

# **“A Picture Is More Than A Thousand Words...To Remember”**

## **Effect of Presentation Format on Recall**

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### **ABSTRACT**

*Visual presentations are increasingly being used in the field of information systems to enrich the decision making process. One essential part in the decision making process is Recall. Recall of the data presented, depends on various factors. As a basic study, we identified and intend to study the effects of color, format, sound and gender on the recall of presented information. In order to achieve the perfect fit between the presentation of data and the task at hand, that is recall, we need to study the various circumstances when a particular presentation scenario is best suited. We do a Computer based Laboratory Experiment to test theory and to test our hypothesis. Our conclusions were 1.The use of graphics was same as text data. 2. Color was same as non-color representations. 3. Interaction of color and graphics was not significant. 4. Recall of Auditory representations was the same as Non-auditory representations. 5. Males were not significantly different than females. We believe a more detailed study may reveal differences.*

### **INTRODUCTION**

The role of a good fit in the means of presentation and the task at hand has become critical. The first reason for this is there is just too much information to grapple with. “Information once rare and cherished like caviar, is now plentiful and taken for granted like potatoes” (Shenk, 1998). The second reason is the lack of time.” The average business man, finds it difficult, if not impossible to read or analyze columns and figures and masses of data rapidly enough to base his decisions upon them when, as is ordinarily the case, he is forced to decide quickly.” (R.Riggleman, 1936). The third is the much claimed increase in decision quality. "organizational success is based on the organization's ability to process information of appropriate richness to reduce uncertainty and clarify ambiguity." (Daft and Lengel, 1986).

Millions of dollars are spent annually in the collection of data to be used in analyzing business. Usually, however, when the measurements have been made and recorded it is difficult to appreciate the relationships. Even when data have been carefully studied it may be almost impossible to show that the conclusions reached are correct and sound. It often happens in a meeting of a committee or board of directors that a sound and carefully prepared plan is rejected simply because the facts presented are not clear. Though it is important to have accurate and significant, one cannot get the most valuable results unless the methods of presentation are

effective. When statistical magnitudes, changes, or distributions are presented in tables or written description, it is not easy for the average mind to grasp or appreciate the relationships and their significances. However, by taking advantage of the condition that any business fact that can be measured can be presented graphically by means of diagrams or charts, we are able to appeal to the mind through the eye, through which medium man easily compares, either consciously or subconsciously, lengths, areas, and volumes. (R.Riggleman, 1936) According to (Schmid), Charts create more interest, are more clearly grasped, save time as it can be visualized at a glance, provide more comprehensive picture and can bring out hidden facts. The potential advantage of the graphical information lies in reducing decision making time.

With the flood of data produced by today's information systems, something must be done to allow business decision-makers to extract the information it contains. Considering this volume of data, today's business decision-maker faces the task of sorting through the jungle of data created by information systems. Visualization technologies allow the business decision-maker to separate the "wheat from the chaff. Representing data suitably in a visual manner, improves the efficiency and effectiveness of the decision-maker, and thus, allows them to separate the information from the "chaff." (Tegarden, 1999).

Today's business decision-maker suffers from information overload while at the same time underutilizing large amounts of relevant information. The primary reasons for this are Key information is difficult to find or recognize. Time-sensitive responsiveness is required.

Since a majority of the brain's activity that deals with processing of sensory data, deals with analyzing visual images, visualization technologies can help resolve this dilemma. (Chorafas and Steinman, 1995) By tapping this innate ability, we may be capable of aiding today's business decision-maker. In this section, we describe why visualization technologies may be appropriate for business problem solving by overviewing visual cognition, cognitive fit theory, and the types of tasks for which visualization can be used. (Tegarden, 1999).

In this paper we shall compare their effects on the recall process. In the following section, we discuss the theoretical background of our research. Then we discuss the details of the method adopted. In the third section we shall analyze the results. In the last fourth section we shall discuss our conclusions and future directions.

## **THEORETICAL BACKGROUND**

The effect of presentation format, along with many other environmental factors, on a number of dependent measures can be examined. Some of the measures in previous studies have been decision quality, decision time, decision maker satisfaction, learning time, retention time, attention attracting ability, attention maintaining ability, visual fatigue (Ives, 1982) reading and retrieval of data, communication of facts, comparison of alternatives, trend analysis, recognition and recall, problem finding, problem comprehension, problem solving under different moderating factors like, decision making styles, time constraints, information overload (Benbasat, 1986c).

Data can be presented in different formats. One intriguing problem faced in the field of Information Systems is to enrich the presentation of data. One pertinent question which can be raised here is: Which presentation format is the best and under what circumstances.

The independent variables will be (1) Color (color / mono) (2) presentation format (3D/ graphic /tabular) (3) speech (4) Gender. In our application, which the respondents will use and make their response, past experiments will be used to identify good representations of the content of the presentation. Our interest in this case is recall, which we shall use as the dependent variable.

The effect Graphics and tabular reports on various managerial tasks like reading and retrieval of data, communication of facts, comparison of alternatives, trend analysis, recognition and recall, problem finding, comprehension and problem solving in order to compare their competitive advantage (Benbasat, 1986c, Benbasat, 1986b).

The independent variables are 1. Color: color or mono 2. Format of presentation: tabular, graphical 3.Voice. The dependent variable is Recall.

### ***Cognitive Fit Theory***

Our primary goal is to make sure that the Format has to fit the task at hand. According to the paradigm of cognitive fit, graphical and tabular problem representations will each facilitate certain well-differentiated tasks – those tasks that emphasize the same type of information. (Vessey, 1991)

### ***Contingency Theory***

Performance success is based upon a suitable match between contextual variables and the organizational arrangements (Rice, 1992)

### ***Media Richness Theory***

According to (Daft and Lengel, 1986) , richness of media reduces equivocality of data by helping decision makers with the capacity to perceive complex subjective messages. However , in a study by (D'Ambra et al., 1998) , the results obtained provide evidence to suggest that equivocality may not be unidimensional, and that the richness of media is perceived multidimensionally in terms of the information carrying capacity of media. The findings on dimensionality of equivocality raise doubts as to the basic assumptions of this concept and media richness theory.

### ***Color***

Color: We will attempt to make the output as visually rich as possible when using color as a level. Our project is computerized and we shall be using the colors available within the computer-programming environment. In case of mono, we shall use black and white as defined by the Computer.(Benbasat, 1985) found that color improved decision quality. The decision quality was some what better in graphical format than in the tabular format. It was also found to

aid people who had perceptual difficulty in understanding a complex figure. One reason, why color is not always expected to be more efficient is, in certain circumstances it does not contribute significantly to the decision making process. Secondly, Color and graphics come at a cost. Graphics create more network traffic compared to pure text data. More space, more speed is required for graphics data. Software to convert text data into graphics are required. These increase the software development time.

### ***Format***

According to (Benbasat, 1986c), in an experiment with decisions as the dependent variable, Graphical and Combination of Graphical and Tabular reports were preferred, Graphical and Combination of Graphical and Tabular reports made completion of task at hand faster.

Recent advances in Computer Science has made it possible to show 3-D representations of the data. (Lee et al., 1986). Multidimensional presentation are the next step to enrich the capacity to make decisions. “The world is complex, dynamic, multidimensional ; the paper is static , flat. How are we to represent the rich visual world of experience and measurement on mere flatland” (Tufte, 1990),

Information presentation: In the graphical level, some minimal necessary text information will be given along with the graphics. The graphical information will be programmatically converted from the text data. This makes sense, since it is our interest to compare text data to graphical data which is supposed to have been converted from the text data. The words in the graphical format will be bold, italics and underlined. In case of tabular, only text information (without any font formatting) will be shown.

### ***Audio***

Voice: Voice factor will have only one level. The voice will be simulated using a computer. We will again programmatically develop voice using computer programs. Graphical interfaces have become useful for the general public, visually challenged individuals still face a barrier (Mynatt, 1997). Although methodologies are developed to convert Graphical user interface into audio, we shall use audio which is not converted from the graphical or text interface. We shall use an audio output which will represent the text or graphical display as close as possible.

### ***Gender***

Most past research has ignored the effects of Gender on recall. According to (Venkatesh and Morris, 2000) research from various IS and non – IS domains have shown significant impact of gender on the perceiving objects. Past research outside of Information systems has shown evidence of the critical role of gender in influencing behaviors in many areas. (Venkatesh and Morris, 2000) Using the TTF model they found significant differences between the responses of the two genders. (Young, 2000) confirmed past conclusions of gender differences in computer attitudes.

### ***Recall***

Modifying the constructs from theory (Loken and Hoverstad, 1985), we developed a measurement instrument for recall. The subjects will be asked to remember as many companies

as possible, and also their ranking with respect to each other. Recall is expected to be better in case of 3-dimensional graphics than text based information (Watson and Driver, 1983)

## METHOD

Earlier experiments by (Benbasat, 1986a) have been done in the area. In one of their experiment they have used decision making under different time constraints as their dependent variable. We shall do a multiple ANOVA experiment using recall as the dependent variable.

The experiment employed a MANOVA test. The independent variables are the format of presentation. The dependent variable is recall (immediate) and recall (elapsed time). Subjects are college students of all levels from the Business School. After the preliminary requirements of accepting the consent of the respondent, the program will provide a small brief about the experiment. After some preliminary demographic questions, the respondent will go through a set of exposures depending on what exposure he/she has been allotted. The respondents are then asked by the application to input their response. After this, the respondent will be debriefed.

All the types and combinations will represent the same information. Each respondent will go through only one type of presentation. The dependent variables are short term recall and long term recall. The constructs for both are used from theory. In all, 5 students with their grades for test1, test 2 and average will be shown. Once the time for seeing the output has expired, the respondent will be asked to write down the name of the students who made the best or the worst grades in the tests (6 questions). Any missed answer will lose a point. The program will receive their responses, grade their responses and store it in a database.

	TABULAR			GRAPHICS				
AUDIO	M	3.6	4.5	6	M	4.6	5	3
	F	4	4	1	F	4	4.5	2
NON-AUDIO	M	4	4	3	M	4	4	1
	F	3	3.5	2	F	4	3.6	3

**Table 1. Univariate Statistics**

= no. of respondents

= treatment means ( short term recall )

= treatment means ( long term recall )

## ANALYSIS

Null Hypothesis: Ho: The effect of format (text or graphics) on short term and long term recall does not depend on the presence of Audio presentation.

Alternative: Ha Hypothesis: The effect of format (text or graphics) on short term and long term recall depends on the presence of Audio presentation.

Using the F test with a significance level of 0.05, we found that none of the factors (Main Or Interaction) were able to help explain the responses.

## CONCLUSION AND FUTURE RESEARCH DIRECTIONS

### *Conclusions*

We recommend a little more complex presentation scheme so that slight differences in the responses due to the presentation format can be detected. Exclusive audio also can be used. The respondents can be blocked by “Audio sensitive” and “Video sensitive”.

### *Future Research Directions*

One major research extension would be to compare spatial data presentation with other formats like tabular presentations. GIS is a major upcoming field in the field of information systems. Demographic Data in a GIS can be divided into attributes and spatial attributes. Combining both, provides a visual presentation to demographic data. Research needs to be done to access the effect of GIS in decision-making capabilities. Its comparison with other types of data presentations can be studied. Research has found it GIS to be, generally, increasing the efficiency of users in more complex problems. (Mennecke et al., 2000)

Balanced Score Cards are another related area which is gaining popularity in enriching the presentation of data. A study similar to the one in this paper can be done to access the significance of the Balanced Score Card. (Mynatt, 1997), Elizabeth D ) discusses about developing an auditory interface to represent graphs for blind users. Studies by (Christel, 1994) suggests that motion video helps better recall performance than a slide show. Adding motion as a factor is also a candidate for future research.

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