1981). Disadvantages of group work include(Diehl and Stroeb, 1987; Lamm and Trommsdorf, 1973):

- attenuation blocking: if ideas are not voiced as they occur, they may be irrelevant at a later time;
- attention blocking: new ideas are not generated since members of the group must constantly listen to others speak;
- concentration blocking: members make less comments, since they try to remember the comments that already have been made;
- air time fragmentation: the group must partition time among members;
- free riding: expectation to ride free on the ideas of others;
- dominance of discussion by one or more members;
- group influence by high-status members;
- failure to remember ideas of others;
- pressure for conformity and associated low tolerance of minority or controversial opinions;
- undue attention to social activities relative to the task activities of the group;
- fear of speaking in public and of personal evaluation.

Procedures have been proposed to facilitate group interaction and to reduce conflict (Ulschack et al., 1981; Van Gundy, 1984). Several of these techniques will be explored in the following section.

2.1.1 Support for Groups

A longstanding concern and need for organizations has been the optimization of group work and group decision making (DeSanctis and Gallupe, 1987). Several techniques have been developed to support and enhance group work. Techniques such as brainstorming and synectics are methods for creative idea generation, while the nominal group technique (NGT) is a structured group management techniques.

2.1.1.1 Nominal Group Technique

Nominal group technique is a structured problem-solving process specifically designed to generate ideas and produce group consensus. It was developed in 1968 by Delbecq and Van de Ven (1968). The technique is especially effective for use in situations where individual judgement must be tapped and combined to arrive at decisions that cannot be calculated by one person. The technique is effective in problem-identification or solution-oriented meetings.

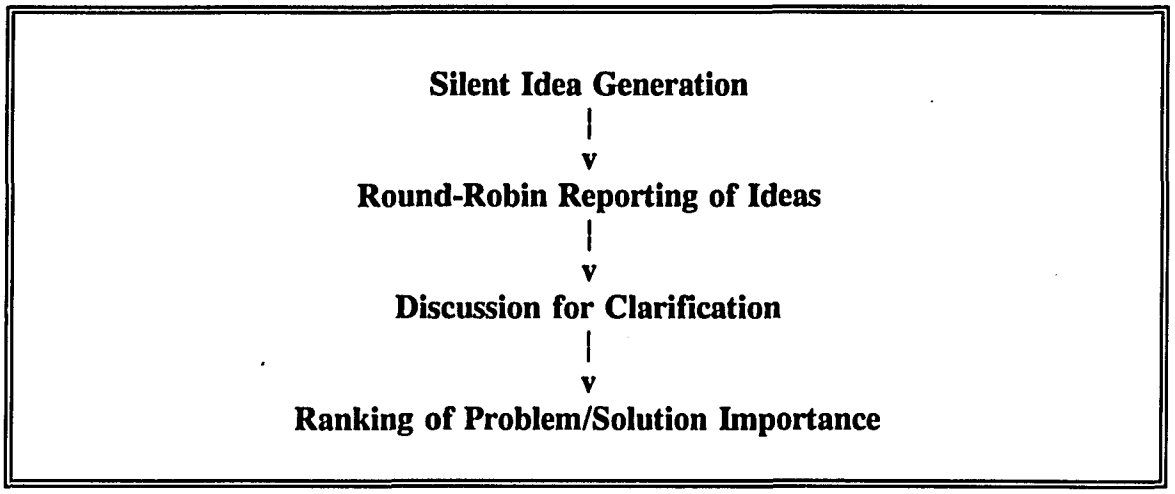


Figure 1: Nominal Group Techniques Process (Ulschak et al., 1981)

The nominal group technique process, outlined in Figure 1, combines a silent time for idea generation with the social reinforcement of an interacting group setting. The nominal group technique meeting usually concludes with a perceived sense of closure, accomplishment, and interest in future action toward solving a problem (Ulschak, et al., 1981). The group is usually facilitated by a trained leader.

The advantages of nominal group technique include the following (Ulschak et al., 1981):

- it can be used with groups of varying background, cultures, education or work roles who share a common problem or goal;
- it can be used in groups where participants do not have previous

training in group process or communication skills;

- it is a quick method of bringing people together to approach a common task;
- it promotes the generation of many ideas surrounding an issue;
- it allows maximum and equal participation of all group members;
- the structure of NGT makes it a relatively easy process to run;
- it allows a group to reach consensus in only about two or two and an half hours.

The disadvantages of nominal group technique include:

- the need for a trained leader or facilitator;
- it can deal with only one question at a time;
- it is inappropriate to use in a group where interacting problem-solving and team-building skills are to be developed.

2.1.1.2 Synectics

Synectics, "the joining together of different and apparently irrelevant elements," originated with Gordon (1961). It is based on the use of metaphors and analogies within a systematic framework to achieve creative results.

Synectics is a technique for creating an environment that encourages creative approaches to problem-solving. Salient aspects of synectics include clearly defined roles for a leader, client, and participants; techniques for getting participants away from the problem; and specific ways of reflecting on ideas (Ulschak et al., 1981). Several interrelated psychological states were identified by Gordon (1961) as being part of the creative process:

- . detachment - the ability to separate oneself from the problem;
- . involvement - the ability to become absorbed in the problem;
- . deferment - the ability to put off making decisions;
- . speculation - the ability to let the mind run free.

The synectics problem solving process consists of three major segments. The first is devoted to defining, elaborating, analyzing and understanding the problem. The second is devoted to applying the different operational mechanisms, the metaphors and analogies, to the problem. When the second segment is completed the group tries to *force a fit* between what they have arrived at as a result of applying the operational mechanisms and the problem on which the group was working. Hopefully, the result of the forced fit is such that it is a solution to the problem, a suggestion that can lead to a solution, or an idea that results in a better understanding or better approach to the problem.

2.1.1.2.1 MindLink Problem Solver Software

MindLink Problem Solver software developed by MindLink, Inc. is based upon primary synectics principles and concepts. Perhaps the most important of these is the use of "triggers" to stimulate ideas. Triggers force together a concept or thought unrelated to the problem and attempt to provoke unique ideas through this combination. Repeatedly forcing connections provides new perspectives that should multiply the number and quality of ideas.

Implementation of MindLink, the connection-making operation is accomplished through a HyperCard-based, four-step problem-solving process: (1) problem identification and definition, (2) wishing exercises and idea generation, (3) development of ideas into solutions, and (4) action plan for implementing solutions. MindLink is designed to help create original solutions to problems.

2.1.1.3 Group Support Systems

Group Support Systems technology includes multiple microcomputers operating on a local area network. Participants enter their ideas and judgements using special group-oriented software. The participant stations can be in the same

room to support face-to-face interaction, in which case a public screen is added to display and edit information during supplementary verbal discussion. Alternatively, the stations could be in different rooms or buildings or cities or countries to support different time and place interactions. The dispersed setting support "anytime anywhere" meetings overcome many typical barriers to collaboration. Group Support Systems technology provides tools that affect the efficiency and effectiveness of information processing in meetings. Capabilities provided by Group Support Systems which can benefit a group include anonymity, simultaneity, process structuring, electronic recording and display, and extended information processing capacity.

The 1980's advances in microcomputer chip technology, graphics and local area networks have led to networked computer systems and environments that support group work. The various systems emphasize either collaboration, meetings, group processes, coordination, decision-making, or communication aspects of group work. The literature often refers to these systems as Group Decision Support Systems (GDSS), Group Support System (GSS), Electronic Meeting System (EMS) or Groupware, interchangeably (Jessup and Valacich, 1993; Marca and Bock, 1992). DeSanctis and Gallupe (1987) define the objective of GSS as improving the group decision making process by removing barriers and providing a spectrum of tools and techniques to facilitate the decision making process. Jelassi and Beauclair (1987)

define GSS as an interactive computer information system that augments the group decision making within an organization with data handling, modeling, and dialogue requirements of groups. Dennis et al. (1988) emphasize the technology that supports the decision making activities and communications.

2.1.1.3.1 VisionQuest Software

VisionQuest is a groupware system developed by Collaborative Technologies Corporation in Austin, Texas. It is designed to support teams in their decision making processes. It assists groups to gather, organize and evaluate ideas.

VisionQuest is built around meeting procedures and processes. Collaborative Technologies recommends its usefulness for meeting processes such as sending out announcements, preparing rosters, establishing meeting purposes and goals, and developing agendas. Other useful meeting processes include opinion gathering, ensuring anonymity, documenting conclusions and commitments. For opinion gathering, VisionQuest uses electronic brainstorming, the nominal group technique, a topic commentator-annotator, group rating, ranking, voting, and meeting critique and evaluation. Members may participate in a VisionQuest session in a central location or via a local area network or via a dial-in system. This flexibility is what is referred to as "any time -- any place" potential of a meeting.

2.1.2 Framework for Studying Group Support

Review of the literature reveals that several frameworks have been proposed for the study of the impact of support for groups.

The Dennis et al. (1988) model consists of group processes, group outcomes, methods and environment.

Nunamaker et al. (1991) contend that the effects of Electronic Meeting Systems (EMS) are contingent on a myriad of group, task, context, and technology factors that differ from situation to situation. Figure 2 presents a high-level view of this research model. Group characteristics that can affect processes and outcomes include group size, group proximity, group composition, group cohesiveness. Task characteristics include the activities required to accomplish the

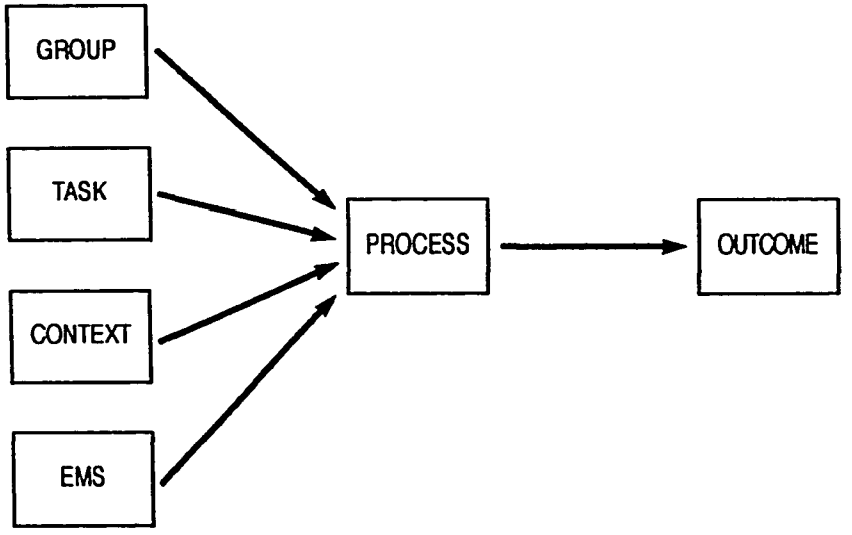


Figure 2: Electronic Meeting System Research Model (Nunamaker et al., 1991)

task and task complexity. Context characteristics include organizational culture, time pressure, evaluative tone, and reward structure. Meeting outcomes depend upon the interaction within the meeting process of these group, task and contextual factors with the EMS components (e.g., anonymity) the group uses.

The Nunamaker et al. (1991) model is an extension of the Dennis et al., (1988) model and contends that meeting outcomes are contingent upon the balance of process gains and losses. The process gains and losses are illustrated in Figure 3. Situational characteristics such as group, task, and context establish an initial balance, which the group may alter by using an EMS. The EMS offers to the group a set of tools for process support, process structure, task structure and task support.

Process support refers to the communication infrastructure such as media, channel and devices (electronic or otherwise) that facilitate communication among members.

Process structure refers to process techniques or rules that direct the pattern, timing or content of communication among members.

Task support refers to the information and computational infrastructure for task related activities.

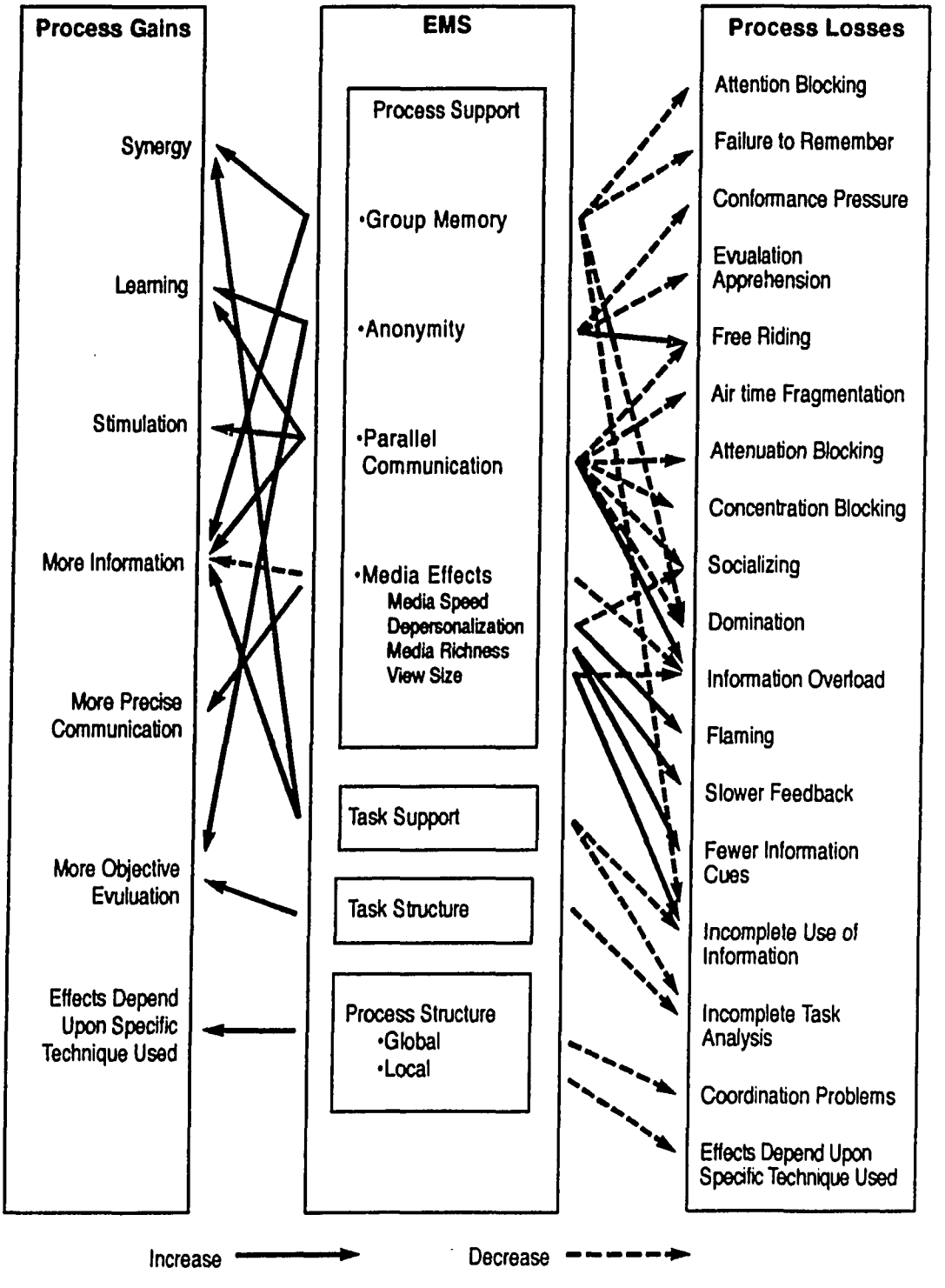


Figure 3: Potential EMS Effects (Nunamaker et al., 1991)

Task structure refers to techniques, rules, or models for analyzing task related information to gain new insight.

Pinsonneault and Kraemer's (1989) framework, illustrated in Figure 4, is evolved from the literature of organizational behavior and group psychology and applied to the study of technological support for groups. The authors conceptualize that the relationship between technological support and group outcomes involve four broad sets of factors concerned with: (1) the context, (2) the process, (3) the task related outcomes, and (4) the group related outcomes of group interaction.

Contextual factor variables refer to factors in the immediate environment of the group. The five most significant contextual variables in behavioral research appear to be personal factors, situational factors, group structure, technological support, and task characteristics.

Group process variables refer to characteristics of the group's interaction. Decisional characteristics, communications characteristics, and interpersonal characteristics are the three segments of the group process.

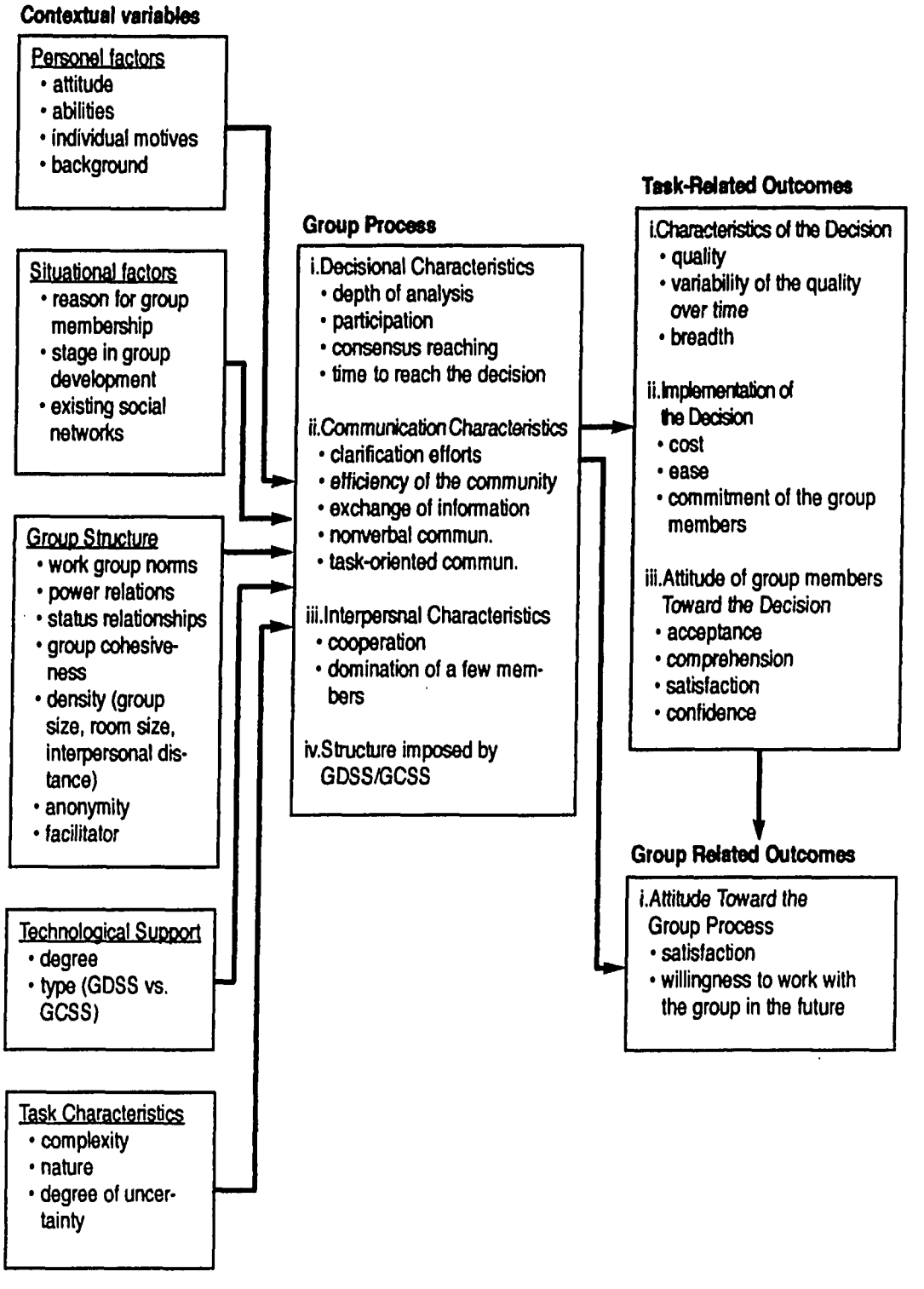


Figure 4: A Framework for Analyzing the Impacts of GDSS on Group Processes and Outcomes (Pinsonneault and Kraemer, 1989)

The group process structure may be viewed as having two dimensions: first is the degree of structure, and second is the type of structure. The structure of these group processes is likely to affect the outcomes of the group.

Task related outcomes consist of three variables: first is the characteristic of the decision, including the decision quality; second is the characteristic of decision implementation, including cost and ease of implementation; and third is the attitude of the group members toward the decision, including the acceptance and satisfaction with the decision.

Group related outcomes include variables such as satisfaction of the group members with regard to the process and the willingness of the group members to work in groups in the future.

Poole and DeSanctis (1989) believe that the Group Support System is just another variable added to the group environment and the group will engage in their activities as usual.

A Factors Oriented Control Model of Group Decision Support Systems is proposed by Fjermestad and colleagues (Fjermestad et al., 1993).

The Applegate (1991) model stresses the transfer and assimilation of GDSS in organizations.

Bostrom et al., (1987) present the Electronic Meeting System as an Information Processing System with input, process and output phases. The model is presented in Figure 5. There are five inputs into the group idea generation process: individual factors, group factors, environment, task, and facilitation. The outputs are the creative ideas generated in response to the task.

The Input-Process-Output model follows the Black Box model in which the process is hidden and not understood. Therefore, the inputs and outputs are studied extensively in order to try to approach an understanding of the process that transformed the inputs into the outputs.

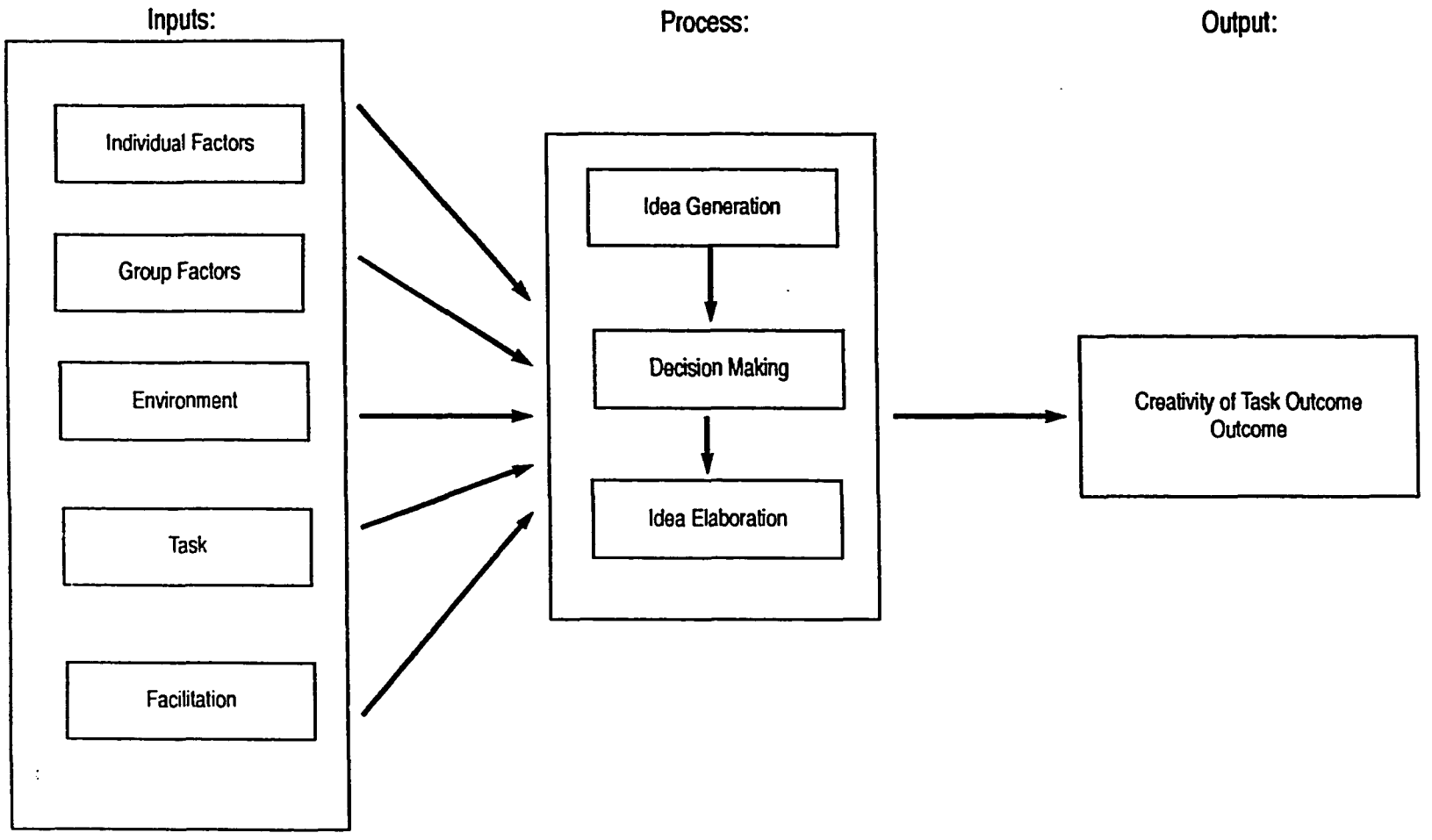


Figure 5: Electronic Meeting System as an Informational Processing System (Bostrom et al., 1987)

2.2 Creativity

The influence of creativity on idea generation and the development of solutions is examined in this section. The creativity literature is quite varied in its focus and operationalization. Various definitions of creativity have been proposed and several measurements of creativity suggested.

2.2.1 Definitions of Creativity

Creativity is a complex area of study that defies precise definition (Torrence, 1988). There is no single accepted definition of creativity. Definitions range from simple to complex. Bruner (1968) provides the simplest definition of creativity, "effective surprise." Miller (1987) defines it as the birth of imaginative new ideas. Parnes (1967) defines creativity as a function of knowledge, imagination and evaluation. Keil (1987) believes that creativity is more than a process or approach. "It is also a state of mind that is always alert and ready to turn any kind of stimulus into an idea."

The classification of creativity by Rhodes (1961) discovered four elements which appeared consistently throughout the definitions: Person, Process, Product,

and Press (often referred to as Environment).

2.2.1.1 Person-Based Definition of Creativity

A great deal of research has focused on identifying the characteristics of the creative person. Galton (1874) researched outstanding scientists and reported that half possessed some of the following characteristics: energy, health, steady pursuit of purpose, business habits, and independence of view. Roe (1952) reported differences involving age and productivity. Helson (1961, 1968) has noted differences in creativity for females as compared to males. Most frequently cited research on creative personality stems from the work of MacKinnon (1960, 1961) and associates at the Institute for Personality Assessment and Research. Torrence (1984) developed the Torrence Tests of Creative Thinking to measure an individual's "creativity level."

2.2.1.2 Product-Based Definition of Creativity

Many researchers have directed their energies to identifying a variety of criteria which characterize a creative product. Taylor (1972) has developed a Creative Product Inventory which profiles a product in terms of the following criteria: generative power, transformation power, degree of originality, relevancy,

complexity, and condensation.

According to Newell and Shaw (1972) for a product to be classified as creative it must: 1) be new or unique, and 2) have value.

2.2.1.3 Process-Based Definition of Creativity

Whether a problem is presented or discovered, creative processes are required to reach creative solutions or products. Osborn (1953) operationalized a procedure to facilitate creative thinking frequently called "brainstorming" which utilizes personal interaction. Gordon (1961) developed another program for developing creativity called "synectics." Van Gundy (1988) lists as many as thirty-one group creativity techniques.

2.2.1.4 Press-Based Definition of Creativity

What constitutes a creative climate? What conditions facilitate and stimulate creativity? Environmentalists such as McPherson (1964), Torrence (1967) and Taylor (1972) have sought to specify situational factors functionally related to creativity and to isolate important variables which foster or inhibit creative expression. Torrence (1967) suggests that the following are important situational

factors: respect for unusual questions, respect for unusual ideas, provide opportunities and credit for self-initiated learning, and allow performance to occur without constant threat of evaluation. According to McPherson (1964) a climate favorable to creativity is stimulating and supportive.

Maddi (1965) assumes an opposing view and suggests that creativity will occur regardless of climate or setting.

2.2.2 Framework for Studying Creativity

Fellers and Bostrom (1993) propose a conceptual model, shown in Figure 6, of interactions among the four elements of the model identified by Rhodes (1961). The four elements are: person, product, process and press. The six lines among the four elements in the model demonstrate the dynamic, cyclical nature of the model, based on the feedback and continual learning that takes places in creative problem solving.

Figure 7 presents the conceptual links among the Creative person, Creative Process, Creative Product and the Creative Environment. Woodman, et al. (1993) propose this systems model for creative problem solving in organizations.

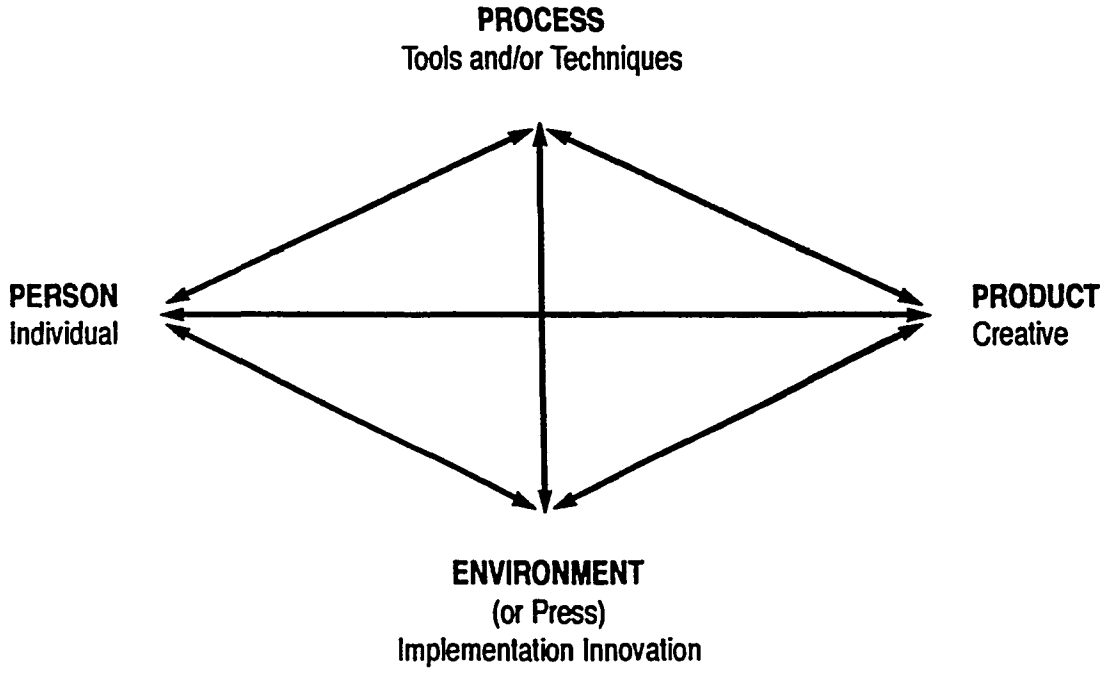


Figure 6: Creative Problem Solving in Organizations (Fellers and Bostrom, 1993)

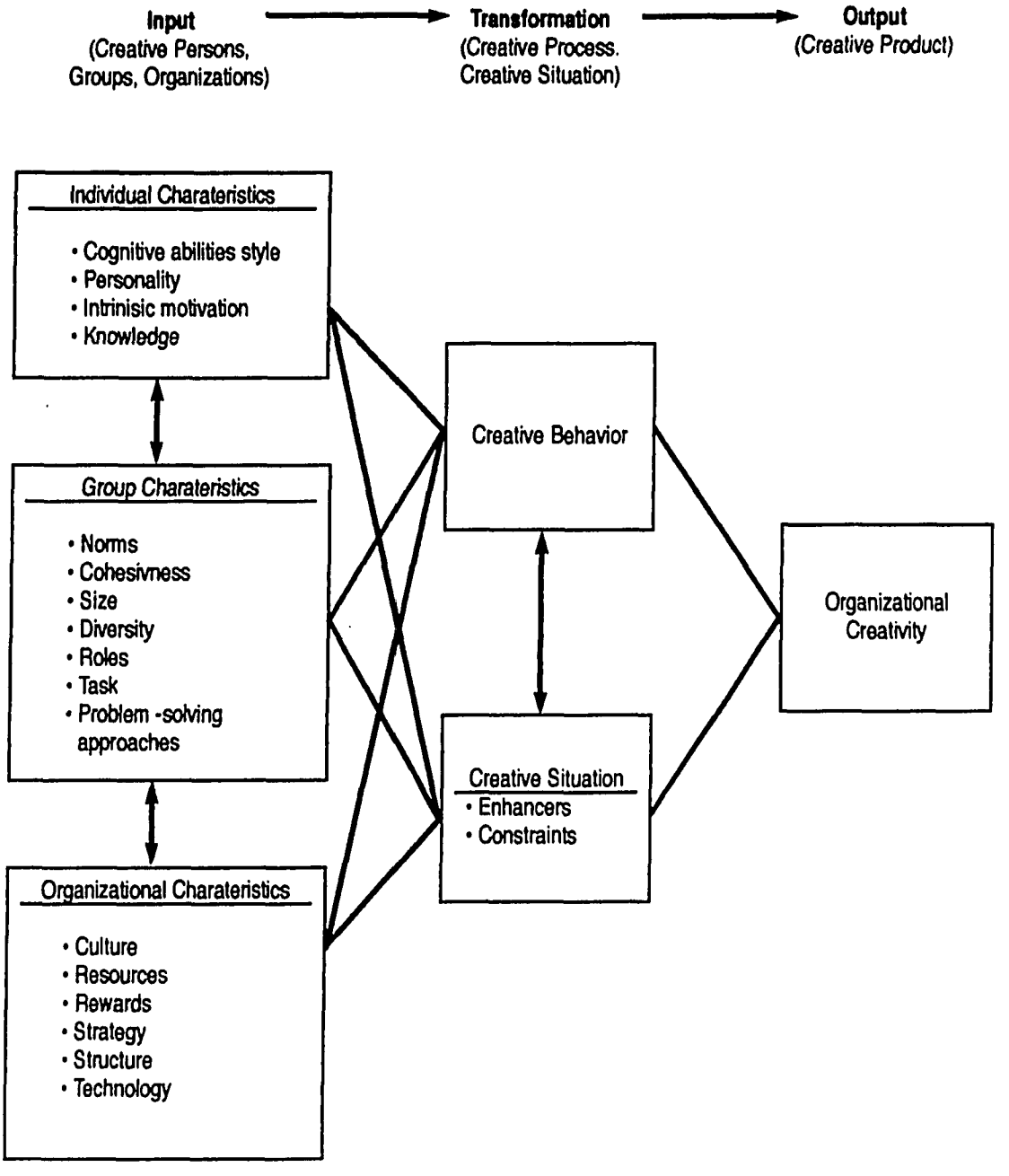


Figure 7: Conceptual Links among the Creative Person, Creative Process Creative Product and the Creative Environment (Woodman et al., 1993)

2.2.3 Measurement of Creativity

The question regarding what to measure is no simple matter. Creativity is complex and many elements interact to uncover this phenomenon. Although different authors use slightly different terms, the basic facets of creativity seem to be qualities of the person, aspects of the process, characteristics of the products, and nature of the environment (Isaksen et al., 1993; McKinnon, 1978; Mooney, 1963; Rhodes, 1961). Consequently, no single measure can capture the essence of creativity. Numerous creativity measures have been designed to examine the variables within each of these facets.

The person facet contains a great array of variables. Galton (1874) examined hereditary genius, Cattell (1906) and other studied eminence, while more recently MacKinnon (1978) in his study of architects used the Adjective checklist (Gough and Heilburn, 1983) to determine personality characteristics of highly creative subjects. Guilford (1986) and Torrence (1974) developed various cognitive abilities measures while Kirton (1976) and Myers and McCaulley (1985) promoted the style approach.

The measurement of the process facet has focused on the various stages of thinking or problem solving people engage in while producing something new and useful. Wallas (1926) provides one of the earliest description of the process. Osborn

(1953) outlined practical strategies for creative thinking. Despite great interest in applying and teaching strategies, few measures explicitly examine aspects of the creative process.

The creative product has been referred to as the "bedrock" of creativity research (MacKinnon, 1978). Given the importance of the product, numerous methods have been used to identify the creative products and subsequently the creativity of their creators. These methods include the number of patents (Albright and Glennon, 1961), number of publications (Cole, 1979), number of citations (Cole, 1979), and peer or expert evaluation (Amabile, 1987; MacKinnon, 1978).

The environment facet of creativity has been studied by Lewin (1936, 1951) and Murray (1938). Amabile and Gryskiewicz (1988) designed a questionnaire to measure how conducive the work environments are for creativity. It has been this facet that has led creativity researchers to undertake interactionist approaches to their work.

2.2.4 Creativity and Innovation

Innovation is defined as that which is newly introduced. Often the terms 'creativity' and 'innovation' are used synonymously, but they are different.

Creativity refers to the generation of novel ideas -- innovation to making money with them (Rosenfeld and Servo, 1991; Frame, 1989; Whiting, 1989). Creativity is a starting point for any innovation, in many cases a solitary process. Innovation is the work that follows idea conception and usually involves the labor of many people with varied, complementary skills. The challenge is to transform creative ideas into tangible products or services that will improve organizational productivity (Rosenfeld and Servo, 1991).

Couger, Higgins and McIntyre (1990) and Frame (1989) clarify the distinction between creativity and innovation by noting that the same relationship exists between discovery and invention. Invention requires a purpose. Discovery, on the other hand, requires no clear purpose of object. Where invention is concerned with implementation of discovery, innovation is concerned with implementation of inventive ideas (Couger, Higgins and McIntyre, 1990). Innovation is a process whereby new ideas are put into practice (Rickards,1985).

2.2.4.1 Sources of Innovation

Where does innovation originate? There are innovations that spring from a flash of genius. Most innovations, however, result from a conscious, purposeful search for innovation opportunities. Unexpected occurrences, incongruities, process

needs, and industry and market change opportunity exist within a company or industry. Demographic changes, changes in perception, or new knowledge opportunity exist outside a company.

Who are the functional innovators? They are users. They are manufacturers. They are suppliers. Many functional relationships can exist between innovator and innovation in addition to user, manufacturer, and supplier.

2.2.4.2 Innovation and Information Technology

Innovation means change. These changes can be incremental or radical, evolutionary or revolutionary, enabling or disruptive (Pearson, 1991). Effecting creative and radical change to realize order-of-magnitude improvements requires innovation (Davenport, 1993). To date, information technology has largely focused on improvements, making business processes faster, more efficient, and better integrated. As shown in Figure 8, there are fundamental differences between improvements and innovations.

	Innovation	Improvement
Change	Abrupt, volatile	Gradual, constant
Effects	Immediate, dramatic	Long-term, more subtle
Involvement	A few champions	Everybody
Investment	High initially, less later	Low initially, high to sustain
Orientation	Technology	People
Focus	Profits	Process

Figure 8: The Contrast Between Innovation and Improvement (McLean and Smits, 1993)

Through re-engineering and the use of information technology, innovations can have an immediate and dramatic effect, leveraging the technology to produce visible effects on the overall profitability of the organization.

2.3 Gender

Gender is a fundamental component of individual identity. In social group work many aspects of behavior are either directly or indirectly related to gender and societal assumptions about it. Gender is one's biological sex and includes chromosomal and genetic factors. Gender identity is the inner, subjective conviction that a person is a male or female. Gender or social sex role is the expectations, behaviors, characteristics, norms, and role sets defined by the larger culture, the family, and the self as appropriately masculine, feminine, or as unrelated to gender. Cultural beliefs and values are integrated into the behavior and thought.

2.3.1 Gender and Creativity

In general, creative persons are seen as ingenious, imaginative, courageous, original, artistic, clear-thinking, insightful, versatile, intelligent, individualistic and complicated. Beyond generality of traits possessed in common by those that are creative, Mackinnon (1975) assumed that stylistic, typological and sex differences would also be found among creative persons.

As for sex differences in creativity, Mackinnon (1975) in proposal to the Carnegie Corporation states that a problem of special interest arises from the fact

that far fewer women than men attain distinction for their originality in the arts, sciences and business. Whether this difference is due largely to social and cultural factors, to differences in role expectations and role possibilities, or to basic psychological and biological differences.

Virginia Woolf (1957) observed that the creative power of women, though highly developed, differs greatly from the creative power of men. Harris (1989) examined whether in fact, female responses to objects, images, and to themselves constitute a different perspective, a different 'reality' from that provided by male perceptions. The perception process involves an interaction between an organism and its environment. Harris (1989) acknowledged that women do perceive at least some phenomena, such as color and complexity of design, differently from men.

Torrence (1962) studied creativity and found that with the appropriate form of encouragement and instruction, females were able to utilize their creative potential as well as males.

2.3.2 Gender and Groups

Sex role perspective emphasizes the complementarity of male and female role, but ignores the process of power and prestige ordering that occurs when men and

women interact. There is evidence that women's and men's roles are not valued equally by society. Men's contributions are more valued not only monetarily (Baroudi and Igbaria, 1995; Igbaria and Baroudi, 1995), but also in terms of status and prestige. These status differences influence male and female behaviors in group settings (Lockheed and Hall, 1976; Meeker and Weitzell-O'Neill, 1977). Persons who have more status display both verbal and non-verbal behaviors that indicate more status and power. They talk more often, address the entire group and are less personal. Those with lower status are more deferent verbally and non-verbally. Status related behaviors do not just arise from socialization but are also related to environmental factors and will change if the environment changes or if status variables (e.g., legitimization) are adjusted (Kanter, 1977).

Female communication style differs greatly from that of men, especially when there is a critical mass, i.e., enough women to counteract the male dominant cultural communication style. Tannen (1990) describes the male purpose for communication as establishing the speaker's place in a hierarchy. Competitive posturing is not a natural or comfortable mode of interaction for women even if some are experts in using it as a survival skill. The female purpose of communication is to make or break connectivity in a community or network.

2.3.3 Gender and Technology

Research points out that in the past the involvement of women with computers has been limited. Many women did not have as much interest in using computers as men did. Wilder, Mackie, and Cooper (1985), Dambrot et al. (1985), Vredenburg et al. (1984) found that more women than men had negative attitudes towards computers, were afraid of computers and were less comfortable using them. A Gallup survey commissioned by MCI Telecommunications (Fox, 1995) reported that one-thirds (32%) of the 605 white-collar respondents admitted to being cyberphobic, with women (39%0 being more fearful than men (27%).

Previous level of education is a factor that may influence the development of computer literacy in women. Dickerson and Gentry (1983) established that a person with more education has a better understanding of the applications of computers.

Bakon, Neilson, and McKenzie (1983) report growing evidence that the long-documented gap between male and female participation in elective mathematics and physical science courses is now being replicated in computer labs.

Turkle (1988), in her study of women college students and their responses to the computer, explains that women tend to withdraw from interaction with formal

technological systems (such as computer information systems) less from negative emotions such as fear than from positive emotions such as a desire to be engaged in interpersonal interactions and to be spontaneously creative, factors women do not associate with computers.

Most women, even those who are technologically sophisticated, think of machines as a means to an end. Men think of the machine as an extension of their own power, as a way to "transcend physical limitations." Men typically imagine devices that could help them "conquer the universe." Women want machines that meet people's needs, "the perfect mother", according to Jan Hawkins, director of Children and Technology, a New York think tank (Kantrowitz, 1994). Women want to use the computer to help create and maintain the space necessary for the link between the individual and the community (Eastman, 1991).

Klawe and Leveson (1995) assert that drawing women into the field of computing and maintaining that momentum is a challenge that needs to start at a very young age. Eccles (1987) of the University of Colorado has published some studies showing how student, teacher and parental attitudes discourage girls from pursuing science and math despite the fact that females, in general, get better grades in math and science than males.

Jegede and Okebukola (1992) found cooperative group work to correlate positively with computer interest. The results of their study showed that the more experienced students had lower anxiety toward computers and generally showed more interest.

Research data have repeatedly indicated that males show more favorable attitudes toward computers (Collis, 1985; Dambrot et al., 1985), perceive that computers will be a career asset (Nickell et al., 1987), and competence (Dambrot et al., 1985; Ogletree and Williams, 1990) in computing tasks than females. These sex differences tend to be consistent across age groups from elementary school through college age population. The implications of these computing differences hold importance at both the national and individual level in our increasingly technological society (Nye, 1991).

Chapter 3

Research Framework

A research framework for this study is introduced and the hypotheses to be tested are identified in this chapter.

3.1 The Research Framework

This research framework combines the Information Processing System framework established by Bostrom, et al.'s, (1987) with Pinsoneault and Kraemer's (1983) framework for studying technological support for groups. Also incorporated into this framework is the Creative Problem Solving in Organizations model proposed by Fellers and Bostrom (1993) based upon Rhodes (1961) analysis of creativity. Woodman et al. (1993) proposed the Conceptual Links among the Creative Person, Process, Product and Environment motivated the research framework for this study. The components of this framework include the input phase with identification of group gender composition and intervening and adaptation factors. The process phase includes a choice of several group support tools available to the group. The outcome phase contains the idea generated for an information system. Larsen's (1993) definition of innovation will be used to assess

the proposed information systems ideas. The contextual factor includes the environment or task of the study. The dynamic relationships among the components are shown in Figure 9.

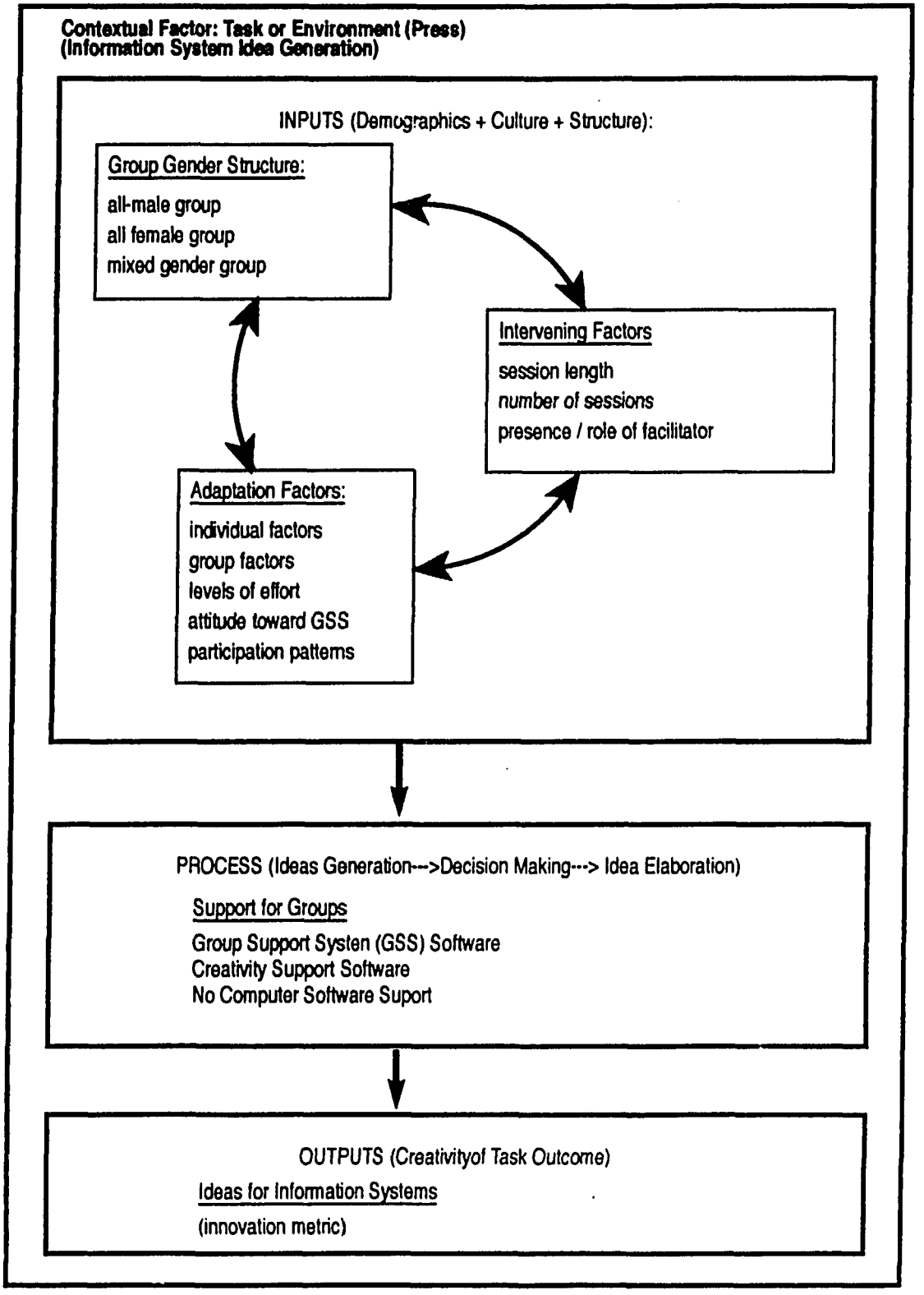


Figure 9: A Framework for the Study of the Impact of Group Support Tools on Information System Idea Generation by Different Gender Groups

3.2 Hypotheses

The following hypotheses will be tested:

Hypothesis 1 (interaction):

H_{12}. There is an interaction effect between the type of group support tool utilized and the gender composition of the group in the production of innovative information system ideas.

H_{12a}. When there is no software support, all-female groups will produce more innovative information system ideas than all-male or mixed gender groups.

H_{12b}. When Group Support System Software is used, all-female groups will produce less innovative information system ideas than all-male or mixed gender groups.

H_{12c}. Creativity Support Software will equalize the gender effect, i.e, all-female, all-male and mixed

gender composition groups will perform equally well using Creativity Support Software.

Hypothesis 2 (main effect):

H_1. The type of group support tool utilized is a factor in the production of innovative information system ideas.

H_{1a}. Creativity Support Software encourages group production of more innovative information system ideas than no software support.

H_{1b}. Group Support System Software encourages group production of more innovative information system ideas than No Computer Software Support.

H_{1c}. Creativity Support Software is at least as effective as Group Support System Software in production of innovative information system ideas.

III. THE STUDY

Chapter 4

Research Methodology

A description of the research methodology is presented in the following chapter. This will include discussions of the research design, description of variables, experimental task, subjects, sample size calculation, and method of conducting experiment.

4.1 Research Design

To test the hypotheses presented in the previous chapter, a controlled laboratory experiment was conducted.

A 3 X 3 completely randomized factorial design with repeated measures was used (Kerlinger, 1986; Spector, 1981). There were two independent variables: group gender composition and group support tool utilized. The groups were composed of all-male, all-female and mixed gender participants. There are two computer group support tools utilized: Group Support System Software, Creativity

Support Software and No Computer Software support. The experimental design is outlined in Figure 10.

All groups, consisting of three to five subjects, were randomly assigned to one of the nine experimental categories as follows:

(1) All-male group conducting the information system idea generation task with the support of Group Support System Software.

(2) All-male group conducting the information system idea generation task with the support of Creativity Support Software.

(3) All-male group conducting the information system idea generation task with No Computer Software support.

Support for Group / Group Gender Composition:	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
All-Male Group	(1)	(2)	(3)
All-Female Group	(4)	(5)	(6)
Mixed Gender Group	(7)	(8)	(9)

Figure 10: 3 X 3 Experimental Design

(4) All-female group conducting the information system idea generation task with the support of Group Support System Software.

(5) All-female group conducting the information system idea generation task with the support of Creativity Support Software.

(6) All-female group conducting the information system idea generation task with No Computer Software support.

(7) Mixed gender group conducting the information system idea generation task with the support of Group Support System Software.

(8) Mixed gender group conducting the information system idea generation task with the support of Creativity Support Software.

(9) Mixed gender group conducting the information system idea generation task with No Computer Software support.

4.2 Description of Variables

The independent variables in this experiment are tool support for groups and group gender composition. A 3 X 3 is formed by considering three tools for support of groups in combination with the three possible group gender compositions (all-male, all-female, and mixed gender).

The dependent variable was assessed through ratings by five independent

expert judges. All proposed solutions were presented to the judges in a uniform manner to avoid any presentation bias. (The presentation template sample used is exhibited in Appendix M). The judges were told to read the solutions and assign ratings using their own criteria. The innovativeness of the solution was operationalized by having the judges rate the novelty, usefulness, feasibility and the overall creativity of the solution on separate Likert scales. Please refer to Appendix K to see the instructions the judges were given for rating the solutions and the definitions of the various scales.

In group support, creativity and gender literature, several variables are studied and determined to affect the outcome of idea generation. In determining which of the set of independent variables has the greater effect on the dependent variable, variables known to affect the dependent variable are controlled. In this research control variables included task, environment, individual factors, group factors, level of effort, attitude toward group support, participation pattern, presence/role of facilitator, session length, and number of sessions. The summary of variables utilized in this study is presented in Figure 11.

Independent Variables:

Tool Support for Groups:	**Group Support System Software, Creativity Support Software, and No Computer Software support.**
Group Gender Composition:	**All-male, all-female, and mixed gender composition groups.**

Dependent Variable:

Innovation of Information System Idea Generated.

Control Variables:

Environment
Task
Individual Factors
Group Factors
Level of Effort
Attitude Toward Group Support
Participation Pattern
Session Length
Number of Sessions
Presence/role of Facilitator.

Figure 11: Summary of Variables

4.3 Experimental Task

An information system idea generation project for a fast-food restaurant like Denny's Inc. was utilized, following DeSanctis' (1989) recommendation for use of realistic tasks.

Gallupe (1986) suggests that any experimental task for Group Support System research needs to meet the following criteria: 1) the task must be realistic and interesting; 2) the task description must be accurate and consistent; 3) the task must be applicable.

A circumplex scheme of task classification for task types in social psychology is presented by McGrath (1984). Eight different task types are identified: planning, creative, intellective, decision-making, cognitive conflict, mixed motive, competitive, and performance/psych-motor. The experimental task utilized in this study is composed of three types of tasks: creativity, decision-making, and performance. First, the task required the production of many novel ideas for an innovative information system, then, the selection of the "best" idea(s) generated, and finally, preparation of a paragraph description of the idea(s) selected.

The experimental task chosen was semi-structured to permit flexibility and novelty and did not depend on special skills. A complete description of the task is found in Appendix B.

4.4 Subjects

Undergraduate students at a large urban Northeastern university were the subjects of the study. The decision to use students is backed by research by Gallupe (1986) and Dickson (1989), who recommends using students as surrogates in Group Support System research, since their performance is similar to the performance of manager.

4.5 Sample Size

With best available estimate for the mean and standard deviation from Lobert (1993), it is projected (Cohen, 1977; Montgomery, 1991) that four replications of each cell in the experiment will be necessary to secure a statistical test power over .8, based on an alpha level of .05. (Refer to Appendix A for sample size calculations.) Therefore, it was anticipated that a total of 36 groups will be required.

4.6 Method of Conducting Experiment

Various undergraduate business and business-related classes were visited for the purpose of recruiting students. (A sample of the letter requesting permission of

the instructor to visit classes is presented in Appendix G.) Students were informed of the nature of the study and asked to volunteer to be subjects. A sample student participant response form is shown in Appendix H. A list of potential participants is developed. Each person is then contacted to determine their continued interest in the study, and willingness to participate. A convenient time was arranged for a groups of three to five subjects to participate in an experimental session.

At the experimental session, the subjects in the group were presented with an handout. The handout contained a consent form (Appendix C) outlining the guidelines for participation to be signed before the experiment. The experimental subjects were then asked to complete the Initial Questionnaire as part of the pre-session information gathering. The Initial Questionnaire included such items as the subject's age, major, computer experience and current work situation. An example of this instrument is provided in Appendix D.

An experimental session was administered. The subjects read the task description (Appendix B). After reading the task description, the subjects were given an opportunity to ask questions for clarification purposes.

For groups of subjects assigned to Group Support System Software tool treatment, the experimental session was conducted in a computer laboratory. A

group of microcomputers were networked to support the VisionQuest software. One of the microcomputers was designated as the facilitator's/administrator's station. The subjects in the group read the instructions (Appendix E1) for idea generation using VisionQuest. The use of the software was explained by the facilitator.

For groups of subjects assigned to the Creativity Support Software tool treatment, the experimental session was also conducted in a computer laboratory. The subjects in the group read the instructions (Appendix E2) for idea generation using the synectics process with MindLink software. A single microcomputer was running the MindLink software. The participants set in a semi-circle and the facilitator chauffeured the interaction with the software.

For groups of subjects assigned to the No Computer Software support tool treatment, the experimental session was conducted in a faculty conference room. The subjects set in a semi-circle around the facilitator. The subjects in the group read the instructions (Appendix E3) for idea generation using the Nominal Group Technique with No Computer Software support. All ideas generated were written on index cards and read out loud by the facilitator.

All subjects in all experimental treatments were asked to complete the Follow-up questionnaire.

Appendix F contains the Follow-Up Questionnaire answered after the task was completed. The questions included perception of the experiment, motivation level, experience with the group process and the experimental task, and satisfaction with the outcome.

All experimental sessions were facilitated by the same facilitator, the researcher, to balance any facilitator effect that might affect the group outcome.

4.7 Expert Judges

The judges made their assessment independently and without any coaching. They were instructed (Appendix K) to rate the proposed information system ideas in relation to the scales printed (Appendix L). Each scale has two alternative characteristics as end points. The rating should reflect both direction and proximity (in meaning) to the word that better describes the proposed idea.

Information system ideas generated will be judged on an innovation metric scale by Information System expert judges and domain expert judges.

IV. RESULTS

The statistical results presented in this section were obtained with the aid of SPSS/PC for Windows running on a Pentium 90Mhz microcomputer and MicroSoft Excel 5.0 software running in the Windows environment on a i486 33Mhz microcomputer.

Chapter 5

Subject Information

This chapter presents the results of the initial questionnaire and some of the follow-up questionnaire items which solicited background information from the subjects. The descriptive statistics presented are for all 171 subjects in the study, as well as broken down by experimental treatment group.

5.1 Demographic Data

Figures 11 and 12 present the demographic data on all the subjects that participated in the study. This information was collected using a pre-session questionnaire form - Initial Questionnaire - contained in Appendix D. The subjects

were college students from the New York metropolitan area, on average, 25.55 years old, with an average of 75.76 credits completed. There were 44% males and 56% females; 82% of all subjects were Business (accounting, economics, finance, international business, management and marketing) majors, and 18% of the subjects were either Liberal Arts majors or Undecided; 84% of the subjects were working at the time of the experiment.

Attribute (n=171)	Mean	Standard Deviation
Age	25.55	6.5
Credits Completed	75.76	35.52

Figure 11: Subject Demographic Data

Attribute (n=171)	Response
Gender	Female = 96 (56%)
Work currently	Yes = 143 (84%)
Major	BUS = 140 (82%)

Figure 12: Additional Demographic Data on the Subjects

Figure 13 presents the demographic comparisons for the age, credits completed, currently working and major variables for the group support tool treatment. Figure 14 presents the demographic comparisons for the subgroups.

Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
Age			
mean	25.84	24.54	26.11
st. dev.	7.52	5.59	5.98
Credits Completed			
mean	75.32*	58.29*	82.49*
st. dev.	36.84	36.42	29.21
Work = Yes			
n (%)	52 (30.4%)	40 (23.4%)	51 (29.8%)
Major = BUS			
n (%)	53 (31.0%)	41 (24.0%)	46 (26.9%)

* = significant at $p < .01$ level

Figure 13: Demographic Comparisons for the Tool Treatment

Group Gender Composition	Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
All-male Group	Age			
	mean	26.33	25.42	25.69
	st. dev.	6.14	5.45	6.65
	Credits Completed			
	mean	81.13	63.33	103.39
	st. dev.	33.62	32.49	31.73
	Work = Yes			
	n (%)	14 (8.2%)	10 (5.8%)	11 (6.4%)
	Major = BUS			
	n (%)	12 (7.0%)	7 (4.1%)	13 (7.6%)
All-Female Group	Age			
	mean	27.06	24.80	26.52
	st. dev.	8.78	6.21	4.43
	Credits Completed			
	mean	69.06	62.72	75.09
	st. dev.	35.24	36.74	20.38
	Work = Yes			
	n (%)	14 (8.2%)	14 (8.2%)	25 (14.6%)
	Major = BUS			
	n (%)	11 (6.4%)	17 (9.9%)	18 (10.5%)
Mixed Gender Group	Age			
	mean	24.90	23.67	25.84
	st. dev.	7.46	5.13	7.43
	Credits Completed			
	mean	75.74	50.50	77.16
	st. dev.	39.67	39.14	31.07
	Work = Yes			
	n (%)	24 (14.0%)	16 (9.4%)	15 (8.8%)
	Major = BUS			
	n (%)	30 (17.5%)	17 (9.9%)	15 (8.8%)

Figure 14: Demographic Comparisons for the Subgroups

5.2 Computer Background

Several questions on the questionnaire addressed the issue of the use of and experience with computers. Students had an average of 3.4 years of personal computer experience. They rated their overall computer knowledge to be 3.67 on a seven-point scale, where 1 was "not at all knowledgeable", and 7 was "extremely knowledgeable." Sixty percent of the working subjects' jobs required the use of a computer; 57% of all subjects use a personal computer at home. Figure 15 presents the relevant statistics for subject computer background.

Attribute	Statistics
Computer Experience (in years) Mean St. Dev.	 3.40 3.34
Overall Computer Knowledge (7-point scale) Mean St. Dev.	 3.67 1.27
Use computer at work	86 (50.3%)
Use computer at home	98 (57.3%)

Figure 15: Subject Computer Background

Given the subjects' familiarity with personal computers and overall computer

knowledge, it was concluded that the subjects would not have any trouble using keyboards in order to enter the ideas in the software supported sessions.

Figure 16 presents the computer background comparison for the subgroups.

Group Gender Composition	Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
All-male Group	Computer Experience			
	Mean	3.31	3.08	2.56
	St. Dev.			
	Overall Computer Knowledge (7-point)			
	Mean	3.73	3.83	3.27
	St. Dev.	1.58	1.64	1.05
	Use computer at work	7 (4.1%)	9 (5.3%)	5 (2.9%)
	Use computer at home	8 (4.7%)	8 (4.7%)	9 (5.3%)
All-Female Group	Computer Experience			
	Mean	2.60	2.60	5.49
	St. Dev.			
	Overall Computer Knowledge (7-point)			
	Mean	3.50	3.37	4.04
	St. Dev.	1.20	1.12	1.10
	Use computer at work	9 (5.3%)	9 (5.3%)	21 (12%)
	Use computer at home	8 (4.7%)	12 (7.0%)	14 (8.2%)

Mixed Gender Group	Computer Experience Mean	3.71	3.46	2.36
	St. Dev.			
	Overall Computer Knowledge (7-point) Mean	3.68	3.78	3.63
	St. Dev.	1.25	1.11	1.50
	Use computer at work	12 (7.0%)	10 (5.8%)	4 (2.3%)
	Use computer at home	17 (9.9%)	11 (6.4%)	11 (6.4%)

Figure 16: Computer Background Comparison for the Subgroups

None of the subjects had prior experience with either VisionQuest system or MindLink software utilized in the study.

5.3 Attitude Toward Group Work

Data on subjects' attitudes toward group work was gathered in the follow-up questionnaire - Appendix F. Working with a five-point scale, where 1 was "strongly agree", 3 was "neutral", and 5 was "strongly disagree", the subjects had to rate the following two statements: 1) "In general, I like to participate in groups."; 2) "In general, I fear speaking in public." The summary statistics on the responses are presented in Figure 17.

Group Gender Composition	Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
All-male Group	In general, I like participating in groups:			
	Mean	1.93	1.58	2.33
	St. Dev.	1.22	0.90	1.15
	In general, I fear speaking in public:			
	Mean	3.73	4.00	4.00
	St. Dev.	1.58	1.13	1.22
All-Female Group	In general, I like participating in groups:			
	Mean	1.83	1.55	1.88
	St. Dev.	1.10	0.83	1.24
	In general, I fear speaking in public:			
	Mean	3.28	3.10	4.00
	St. Dev.	1.52	1.52	1.22
Mixed Gender Group	In general, I like participating in groups:			
	Mean	1.65	1.83	2.00
	St. Dev.	1.05	0.71	1.20
	In general, I fear speaking in public:			
	Mean	4.29	3.28	3.79
	St. Dev.	0.97	1.27	0.98

Figure 17: Attitude Toward Group Work Comparison for the Subgroups

5.4 Group History

Group history information was solicited from subjects on the Follow-Up Questionnaire - Appendix F. Group members were asked to answer the question: "How well did you know everyone in your group?" Check one: 1 = "First time working with those present", 2 = "Worked once or twice with some of those present", 3 = "Worked once or twice with most of those present", 4 = "Worked a lot with one or some of those present", 5 = "Worked a lot with most of those present." The average response was 2.0.

Figure 18 presents the means and standard deviations for the group history variable for the group support tool treatment. Figure 19 presents group history information for the subgroups.

	Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
	"How well did you know everyone in your group?"			
	Mean	2.52*	2.02*	1.54*
	St. Dev.	1.63	1.46	1.00

* = significant at $p < .01$

Figure 18: Group History Comparison

Group Gender Composition	Attribute	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support
All-male Group	"How well did you know everyone in your group?"			
	Mean	2.14	1.92	1.92
	St. Dev.	1.61	1.31	1.19
All-Female Group	"How well did you know everyone in your group?"			
	Mean	2.44	2.45	1.36
	St. Dev.	1.62	1.85	1.00
Mixed Gender Group	"How well did you know everyone in your group?"			
	Mean	2.74	1.59	1.53
	St. Dev.	1.65	0.87	0.84

Figure 19: Group History Comparison for the Subgroups

5.5 Statistical Analyses of Subjects' Background Information

Using Analysis of Variance for comparisons of the **age** variable along the group support **tool** and group **gender** composition variables revealed no statistically significant differences. As displayed in Figure 13, comparisons for the **credits** completed variable along the group support **tool** variable revealed a significant difference at the $p < .01$. Subjects in the Creativity Support Software treatment had, on average, the least number of credits completed and the subjects in the No Computer Software support treatment had, on average, the most number of credits completed. No statistically significant difference along the group **gender** variable was detected for the **credits** completed variable. The interaction effect for group support **tool** and group **gender** composition variables was not significant for either the **age** or the **credits** completed variables. The data is summarized in Figure 14.

Using Chi-Square tests for the comparison of qualitative responses for **major** and currently **working** variables revealed no significant differences for the group support **tool** variable, or for the group **gender** composition variable, or for the interaction of group support **tool** and **gender** composition variables. Summary of the data is presented in Figure 14.

Comparison of computer background characteristics along the group support tool and group gender composition variables, presented in Figure 16, revealed only one statistically significant difference. There was a significant interaction ($p < .05$) between the group support tool and group gender composition for years of computer experience. Females assigned to an all-female group in the No Computer Software support tool treatment had a significantly higher amount of computer experience (average 5.49 years experience).

Comparison of the attitude toward group work and public speaking revealed no significant differences among the subgroups.

Comparison of group history among the different subgroups, presented in Figure 19, revealed significant difference ($p < .01$) for the group support tool variable. Subjects in the Group Support System Software treatment had worked together more often than the subjects in the No Computer Software support treatment. No significant difference in group history was observed for the group gender composition variable. The interaction effect for group support tool and group gender composition variables was not statistically significant for the group history variable.

The analysis of subjects' background information using Analysis of Variance

and Chi-Square tests to detect differences along the tool and the group gender composition treatments revealed only three statistically significant effects. There was a significant group support tool effect for the credits completed and group history

Attribute:	Tool Effect	Group Gender Composition Effect	Tool and Group Gender Composition Effect
Demographics:			
Age	n.s.	n.s.	n.s.
Credits Complete	$p < .01$	n.s.	n.s.
Work Currently	n.s.	n.s.	n.s.
Major	n.s.	n.s.	n.s.
Computer Background:			
Computer Experience	n.s.	n.s.	$p < .05$
Computer Knowledge	n.s.	n.s.	n.s.
Use of Computer at Work	n.s.	n.s.	n.s.
Use of Computer at Home	n.s.	n.s.	n.s.
Attitude toward Group Work:			
Like Participating in Groups	n.s.	n.s.	n.s.
Fear Public Speaking	n.s.	n.s.	n.s.
Group History:			
Worked with Those Present	$p < .01$	n.s.	n.s.

n.s. = not significant

Figure 20: Summary of Statistical Findings for the Subjects' Background Information

variables, and an interaction effect for the computer experience variable. The researcher concludes that the experimental manipulation of subjects was successful. Figure 20 summarizes the statistical findings for the subjects' background information.

Chapter 6

Analysis of Experimental Data

In this chapter, the data from the experimental study described previously is analyzed. First, the assessment of innovative idea production is discussed. The data analysis in this chapter will proceed as follows: 1) reliability of judges' ratings for internal consistency; and 2) testing of each hypothesis with the appropriate analysis of variance procedure. The results of the analyses are presented in this chapter and will be discussed in chapter 8.

6.1 Assessment of Innovative Idea Production

MacKinnon (1978) referred to the creative product as the "bedrock" of creativity research. Examination of the product reflects qualities of the person who created the product, the process used to form the product, and aspects of the environment in which the product was developed. As Amabile (1982) stated, "a product-centered operational definition is clearly most useful for most empirical research in creativity." Besemer & O'Quin (1987) focused explicitly on delineating the qualities unique to creative products.

6.1.1 Assessment of an Innovative Idea

Amabile (1987) used a consensual assessment approach to evaluate the creativeness of a product created by individuals in her studies on intrinsic motivation. This inter-judge method has experts in a particular domain use their implicit criteria to evaluate products related to that domain.

6.1.2 Assessment an Innovative Information System Idea

In this study, to evaluate the creativity of task outcomes, methodologies and instruments from the field of creativity were adapted. The Creativity Evaluation Questionnaire (Appendix L) was used to obtain judges' ratings for each information system idea generated by the experimental groups on thirteen items.

A consideration in evaluating the performance of a group is how should the various factors composing solution attributes be analyzed? Options for analysis include: 1) analysis of the individual components of an innovative solution, e.g., novelty, usefulness and feasibility; 2) arithmetically combining the individual factors into a composite score; 3) global measure of solution quality, e.g., creativity.

Two guidelines aided in determining which views of the data to use in

analyzing the information system ideas. First, the use of both multivariate and univariate approaches to measuring constructs is recommended by Amabile (1982). In other words, one should measure the overall construct as well as the various factors that one believes composes the construct. Second, DeSanctis (1989) calls for multiple methods, whenever possible, to assess the dependent variable.

6.2 The Expert Judges

In the experimental study, five expert judges were used to evaluate the groups' solutions to the experimental task. Each judge evaluated the solutions from each of the 46 groups.

The expert judges selected for evaluation of creativity were five information systems professionals with an average of 16 years of experience. Three were female and two were male. As suggested by Baker (1978), the judges were not preselected on any dimension other than familiarity with systems analysis and design. The judges were familiar with the task presented to the subjects, and they could easily apply their expertise in the evaluation process.

6.2.1 Reliability of Judges' Ratings

The reliability of the judges' ratings was evaluated for internal consistency using Cronbach's (1951) coefficient alpha. The Reliability function in SPSS/PC, which yields a standardized alpha was utilized. The Reliability function in SPSS has been employed by Amabile (1992), Sampler (1992) and Lobert (1993) in working with the consensual assessment technique. Standardized alpha of α=.9509 was calculated for the creativity item. This alpha is in the acceptable range (Nunnally, 1978).

The reliability of the judges' ratings was also assessed using the Kendall's coefficient of concordance *W* measure. Kendall's coefficient of concordance *W* is useful in determining the agreement among several judges (Siegal, 1956). Using the Nonparametric procedure in SPSS/PC, *W* was calculated for the responses of the five judges rating the 46 solutions for the creativity item. Kendall's coefficient of concordance *W* of .3571 was computed, significant at p=.0009. A high or significant value of *W* may be interpreted as meaning that the judges are applying the same standard in ranking the "objects" under study. Thus, the judges' pooled ordering may serve as a "standard," especially when there is no relevant external criterion for ordering the "objects" (Siegal, 1956).

Cronbach's coefficient alpha test and Kendall's coefficient of concordance *W* indicate agreement among the judges as to the relative level of creativity present in all the solutions evaluated for this study. The averaging of the judges' scores was justifiable.

The average creativity scores obtained were then used to perform the analyses to test the hypotheses.

6.3 Statistical Techniques

To test the hypotheses of this study, statistical techniques were used. The Analysis of Variance technique was used to better understand the significant sources of variations. Two factors were considered to contribute to the variation in the assigned creativity score. The interaction of the factors was also considered to contribute to the creative performance of the groups. The comparison of the creativity scores among the nine experimental treatments was done using the two factor fixed effects with interactions model (Berenson, 1992).

Three different views of the dependent variables were used in assessing innovative information system idea: 1) analysis of the individual components of an innovative solution, e.g., novelty, usefulness and feasibility; 2) arithmetically

combining the individual factors into a composite score; 3) global measure of solution quality, e.g., creativity.

6.4 Hypothesis 1: There is an interaction effect between the type of group support tool utilized and the gender composition of the group in the production of innovative information system ideas.

The purpose of hypothesis 1 and its subhypotheses was to investigate the interaction effect of group support tools utilized and the group gender composition in the production of innovative information system ideas by the experimental groups.

6.4.1 Statistical Test Results

Testing for the interaction effect of group support tool utilized and the group gender composition in the production of innovative information systems ideas using the three data views of the dependent variable described in section 6.3 revealed a significant interaction for the novelty item ($p=.036$). The results for the analysis of variance for the novelty item are presented in Figure 21. The cell means for the novelty items are presented in Figure 22. Graphical inspection, illustrated in Figure 23, of the novelty cell means provides insight into this statistically significant interaction of group support tool and group gender composition. The pattern of cell

means for the groups with No Computer Software Support is different from the pattern of cell means for the groups provided with computer software support. Same gender groups performed differently (and better) when No Computer Software support was present.

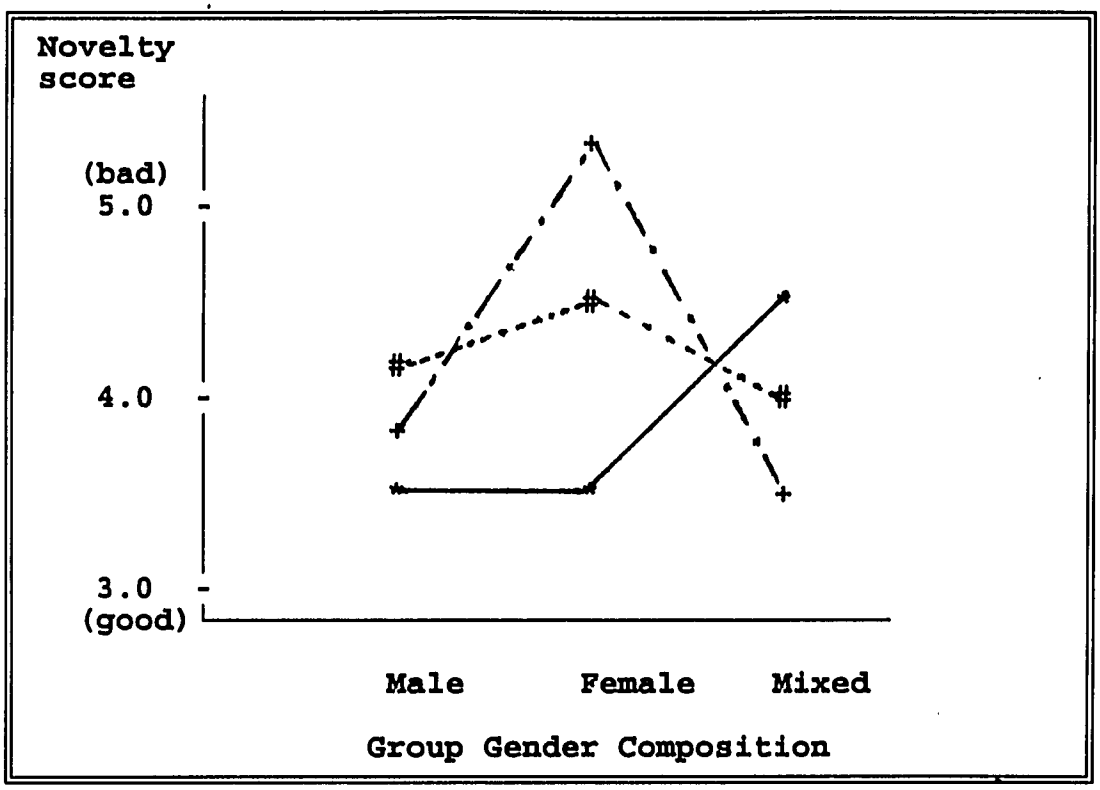
The interaction effect for **usefulness**, **feasibility**, the composite score of **novelty+usefulness+feasibility**, and **creativity** were not statistically significant. The cell means for the **usefulness**, **feasibility**, the composite score of **novelty+usefulness+feasibility**, and **creativity** items are displayed in Figure 22. Analysis of Variance results are presented for **usefulness** in Figure 24, for **feasibility** in Figure 25, for the composite score of **novelty+usefulness+feasibility** in Figure 26, and for the global **creativity** score in Figure 27.

Source of Variation	Sum of Squares	d.f.	Mean Square	F-ratio	Signif. Level
Main Effects:	5.570	4	1.392	1.498	.223
Tool	3.096	2	1.548	1.665	.203
Gender	2.843	2	1.421	1.529	.230
2-Way Interaction: Tool Gender	10.724	4	2.681	2.883	.036
Residual	34.405	37	.930		
Total	50.699	45	1.127		

Figure 21: Analysis of Variance for the Novelty Item

Group Gender Composition	Item:	Tool: Group Support System Software	Tool: Creativity Support Software	Tool: No Computer Support	Total
All-Male Group	novel	4.10	3.80	3.55	3.82
	useful	3.50	3.80	3.20	3.50
	feasible	2.55	3.50	3.25	3.10
	novel+useful +feasible	10.15	11.10	10.00	10.42
	creative	3.70	4.10	3.45	3.75
All-Female Group	novel	4.50	5.37	3.49	4.39
	useful	3.60	4.77	3.71	4.06
	feasible	2.85	3.23	3.54	3.27
	novel+useful +feasible	10.74	13.37	10.95	11.72
	creative	4.35	5.07	3.43	4.22
Mixed-Gender Group	novel	3.98	3.49	4.55	4.02
	useful	3.78	4.08	3.55	3.81
	feasible	3.50	3.72	3.50	3.48
	novel+useful +feasible	11.08	11.48	11.60	11.32
	creative	3.70	3.72	4.35	3.86
Total	novel	4.14	4.39	3.79	4.10
	useful	3.66	4.28	3.53	3.82
	feasible	3.01	3.47	3.45	3.30
	novel+useful +feasible	10.81	12.13	10.77	11.23
	creative	3.86	4.36	3.68	3.97

Figure 22: Cell Means for the Novelty, Usefulness, Feasibility, Novel+Useful+Feasible, and Creativity Items



#: Group Support Software
+: Creativity Support Software
*: No Computer Software Support

Figure 23: Graph of Cell Means for the Novelty Item

Source of Variation	Sum of Squares	d.f.	Mean Square	F-ratio	Signif. Level
Main Effects:	7.002	4	1.751	3.798	.011
Tool	4.803	2	2.401	5.210	.010
Gender	2.199	2	1.099	2.385	.106
2-Way Interaction: Tool Gender	1.241	4	.310	.673	.615
Residual	17.055	37	.461		
Total	25.298	45	.562		

Figure 24: Analysis of Variance for the Usefulness Item

Source of Variation	Sum of Squares	d.f.	Mean Square	F-ratio	Signif. Level
Main Effects:	3.713	4	0.928	1.174	.338
Tool	2.654	2	1.327	1.678	.201
Gender	1.622	2	0.811	1.026	.369
2-Way Interaction: Tool Gender	1.002	4	0.251	0.317	.865
Residual	29.263	37	0.791		
Total	33.979	45	0.755		

Figure 25: Analysis of Variance for the Feasibility Item

Source of Variation	Sum of Squares	d.f.	Mean Square	F-ratio	Signif. Level
Main Effects:	30.102	4	7.526	3.477	.017
Tool	17.991	2	8.995	4.157	.024
Gender	11.945	2	5.972	2.760	.076
2-Way Interaction: Tool Gender	11.102	4	2.775	1.282	.294
Residual	80.073	37	2.164		
Total	121.277	45	2.695		

Figure 26: Analysis of Variance for Novel+Useful+Feasible Composite Item

Source of Variation	Sum of Squares	d.f.	Mean Square	F-ratio	Signif. Level
Main Effects:	5.696	4	1.424	1.734	.163
Tool	3.813	2	1.907	2.322	.112
Gender	1.969	2	0.984	1.199	.313
2-Way Interaction: Tool Gender	7.063	4	1.766	2.150	.094
Residual	30.386	37	0.821		
Total	43.144	45	0.959		

Figure 27: Analysis of Variance for the Creativity Item

6.5 Hypothesis 2: The type of group support tool utilized is a factor in the production of innovative information system ideas.

The purpose of hypothesis 2 and its subhypotheses was to investigate the effects of group support tools utilized on the innovative information system ideas suggested by the experimental groups.

Mean and standard deviation for each cell of the three views of the dependent variable are provided in Figure 28.

6.5.1 Statistical Test Result

The results of the analysis for hypothesis 1 are presented in Figure 28. There was a statistically significant group support tool factor difference for innovation as measured by the usefulness item ($p=.01$) and the composite item of novelty+usefulness+feasibility ($p=.024$). Groups provided with Group Support System Software and No Computer Software Support proposed information system ideas that were rated superior for innovation as measured by the usefulness item

(scale [1] = "extremely useful" to [7] = "not at all useful") and the **novelty+usefulness+feasibility** composite score.

Data View:	Tool: Group Support System Software n=16	Tool: Creativity Support Software n=15	Tool: No Computer Support n=15	F-ratio	signif. level
Novelty					
mean	4.13	4.39	3.79		
std. dev.	1.03	1.25	0.86	1.2222	.3046
Usefulness					
mean	3.66	4.28	3.53		
std. dev.	0.48	0.77	0.79	5.0390	.0108*
Feasibility					
mean	3.01	3.47	3.45		
std. dev.	0.84	1.01	0.70	1.4098	.2553
Novel+Useful+ Feasible					
mean	10.81	12.13	10.77		
std. dev.	1.02	1.95	1.56	3.7857	.024*
Creative					
mean	3.86	4.36	3.68		
std. dev.	0.92	1.14	0.78	2.0328	.1434

* = significant at $p < .05$

Figure 28: Table of Means, Standard Deviations and F-ratios for Each Dependent Variable for the Tool Factor

There were no statistically significant group support tool differences detected

for the individual components of novelty and feasibility, or for the global creativity score.

Chapter 7

Post Session Feedback

This chapter presents the results of the follow-up questionnaire items solicited from the subjects at the completion of the experimental task. The statistics presented are for all 171 subjects in the study, as well as broken down by each experimental treatment group. The results of the analyses are presented in this chapter and will be discussed in chapter 8.

The post-session follow-up questionnaire could provide insight into subjects' perception of the experiment, their experience with the group process and the experimental task. Comparisons of the different experimental subgroups were performed along each of the independent variables: group support tool and group gender composition. Analysis of variance procedures were used to discover any differences in response among the subgroups.

Overall, the follow-up questionnaire revealed that the instructions were clear, and the subjects' motivation level was high.

7.1 Task Evaluation

In this study, an information system idea generation project for a fast-food restaurant like Denny's Inc. was utilized, following DeSanctis' (1989) recommendation for use of realistic tasks.

Gallupe (1986) suggests that any experimental task for Group Support System research needs to meet the following criteria: 1) the task must be realistic and interesting; 2) the task description must be accurate and consistent; 3) the task must be applicable. The task used for this study met the above criteria. To the subjects', the task was interesting (average score= 2.75), important (average score= 2.70), and useful (average score= 2.70). The task was not difficult (average score= 5.51). The rating for each criteria was on a seven-point scale anchored by pair of words.

7.2 Motivation Level

Motivation level was assessed in the follow-up questionnaire in two ways. One question asked each subject to rate their individual motivation level. "How would you rate the work you did during the session on the following? 'I was extremely motivated [1] ... to ... [7] I was not at all motivated'." The average

individual motivation level was 2.56, with no significant statistical difference detected for the treatments.

The second question on motivation level asked each subject to rate the motivation level of their group. "My group was extremely motivated to complete the exercise successfully." The response used a five-point scale anchored by 1="strongly agree," 3="neutral," and 5="strongly disagree." The average group motivation level was 1.70, with no significant statistical difference detected for the treatments.

7.3 Group Dynamics

The group dynamics were examined by asking the subjects questions dealing with participation, cooperation, contribution of ideas, comfort in contributing, involvement in the group effort, and domination. Figure 29 presents the summary of feedback on group dynamics.

Question 1="strongly agree," 3="neutral," 5="strongly disagree"	Mean	Std. Dev.
My group was extremely cooperative in working together to solve the Denny's problem.	1.49	0.75
All group members worked closely together.	1.91	0.89

The group process was dominated by one or more individuals.	3.11	1.29
I was forced to conform to others in my group.	4.25	1.12
I felt comfortable contributing ideas.	1.42	0.79
I was able to contribute all my ideas.	1.64	0.93
I was totally involved in the group effort.	1.57	0.84

Figure 29: Summary of Feedback on Group Dynamics

Using analyses of variance to detect variations for the group dynamics variables for the two independent variables of group support tool and group gender composition resulted in a statistically significant interaction effect for the group cooperative question ($p=.017$). Mixed gender groups report higher level of group cooperation when using the Group Support System Software tool. Same gender group reported higher level of group cooperation when using Creativity Support Software tool. For all other group dynamics variables tested, no statistically significant differences were detected.

7.4 Level of Satisfaction

The subjects' satisfaction with the work performed during the session and satisfaction with their own participation was solicited.

Subjects' reported that it was fun to participate (average score=2.35), the work performed during the session was important (mean=2.79) and useful (mean=2.49).

Subjects' were also satisfied that they were able to contribute all their ideas (mean=1.64) and felt comfortable contributing (mean=1.42).

7.5 Group Support Tool Effect

The effects of the group support tool utilized, the work performed during the experimental session and the overall satisfaction with the tool utilized were assessed in the follow-up questionnaire. The questions from the questionnaire and cell means are presented in Figure 30.

Question:	Tool: Group Support System Software		Tool: Creativity Support Software		Tool: No Computer Support		Signif. Level
How would you rate the work you did during this session:							
extremely enjoyable [1]...to...[7] not at all enjoyable	2.01	1.28	2.38	1.37	2.82	1.42	p=.011
extremely interesting [1]...to...[7] not at all interesting	1.92	1.21	2.47	1.44	2.65	1.48	p=.020
How would you rate the method used for generating ideas:							
extremely useful [1]...to...[7] not at all useful	1.81	1.18	2.58	1.60	2.59	1.50	p=.009
extremely difficult to use [1]...to...[7] not at all difficult to use	5.91	1.58	5.22	1.69	5.02	1.65	p=.016
Overall, how satisfied were you with the method you used in today's exercise?							
extremely satisfied [1]...to...[7] not at all satisfied	1.64	0.88	2.12	1.36	2.16	1.11	p=.022

Figure 30: Effects of Group Support Tool

Subjects provided with the Group Support System Software tool reported that

work during the session was more enjoyable (p=.011), and more interesting (p=.020). The subjects also found the Group Support System Software method to be more useful (p=.009) and not as difficult (p=.016) compared to Creativity Support Software and No Computer Software Support. Overall, the subjects were more satisfied (p=.022) with the Group Support System Software method than any other method.

7.6 Gender Effect

The responses in the follow-up questionnaire were investigated along the group gender composition variable. Only one of the responses was statistically significant when controlled for the group gender composition. The question: "The method ensured that everyone in the group had equal opportunity to present ideas. definitely [1]...to...[7] definitely not" was significant with p=.024. Summary of cell means is presented in Figure 31.

Question:	All-Male Groups	All-Female Groups	Mixed Gender Groups	Signif. Level
The method ensured that everyone in the group had equal opportunity to present ideas. definitely [1]...to...[7] definitely not	1.18	1.75	1.37	p=.024

Figure 31: Gender Effect

Subjects in all-female groups reported less of an opportunity to present ideas during the experimental sessions as compared to the reports of all-male and mixed gender composition groups. Interesting to note that the average score of 1.75 for all-female groups for this item is actually a very positive result. It is only significant when compared to the other two groups' responses. Additionally, no significant group gender composition differences were detected to the questions: "I was able to contribute all my ideas," or "I felt forced to conform to others in my group."

Chapter 8

Discussion of Results

In the previous two chapters, detailed statistical results of the experiment and post-session survey were presented. In this chapter, the results will be reviewed, limitations will be described, and implications will be discussed.

8.1 General Discussion

Groups of subjects participated in an experiment in which they were presented with a task and then were asked to propose a solution to the problem presented in the task. Groups of subjects were exposed to different group support tools as part of the experiment. Groups of subjects also differed in terms of group gender composition. Hypotheses were tested, and the results will be discussed in the following paragraphs.

Hypothesis 1 and its subhypotheses was to investigate the interaction effect of group support tools utilized and the group gender composition in the production of innovative information system ideas by the experimental groups. The analyses

revealed a significant interaction effect for the novelty of solutions:

- Superior performance of same-gender groups when No Computer Software support was present. All-male and all-female groups performed at the same level with No Computer Software support.

- All-female groups provided with Creativity Support Software performed the worst. All-female groups performance improved when Group Support System Software was utilized, but was not as good as the performance when No Computer Software support was utilized.

- In mixed-gender groups, computer software support enhanced performance. When comparing computer software support, the use of Creativity Support Software resulted in better performance for mixed-gender groups.

Hypothesis 2 and its subhypotheses investigated the effects of group support tools utilized on the innovative information system ideas suggested by the experimental groups. The analyses revealed statistically significant group support tool factor effect for innovation as measured by the usefulness item and the composite item of novelty+usefulness+feasibility. Groups supported with Group Support System Software and No Computer Software support proposed information

system ideas that were rated superior for innovation as compared to the those proposed by groups supported by Creativity Support Software.

8.2 Limitations of the Study

As with any study there are limitations. This is especially true for experiments as one seeks to control variables and simplify the complex nature of the process under investigation.

In order to make the experiment feasible, a short case problem was selected. A problem of this length may not capture the richness of detail and complexities that exist in organizations. This may also have affected the type of solutions developed and/or the ability of the subjects to develop creative solutions.

In addition, for brevity, the subjects completed the task in a relatively short period of time, about one hour. In many organizations, the process of identifying information systems can take days, weeks, months, or even years. Thus, the quality of ideas may have been limited by the length of time expended in competing the task.

In any experiment involving human subjects, problems with subject motivation, seriousness and involvement always exist. Hopefully these problems were minimized by making the case as realistic as possible and the laboratory setting mimic a "real world" setting. The subjects worked with the knowledge that the results generated in the session would be evaluated by expert judges. High extrinsic motivation for the task was assured through the use of a contest. The contest also assured non-disclosure of the task to other subjects. To stimulate intrinsic motivation, subjects were encouraged to participate in order to get an opportunity to work with new technology. Subjects' self-reported level of involvement and motivation was high.

The sample of expert judges selected was fairly small. The judges were selected for their expertise in systems analysis and design. The judges may have been biased due to their experience, and therefore, the creativity assessment in this study is possibly limited by the sample of judges utilized.

8.3 Implications of the Study

It is important in any study to establish theoretical and practical implications as well as directions for future research.

8.3.2 Theoretical Implications

Despite the many limitation of this experimental study noted in the previous section, the results of this thesis were consistent with findings from studies of gender and groups, and computer group support literature. Research in gender and groups has shown that status differences influence male and female behaviors in group settings (Lockheed and Hall, 1976; Meeker and Weitzell-O'Neill, 1977). Computer group support literature has established anonymity and objective evaluation (Hughes, 1963; Nunamaker et al., 1991) as inherent attributes of computer group support. As this study demonstrated, computer group support balanced status differences in mixed gender groups.

8.3.2 Practical Implications

As organizations seek to develop information systems for strategic positioning, it is critical that groups seeking innovative information solutions be provided with appropriate group support tools. The results of this study suggest that when the groups are composed of both males and females, the group support tool of choice is Creativity Support Software for the most novel information system ideas. When looking for novel information system ideas, groups of all-male or all-

female groups would perform best when No Computer Software support is used. When looking for the most useful information system idea or the most novel+useful+feasible information system idea, the same high level of performance is achieved using No Computer Software support or Group Support System Software.

8.3.3 Implications for Future Research

The findings of this study raise a number of related issues for further research. Future research should be pursued in several directions.

In future studies, other Group Support System Software, and Creativity Support Software should be examined to determine if results of this study might be replicated with the other software tools. Results of these studies would also indicate if the tools chosen for this experiment were appropriate and studies might be undertaken to replicate results with the same software tools.

The impact of place and time in collaborative idea generation should be further examined. The study would allow for executives and managers to engage in idea generation in a field setting to take place over an extended period of time.

With expanded use and interest in applications using the Internet or the World Wide Web, studies involving information system idea generation in anytime, anyplace meetings should be explored.

Further studies should look at varying participant experience level, background and age, to further explore the influence of these variable on innovative information system idea generation by groups composed of all males, all females, and mixed gender.

V. CONCLUSIONS

Chapter 9

Summary and Conclusions

In this final chapter, a brief description of the problem investigated, methods used, analysis and results and implications will be presented.

9.1 Problem Investigated

This study investigated the process of identifying innovative information system ideas with the hope of better understanding how organizations will be more likely to discover innovative information system ideas as a result of their efforts.

From the literature of groups and collaborative work, creativity and innovation, and gender in information system idea generation a model of the factors affecting the process of innovative information system idea generation for a group was developed. Factors affecting this model that were discussed include: type of group support tool and group gender composition.

The model focused on the group as decision maker in order to understand the effects of factors listed above on the decision process and its outcome.

Previous research has focused on the development of frameworks for studying the effects group support, and frameworks for studying creativity. There has been limited research evaluating these frameworks. This research seeks to extend the understanding of these theoretical frameworks, as well as investigating the additional factors mentioned above. In addition, practitioners may benefit from such a study if it improves the ambiguous process of innovative information systems idea generation.

9.2 Method of Investigation

In order to evaluate the impact of group support tools and group gender composition on innovative information system idea generation, a laboratory experiment was utilized. The two factors of primary interest were 1) group support tools, and 2) group gender composition. The group support tools factor was varied across three levels (Group Support System Software, Creativity Support Software and No Computer Software support). The group gender composition was also varied (all-male, all-female, and mixed gender groups). The variation of these factors resulted in a 3 X 3 factorial experiment. At least four groups per cell were

selected for the study.

An information system idea generation task for a fast-food restaurant like Denny's Inc. was used. After reading the task, the subjects in each group were asked to proposed solutions to the problem presented in the task.

Five independent expert judges evaluated the proposed information system ideas for creativity and innovation using the Creativity Evaluation Questionnaire.

9.3 Summary of Results

This study set out to answer the following questions:

1) Does Creativity Support Software encourage production of innovative information system ideas by different gender groups?
2) Is Creativity Support Software at least as effective as Group Support System Software in producing innovative information system ideas in different gender groups?
3) Is Creativity Support Software at least as effective as Group Support System Software in producing innovative information system ideas?

We were able to answer the first two questions positively and the answer to

the third question was negative.

Creativity Support Software appeared to have encouraged the production of innovative information system ideas as measured by its novelty dimension in groups composed of male and female members. Creativity Support Software tool was best for mixed gender groups when compared to No Computer Software support and better than Group Support System Software. For all-female groups, Creativity Support Software was the worst type of support, followed by Group Support System Software, and No Computer Software support proved to be the best. For all-male groups, Creativity Support Software provided intermediate results when compared to No Computer Software support, which was the best, and Group Support System Software, which provided the worst support.

Comparing group support tools, significant differences among the tool were detected along the usefulness dimension of innovative solutions, and the composite score of novelty+usefulness+feasibility. Utilizing the Creativity Support Software tool, groups generated the least useful and least novel+useful+feasible information system ideas. Utilization of Group Support System tool and No Computer Software support tool by groups resulted in information system ideas that had the same high level of usefulness and the same high level of novelty+usefulness+feasibility.

9.4 Implications and Conclusions

This study has demonstrated the importance of group gender composition when considering group support tool utilization for innovative information system idea generation. From a practical viewpoint, this gives some guidelines as to the type of group support tool necessary to achieve a particular level of innovation for information system ideas based on the group gender composition.

Appendix A

Sample Size Calculations

a = Number of levels of factor A = 3

b = Number of levels of factor B = 3

D = Difference between any two row means to be detected = 2

n = number of replicates of the experiment

σ = estimate of the standard deviation = .8

n	Φ^2	Φ	Numerator D.F.	Error D.F.	β	Power
3	1.875	1.37	4	18	.25	.75
4	2.500	1.58	4	27	.20	.80

Figure 32: Sample Size Calculation (Montgomery, 1991)

APPENDIX B

Task Description

Idea Generation for Information System

Denny's, Inc.

When it comes to strategic uses of information systems, winning new customers is important, but keeping old ones is probably even more so. The part IS can play in measuring customer satisfaction and enabling quick response to problem areas is a crucial contribution of information technologies. "Customer sampling is no longer acceptable; it must be a 100 percent check," Richard Kislowski, an IS staffer for the Denny's restaurant chain says. "The time window has shrunk drastically. You need to find any individual complaint and show how information technology can turn it around then and there."

For example, an automated distribution system at Denny's corporate headquarters enables clerks to log in "outages" each time a franchise requests items that are out of stock. The value of the systems is that management is now able to measure how much they are losing in potential sales due to outages.

Prepare a paragraph proposal for either a new subsystem or an improvement to the current system, that would meet the Denny's goals. Your document should mention the objective of the proposed system/subsystem and its anticipated benefits.

Do not be inhibited by things as they are. Existing structures and methods should not be accepted as constraints on your recommendation. They are simply a starting point.

APPENDIX C

CONSENT FORM

Project: Group Idea Generation for Information System
Investigators: Dr. Dorothy Dologite and Esther Klein

A study on group idea generation in Information Systems is being undertaken at the College of Staten Island. It will require participants to take part in a group session that will last about one hour.

1. **I understand that my participation in this study is strictly voluntary and that I may withdraw at any time without prejudice.**

2. **All information collected will be kept confidential and I will not be identified by name in any written records.**

3. **I understand that my participation in the study does not pose any personal risk to me.**

4. **I understand that I may ask questions of the researchers at the time I sign this document, or at any time during the study, pertaining to issues that I do not understand.**

5. **I agree not to discuss the procedures, or outcomes of any sessions, until the study is completed. I may obtain information on the results of this study, once they become available, by contacting the investigators.**

NAME:
PRINT:_____ **SIGN:**_____

AGE:_____

PARENT/GUARDIAN'SSIGNATURE:_____
(if under 18 years of age)

APPENDIX D

INITIAL QUESTIONNAIRE

INSTRUCTIONS: Please be sure to answer all the questions.

Group ____

ID # (last 4 digits of your social security #): _____

Date of Birth: Month _____ Day ___ Year ____

Course #: _____ Section: _____

MAJOR: Accounting [] Business [] Finance []
Management [] Marketing [] Undecided []
Other [] Specify: _____

Sex: []Male []Female

Number of credits completed: ____

Personal computer experience: _____Years _____Months

I am presently working []part-time []full-time

Does your job require you to use a computer? []yes []no

Do you have a personal computer on your desk at work? [] yes []no

What software do you use?_____
_____

Do you use a personal computer at home? [] yes []no

How knowledgeable are you in each of the following computer applications? (Place a checkmark in the appropriate box for each category, where 1 means not at all knowledgeable and 7 means extremely knowledgeable.)

	not at all knowledgeable 1	2	3	4	5	6	7 extremely knowledgeable
word processing:	[]	[]	[]	[]	[]	[]	[]
spreadsheets:	[]	[]	[]	[]	[]	[]	[]
database:	[]	[]	[]	[]	[]	[]	[]
graphics:	[]	[]	[]	[]	[]	[]	[]
group support systems:	[]	[]	[]	[]	[]	[]	[]
programming languages:	[]	[]	[]	[]	[]	[]	[]
games:	[]	[]	[]	[]	[]	[]	[]
Online computer services: (e.g., America Online, Prodigy, etc.)	[]	[]	[]	[]	[]	[]	[]
Overall, how knowledgeable are you with computers?	[]	[]	[]	[]	[]	[]	[]

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APPENDIX E

INSTRUCTIONS FOR IDEA GENERATION

APPENDIX

APPENDIX E1
Instructions for Idea Generation
using VisionQuest Group Support System Software

You are to generate a solution to the problem that was presented to you earlier, using Group Support System Software on the network of PCs. Do not talk with your fellow group members and follow the rules below:

(1) Generate as many ideas as possible in the time given and do not be afraid to suggest "wild" solutions. Be creative and innovative! Enter every suggestion that comes to mind.

Do not criticize! Withhold your judgement until everyone is ready to evaluate ideas.

Use ideas of your own, or of others, that were previously suggested to stimulate your thinking, and to improve the solutions. You may combine several ideas.

Continue with the process until you are told to stop. Do not talk!

(2) Start by evaluating the generated ideas using the software and then discuss the general direction for the system that you will propose. You may want to select one of the generated ideas for your system or incorporate several of them into a bigger system.

Once you decide what system you are going to propose, you will then use the software to write a proposal elaborating on your ideas. You will indicate the name for the system and describe the functions that the system will perform and its benefits.

APPENDIX E2

Instructions for Idea Generation using the Synectics Process with MindLink Software

You are to generate a solution to the problem that was presented to you earlier, using the Synectic Process with MindLink Software on the personal computer. Follow the steps below:

(1) **Enter the name and description of the problem that you intend to solve or explore**

(2) **Enter wishes about your problem.**

A wish is a thought or a beginning idea that attempts to solve a problem or address a need with the words "I Wish ...". (Wishing allows for expansive thinking; avoids the need to defend; allows bits and pieces of ideas to be voiced; increases the level of speculation; and invite further thinking.)

(3) **Do a wish trigger to get more wishes.**

A trigger aids and cues to help extend or freshen our thinking about a problem or opportunity. Some triggers are designed to give us more perspective on what we are thinking about. Some are designed to help us speculate. Some are designed to "jump start" our thinking when we are getting no ideas at all, or no new ones.

(4) **Pick a wish and enter ideas about this wish.**

You may trigger to get more ideas about this wish.

(5) **Select an idea to develop a potential solution.**

- **(i)** **list the pluses for this idea.**
- **(ii)** **list the concerns for this idea.**
- **(iii)** **pick the biggest concern and think of options around it.**
- **(iv)** **list the next steps for implementing this idea.**

(6) **Repeat step 5 of the process for different ideas until you arrive at a solution that is satisfactory to all members of the team or are told to stop.**

Once you decide what system you are going to propose, you will use the index cards provided to you to write a proposal elaborating on your ideas. You will indicate the name for the system and describe the functions that the system will perform and its benefits.

APPENDIX E3

Instructions for Idea Generation
using No Computer Software Support

You are to generate a solution to the problem that was presented to you earlier, using brainstorming technique. Follow the steps below:

(1) **Generate as many ideas as possible in the time given and do not be afraid to suggest "wild" solutions. Write down every suggestion that comes to mind. Think about a situation that you may have encountered at a restaurant like Denny's and how you would solve it through information systems. Be creative and innovative!**

Do not criticize! Withhold your judgement until everyone is ready to evaluate ideas.

Use ideas of your own, or of others, that were previously suggested to stimulate your thinking, and to improve the solutions. You may combine several ideas.

Continue with the process until you are told to stop.

(2) **Start by evaluating the generated ideas and discussing the system that you will propose. You may want to select one of the generated ideas for your system or incorporate several of them into a bigger system.**

Once you decide what system you are going to propose, you will use the index cards provided to you to write a proposal elaborating on your ideas. You will indicate the name for the system and describe the functions that the system will perform and its benefits.

APPENDIX F

FOLLOW-UP QUESTIONNAIRE

INSTRUCTIONS: Please be sure to answer all the questions.

Group ____

ID # (last 4 digits of your social security #): _____
Date of Birth: Month _____ Day ___ Year ____
Course #: _____ Section: _____

How would you rate the Denny's problem on each of the following?

	1	2	3	4	5	6	7	
extremely difficult	[]	[]	[]	[]	[]	[]	[]	not at all difficult
extremely interesting	[]	[]	[]	[]	[]	[]	[]	not at all interesting
extremely important	[]	[]	[]	[]	[]	[]	[]	not at all important
extremely useful	[]	[]	[]	[]	[]	[]	[]	not at all useful
extremely difficult to understand	[]	[]	[]	[]	[]	[]	[]	extremely easy to understand

How would you rate the work you did during this session on each of the following?

	1	2	3	4	5	6	7	
extremely enjoyable	[]	[]	[]	[]	[]	[]	[]	not at all enjoyable
extremely interesting	[]	[]	[]	[]	[]	[]	[]	not at all interesting
extremely important	[]	[]	[]	[]	[]	[]	[]	not at all important
extremely useful	[]	[]	[]	[]	[]	[]	[]	not at all useful
I was extremely motivated	[]	[]	[]	[]	[]	[]	[]	I was not at all motivated

How would you rate the method used for generating ideas?

	1	2	3	4	5	6	7	
extremely useful	[]	[]	[]	[]	[]	[]	[]	not at all useful
extremely difficult to use	[]	[]	[]	[]	[]	[]	[]	not at all difficult to use
instructions were extremely clear	[]	[]	[]	[]	[]	[]	[]	instructions were not at all clear
extremely fun to participate	[]	[]	[]	[]	[]	[]	[]	not at all fun to participate

The method ensured that everyone in the group had equal opportunity to present ideas.

	1	2	3	4	5	6	7	
definitely	[]	[]	[]	[]	[]	[]	[]	definitely not

How well did you know everyone in your group? (Check one.)
__ First time working with those present.
__ Worked once or twice with some of those present.
__ Worked once or twice with most of those present.
__ Worked a lot with one or some of those present.
__ Worked a lot with most of those present.

Please indicate the extent to which you agree or disagree with each of the following statements. Circle a number from 1 (strongly agree) to 5 (strongly disagree) for each statement.

	strongly agree		neutral		strongly disagree
My group was extremely cooperative in working together to solve the Denny's problem.	1	2	3	4	5
My group was extremely motivated to complete the exercise successfully.	1	2	3	4	5
All the group members worked closely together.	1	2	3	4	5
The group process was dominated by one or more individuals.	1	2	3	4	5
I felt forced to conform to others in my group.	1	2	3	4	5
I felt comfortable contributing ideas.	1	2	3	4	5
I was able to contribute all my ideas.	1	2	3	4	5
I was totally involved in the group effort.	1	2	3	4	5
In general, I like to participate in groups.	1	2	3	4	5
In general, I fear speaking in public.	1	2	3	4	5

Overall, how satisfied were you with the method you used in today's exercise?

	1	2	3	4	5	6	7	
extremely satisfied	[]	[]	[]	[]	[]	[]	[]	not at all satisfied

What did you like best about the method you used today?

What did you like least about the method you used today?

Any additional comments:

APPENDIX G
PERMISSION TO VISIT CLASSES

from the desk of Esther Klein

April 6, 1995

Dear Barry:

I would like your permission to call upon your ACC114 , ACC121 , ACC121 , ACC415 classes to participate in an experiment I'm conducting as part of my PhD dissertation.

The experiment consists of groups of 4 or 5 students performing an Information System related task with the aid of different state-of-the-art group support techniques. To complete the task a group takes about 45 minutes.

I anticipate that I will be conducting the experiments after Spring recess. I would like to call on different groups of students for a three week period.

Please fill-in the lower portion of this letter and return it to me with your permission.

Thank you for your consideration and assistance in this matter.

Sincerely,

Esther

Esther:

You may call on the students in my (please circle) ACC114 , ACC121 , ACC121 , ACC415 classes to participate in the experiment.

The best day and time to stop by and familiarize the students with the experiment is (please circle)

ACC114	TUE	10.10	THR	10.10
ACC121	TUE	4.40	THR	4.40
ACC121	WED	6.30		
ACC415	TUE	2.30	THR	3.35

from Barry

APPENDIX H

PARTICIPANT RESPONSE FORM

Name _____

Telephone (day) _____ (eve) _____

I would like to participate in the experiment: yes____ no_ ___

If yes, please fill in the days and time when you are available

first choice: Day _____ **or** Date ___/___/___ Time _____

second choice: Day _____ **or** Date ___/___/___ Time _____

third choice: Day _____ **or** Date ___/___/___ Time _____

Date of Birth: Month _____ Day ___ Year ____

Course #: _____ Section: _____

MAJOR:

- Accounting ___
- Business ___
- Finance ___
- Management ___
- Marketing ___
- Other ___ Specify: _____
- Undecided ___

Sex: Male___ Female___

ID # (last 4 digits of your social security #): _____

THANK YOU!

Esther Klein

APPENDIX I
LETTER TO EXPERT JUDGES

from the desk of
Esther Klein
975 East 19th Street
Brooklyn, New York 11230
(718) 253 - 8796

January 1, 1996

Dear Judge:

Thank you for agreeing to perform the function of an expert judge in my dissertation research project.

Enclosed are the proposals generated by groups of students for an information system for a restaurant like Denny's in response to the task description. (Copy of task description is enclosed.)

I would like you to evaluate each of the enclosed proposals in several categories using the enclosed questionnaire. The questionnaire is a tool for clarifying your view of the proposed idea that you are considering. All answers are 'right' answers, since you are simply evaluating the proposed idea. Please answer all the questions as best as you can, and return the enclosed material in the provided envelope as soon as possible.

If you have any questions, please call me at any time. I am immensely appreciative of your time and attention.

Sincerely,

Esther Klein

Enclosures

APPENDIX J
QUESTIONNAIRE FOR JUDGES

Name _____

Title _____ Company _____

Address _____

_____

Telephone (day) _____ (eve) _____ EMail _____

Please check (✓) all the businesses/industries you've been affiliated with:

_____ Manufacturer of Computers and Peripherals
_____ Banking
_____ Finance
_____ Insurance
_____ Real Estate
_____ Medical & Health Care
_____ Law
_____ Education
_____ Wholesale/Retail/Trade
_____ Government -- Federal/State/Local
_____ Communications Systems/Utilities
_____ Systems Integrator, VARs, Computer Service Bureau, Software Planning & Consulting Services
_____ Manufacturing (other than computer)
_____ Other _____
(please specify)

Please check (✓) all the titles/functions that describe your assignments:

_____ Chief Information Officer/Vice President
_____ Director/Manager MIS Services
_____ Director/Manager Systems Development
_____ Software Developer
_____ Consulting Manager
_____ Treasurer, Controller, Financial Officer
_____ Information Center Manager
_____ Educator
_____ Other _____
(please specify)

Information systems experience: _____Years _____Months

Please name two of the most recent organizations you've been affiliated with:

_____

_____

Thank You!

APPENDIX K
CREATIVITY EVALUATION QUESTIONNAIRE

The Creativity Evaluation Questionnaire is a revised version of the CPSS—Creative Product Semantic Scale. The original CPSS is used to analyze existing products. This revised version is designed to assist professionals in evaluating the creativity of proposed information system ideas.

INSTRUCTIONS

Please consider the proposed information system idea in relation to the scales printed. Each scale has two alternative characteristics as end points. Place a checkmark (✓) over the position on the scale that best reflects your rating of the proposed information system idea. Your rating should reflect both direction and proximity (in meaning) to the word that better describes the proposed idea. While not belaboring your selection, give careful thought to how each word relates to the proposed information system idea.

Don't be concerned if the words do not seem to be complete opposites. Some pairs are but some are related in other ways. Simply ask yourself, "Will the proposed information system idea, if implemented, be more like one term or more like the other?" If you find that the proposed information system idea will be equally like one term and equally like the other, select a point near the middle of the continuum.

Do not worry if you realize that people may define words differently, or that others may not agree with your definitions. Studies of reliability suggest that these differences do not cause much real disparity in evaluation.

APPENDIX L **GROUP: _____**

CREATIVITY EVALUATION QUESTIONNAIRE

The proposed information system idea presented is:

appropriate	_ _ _ _ _ _ _	inappropriate
unique	_ _ _ _ _ _ _	ordinary
usual	_ _ _ _ _ _ _	unusual

From the technical point of view, the proposed information system idea, if implemented, will be:

complex	_ _ _ _ _ _ _	simple
workable	_ _ _ _ _ _ _	unworkable
pioneering	_ _ _ _ _ _ _	unprogressive

From the organizational point of view, the proposed information system idea, if implemented, will be:

inessential	_ _ _ _ _ _ _	essential
inexpensive	_ _ _ _ _ _ _	costly
astounding	_ _ _ _ _ _ _	common

Overall, the proposed information system idea is:

creative	_ _ _ _ _ _ _	uncreative

Rate the proposed information system idea in terms of the following characteristics:

extremely novel	_ _ _ _ _ _ _	not at all novel
extremely useful	_ _ _ _ _ _ _	not at all useful
extremely feasible	_ _ _ _ _ _ _	not at all feasible

APPENDIX M
Sample Proposal Template

GROUP: _____

PROPOSAL FOR INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: _____

DESCRIPTION OF PROPOSED IDEA:

_____
_____
_____
_____
_____

ADVANTAGES:

- _____
- _____
- _____

APPENDIX N
Proposed Information System Ideas:

GROUP: I-01

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: A Better Denny's

DESCRIPTION OF PROPOSED IDEA:

Through computer, Denny's can improve their reputation and overall make their restaurant a better one. Through computers, Denny's can set up a mailing list and send away coupons and promotions that will be taking place. This will bring in the regular customers as well as new customers.

As well, computers will benefit Denny's by keeping track of the inventory coming in and going out of the store. Through this procedure there will be no shortages of food. The result of this is that the customers will be satisfied and by keeping track of the inventory, Denny's will be able to stop shrinkage and probably save the store a lot of money.

Also, if every customer has their own card or number that the computer can scan, they can keep track of all their visits. After a certain amount of visits, they should receive a free meal. Having a promotion like this one will keep the flow of consumers coming in.

ADVANTAGES:

- Better tracking of inventory
- Better customer service
- Stop shrinkage
- Keep old customers and bring in new ones
- Improves overall reputation
- Special promos will keep steady customers
- Increase in Profits!

GROUP: I-02

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: DRIVE-THRU COMPUTER ORDER

DESCRIPTION OF PROPOSED IDEA:

Have a system that allows you to place an order through the phone. The phone should be connected to a computer that will display the orders.

Function: Facilitates the drive-thru process by saving time. The customer doesn't have to wait to have someone ask them for the order.

Also, it will eliminate the "clarity" problem. There will be less mistakes in the order. The consumers will come out less frustrated.

ADVANTAGES:

- The idea will attract new customers.
- Having a more satisfied customer will increase profits.
- The restaurant will be recognized for the innovative idea.
- Customers wont have anyone to blame but themselves if they get the wrong order.
- They won't get as many complaints.

GROUP: I-03

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Service Survey

DESCRIPTION OF PROPOSED IDEA:

Keep track of inventory through database to have inventory control.

Have suggestion cards, then enter cards into computer to keep track of what was liked and disliked so improvements can be made.

Enter information on how popular promotional items are - kids meals, discounts, "Advertising Specials", etc.

ADVANTAGES:

- It will be easier to keep inventory so that we do not run out of anything.
- We can use customer inputs to our advantage.
- We can keep people coming back to Denny's by offering excellent service.
- Suggestion cards help by improving our overall business -> appearance, food tastes, service, atmosphere.

GROUP: I-04

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Enviro Tech Fast Food Process

DESCRIPTION OF PROPOSED IDEA:

Computerized order pad - order by code (display in kitchen-screen on/near stove.)

Compatible computerized stove -> need less staff
- matching codes (for temp. welldoneness)

Faster to give order and have less errors-can't read exact preparation temp, welldoneness, price.

ADVANTAGES:

- Faster service.
- Less errors.
- Food the way you want it.
- Need for less staff.

GROUP: I-05

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: A Better Management

DESCRIPTION OF PROPOSED IDEA:

A complete system to keep track of
- **Payroll**
- **Inventory**
- **Preference**
- **Reservations**
- **Entertainment**
- **Appointments**

ADVANTAGES:

- **Save Time**
- **Precaution for running out of inventory**
- **Can use of wider span of management. (less cost)**

GROUP: I-06

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: "What's on the menu"

DESCRIPTION OF PROPOSED IDEA:

You go to a restaurant and you really don't know what you want to eat. Perhaps by using a computer - made available to customers, it can help you decide.

For example, the system will ask you questions like what kind of food do you like best e.g. chicken, meat, veggies.

Restaurants that have computer programs which can be linked to personal computers at home or work. You can type in your order for delivery.

Give customers access to a computer so they can give a recipe suggestion and feature some with their first names on weekends.

ADVANTAGES:

- Saves times
- Lets customer know exactly what they are getting
- Friendlier atmosphere
- Don't have to go out if you don't have to
- Lets people know anyone can use a computer for almost anything
- Avoids busy telephone lines
- Lets you know your suggestions count.

GROUP: I-07

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Touch and Go

DESCRIPTION OF PROPOSED IDEA:

Computer terminals at tables with an electronic menu that alerts the waitress, cooks, etc. of order.

This terminal should be linked to the main computer that checks inventory levels and alleviates "outages" and keeps customers satisfied. Once orders reach a certain level "coupons" are automatically mailed this service would be efficient.

ADVANTAGES:

- Allows quick and easy ordering
- Keeps track of inventory
- Keeps track of individual items sales
- Helpful in issuing coupons
- Waiters can order by touch screen
- Order relayed directly to cook
- Finished order to main frame for reorder inventory and advertising usage
- Eliminates time
- Quicker service, greater customer satisfaction (no outages)

GROUP: I-09

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Auto-Satisfaction

DESCRIPTION OF PROPOSED IDEA:

When customer enters a busy restaurant and hostess seats them have the hostess enter the time the customer was seated onto a PC. The hostess can then track how long customers have waited for their order to be taken.

Also, when entering the time there should be a message that prompts telling the hostess that customers in table one have been there for a certain amount of time which means that their order should have been taken.

Allow only a certain amount of time between the order being taken and the food coming out.

Use computers to keep track of the time an order was taken and give some feedback at the given interval of time whether it's the serving of the order or a reason for the delay. Attain the average time for each type meal through sampling and allow the public to know these times so they know how long they should expect to wait.

ADVANTAGES:

- Waiting time is known, satisfaction -> no guessing.
- Never left without communication w/an employee for too long.
- Should arise the computer has all the information and it can be examined so that next time it can be avoided.
- Waitress to keep track of the order in which orders were taken.
- To prepare orders in bulk if multiple orders of a particular item is taken at the same time. (cuts down time of preparation)
- Happier customers
- More customers means more money
- Good reputation for good food, fast service.
- Minimize the number of waiters/waitresses needed

GROUP: I-A

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Minimize Time Maximize Profit

DESCRIPTION OF PROPOSED IDEA:

1) Computers keep track of the orders of the customers, what they ordered, what they didn't order and their comments (dislikes, likes) on the food itself (and on the service).

2) Computer, to help save time, take orders upon entering and having the food ready when seated or keeping track of the time between ordering and receiving food.

3) Computer keeps track of what inventory/stuff comes in and what is actually utilized.

4) Computer counts people who comes during specific time frame allowing to hire accordingly.

5) Computer keeps track of the number of times the customers come in offering a free bonus after a certain number of visits.

ADVANTAGES:

- Keep track of food likes etc. will help decide what ways to cook the food and also how much of the different orders should have on hand so more ordinary stuff will be in inventory saving space and money.
- Time saving ideas keep the customers happy not waiting and also save money on sales by not having customers waiting at tables without food.
- Saving money on waste is accomplished by keeping track of what comes in and out.
- When customers think they will get free stuff if they keep returning will bring them back for resale achieving the keeping of old customers.

GROUP: I-B

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Quicker Service More Satisfaction

DESCRIPTION OF PROPOSED IDEA:

1) Table panel that records orders, customers by A/C #, food and service ratings and inventory.

2) Electronic Surveys
- allowing you to electronically rate the service you have received. Either with the survey machine and the table or up by the register.

3) Sending vouchers to customer that attend regularly create a Denny's discount card where the family can obtain 10% off. Once you calculate how regularly this person or family attends then, they would receive a free dinner or desert on Denny's.

ADVANTAGES:

- Gaining customers because of the quality of service.
- Time is a precious commodity and we all would like to have more of it.
- Presenting efficient and quality service would attract new customers and the old customers would become an asset to the company because of the satisfaction of your service.
- When people enjoy themselves feel as though they have received their money's worth. The service speaks for itself and the customers advertise and speaks for you.

GROUP: I-C

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: VAM (Voice-Activated Menu)

DESCRIPTION OF PROPOSED IDEA:

Electronic menu with TV like photos of food order food at table through a keypad and a smiling waiter/waitress to serve you. Check can be printed at your table whenever you're ready to go.

Set up computerized menus at each table. These computerized menus would allow us to choose what we want to order just by the touch of a few buttons. It will display prices as well in order that it may give us a receipt once we have put in our order. This computerized menu should be connected to a database in order to make it easier to keep track of outages.

ADVANTAGES:

- Diminishes tasks and lowers need for employees
- One person can take care of more tables efficiently
- Innovative because no current restaurant has it and people will be drawn to Denny's just for the experience.
- Reduces unhappy customers that are constantly looking for waiter/waitress
- Helps to keep a more precise inventory of food as well as which foods are most demanded during which part of the day
- Cuts down addition errors that would be made by waitress when adding up bill
- Customers can't say they ordered one thing and waitress brought them another
- Makes things move much faster or much slower depending on customer and if she/he is in a hurry or not
- Easier to keep track of outages.

GROUP: I-D

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Place M.A.T.

DESCRIPTION OF PROPOSED IDEA:

In a restaurant of the future, customers will sit down to computerized touch menus (like at Chemical Bank's ATM machines) at their table. This eliminates use, cost, nuisance and time of waiters/waitresses and increases food arrival and stock measuring considerably. After pressing the desired meal on the screen, the choices appear in the kitchen before the chef so he/she can begin immediate preparation.

When you sit down you punch in your home. (Like at Kinko's computer rental policy). The computer menu/screen notes time, table # and any other relevant information. This will allow you to pay and record payment at the end of the meal because when you leave you would need to log out. A bill would spew forth from the menu/computer screen and you could go to pay. If payment is in cash, take it to the register (unfortunately a person). If payment is a credit card, you could punch in your # or swipe it through and could leave. No tip is necessary! Or, you could choose to be billed, punch in your address (or not even necessary, the computer once it has your name could find you), and a bill from the restaurant can be sent. Thus, also eliminates waiting time for the bill.

Back to the menu, your dinner choice appears before the chef, and of course to inventory control. What every person orders is therefore kept track of immediately, thereby clarifying popular and unpopular dishes and preventing outages from occurring in the future. The inventory control could also be directly hooked up to the supply managers (like paying bills directly from your bank account without having to sign a check, etc.) and when supplies get too low the supply stock automatically sends you more, eliminating outages completely.

Name and address required to log in. This way can keep track of amount of visits - can receive a discount after *n*th visit and customer does not have to hold on to an annoying easy to lose card. All customers receive a receipt when they leave as proof of payment.so no one can steal. Perhaps even insert receipt ticket into a computerized door to insure payment. Once payment is confirmed, (a matter of seconds), door is opened. If no ticket, can't leave because door remains locked. The only time people are required are to bring you your food.

ADVANTAGES:

- Prices listed next to every item printed on screen
- Business cards spewed with receipt ticket to first/third time customers.
- Eliminates outages, customer complaints, dissatisfaction
- Eliminates human error of: wrong order, Incorrect amount to be paid.
- Eliminates tip
- Decreases waiting time for food (a number 1 complaint in many restaurants.
- Eliminates the use of greasy, overused menus and the need/expense to constantly change and update them.
- Promotes customer frequency by keeping track if times visited and offering discounts.
- Decreases tendency to shoplift/eat without being able to pay

GROUP: I-E

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Automated Ordering/Inventory Control

DESCRIPTION OF PROPOSED IDEA:

Automated order recording by waitress(er) w/direct link to inventory. Thus implementing a sophisticated inventory control mechanism and orders going to the kitchen via the waitress's computer.

ADVANTAGES:

- Better/improved inventory control
- Improved ordering - more correct items for the correct table.
- Better communication between cook and waitress because order goes to cook via computer.

GROUP: I-F

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Ideas for Profiting

DESCRIPTION OF PROPOSED IDEA:

1) Keep track of what food is sold and when through the use of a computer. Perhaps keep track of the most and least popular of the foods. Thereby increasing sales projections.

2) Inserting cash/credit card without getting up.

3) Computerizing the order slip - automatic change in register
By sending the order to the kitchen making sure nothing leaves the kitchen without being paid for.

ADVANTAGES:

- By finding out what is ordered most Denny's can offer specials on that and make sure they are overstocked whereas knowing what is ordered least Denny's won't have to spend money on useless food.

- By being able to pay by cash/credit card without getting up. People could save at least five minutes thereby minimizing waiting periods (getting customers in and out faster) and maximizing profits.

- By developing a way of making sure nothing leaves the kitchen without being on the slip will save lots of money of free loading by waiter/waitress, etc.

GROUP: I-G

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Virtual Reality and Real Service

DESCRIPTION OF PROPOSED IDEA:

1) Virtually reality - menu. People look at a menu of virtual reality and actually order from the food they "see" before them.

2) Try to figure out the surrounding community's demographics and have staff most similar to customers at same times. As far as age, musical taste, etc.

3) Computer at table to make anonymous complaints regarding food or service and suggestions.

4) Special prices on special meals by factoring in times of day and economics of the customers.

5) Use computers to detail leftover percentages to cut down on waste of portion sizes, beverages sizes, uneaten coleslaw, pickle, etc.

ADVANTAGES:

- People feel more comfortable being served by people who are most like them. It improves the experience.
- Many times you want to complain about food quality, portion size and staff. But don't want to suffer consequences. Example, waiter spits in your food in retaliation. With idea # 3 you can get your message across to owner or manager without fear of retaliation.
- Eliminate errors, maximize workers' time, increase company's profit.

GROUP: I-H

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Denny's Put the Class Back in Fast Food

DESCRIPTION OF PROPOSED IDEA:

Wish they have more choices, have clean facilities, would consider the time element factor since most people are pressed for time.

ADVANTAGES:

- Assured to get back to work on time.
- Guaranteed that you have a variety of choices
- Clean facility attract more customers with children and even without children.

GROUP: I-I

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Building Blocks for a Strong Restaurant

DESCRIPTION OF PROPOSED IDEA:

Wish they have a suggestion box and take action according to the suggestions and for a record of every order on the computer and keep an account of each sale and supplies.

ADVANTAGES:

- **High sales**
- **Speedy service**
- **Good reputation**
- **More Loyal customers**
- **Customer satisfaction**
- **Easy access to accounts**
- **Less paperwork**
- **Minimizing fraud**
- **Good tracking of problems**

GROUP: I-J

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: What You Want Is What You Get

DESCRIPTION OF PROPOSED IDEA:

Wish that customer service can reach a high level of perfection, that restaurants wouldn't have waiting lists: could order by computer anything any day, that famous people would visit the restaurant so that you can meet them and talk to them, can provide some excitement such as Banji jumping, skydiving -- VIRTUAL REALITY IN THE RESTAURANT.

ADVANTAGES:

- Provide what customers want
- Attract customers to restaurant
- People would come often -- have "regulars" coming to the show
- Improve image of restaurant
- Unique features
- Franchising opportunity

GROUP: I-K

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: The Improvement of the Restaurant

DESCRIPTION OF PROPOSED IDEA:

Wish the inventory system was better managed with employees input on major decisions, the risk for outages would be almost eliminated since problem is resolved before it has a chance of occurring, be online with food distributor, occasionally survey customers to see what are the most popular dishes.

ADVANTAGES:

- Helps eliminate problem before crisis occurs
- Being online provides for quicker ordering and quicker delivery
- Eliminates ordering problems
- Chain of command for ordering

GROUP: I-L

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: CPW-Villa

DESCRIPTION OF PROPOSED IDEA:

Wish for better control of air, to establish a restaurant reservation system by connecting to other restaurants when my establishment is full, to keep track of inventory, including purchase price, selling price and labor cost, through logon menu, hours and seating availability, actual restaurant layout could be presented.

ADVANTAGES:

- Efficient service
- Eliminate outages
- Steady amount of customers
- Comfortable and fun and enjoyable environment
- Know what your profit is including profit on individual items at all times
- No need to turn customers away
- Make reservations from another restaurant
- Order Ahead

GROUP: I-M

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Denny's ...AHHHHH satisfied

DESCRIPTION OF PROPOSED IDEA:

Wish to improve the running of the business without compromising the social responsibilities both locally and globally and focusing on the needs of different individuals, using a computer at every table to be able to look and order from menu. Tie the order to the kitchen and track the inventory through a central location where items are automatically reordered when low or out.

ADVANTAGES:

- Minimize out of stock situations
- Track what individuals are ordering
- Determining peak times
- Track by region
- Provide faster service so you will have better turnover
- Faster service means happier customers
- Overall better service
- Company will save money and time

GROUP: I-N

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Computer Express Checkout

DESCRIPTION OF PROPOSED IDEA:

Wish for prompt attention, have a table number tied into the checkout process using a computer, roller skates for waiters.

ADVANTAGES:

- **No waiting for waiter**
- **No waiting for check especially when in a rush**
- **Saves aggravation and fights**

GROUP: I-O

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Snaring a Larger Market Share with the Internet

DESCRIPTION OF PROPOSED IDEA:

Investigate the possibilities of creating a presence on the information superhighway for various purposes including, but not limited to, advertising and customer interface.

ADVANTAGES:

- Competitive prices
- Automated order system
- Seasonal Tracking
- Do it yourself automated ordering
- Tracking customers' utilization of special offers
- Special offers and promotions
- Investigating the competitors' and tracking their offers in a database
- Create a dream like environment
- Create colorful setting
- Aesthetically attractive setting
- Use internet to order food and to deliver it and advertising it

GROUP: I-P

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Menu Manager

DESCRIPTION OF PROPOSED IDEA:

Wish there would be a touch screen at the table, keep a running tab, questions about food can be answered promptly and accurately, control music and temperature at the table, an interactive menu, place order without waiter/waitress, keep running tab, paying bill at the table.

ADVANTAGES:

- File could be kept on customers
- Coupons could be sent directly to customers on file
- Bulletin board for upcoming events
- Read the news on the screen
- Advertise on the screen
- TV on screen
- Recommendations and/or complaints
- Paying bill at the table
- Call ahead for your reservations
- Pick your seats from different sections such as smoking/non smoking, window seats, etc.

GROUP: I-Q

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Customer's Dream

DESCRIPTION OF PROPOSED IDEA:

Wish we could utilize our inventories better, such as creating new menu items with what is known as excess now, to cut down on waste. Wish we had a product to advertise to demonstrate a newly developed product. We should slowly reduce our prices while measuring our customers, and offer every other breakfast free.

ADVANTAGES:

- Attract new customers
- Reduce waste, possibly
- Increase profits
- Market share
- Possibly widen customer base

GROUP: I-R

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Electronic Menu: Perfect service when you need it

DESCRIPTION OF PROPOSED IDEA:

Replace waiters with electronic menu with graphics and voice or touch activation, includes optional voice description, ingredients and picture of the dish. The description could be accessed in different languages. Call button for human assistance.

ADVANTAGES:

- Quick service
- No attitude
- Better food
- Higher customer satisfaction
- Better service
- More return business
- More new business
- Happier owner/lower cost – no waiters to pay
- Cheaper to patrons: no tipping required

GROUP: I-S

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Denny's Very Important Patron (VIP) Card

DESCRIPTION OF PROPOSED IDEA:

Wish that Denny's could use smart card technology whereby each customer would have a credit card which had the ability to be scanned which would capture customer preferences.

ADVANTAGES:

- Store personal preferences
- Keep track of food trends
- The ability to determine which products to test in which area of the country
- Not having to carry cash
- People having a good feeling of possibly winning grandiose promotional item or gaining a freebie
- Give people a sense of visiting family since they can identify you by name, know what you like and know your birthday, etc., you can go to any restaurant and feel like a regular
- Order can be placed electronically
- Pick up food at your convenience.

GROUP: I-T

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Communicating to Serve You Better

DESCRIPTION OF PROPOSED IDEA:

Wish management would seriously consider customers' needs, wants and opinions, they would wipe their silverware off, their service would be as quick as possible, management would encourage feedback from employees regarding customer satisfaction and invite all suggestions.

ADVANTAGES:

- Giving a customer what they want
- Encouraging business
- Show concern for customers
- They would be in competition to provide better service
- It would encourage employees with better attitudes because they are also being taken into consideration.

GROUP: I-V

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Eat to Your WORLD'S Delight at Denny's

DESCRIPTION OF PROPOSED IDEA:

Wish for a larger variety of cultural food, the menu would contain nutritional information, for computer service, the restaurant be understandable to see the needs of the health conscious clientele, the restaurant be open 24 hours with no menu restrictions.

ADVANTAGES:

- Hire international chef
- Catering to a broader variety for people
- Cater to people working unconventional hours
- Better nutrition

GROUP: I-W

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Around the World for the Price of a Meal

DESCRIPTION OF PROPOSED IDEA:

Wish they kept track of valued customers':

1) offer discount on new dishes;
2) customer birthdays and offered discounts to the celebrant and have childrens' menu decorated with Computer Generated Graphics.

ADVANTAGES:

- **Find out about restaurant thru child's school**
- **Incentive to go to restaurant since there are no others like it**
- **Chance for trip**
- **Sign up through Internet**
- **Give children something to do**

GROUP: I-X

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Denny's Buffet Trivia

DESCRIPTION OF PROPOSED IDEA:

Being that at a place like Denny's people want to be served immediately. Computers can be used here for totalling up tables quickly in order to help get the people in and out of the place without waiting long for a check. Some restaurants now have systems that when an order comes in, there is a screen that sends the order down to the people making the food so the waiter or waitress spends less time running back and forth from the kitchen to the dining room. Hosts and hostesses in a place such as Denny's could also use computers to tell them what time people sat down and when the next available table will be ready for people who are waiting to eat.

Giving out a choice as to what people prefer on the menu and different types of menu according to type of theme it is. Speeding the menu idea by the questionnaire and being efficient in this way.

ADVANTAGES:

- Efficiency, preference and customer satisfaction according to different types of customers.
- This would help to define what customers expect, and would like to see in our restaurant chain.
- To broaden our customer base by showing our willingness to satisfy all groups and at the same time maintaining our quality that has enabled us to expand.

GROUP: I-Y

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Denny's Compuserve

DESCRIPTION OF PROPOSED IDEA:

The computer system can send up an alarm when inventory runs low.

Different computer stations can send messages to the kitchen with the orders.

Use the computers to keep track of the very regular customers and create a mailing list for them when new products are to be introduced.

A computer should be set up at each franchise with the main frame at headquarters. At each franchise, a waitress will order thru computer input which will decrease inventory; the order will also keep track of time each order takes; the order will designate what is most in demand and what isn't. At the main office, it will be possible to offer discounts on slow moving items.

ADVANTAGES:

- The benefit of using inventory is to keep up on menu items most ordered.
- Customers will never hear "we don't have it," and we can tailor service to them.
- A faster paced fast food restaurant where more time could be spent with catering to customers rather than running around trying to learn if there are any hotdogs in the kitchen.

GROUP: I-Z

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Fresh Service/Satisfied Customers

DESCRIPTION OF PROPOSED IDEA:

Use computer to keep track of business during different weather conditions in order to have more help available.

Have fresher food, use tie-in promotions with major stores nearby.

ADVANTAGES:

- Better service
- Customer satisfaction
- More volume, the same faces will keep coming back
- Good word of mouth can be a strong advertising tool
- Satisfied customers will bring in more customers

GROUP: I-10

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: dtm: denny's teller machine

DESCRIPTION OF PROPOSED IDEA:

TV screen at each table, so customer can watch their food being prepared and indicate to chef additional ingredients to be added, and also the length of time to cook the food.

The purpose of having a computer at each table is to give the customer more power in deciding exactly what they want. It would give the customer the option to order something without meeting a waiter, view the cook as he makes the food, and the option to suggest or to complain.

ADVANTAGES:

- Satisfied customer
- Given the ability to get what they want, see it made, offer ideas or complaints
- Be given the opportunity to be personally made aware of future offers by the restaurant
- The customer is pampered at all costs.

GROUP: I-11

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Speed Server

DESCRIPTION OF PROPOSED IDEA:

There can be touch screens for the server to use when telling the cook what they ordered. This will also keep track of the inventory and tell you when you have to reorder.

Make it so you can set a certain inventory level for each item and when it goes below that item the computer will let you know i is time to reorder.

ADVANTAGES:

- Faster service
- Less repeat of "outages"
- Quick and easy service
- Satisfied customers
- More efficient
- Larger Profits
- Better operation
- Easier job for server

GROUP: I-12

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: PC Denny's

DESCRIPTION OF PROPOSED IDEA:

Instead of having a waiter/waitress taking your orders, have the dining tables equipped with a computerized food ordering system. The menu appears on a screen, and the customer chooses his/her desired meal. The system will also estimate time of food arrival.

Use computer to display survey outside the restaurant, such as the most wanted food, the most healthy food, the most popular diet for different range of ages. And all the survey should do automatically with a touch of a finger. (A touch screen computer -- needn't use a keyboard or mouse)

ADVANTAGES:

- People feel more self sufficient
- Lowering cost
- Low labor costs
- What you see is what you get
- Efficiency
- Save time for customers
- Attract more customers to Denny's

GROUP: I-13

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Complaint/Satisfaction Log

DESCRIPTION OF PROPOSED IDEA:

Keep a log of customer's likes and dislikes so that we can always be aware of what the customer is thinking about our restaurant. In this way, we are staying ahead because we will know what we are doing wrong and improve upon it. We are also able to find out what customer likes about Denny's and continue to do it or upgrade it.

ADVANTAGES:

- Will be able to upgrade our performance if the customers are not satisfied.
- Will be aware of what customer likes and continue doing it.
- The customer will be pleased that Denny's cares about them.
- Customers like to know that they are being heard.

GROUP: I-14

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Cyberservice

DESCRIPTION OF PROPOSED IDEA:

Use a computerized pad to take orders would be quicker and more effective because the chef would have an easier time reading the computer than someone's handwriting.

There should be a small, telephone like keyboard at each table that will allow the customer to get napkins, a refill, the check, etc. This so that the customer does not have to unnecessarily wait for anything.

ADVANTAGES:

- Faster and more accurate service
- Happier, satisfied customers
- Good reputation
- Less arrogant waiters/waitresses
- Make customer feel in control
- No more long waits for necessary utensils or napkins

GROUP: I-15

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: tech.rest.

DESCRIPTION OF PROPOSED IDEA:

Fast service can be reached by using online computers between the waitress and the chef.

Keeping track of all deliveries and how much of your stock you have left with a computer, to insure freshness.

ADVANTAGES:

- Speed and accuracy
- Efficiency and accuracy
- Serving the public in a fast efficient way
- Freshness and quickness

GROUP: I-16

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: touch and go

DESCRIPTION OF PROPOSED IDEA:

Use touch screen at each table so that the customers can order right from the table without menus and see a picture of each item and a description (would solve the problem of getting a waiter's attention.)

ADVANTAGES:

- Increased clientele
- Makes customers feel comfortable and not rushed
- Better knowledge of customer wants and needs for better service

GROUP: I-17

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: The Computerized Waitress

DESCRIPTION OF PROPOSED IDEA:

A computerized system which allows customers to order food without waitresses, and it also tracks inventory levels and the hours in which the store is busiest to ensure proper staffing is achieved.

Also, use the computer to keep track of inventory, have the system automatically order required ingredients at a pre-set level, to avoid shortages.

ADVANTAGES:

- Decrease shortages
- The reduction of actual employee tasks would make it more efficient, provide greater satisfaction to both existing and new customers.
- Ensure that the restaurant is properly staffed.
- Ensure that the restaurant is sufficiently stocked.

GROUP: I-18

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Best Savings Thanks to Denny's and Its Card

DESCRIPTION OF PROPOSED IDEA:

Have a Denny card as people buy more they get rebate.

Give free food or discount coupons.

Send to the customers personal greetings in the mail.

ADVANTAGES:

- Customers can save money when they apply for the Denny card.
- They can get coupons from Denny's.
- Bigger market.
- Increase sales.
- More customers.

GROUP: I-19

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: ON-LINE with Denny's

DESCRIPTION OF PROPOSED IDEA:

Denny's has a reputation for poor customer service where minorities are concerned. Perhaps a user friendly computer terminal could be installed in every restaurant, and customers could log on there to register complaints/suggestions about their experience at Denny's.

Keep a data base of demographics and psychographics on their customers and pertinent information such as birthday, food preference, etc.

ADVANTAGES:

- More customer satisfaction.
- Repeat visits to Denny's.
- Increased sales.
- Increased operating profit.
- Able to give attention to customer needs.
- Better ratings for Denny's.
- More business, happier working conditions.

GROUP: I-20

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: TOUCH SCREEN MENU

DESCRIPTION OF PROPOSED IDEA:

Use a screen to list a menu. The things you no longer have should not appear on the menu.

Have a computer at the front desk to type in orders so that the chefs in the kitchen can check with their computer to see what they need to cook.

When each order is entered, the computer will show amount owed including gratuity. At the end of the meal, a bill is printed.

ADVANTAGES:

- Fast service.
- Customer satisfaction.
- No long wait to have orders taken.
- No long wait for bill.
- No incorrect bill -- no disappointments.

GROUP: I-21

PROPOSAL FOR AN INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Help me serve you

DESCRIPTION OF PROPOSED IDEA:

Automated service and ordering from the table to avoid waiting to be serviced by a waiter. Also, it would inform the customers of what is available to order and what is not. As each order is entered, automatically it should deduct it from the inventory on site.

ADVANTAGES:

- Efficient.
- Time saving.
- Attracts customers.
- Less time consuming than manual checking of inventory.
- This is the computer age - everyone will love it!

GROUP: I-22

PROPOSAL FOR INFORMATION SYSTEM

FOR RESTAURANT LIKE DENNY'S

TITLE/NAME: Lean Mean Burger Machine

DESCRIPTION OF PROPOSED IDEA:

The menu can be expanded to include "diet" foods -- fat-free or low fat. Discounts may be offered to attract these customer. Monitoring how much fat-free food is being sold. There could possibly be a tie in to a Weight Watchers' group and attract new customers that would not normally go to a fast food restaurant.

ADVANTAGES:

- Low fat meal attract health conscious customers
- Budget-conscious will visit the restaurant more often

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