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Effects of Various Logotype Structures on Advertising Content Retention

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EFFECTS OF VARIOUS LOGOTYPE STRUCTURES
ON ADVERTISING CONTENT RETENTION

BY

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B.S., University of Florida, 1969

THESIS

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Chapter 1

INTRODUCTION AND BACKGROUND

People often ask whether advertising should more properly be termed an art or a science. Neither the practitioners nor the academicians have ever agreed on an answer, mainly because advertising has some of both. In general, creative people prefer to regard it as an art and themselves as artists who can, through their own innate creative ability come up with effective ways of communicating advertising ideas.

However, people who work in any of the areas of advertising closely related to marketing are likely to emphasize the science of advertising. Today's researchers, backstopped by great advances in research methodology and by computers, have come up with a mass of facts and have systematized much of what we know about advertising. From these facts have arisen principles which some will call "scientific," and some will not. Scientists can test the product of the artist of advertising and tell how well it can accomplish its communication job.

However, advertising, because it deals with people, and its main products are artistic expressions of human creativeness, will never be an exact science.

This statement, from S. Watson Dunn's Advertising (1969:13), places in perspective the contents of this investigation. The experiments reported here are an attempt to quantitatively evaluate the influence of an art form on the human recall of learned information: The specific art form under scrutiny is the advertising logotype as used to identify a company and the company's products.

The advertising logotype is a distinctive treatment of a corporate trademark or symbol, according to Wright.
and Warner (1964:320). It is defined by Webster (1965:498) as, "a piece of type or a single plate faced with a term (as the name of a newspaper or a trademark)." It should not be confused with trademarks in general for it is, rather a subset of trademarks. A trademark may be merely the spelled name of a manufacturer. The logotype is frequently known as the signature, slug, or commonly, logo. The logotype is the central graphic symbol of a company. It is the visual marker upon which the corporate entity depends for ready identification of its products, advertising, real property and communications.

**Historical Development**

Presbrey (1968:5) indicates that the first graphic symbols in advertising were used in ancient Athens, or perhaps Carthage. At this point, signboards were used to indicate the nature of shops' wares. The Romans used such symbols, which became informally standardized, on a much larger scale. Cows represented dairymen, grapevines ("bushes") were used to denote taverns, while phalluses, symbols of life, indicated bakeries. Presbrey (1968:13) later notes that logotype, or symbol, development in the Western world has roughly paralleled the development of Western culture.

Trial and error in advertising tended to indicate that simplicity is better than complexity in commercial symbols. It was not until the latter half of the nine-
teenth century, however, that the logotype appeared in its current format. Jenkins (1967:303-307) describes symbols of this period as having the deliberate intent of reaching across language and education barriers to commercial communication.

In this period, the first logotype was registered with the United States Patent Office. Dunn (1969:332) notes that the Averill Chemical Paint Company used a complex, patriotic motif in this logotype. Many registered trade characters, however, go back much further in time. The Baker's Chocolate "German Girl" was used as early as 1825.

Function

Despite the importance historically assigned to the logotype in commercial communications, current advertising texts and research contain little notice of the logotype, devoting perhaps a page in a book to the subject.

Examples of light treatment include Stansfield (169:931), who indicates that logotypes should be "distinctive, practical and meaningful." Even Dunn (1969:334) goes only a bit further, listing eight guidelines, including legal ones. The guidelines are, as Stansfield's statement, subjective. Because of such statements, one might feel that logotypes have fallen into the artistic zone of advertising.
Little consensus can be found among writers as to what is specifically important about the logotype, except it is used as an element of display advertising. The necessity for effective logotypes is recognized, as by Fujita (1967:294), but the elements of that effectiveness seem to elude those who seek them.

Sandage and Fryburger (1968:367) make comment on the deliberate function of the logotype, which sheds some light on the problem of effectiveness. They indicate that in modern advertising, retention and recall of both company name and product line are the crucial goals of the advertisement. The buyer, they note, must be prompted to make the "proper" decision about which product to purchase, and he must do this at the moment he is prompted to make his purchase, even though he may not be exposed to advertising (other than the package itself) at the moment. The logotype, if it is to be the focus of the company's communication, should be capable of jarring the memory of the buyer; of bringing to mental salience both the product and the name of the company.

To accomplish this memory-jarring mission, the logotype, obviously, should be capable of triggering recall of company name and product line.

The question, "Do current logotypes accomplish this task?" might be answered with an unfortunate, "often, no."

This writer discovered only one research project
which devoted itself to the effectiveness of logotypes now in use. Bevis, in Konrad and Erickson (1966:39-41), describes studies by the Opinion Research Corporation. The general conclusion of the studies is, "what the trademark says to consumers may be sharply at odds with that either management or the designers intended it to say."

Therefore, although the logotype is recognized as important, and although their designers have a reasonably clear idea of what the logotype is supposed to accomplish, the artistic approach seems to have some shortcomings. This research has isolated one aspect of the graphics of logotypes, and attempted to measure the effects of varying that element on the retention of the information associated with the logotype.

More specifically, the purpose of this study was to determine whether different basic designs of logotypes would produce significant differences in recall of company names and product lines previously associated with the logotypes.

An examination of the background research in visual stimuli indicates that many of the aspects of graphics have been experimentally studied, but logotype designs have not.

BACKGROUND RESEARCH

It is possible to identify and classify the possible variables of advertising layout. Logotypes are
generally considered an element of layout for advertising. But logotypes often appear standing alone, and then become an advertisement themselves, rather than just an element of a larger advertisement. Because of this they contain all the problems of layout and their effectiveness as visual stimuli is dependent largely on those problems.

Authors disagree on the relative importance of the different factors which affect learning of messages in the visual mode, but from Kleppner (1966:127-137), Mandell (1968:422), and Sandage and Fryburger (1968:356-371), a listing of crucial aspects of visual communications can be established. These factors include design (graphic structure), color (both intensity and hue), size (the total amount of available space occupied by the message), complexity (the number of layout elements involved), location (the proximity of the message to the subject), duration (the length of exposure time), repetition (the frequency of exposure), appropriateness to the situation, and the usefulness of the message to the receiver.

The effects of some of these elements are more obvious than the effects of others. Size and location, for example, compared to duration and frequency.

Of these elements, design was the subject of this project. Although experimental work has been conducted on all the other elements involved, design has not been experimentally examined. Dunn, perhaps, would classify this as the most creative aspect of logotype graphics, for
it is the one which has felt the least scientific scrutiny. Research on the other elements of layout is presented here to place this study in its proper perspective in a framework of research in the visual stimuli.

**Color**

Color as an element of graphics has received the most continuing study in the last five years. Dwyer has been isolating the parameters of color's influence on learning. In teaching human anatomy, Dwyer (1969:34) found that black and white line art was more useful for reorganizing a subject's thinking about a topic than was full color art. He also discovered, however, that color was better for identifying material that would be reintroduced from different aspects (for example, posterior versus anterior views of organs). In another experiment, Dwyer (1971:412) determined that simple, shaded color was the best tone for a learning situation. He reported subjects' feelings that although color was useful, it could be overdone, with confusion resulting.

This finding tends to confirm and summarize Dwyer's earlier work, and complements the findings of Travers and Alvarado (1970:60). That study was limited to children and indicated that children learn most easily from true, saturated (i.e. neither shaded nor tinted) colors. The comparison of children's preference for saturation to Dwyer's finding of adult preference for shading may hold implications for businesses reaching both markets.
Size

Size as an element of visual communication is perhaps the most obvious of all elements of layout. It has considerable capacity for gaining attention. That the basic selling rate for all graphic media is based on size is one indication of the importance placed on this element.

By projecting images for students, and making the images either smaller or larger, Dwyer found that he could affect the rate of learning. Smaller pictures, which were probably harder to see, produced lower scores on testing. (This is exempting the case where a picture would be too large to see, as might occur with a subject standing next to a very large display.)

Moore (1971:438) also concluded that size was an important factor, smaller graphics being more difficult to optically resolve. However, Moore conducted his study with realistic art, photographs, while Dwyer was dealing with more stylized representations.

Complexity

The complexity of a visual display, such as a logo-type, is based on the density and character of the elements which compose the display. Thomas (1969:857) and Jenkins (1967:303) conclude that children prefer more complex stimuli than do adults. Thomas notes that complexity preference seems to peak at eleven years of age, when a preference for more simplified shapes becomes the
trend again. This is the second element which shows a
differential between adults and children (color being
the first). Both Thomas and Jenkins conclude that
adults (who control most of the buying power) learn and
retain better from relatively simple pictures.

This tends to confirm the statements by Jenkins
on page 3 of this work, that simpler pictures cross
language and education barriers to communication more
efficiently than complex pictures.

Other researchers have dealt with complexity. One
is Moore (1971:442-443), who indicates that simplicity in
graphics improves learning and recall. Vitz (1966:109-
110) reached conclusions that persons have levels of
preferred complexity, and that this is not always the
lowest level from which they could select. (His exper-
iment dealt with subjects selecting polygons with which
they felt "most at ease." ) Vitz also reported a sort of
innoculation effect, where the subject's level of complexity
preference increased as he was exposed to increasingly
complex figures.

Balance

Balance is closely allied to complexity, for
elements arranged in a random manner are more difficult to
identify and comprehend than those arranged in an orderly
fashion. Cottrell (1971:125) says the human mind is more
at ease with balanced cognitive structures. He notes that
such structures are ultimately easier to recall, but
not necessarily to learn initially. Dunn (1969:360-361) emphasizes the importance of balance in advertising layouts, distinguishing between formal (symmetrical) and informal (asymmetrical) balance. Informal balance generates more interest on the part of the reader, he says, because the formal balance tends to fatigue the eye.

**Location**

The location of the advertisement or logotype is logically crucial. The message must (obviously) be placed in the visual range of the subject. While researchers such as Berlyne (1960:320) assume differences in learning when the location of the stimulus before the subject is changed, there does not seem to have been any experimental work which indicates a preferred set of limits on the location of the stimulus.

**Duration**

The duration of the advertisement exposure is not as obvious as location, but again is fairly basic. The number of elements which the mind can grasp from a visual display increases as the duration of the display time increases. Vitz (1966:106) noted that a mean time of ten seconds was required for a subject to view six pictures and select the one with which he felt most at ease.

The effects of duration are important, in any mode. Often a buyer may wish to examine the display and have only
a limited time to do so, as with outdoor advertising or television. In many situations, especially buying ones as described by Sandage and Fryburger on page 4 of this thesis, the advertisement must do its work in a very short time.

Repetition

It has been shown by Spector (1960:92-93) that repeated exposure has a definite effect on the retention of advertising content. Much other work has been done in this area since Spector's report, probably because of the large expense of broadcast media and efforts to reap the greatest benefits possible for that expense. According to Barton (1964:146), repetition has more effect on persuasion than it does on recall.

A study in repetition by Pomerance and Zielske (1958:25-27) indicates that the advertiser is doing a more effective communication job if he reaches fifty people twice rather than one hundred people once.

The known effect of repetition on persuasion is shown by the reliance placed on repetition in the field of psychological indoctrination.

Appropriateness

The appropriateness of the appeal or message to the subject is important to the subject's speed of learning. The message must not be offensive for legal reasons if not social ones. Nor, as Dunn points out (1969:341), is the message likely to be perceived as credible if the
advertisement seems to promise more than the product can be expected to deliver. Dunn gives this example,

An illustration that is out of key with reality starts the message off on the wrong foot. Women do not ordinarily clean house in high heels . . . . If the picture is consistent with a woman's experience, she will believe it and tend to accept the verbal part of the advertisement.

Preston (1967:214) advocates that a rational approach to advertising is beneficial in helping the subject learn and recall. Later, Preston (1968:508) expanded his work to distinguish among emotional, intellectual and rational appeals. He notes that different appeals are appropriate under different circumstances. Products that can not be well differentiated, for example, may not be sold effectively with intellectual appeals, but do quite well with emotional appeals. To define whether a given logotype is appropriate or not would be a subjective decision, since different consumers have different standards of mental acceptance.

Usefulness

The usefulness of the product is thought to have bearing on the efficiency of learning and recall by the subject. It has not been described whether this applies when subjects have current use for the product, or if the effect operates when subjects feel they might have some future use for the information.

In one study, Seiler (1971:334) has indicated that the perceived value of groups of symbols has an effect on
the retention of their content. The impact of this effect on advertising seems reasonably clear: If the subject cannot use the product, he is less likely to remember the message.

BACKGROUND SUMMARY

All the elements discussed here are variables which affect the efficiency of learning from visual stimuli. There are other factors too, obviously, in the receiver of the message, which act to either facilitate or hamper the learning of the message. Because logotypes are messages with a memory-jarring function, they are affected by these elements. In the progress of the project these elements were considered as possible contaminants, and allowances were made accordingly.

A fairly large body of psychological and educational research has been done in the last few years, some of which has been applied piecemeal to advertising. But companies and agencies still place much emphasis on "tried and true" methods. Ultimately decisions regarding design and function of logotypes are arrived at subjectively, in many cases. The result was noted by Bevis on page 4 of this thesis.

Until this time there has been no laboratory research that confirmed or denied that one logotype structure class is more memorable than another. The material presented here should be of value to those engaged in graphic communications. In addition to
marketing, this material could be of value to educators who seek refinement in visual aids, as suggested by Dwyer (1969:37).

The purpose of this study, to restate, was to determine whether different basic designs of logotypes produce significant differences in recall of company names and product lines previously associated with the logotypes.

It was therefore decided to conduct a series of experiments, isolating the logotype design as the independent variable and measuring recall of associated information as the dependent variable. Because of the differentials noted between children and adults in experiments concerning other aspects of visual stimuli, notably color and complexity, it was decided to conduct the experiments on both adult (college level) and child (elementary school level) subjects.
Chapter 2

PROCEDURE

The central problem of this study was to determine the relative effects of various logotype structure designs on recall of information learned in association with the logotype. The pragmatic purpose, however, was to establish an order of ease of learning, both of company name and product line, among the various classes of logotypes.

HYPOTHESES AND TERMS

The purpose of this study having been established, and the central problem defined, it was necessary to place the problem into operational terms, and couch those terms in hypotheses which lent themselves to testing.

Classes

In formulating the hypotheses, the following definitions are used. Additional definitions of repeated terms follow the hypotheses.

Class I. Class I logotypes are defined for this study as those of purely geometric design. Examples of this are, "diamonds, squares, circles and ovals," as noted by Dunn (1969:333). The Citgo Oil Company currently uses a red triangle in place of their older green shamrock design.
which was deemed "not sharp and dominant enough to be completely effective." The bolder red triangle is "geared to a modern America... with a need for clarity and sharp visibility," in the words of the company. This points up the strength of the Class as a whole, with its major weakness being ambiguity.

**Class II.** The Class II logotypes, as suggested by Mandell, are defined as realistic art. In this category, the picture may be an animal, as the Hartford Insurance Company's stag, or some symbol of the product, as the Fisher Body coach. Burton and Presbrey feel this is probably the oldest class, with "strong memorability... perhaps the strongest of all." Burton (1970:49) also notes that the logotypes of this class are strongest when used in association with the printed name of the company. For this study, however, such names were removed to prevent contamination of the graphics.

**Class III.** Possibly definable as cartoon art, this class is more accurately described as stylized art. The logotypes still uses a representation of some object, but it is no longer realistic in appearance or context. The Class II logotypes obviously blend into the Class III at some point on a continuum, and steps were made to prevent usage of logotypes in this experiment which do not fall distinctly into either one or the other of the classes. Three criteria operationally separated the classes.
Class II art would show: a) detail in the picture, b) proper proportion of the represented objects, and c) credible representations of the objects. Failure on any of these criteria would place the art in Class III. Examples of this, which were not used but are given for clarification, would include Green Giant Foods' "Jolly Green Giant," which cannot be considered realistic, although it does show detail and human proportions, for it is not credible. On the other hand, the Quaker Oats Company's "Quaker Man" shows more credibility and therefore would fall into Class II.

Class IV. Class IV logotypes are composed of letters and numbers. Ultimately, no logotypes which contained numbers were used in the experiment, but might well have been. Trademark names of companies are not meant to be included in this class, but rather abbreviations for companies. Thus the logotype of the 3M Company (formerly Minnesota Mining and Manufacturing) would not be used for "3M" is literally the name of the company. "GE" could be used for the General Electric Company, for the letters are only an abbreviation, not the literal name.

Burton describes this class of logotypes as, "hard to remember and difficult to (legally) defend." Initials and numbers, he notes (1970:50),

might be expected to have quite limited usage as trademarks. Instead they are one of the most popular trademarks . . . The corporation is asking consumers for one more memory feat because of the bewildering
profusion of initials and numbers we are asked to remember by the government, our banks, the telephone company... and almost every other organization that touches our lives. (Some examples from one issue of Business Week are: IBM, GE, RCA, TWA, UOP, OP, GM, INA, and NCR.)

One might argue that a large company with a highly diversified system of products might prefer a simple logotype of this class, however.

Class V. Logotypes of this class have been operationally defined as functional representations. With these logotypes emphasis is removed from the company and placed on what the company either produces or does as a service. AMTRAK uses such a logotype, a streamlined graphic which indicates its role as a common carrier, but does nothing to refer to the company itself. A company dealing in recycling might well use a logotype with a circuitous flow to describe that function. Both Travelers and Prudential insurance companies use Class V logotypes. The red umbrella and the Rock of Gibraltar are symbols of the protective nature of the companies. Oldsmobile Division of General Motors formerly used a rocket to denote the "rocket action" of their automobiles, but which gave no clue to the name of the company.

Hypotheses

The oldest form of commercial art, as Presbrey has noted, is a simple representation in a realistic form. One example of this, the cow used to describe a dairy, has been
given as an example. This form of communication became prominent at a time when reading was for the highly educated. Pragmatically speaking, it worked, and that was enough for the ancient business man who did not dwell on the reasons behind it. Because such art was simple, and couched in things readily familiar to all, it was readily learned and remembered. It is not reasonable to expect that learning processes have changed much over the centuries, and therefore the pragmatic truths discovered then will probably be in effect today. Therefore, Hypothesis One was proposed:

Company names associated with Class II logotypes (realistic art) will be recalled more frequently than will company names associated with logotypes of any other class.

While realistic art is most useful for describing the company name, the product is often more difficult to represent. This is especially true where the product is abstract, where product lines are diversified within a company, or where product differentiation by manufacturers is difficult. But functional representations may be expressed many ways, allowing for easier discrimination by the customer of the products. Insurance companies, where the product is both quite abstract and non-differentiated due to law, have turned to the representation. Travelers' umbrella and Prudential's Rock have already been cited as examples, Fireman's Fund, Allstate, Continental, Sentry Indemnity and Preferred Risk (a liquor bottle with a large X over it), are further examples of this type. All are
aimed at helping the consumer identify and discriminate among products which are not inherently different.

Therefore, Hypothesis Two was proposed:

Product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class.

As noted earlier, differences have been discovered between children and adults with respect to certain aspects of graphics. Preferences for complexity and color vary with age, as seemingly does style of preferred art. It is not likely that complexity preferences would affect this study, since logotypes are generally quite simple in their current forms. But the attention span of children is shorter than that for adults. Therefore, Hypothesis Three was proposed as:

Company names associated with Class II logotypes (realistic art) will be recalled more frequently than will company names associated with logotypes of any other class, and product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class, but the mean level of recall will be significantly lower for children than for adults, with respect to both company name and product line.

A test of this hypothesis will be useful for companies attempting to reach children as a specific market.

Because a time interval exists from the point of decision to purchase, it is useful to know if effects which are present at the time of initial exposure persist. There is no reason to suspect that a sleeper effect is extant
that would cause a differential rate of forgetting of information associated with logotypes of any given class.

Therefore Hypothesis Four was proposed as:

Both immediately after exposure to the original logotypes and messages and for periods of time up to two weeks after, company names associated with Class II logotypes (realistic art) will be recalled more frequently than will company names associated with logotypes of any other class, and product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class, but the mean level of recall will be significantly lower for children than for adults with respect to both company name and product line.

Additional terms

There are a number of terms in this report which appear repeatedly. Although they may appear intuitively obvious, it is useful to describe them in some detail.

Structure. Structure is taken to mean the graphic design of the content of any piece of art, in this case, logotypes. The word design is a close synonym, when taken to mean "an underlying scheme which governs . . . . pattern, motif," in Webster (1965:224). There are five nominative levels of structure in this experiment. They are the classes, which comprise the independent variable.

Class. This is a reference to any one of the five structure levels previously established. In the statistical analysis of the data, the class data become statistical data cells. Thus analysis of variance within and among cells, and comparison of paired cell means are references
to these five classes. A possible point of confusion could arise in the reading of this paper if it were not noted that the experiments were conducted with classes of students in school classrooms. Usage of the word must always be considered in context.

**Recall.** Recall is the sole dependent variable of this experiment. It is, simply, the ability of the subject to remember the company name and product line associated with a logotype when shown the logotype.

**Advertising content.** This term is applied to the messages which are associated with the logotypes of this experiment. These messages, it should be noted, are not strictly advertising, for they attempt neither motivation nor persuasion of the viewer. They are simple pieces of information.

**CONTROLS ON VARIABLES**

Two basic types of variables are involved with this report. Manipulated variables, which are the independent and dependent; and contaminating variables, which could have interfered with causal relationship under scrutiny.

**Contaminating Variables**

These variables are the same elements of layout that were discussed in Chapter 1. Logically, if structure was to be the independent variable, all other elements would have to be strictly controlled. Beyond these layout
variables, there were other contaminants such as the physical conditions of the experiment that were deliberately controlled in the procedure, and will be noted later.

**Color.** Although most logotypes appear in color, it was determined that all the logotypes used in the experiment would have to be in black and white. This would remove any "learning advantage" that one logotype might have over another purely on the basis of color. The other possibility would be to have all the logotypes appear in the same color, which would be less practical. All the test logotypes were copied on panchromatic black and white film, reducing the colors to shades of grey.

**Size.** Copying the logotypes on black and white film also provided the first move towards controlling the size of the image which the subjects would view. By processing the film as a transparency, and mounting the film as 35 mm slides, they could be shown with an ordinary slide projector on any screen. Varying the distance from the screen discretely allowed for control of image size. This could have been more accurately done by printing the logotypes in a booklet form, but this would have limited control on exposure time, which is discussed below.

**Complexity.** Although the complexity of the visual display could have been a subjective matter, attempts were made to objectively validate the slides as equally complex.
No matter what level of complexity was to be used, all the logotypes would have to be of the same level. A panel of six persons, aged nineteen to twenty-five, viewed slides of fifty logotypes which were prepared as noted above. The logotypes were shown four times.

The first two showings were for familiarization. The third viewing was for structure class. Each panelist was asked to decide in which of the five classes he or she felt the logotype properly belonged. A two-thirds consensus was required to place a logotype in a particular class. Less than this indicated that the logotype was too vague, and it was removed. The remaining logotypes were then shown for the fourth time, for complexity validation. If three or more panelists felt that any logotype was, "more or less complex than average for these logotypes," it too was rejected. This process was repeated until each class had only five remaining logotypes. The slides were then shown to and approved by the thesis committee.

**Location and duration.** Both of these factors were simply controlled by use of projected slides. Use of screens for projection assured the same relative viewing angle for each subject, within reasonable limits.

Duration was considered critical and strictly controlled. The initial exposure time was ten seconds. This was the time noted by Vitz, earlier, as average for an eleven-year-old subject to view a few simple drawings and
select the one with which he felt most at ease. It also allowed the associated information to be stated twice on a prerecorded tape. Ten seconds is also the usual shortest time for a television advertisement. The actual time of exposure did not vary more than one second from this limit.

The subsequent exposure times were twenty seconds. This was a simple doubling of the original time. It was felt that the time would be sufficient for the subject to recognize the logotype, examine the five choices on the test instrument and make a considered choice. During the pilot studies it was noted that the subjects generally had no trouble identifying the logotype and marking their tests, if they remembered the information at all.

Repetition. This contaminant is one of the most obvious, and also one of the easiest to control. Use of unknown or fictitious logotypes was deemed the simplest solution. Obscure companies (obscure to students probable range of knowledge) were obtained from four sources:
- Thomas' Register, an industrial buyers' directory;
- Advertising Redbook, a directory of advertising agencies;
- Graphis, an international periodical of graphic arts; and from a poster for the Fox River Paper Company of Wisconsin. Only two subjects knew any of the logotypes. One was an adult who had used industrial products in his profession. The other was a child who had lived next door to one of the companies before moving to Florida. In this way
contamination by differences in the numbers of times various subjects had seen the logotypes was avoided.

**Appropriateness and usefulness.** These two factors were both fairly simple to control. Appropriateness was limited as a potential factor by not using persuasion. There was no need for credibility, and therefore no need for appropriateness, except for purposes of good taste.

Usefulness, as complexity, needed to be of no specific level. But keeping one level of usefulness for both adults and children was more difficult. It was decided that uselessness would suffice. Products and companies for which neither group would have cause to desire were selected. Products such as industrial belting, synthetic jewels, and plastic castings were used for this effect.

Manipulated Variables

These are the experimental dependent and independent variables. The independent variable was logotype structure, with the five classes being the levels of treatment. The dependent variable was recall of the associated information, with correct selection of a multiple choice answer being the measure. Structure was discussed in the opening of Chapter 2, pages 15 through 18.

**Recall.** Recall was measured in two dimensions. First was the nominative dimension of two levels: company
and product. Second was a continuum dimension of time with three points of measure: immediate; forty-eight hour; and two-week.

The subject was said to have recalled the information if he could select the correct answer from a set of five possible answers. The four incorrect answers in the set were made up from correct answers to other logotypes. There was no "second choice" possibility in scoring, the answer being either correct or incorrect. With twenty-five logotypes, there were twenty-five sections on the test. Each section was composed of two, five-answer sets, one each for product and company. Thus there were fifty different items to be recalled.

**EXPERIMENTAL PROEDURE**

In this section, production of materials to be used in the testing, selection of subjects, experimental procedure and changes resulting from the two pilot studies will be discussed. Production of materials will be covered first.

**Slides.** The number of slides needed for the experiment was contingent on the type of data analysis to be used. The number was set at five per cell, high enough that no subject would likely answer all questions correctly but small enough for ease of handling and avoidance of confusion resulting in random guessing.

All the slides were copied from the sources
mentioned above with a 35 mm camera. Processing of the slides resulted in one problem. The slides were returned from processing as mounted negatives, rather than positives as had been specified. But since the logotypes were unknown to the subjects, and the difference was only a reversal of black and white, they were not recopied. This worked to the ultimate advantage of the experiment. With basically white lines on black fields, the slides seemed easier to view in darkness because of reduced glare on the screen.

Testing instruments. The testing instrument was a multiple-choice, ditto-reproduced form. It contained twenty-five answer sections, each section composed of two sets of five-choice multiple choice answers (one set each for company and product). The four incorrect answers in any set were made from a random selection of correct answers from other sections of the test.

Arrangement of the answers in the sections and sets was done by prenumbering the correct answers for each of the logotypes, and then arranging them with the aid of a random number table. The order of showing of the slides in each presentation was randomized by this act. The order was completely changed for each of the posttests. A copy of each of the three tests appears in Appendix C.

Four hundred copies of each test were produced. Half of the copies for each test were designated with a "T" for use by the adult group, or a "K" for use by the
child group. This was done to avoid mixing of data across the groups. Each of the three tests was also designated with a "1," "2," or "3," to indicate whether it was an immediate test, forty-eight-hour test or two-week test. The result of this coding was two hundred copies each of six different tests: T-1, T-2, T-3, K-1, K-2, K-3.

All the "1" tests were identical, whether T-1 or K-1, with the same order of answer sections and sets. The same was true for the "2" and "3" tests, but all of the three sets differed considerably from one another.

Recorded tape. A recorded tape was used to present the message to be learned and recalled. This was done to insure that all the subjects would hear the same exact message, since voice inflections and timing could vary considerably otherwise.

The tape was matched to the slides and recorded with soft clicks at ten-second intervals as a signal for the experimenter to advance the slide. The company name and product line were stated twice with maximum simplicity, for example: "Bird Moulding, plastic castings; Bird Moulding, plastic castings."

Selection of Subjects

It would have been desirable to conduct the experiments related here on a large sample of the general population. Practicality, however, hampered this desire. Two groups of subjects were needed, one adult group and one
child group. This was done because of differentials noted in previous complexity and color stimulus research. It was felt that the possibility of such a differential might be found in recall for the various logotype classes. It was determined that one hundred subjects for each of the groups would be the absolute minimum acceptable number. It was also realized that in all probability the number of subjects receiving the initial treatment and "1" posttest would be greater than the number available for the "3" posttest, with attrition coming from a variety of sources. The numbers of the groups did vary considerably. The T-1 group contained one hundred ninety-eight subjects, while the T-3 retained only one hundred thirty-eight. K-1 contained one hundred forty-six, while K-3 retained only one hundred nineteen, quite close to the cut-off point.

All the T subjects were selected from the Florida Technological University student body. In an attempt to obtain a cross-section of students, various courses were tapped for subjects, including: COM 100, an introductory communications course for non-communications majors; COM 301, all sections of this course, a behaviorist approach to communications; and COM 411, one section of a communications law course. Use of students from other colleges of the University would have been desirable, but proved impractical. The pilot studies indicated that the subjects would probably not attend the testing sessions voluntarily. Because of this, instructors granted class time after the
period of instruction to the experiment. This aspect of subject selection finally determined the interval for the "2" posttest (forty-eight-hour), rather than a preferred twenty-four hour test. The large class sections necessary to achieve the numbers of subjects required did not meet on consecutive days, but on alternate days. The experimental design was altered rather than attempt to give the test many times to small sections, which would have allowed more room for error to creep into the findings.

All the K subjects were taken from the student body of the Casselberry, Florida, Elementary School. All sections of the fifth grade at the school were utilized, which not only achieved the minimum number of subjects, but gave a cross section of learning abilities. The grade level was used to obtain subjects in the ten and eleven age group, the level indicated by Thomas as having the maximum level of preferred complexity. As with the T group, the experiment was conducted during class time.

Pilot Studies

An initial pilot study was made using a nonrandom group of eleven graduate and undergraduate students from Florida Technological University. The purpose of the study was to test the proposed procedure for validity. Order effects were noted when the slides were not reordered after the initial exposure and before giving the posttest. It was also noted that the recorded tape was not clear enough to be fully understood by all the subjects. It was later
re-recorded.

A second pilot study was then conducted to test the changes, this time running all three posttests. Use of volunteer subjects meeting out of class indicated that this method of procuring subjects was hopeless. Only seventeen of forty-three returned for the two-week test. A second result was a redesign of the test instrument. At this time the four incorrect answers in each answer set were composed of dummy companies not found elsewhere on the test. The subject needed only to look for a name and product line he had heard before to find the answers. In short, the slide was not the memory trigger. By using and reusing the names and products of the twenty-five companies, the subject was forced to use the slide as the trigger of recall.

A third change resulting from the second pilot study was in the statistical analysis. It became obvious that the amount of data and repetitive calculation would be quite large, too much so for analysis using small calculators. A suitable analysis of variance test was found in Honeywell Corporation's MOD I software manual (Appendix B), which was applied to the data by an IBM 370 computer.

Interviews with subjects of the second pilot study indicated that, with the changes noted above, the test was an accurate measure of the hypotheses, and that no further modifications would be necessary. It was therefore decided to proceed with the experimental testing.
The central problem of this project was to determine the relative effects of various logotype structure designs on recall of information.

To do this, logotypes were divided into five classes. One of these classes was hypothesized to be best for recall of company names. Another was felt to be best for recall of product lines. Adult and child subject groups were given unknown logotypes and product information, then tested for recall of the information upon reexposure to the logotype. Both groups received the same three tests over a two-week interval to see if effects noted at the time of treatment would persist over a period of time.
Chapter 3

RESULTS

The central problem of this project, the differential effects on recall of various logotype structures, was seen as having three dimensions. The first was the type of information to be recalled, whether company name or product line. The second dimension of the problem was age: that is, would the structures affect children in the same manner as they would adults? The third dimension of the problem was time: would the effects which are noted at the time of the treatment and immediate posttest persist over a period of days or weeks?

To test these dimensions the experiment was broken down three ways. The data which resulted from the testing was, of course, also broken down along the three dimensions. Although six tests were conducted, two groups on three different occasions, the end result was really twelve different tests: adult and child; immediate, forty-eight-hour and two-week time periods; and company name and product line categories.

As a note: the statistical terms and abbreviations used in this chapter are clarified in Appendix A. These are not formal definitions, but descriptions intended to clarify textual and tabular material for the reader who
may be unfamiliar with these terms.

A note of clarification as to the specific statistical formulas used in this experiment may be found in Appendix B. It should be noted, however, that the various statistical analyses were performed by computer and not by the experimenter. The Florida Technological University Computer Services section provided technical assistance for these analyses.

The initial analysis of each of the twelve tests was to determine if the mean score for any of the five classes (cells) of logotypes was significantly different from the other four cells' means. As suggested by Walpole (1968:291), analysis of variance was required for this step.

The analysis yields a quantity called an F-ratio, which can be compared to a table of the F-distribution to determine whether any of the means is significantly different from the other means. The specific distribution table used is dependent on the number of degrees of freedom involved in the data (see Appendix A), and the level of significance which is being used for the test.

If the F-ratio indicated that significant differences existed, a secondary analysis of the same raw data was performed to determine if that difference involved the particular logotype cell (class) under scrutiny. This was done with a series of t-tests, as suggested by Walpole (1968:225). The cell hypothesized as having the greatest
mean score was compared, by t-test, to each of the other cell means in turn. Thus four t-tests were required for each of the analyses.

The t-test yields the t-ratio as its output. This ratio can be compared to a table of the t-distribution to determine if the two means involved in computing the ratio are significantly different from one another.

The desired level of significance for this project was set at .005. Reaching this level merely indicates that, in an oversimplified statement, the computed ratio exceeds the value of that ratio which might occur by chance at that level of probability (Nemmers, 1968:436). In short, the means are most likely different from one another, and reflect a true difference in scoring by the subjects. (This definition is not intended to be exactly precise, but is offered as an aid to the reader.)

In summary, analysis of variance (F-test) and comparison of paired cell means (t-test) provided a two-step analysis of the experimental data. All data were derived from the twelve tests noted, which were conducted to either confirm or deny the four hypotheses of this thesis. In each instance the hypothesis was confirmed.

**Hypothesis One**

The first hypothesis was proposed as:

Company names associated with Class II (realistic art) logotypes will be recalled more frequently than will company names associated with logotypes of any other class.
This hypothesis was calculated to provide an ordering of logotype classes by their efficiency in triggering recall of company names. It was felt that Class II (realistic art) would have a higher mean rate of recall than any other class for company names. The data confirmed the hypothesis.

Testing of the hypothesis was done with a sample of one hundred ninety-eight students from various courses at Florida Technological University. Because the hypothesis contains no reference to time, age differences or product lines, only the company names data from the T-1 test were used in proving the hypothesis. Table 1 contains the relevant data.

Table 1. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 198 Adults, Immediate Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>617.5</td>
<td>197</td>
<td>3.13</td>
<td>4.14*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>189.9</td>
<td>4</td>
<td>47.48</td>
<td>62.73*</td>
</tr>
<tr>
<td>Residuals</td>
<td>596.5</td>
<td>788</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,403.9</td>
<td>989</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

Analysis of variance yielded an F-ratio for the cells of 62.73. This value exceeds the 3.32 value for significance at the .01 level. The F-ratio value for the subjects was calculated as 4.14. This value, which
exceeded the critical ("cut-off") value of 1.32 for the subjects, indicates that significant differences also exist among the subjects' scores. Thus they were a heterogeneous group as far as their scores are concerned. Because significance was found, in accordance with the procedure established for this project, four t-tests were performed to compare the specified class means.

Table 2 reveals that the hypothesized class, Class II, had a greater mean score than the other classes. The Class II (realistic art) mean was computed as 4.51, out of a possible five. The range of means for the other four classes was from 3.21 for geometrics to 3.58 for functional representations. The resulting t-ratios, which range from 6.34 to 12.33, were all significant at the .005 level. The critical level was 2.58.

Table 2. Significance of Differences Between Logotype Classes for Company Names Mean Recall Scores: 198 Adults, Immediate Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>1.30</td>
<td>352</td>
<td>12.33*</td>
</tr>
<tr>
<td>II-III</td>
<td>1.04</td>
<td>376</td>
<td>10.82*</td>
</tr>
<tr>
<td>II-IV</td>
<td>.82</td>
<td>356</td>
<td>7.93*</td>
</tr>
<tr>
<td>II-V</td>
<td>.66</td>
<td>354</td>
<td>6.94*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.
Therefore, Hypothesis One was confirmed. Realistic art provided a better trigger of recall of company names than did any other class of logotypes, with a significance of .005.

**Hypothesis Two**

The second hypothesis was proposed as:

Product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class.

This hypothesis was designed to test the various logotypes in their ability to stimulate recall of product line. It was felt that Class V (functional representations) would have a higher mean rate of recall than any other class for product lines. The hypothesis was confirmed.

Testing of the hypothesis was done with the same adult sample that provided the raw data used to confirm Hypothesis One. The product lines category from the T-1 test were used in proving Hypothesis Two.

Using the same statistical procedures employed for Hypothesis One, analysis of variance produced an F-ratio for the logotype classes of 41.95. This value, shown on Table 3, is significant at the .01 level, the critical value being 3.32. The F-ratio value for the subjects was calculated as 5.54. This value is also significant at the .01 level, again indicating significant score differences within the group.
Table 3. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 198 Adults, Immediate Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>835.5</td>
<td>197</td>
<td>4.24</td>
<td>5.54*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>128.5</td>
<td>4</td>
<td>32.13</td>
<td>41.95*</td>
</tr>
<tr>
<td>Residuals</td>
<td>603.5</td>
<td>788</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,567.5</td>
<td>989</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.
Definitions of headings are found in Appendix A.

T-tests shown on Table 4 were executed to determine whether the hypothesized cell, Cell V, had a greater mean score than the other four cells, at the desired level of significance. The Class V (functional representation) mean was calculated to be 4.32. The range of means of the other four classes was from 3.34 for letters and numbers to 3.85.

Table 4. Significance of Differences Between Logotype Classes in Product Lines Mean Recall Scores: 198 Adults, Immediate Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-I</td>
<td>.96</td>
<td>353</td>
<td>8.08*</td>
</tr>
<tr>
<td>V-II</td>
<td>.47</td>
<td>386</td>
<td>4.51*</td>
</tr>
<tr>
<td>V-III</td>
<td>.69</td>
<td>376</td>
<td>6.29*</td>
</tr>
<tr>
<td>V-IV</td>
<td>.97</td>
<td>354</td>
<td>8.21*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)
Definitions of column headings are in Appendix A.
for realistic art. The resulting t-ratios were all significant at the .005 level. The values ranged from 4.51 to 8.21, surpassing the 2.58 critical value.

Therefore, Hypothesis Two was also confirmed. The functional representation logotype class had a significantly greater mean recall in the product line category than did any other class of logotypes.

Hypothesis Three

The third hypothesis was proposed as:

Company names associated with Class II logotypes (realistic art) will be recalled more frequently than will company names associated with logotypes of any other class, and product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class, but the mean level of recall will be significantly lower for children than for adults, with respect to both company name and product line.

The third hypothesis is a restatement of the first two hypotheses, but with the added factor of age. The hypothesis, therefore, is composed of three portions. All were confirmed.

The first portion, dealing with company names, hypothesized Class II (realistic art) as having the highest mean score. The second portion dealt with product lines, and had Class V (functional representations) hypothesized as the highest mean. The third portion concerned the comparison of total mean recall between the adult and child groups. One hundred forty-five students from the fifth grade of the Casselberry, Florida, Elementary School were
used as subjects.

**Portion one.** As can be seen by Table 5, the F-ratio for the logotypes was 72.81. This value, exceeds the critical value of 3.32, and was therefore significant at the .01 level. The subjects' F-ratio was calculated as 2.17, again significant. This is desirable, for it indicates a trend towards a heterogeneous sample of abilities among the subjects.

Table 5. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 145 Children, Immediate Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>338.9</td>
<td>144</td>
<td>2.35</td>
<td>2.17*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>315.9</td>
<td>4</td>
<td>78.98</td>
<td>72.81*</td>
</tr>
<tr>
<td>Residuals</td>
<td>624.9</td>
<td>576</td>
<td>1.08</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,279.7</td>
<td>724</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

The class hypothesized as having the greatest mean score was Class II (realistic art). The mean score for company names on this test (K-1) was 3.07, greater than any other class. The range of means for the other four classes was from 1.12 for geometrics to 1.95 for functional representations. As Table 6 documents, the resulting t-ratios were all significant at the .005 level. The critical ratio was set at 2.58, and the range of the
t-ratios was from 7.83 to 14.75.

Table 6. Significance of Differences Between Logotype Classes in Company Names Mean Recall Scores: 145 Children, Immediate Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>1.95</td>
<td>277</td>
<td>14.75*</td>
</tr>
<tr>
<td>II-III</td>
<td>1.25</td>
<td>290</td>
<td>8.87*</td>
</tr>
<tr>
<td>II-IV</td>
<td>1.54</td>
<td>291</td>
<td>10.68*</td>
</tr>
<tr>
<td>II-V</td>
<td>1.12</td>
<td>291</td>
<td>7.83*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.

Therefore, portion one of Hypothesis Three which is similar to Hypothesis One was confirmed. The effect noted for the adult group, that realistic art provided a significantly higher mean score of recall of company names than did any other class of logotypes, was also noted for children, at the same .005 level of significance.

Portion two. This portion of Hypothesis Three was concerned with product lines. As in Hypothesis Two, Class V (functional representations) logotypes were predicted to have the greatest mean score. Table 7 shows a 36.28 F-ratio for the logotypes, significant at the .01 level. The F-ratio for the subjects was significant at 3.40, exceeding the critical level of 1.32 for the number
of degrees of freedom listed.

Table 7. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 145 Children, Immediate Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>490.6</td>
<td>144</td>
<td>3.36</td>
<td>3.40*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>143.2</td>
<td>4</td>
<td>35.80</td>
<td>36.28*</td>
</tr>
<tr>
<td>Residuals</td>
<td>576.4</td>
<td>584</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,210.2</td>
<td>734</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level

Definitions of headings are found in Appendix A.

The Class V mean was then compared to the means of the other cells for confirmation or rejection of portion two. The results are shown on Table 8. The Cell V mean was found to be only 2.53. Although this was a small mean

Table 8. Significance of Differences Between Logotype Classes in Product Lines Mean Recall Scores: 145 Children, Immediate Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-I</td>
<td>1.16</td>
<td>234</td>
<td>8.15*</td>
</tr>
<tr>
<td>V-II</td>
<td>.50</td>
<td>222</td>
<td>3.32*</td>
</tr>
<tr>
<td>V-III</td>
<td>.82</td>
<td>239</td>
<td>5.60*</td>
</tr>
<tr>
<td>V-IV</td>
<td>1.17</td>
<td>235</td>
<td>8.19*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.
in comparison to the adult group, it was significantly greater than any of the other four cell means. The range of those four was from 1.36 for letters and numbers to 2.03 for realistic art. The corresponding t-ratios ranged from 3.32 to 8.15 and all of them were in excess of the 2.58 value for the .005 significance level.

Therefore, portion two of Hypothesis Three was confirmed. The effect previously noted for adults of Class V having a significantly larger mean recall score in the product lines category than any other class was also bound to be true for children.

Portion three. Hypothesis Three also compares the mean total recall scores of the adult group versus the child group. It stated that although the effects noted for the adult group would also be noted for the child group, with respect to the classes of logotypes with the greatest mean recall for company names and product lines, the adult group would stand significantly higher in total mean score.

The measure of total mean score is the average number of correct answers out of the possible fifty on each of the K-1 and T-1 tests (five cells of five possible each for both company names and product lines). It was valid to compare only posttests of the same time interval, e.g. K-1 to T-1.

The same t-test used elsewhere in this paper was applied to the scores of the two groups. The results are
shown on Table 9. The T-1 mean score was 37.23, with a standard deviation of 8.01. The K-1 mean score was 18.63, with a standard deviation of 6.65. A t-ratio of 23.49 was computed, which is significant at the .005 level for 337 degrees of freedom.

Table 9. Comparison of Paired Total Mean Scores for the Immediate Posttest, Adults versus Children

<table>
<thead>
<tr>
<th>Groups ¹</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-K</td>
<td>18.60</td>
<td>337</td>
<td>23.49*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

¹Groups: T, Adult Immediate Posttest; K, Child Immediate Posttest.

Definitions of column headings are in Appendix A.

Portion three for Hypothesis Two was confirmed: the total mean scores of the adult group was significantly greater than the total mean score for the child group.

With all three portions confirmed, Hypothesis Three was confirmed as a whole. The effects noted for adults were the same effects noted for children, except that the adults maintained a higher mean level of scoring than the children. This is, of course, applicable only to the immediate posttest. To discover the impact of time on the differential power of the logotype classes, a fourth hypothesis was proposed and tested.
Hypothesis Four

The fourth hypothesis was proposed as:

Both immediately after exposure to the original logotypes and messages and for periods of time up to two weeks after, company names associated with Class II logotypes (realistic art) will be recalled more frequently than will company names associated with logotypes of any other class, and product information associated with Class V logotypes (functional representations) will be recalled more frequently than will product information associated with logotypes of any other class, but the mean level of recall will be significantly lower for children than for adults, with respect to both company name and product line.

Hypothesis Four is largely a restatement of Hypothesis Three, with the addition of the time dimension. The purpose of this hypothesis was to determine if the logotype structure effects confirmed for the adult and child groups would persist over time.

To measure this, the T-1 and K-1 tests were each replicated twice. The T-2 and K-2 tests followed the initial treatment and posttest after forty-eight hours, and the T-3 and K-3 tests followed after two weeks. There was no further treatment after the initial treatment, nor were the subjects priorly informed of the replication posttests.

The testing of Hypothesis Four therefore has nine parts. They are, to enumerate: T-2 company names, T-2 product lines, K-2 company names, K-2 product lines, T-3 company names, T-3 product lines, K-3 company names, K-3 product lines, and the mean score comparison of T-2 to K-2 and of T-3 to K-3. Hypothesized highest mean class scores, testing procedure and analyses were identical to those
in the previous sections. Every portion was confirmed. Instead of referring to the portions by number, however, they will be named for clarity.

**T-2 company names.** The T-2 sample retained one hundred fifty-nine of the one hundred ninety-eight subjects from the T-1 group. Table 10 presents F-ratios for the logotype classes and subjects. Both exceeded their critical levels for the .01 level of significance, their levels reaching 73.19 and 3.92 respectively.

Table 10. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 159 Adults, 48-Hour Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>444.8</td>
<td>158</td>
<td>2.81</td>
<td>3.92*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>210.5</td>
<td>4</td>
<td>52.62</td>
<td>73.19*</td>
</tr>
<tr>
<td>Residuals</td>
<td>454.3</td>
<td>632</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,109.6</td>
<td>794</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

As exhibited in Table 11, Class II (realistic art) was compared to the other four cells. The Class II mean was computed to be 4.50, while the other four cells ranged from 2.06 (stylized art) to 3.70 (letters and numbers). The resulting t-ratios ranged from 7.72 to 14.10, all significant at the .005 level.
Table 11. Significance of Differences Between Logotype Classes in Company Names Mean Recall Scores: 159 Adults, 48-Hour Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>1.35</td>
<td>263</td>
<td>12.29*</td>
</tr>
<tr>
<td>II-III</td>
<td>1.45</td>
<td>279</td>
<td>14.10*</td>
</tr>
<tr>
<td>II-IV</td>
<td>.80</td>
<td>277</td>
<td>7.72*</td>
</tr>
<tr>
<td>II-V</td>
<td>.88</td>
<td>260</td>
<td>7.79*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.

This portion of Hypothesis Four was confirmed: the realistic art logotypes provided a significantly higher company name recall than any other cell, in the adult group, forty-eight hours after the initial treatment.

Table 12 reveals an analysis of variance F-ratio for logotype classes of 46.71. The value for the subjects was 4.36. Both of these ratios were significant at the .01 level. As with Hypothesis Two, and in keeping with the established format of analysis, t-tests were then performed for the paired cell means of the specified cells.
Table 12. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 159 Adults, 48-Hour Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>619.2</td>
<td>158</td>
<td>3.92</td>
<td>4.36*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>167.8</td>
<td>4</td>
<td>41.94</td>
<td>46.71*</td>
</tr>
<tr>
<td>Residuals</td>
<td>576.4</td>
<td>632</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,354.4</td>
<td>794</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

Class V had been hypothesized as having the highest mean recall of any of the five classes, for product lines. The Class V (functional representations) mean was 4.27, with the range of means for the four other cells being from 2.96 for geometrics to 3.68 for stylized art.

As displayed on Table 13, resulting t-ratios from 4.78

Table 13. Significance of Differences Between Logotype Classes in Product Lines Mean Recall Scores: 159 Adults, 48-Hour Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V-I</td>
<td>1.31</td>
<td>290</td>
<td>9.89*</td>
</tr>
<tr>
<td>V-II</td>
<td>.97</td>
<td>290</td>
<td>7.40*</td>
</tr>
<tr>
<td>V-III</td>
<td>.59</td>
<td>304</td>
<td>4.78*</td>
</tr>
<tr>
<td>V-IV</td>
<td>1.09</td>
<td>303</td>
<td>8.77*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V functional rep.

Definitions of column headings are in Appendix A.
to 9.89 were calculated. All these t-ratios were significant at the .005 level.

In this portion of Hypothesis Four it was established that Class V logotypes had a significantly higher recall mean for products than the logotypes of any other class, for adults, two days after exposure to the treatment.

**K-2 company names.** The K-2 sample retained one hundred nineteen of the original K-1 sample of one hundred forty-five. Analysis of variance, reported in Table 14, produced a classes F-ratio of 71.25, and a subjects F-ratio of 2.41. These F-ratios are greater than their respective critical levels for the .01 level of significance.

**Table 14. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 119 Children, 48-Hour Posttest**

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>283.4</td>
<td>118</td>
<td>2.40</td>
<td>2.41*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>283.6</td>
<td>4</td>
<td>70.89</td>
<td>71.25*</td>
</tr>
<tr>
<td>Residuals</td>
<td>469.6</td>
<td>472</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,036.6</td>
<td>594</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

Table 15 indicates that Class II (realistic art) maintained the highest mean company names score. The mean was computed to be 3.52. The other four cell means were from 1.41 for geometrics to 2.18 for functional
representations. The resulting t-ratios, from 9.12 up to 15.43, as predicted, were significant at the .005 level.

Table 15. Significance of Differences Between Logotype Classes in Company Names Mean Recall Scores: 119 Children, 48-Hour Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>2.11</td>
<td>236</td>
<td>15.43*</td>
</tr>
<tr>
<td>II-III</td>
<td>1.35</td>
<td>235</td>
<td>9.75*</td>
</tr>
<tr>
<td>II-IV</td>
<td>1.51</td>
<td>231</td>
<td>10.26*</td>
</tr>
<tr>
<td>II-V</td>
<td>1.34</td>
<td>231</td>
<td>9.12*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level

1 Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.

Significance for this portion of Hypothesis Four was demonstrated. For children the Class II mean was significantly greater than the means for the other logotype cells, forty-eight hours after the experimental treatment.

K-2 product lines. As can be examined in Table 16, an F-ratio of 43.00 was found for the logotypes. The F-ratio value computed for the subjects was 2.85. Once again both of these ratios exceeded their respective critical levels for the .005 level of significance. In accordance with prescribed procedure, t-tests were applied to the paired specified means.
Table 16. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 119 Children, 48-Hour Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>331.1</td>
<td>118</td>
<td>2.81</td>
<td>2.85*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>159.4</td>
<td>4</td>
<td>42.36</td>
<td>43.00*</td>
</tr>
<tr>
<td>Residuals</td>
<td>465.0</td>
<td>472</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>965.5</td>
<td>594</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

The t-test results, presented in Table 17, confirm this portion of Hypothesis Four. Functional representations had been stated to be the highest mean among the cells for product line. Its mean was computed to be 3.03. The four other cells yielded a range of means from 1.55 for

Table 17. Significance of Differences Between Logotype Classes in Product Line Mean Recall Scores: 119 Children, 48-Hour Posttest

<table>
<thead>
<tr>
<th>Classes 1</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-I</td>
<td>1.48</td>
<td>236</td>
<td>9.54*</td>
</tr>
<tr>
<td>V-II</td>
<td>1.14</td>
<td>234</td>
<td>7.63*</td>
</tr>
<tr>
<td>V-III</td>
<td>.70</td>
<td>236</td>
<td>4.38*</td>
</tr>
<tr>
<td>V-IV</td>
<td>1.33</td>
<td>232</td>
<td>8.96*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1 Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.
geometries to 2.34 for letters and numbers, with resulting t-ratios that all exceed the critical ratio for significance at the .005 level.

With this section completed it can be seen that the previously confirmed effects do persist for both adults and children for at least forty-eight hours.

**T-3 company names.** The number of subjects in the adult sample had declined to one hundred thirty-seven after two weeks. F-ratios significant at the .01 level were computed both for logotypes and subjects, as contained in Table 13. The classes F-ratio was 54.73, and the subjects' 3.12. Both ratios were well in excess of their respective critical values of 3.32 and 1.32.

Table 13. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 137 Adults, Two-Week Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>331.2</td>
<td>136</td>
<td>2.44</td>
<td>3.12*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>171.0</td>
<td>4</td>
<td>42.75</td>
<td>54.73*</td>
</tr>
<tr>
<td>Residuals</td>
<td>425.0</td>
<td>544</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>927.2</td>
<td>684</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level

Definitions of headings are found in Appendix A.

As with company name data in each case, realistic art was hypothesized to possess the highest mean among the classes. As revealed on Table 19, the Cell II mean of 4.55
was significant. Means for the four other classes ranged from 2.99 for geometrics to 3.80 for functional representations. The t-ratios were calculated from 6.40 to 13.95. With the critical ratio of 2.58, the differences were significant at the .005 level.

Table 19. Significance of Differences Between Logotype Classes in Company Names Mean Recall Scores: 137 Adults, Two-Week Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>1.57</td>
<td>213</td>
<td>13.95*</td>
</tr>
<tr>
<td>II-III</td>
<td>.92</td>
<td>227</td>
<td>8.84*</td>
</tr>
<tr>
<td>II-IV</td>
<td>.85</td>
<td>217</td>
<td>7.72*</td>
</tr>
<tr>
<td>II-V</td>
<td>.76</td>
<td>205</td>
<td>6.40*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1 Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.

The T-3 company names portion of Hypothesis Four was confirmed. The Class II logotypes, as before, achieved significantly greater mean recall than did any other class, with significance of .005.

T-3 product lines. Utilizing the same statistical procedure as the previous tests, it can be seen in Table 20 that the F-ratio for the classes is 46.43 and 4.43 for the subjects. Both values are significant at the .01 level, being greater than their critical values for that level.
Table 20. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 137 Adults, Two-Week Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>519.6</td>
<td>136</td>
<td>3.82</td>
<td>4.43*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>160.1</td>
<td>4</td>
<td>40.03</td>
<td>46.43*</td>
</tr>
<tr>
<td>Residuals</td>
<td>469.1</td>
<td>544</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,148.8</td>
<td>684</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

The mean for functional representations was (Table 21), as in each previous case, significantly greater than the other cells' means. The Class V mean of 4.26 was significantly greater than the other means at the .005 level. With the four comparison means ranging from 2.84 to 3.64, for geometrics and letters and numbers.

Table 21. Significance of Differences Between Logotype Classes in Product Lines Mean Recall Scores: 137 Adults, Two-Week Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-I</td>
<td>1.42</td>
<td>243</td>
<td>9.78*</td>
</tr>
<tr>
<td>V-II</td>
<td>.74</td>
<td>260</td>
<td>5.59*</td>
</tr>
<tr>
<td>V-III</td>
<td>.62</td>
<td>271</td>
<td>5.12*</td>
</tr>
<tr>
<td>V-IV</td>
<td>1.14</td>
<td>245</td>
<td>7.93*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1 Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.
respectively, the t-ratios ranged from 5.12 to 9.78.

Hypothesis Four was supported for this portion. The Class V mean proved significantly greater than the means of the other four cells, for adult subjects two weeks after exposure.

**K-3 company names.** Of the original one hundred forty-five subjects of the K-1 group, the K-3 sample retained one hundred nineteen. The analysis of variance, reported in Table 22, resulted in an F-ratio of 58.83 for the logotype classes and 3.01 for the subjects. Both of these ratios are significant at the .01 level, their critical regions being 3.32 and 1.32, respectively. Significant differences were still extant two weeks after the experimental treatment.

Table 22. Analysis of Variance of Logotype Classes and Subjects for Company Names Recall Scores: 113 Children, Two-Week Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>329.1</td>
<td>117</td>
<td>2.81</td>
<td>3.01*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>219.8</td>
<td>4</td>
<td>54.94</td>
<td>58.83*</td>
</tr>
<tr>
<td>Residuals</td>
<td>437.0</td>
<td>463</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>985.9</td>
<td>589</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

The t-test results, arrayed in Table 23, compared realistic art to the other four classes, Class II having been hypothesized as having the greatest mean of the five.
The Cell II mean was computed as 3.37, greater than the range of the other means: from 1.59 for geometrics to 2.47 for stylized art. T-ratios resulting from these figures ranged from 5.97 to 13.22. Comparing them to the critical ratio of 2.58, all the differences were accepted at the .005 level of confidence.

Table 23. Significance of Differences Between Logotype Classes in Company Names Mean Recall Scores: 118 Children, Two-Week Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-I</td>
<td>1.78</td>
<td>234</td>
<td>13.22*</td>
</tr>
<tr>
<td>II-III</td>
<td>.90</td>
<td>225</td>
<td>5.97*</td>
</tr>
<tr>
<td>II-IV</td>
<td>1.44</td>
<td>230</td>
<td>10.03*</td>
</tr>
<tr>
<td>II-V</td>
<td>1.29</td>
<td>229</td>
<td>8.82*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

Definitions of column headings are in Appendix A.

This portion of Hypothesis Four was therefore confirmed. After two weeks, the child group company names effect remained significant, with Class II having the greatest of the five means.

K-3 product lines. The results of the analysis of product line data for the child group two-week posttest are displayed on Table 24. The F-ratio of 39.51 for the logotype classes, and the F-ratio of 2.73 for the subjects were both accepted at the .01 level of significance, since
they exceed their critical values. It can be seen that the child group scores remained homogeneous throughout the experiment.

Table 24. Analysis of Variance of Logotype Classes and Subjects for Product Lines Recall Scores: 118 Children, Two-Week Posttest

<table>
<thead>
<tr>
<th></th>
<th>S.S.</th>
<th>df</th>
<th>M.S.</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects</td>
<td>305.5</td>
<td>117</td>
<td>2.61</td>
<td>2.73*</td>
</tr>
<tr>
<td>Logo. Classes</td>
<td>151.3</td>
<td>4</td>
<td>37.82</td>
<td>39.51*</td>
</tr>
<tr>
<td>Residuals</td>
<td>447.9</td>
<td>468</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>904.7</td>
<td>539</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the .01 level.

Definitions of headings are found in Appendix A.

The results of the prescribed t-tests, revealed in Table 25, compared Class V, the hypothesized greatest mean, to the other four cell means. The functional representation mean was 2.30, while the range of means for the other four cells was from 1.42, for geometrics, to 2.48, for stylized art. The resulting t-ratios ranged from 1.92 to 9.44.

One of the ratios did not reach the .005 level of significance. Class III (stylized art) could be accepted at no higher level than .05, the critical ratio for which is 1.65. This was the only t-ratio in the entire experiment which did not attain the desired level of confidence. It was felt, however, that this failing did not serve to reject the whole of Hypothesis Four, and
this portion was accepted as being confirmed, although
with more reservation than the eight other portions of this
hypothesis. Functional representations had the greatest
product lines mean of the five cells, at the .05 level,
for children, two weeks after the treatment period.

Table 25. Significance of Differences Between Logotype
Classes in Product Lines Mean Recall Scores: 118 Children,
Two-Week Posttest

<table>
<thead>
<tr>
<th>Classes</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-I</td>
<td>1.38</td>
<td>224</td>
<td>9.44*</td>
</tr>
<tr>
<td>V-II</td>
<td>.89</td>
<td>234</td>
<td>5.61*</td>
</tr>
<tr>
<td>V-III</td>
<td>.31</td>
<td>234</td>
<td>1.92</td>
</tr>
<tr>
<td>V-IV</td>
<td>1.08</td>
<td>218</td>
<td>7.60*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1 Classes: I (geometrics), II (realistic art), III (stylized art), IV (letters & numbers), V (functional rep.)

2 Significant .05 level.

Definitions of column headings are in Appendix A.

Comparison of total mean scores. The final section
of Hypothesis Four is similar to the third portion of
Hypothesis Three, reported on Table 9, page 46. It deals
with the comparison of the total mean scores of the adult
group versus the child group. It had been hypothesized
(and is confirmed) that although the effects noted for
the adult group would be the same effects for the child
group, with respect to the classes of logotypes with the
greatest mean recall for company names and product lines,
that the adult group would score significantly higher in total mean scores. This can only logically be measured between posttests of the same time interval, e.g. a T-2/K-2 mean comparison and a T-3/K-3 mean comparison.

The measure of total mean score, as before, is the number of average answers out of a possible fifty on each test (five cells of five possible answers each, for both company and product), marked correctly, per subject.

The same formula as applied to the paired mean cell scores in each hypothesis before was applied to the group means. The results are detailed on Table 26, and indicate that the hypothesis was confirmed for this portion.

The T-2 test had a mean total score of 35.43, with a standard deviation of 7.35. This was compared to the K-2 group total mean of 21.82, and standard deviation of 6.34. The resulting t-ratio was 16.52 for 270 degrees of freedom, which exceeds the critical ratio of 2.58, and is therefore accepted at the .005 level of significance.

The T-3 test yields a mean total of 36.04, with a standard deviation of 7.14. In comparison, the K-3 group scored a mean total of 21.77, with 6.57 for a standard deviation. The comparison t-ratio was 16.63, which, as before, could be accepted at the .005 level of significance.
Table 26. Comparison of Paired Total Means for the 48-Hour and Two-Week Posttest, Adults versus Children

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mean Difference</th>
<th>df</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-K 48-Hour</td>
<td>13.60</td>
<td>270</td>
<td>16.52*</td>
</tr>
<tr>
<td>T-K Two-Week</td>
<td>14.27</td>
<td>252</td>
<td>16.63*</td>
</tr>
</tbody>
</table>

*Significant at the .005 level.

1Groups: T, Adult Posttest; K, Child Posttest

Definitions of column headings are in Appendix A.

All nine portions of Hypothesis Four were confirmed. The effects which had been confirmed for Hypotheses One, Two and Three with respect to recall of messages associated with logotypes of various classes were found to remain extant both forty-eight hours and two weeks after the initial experimental treatment. For both adults and children, Class II (realistic art) remains the best trigger of recall of company names, and Class V (functional representations) remained the best trigger of recall of product lines. The mean total recall for the adult group, however, was significantly greater than was the total mean recall for the child group. Thus Hypothesis Four was accepted, as was each of the other hypotheses, at the .005 level of confidence.
Chapter 4

DISCUSSION

The central problem of this study was to determine the relative effects of various logotype structure designs on recall of information learned in association with the logotypes. Support of the four hypotheses by the data presented in Chapter 3 has resolved this problem.

There were, however, three additional points in the experiment that this writer found to be noteworthy. These included certain effects or trends not hypothesized but which caught the attention of the experimenter.

**Increasing Mean Scores**

The first trend that became apparent related to the lack of decline in mean recall scores. The adult total mean scores, reported on pages 46 and 61, decreased only very slightly over the two week period following the presentation of the company names and product lines in the treatment sessions. The T-1 total mean score was 37.23, while the T-2 (the forty-eight hour posttest) had declined to 35.43. But the T-3 (two-week) mean increased back to 36.04.

These figures were not examined to determine if they were significantly different, in fact they are quite small. But they do run contrary to probable expectations.
In a similar manner, the total mean score for the K-1 test was 18.63, while the K-2 mean increased to 21.82. The K-3 mean was only slightly smaller, at 21.77.

This trend, of course, is exactly opposite of what would logically be expected, assuming normal entropy is operating.

The trend is particularly noticeable in the classes hypothesized as having the highest mean scores. Class II (realistic art) for the adult group showed an increase in its mean score over the two week period, in the company names category. It can be seen on page 38 that the mean for the class on the T-1 test was 4.51. After two weeks, however, the score for Class II in the company names category had increased to 4.55, as shown on page 54.

The same Class II mean for the child group also showed an increase over the same period. On the K-1 test, in the company names category, the Class II mean was 3.07, as stated on page 42. After two weeks the cell mean, instead of dropping as would be expected, had increased to 3.37, as indicated on page 58.

Detailed examination of the reported data revealed some declines in scores of cells over the time interval, but also many increases other than those noted here.

The most probable reason for the increase in the mean scores, particularly the total mean scores, lies in the nature of the subjects. The adult group declined
by fifty-one subjects over the two weeks, almost twenty-five percent. There was no obligation on the part of the sub-
jects to take any part of the test. If the subject did not desire to take part, he could walk out, or refuse to fill in his instrument, thus invalidating it.

Class attendance was not mandatory, and the tests were not announced prior to the class. If a subject missed any of the sessions for any reason, he could not take part in the experiment (due to the possibility of repetition effects as noted on page 11 of Chapter 1.)

A similar decline was also noted for the children's group. The decay for the fifth-graders was smaller however; only twenty-six subjects were lost.

This was felt to be largely due to attendance habits and policies in the elementary school. The subjects were not free to leave, or absent themselves by cutting class.

Of the subjects of the initial treatment and test, the ones which seem logically most likely to have resisted any further tests were ones who felt they had not done well on the first test. This is not pure speculation, for interviews with children who flatly refused to cooperate indicated that this was the major reason for refusal to cooperate. Observations of the adult group, and the behavior of some individuals indicated that their reasons were much the same; an intractable attitude towards the experiment and their participation in it.
In one instance, for example, a child knew she did not know the material (and her K-1 test score confirmed this), and she would rather have not taken the test than to take it and not do well as she supposed her classmates to have done.

Histograms printed by computer at the time of scoring of the test instruments tend to support this picture. For example, the T-1 histogram shows a fairly normal curve of scores, but with a rather long lower end tail, extending down into the third standard deviation. The T-3 histogram shows a very similarly shaped curve as the T-1 (as would be expected), but without the extended lower end tail. This would indicate that the T-1 lower end scorers either did not take the test, or perhaps worked together in answering the questions, although efforts were made to prevent the latter case.

Similar changes were observed for the histograms of the child group tests.

This dropping of the lower end scores would probably account at least in part, for the artificial support of high mean scores, despite a general decline in the scores of the persons who took all three tests. It should be noted, however, that this dropping of the lower end scores did not result in a homogeneous sample of scores, as the F-ratio for each test section indicate the presence of significant variance among the subject scores.
Second Highest Means

The second trend of note related to the mean scores in the cells other than the cell hypothesized as having the greatest mean. An examination of the data cells will reveal a consistency among the classes with the second highest mean scores.

To reiterate, Class V (functional representations) was the class hypothesized to have the greatest mean in the product lines category in each test. Class II (realistic art) was the cell hypothesized to have the greatest mean in the company names category for each test. Both of these hypotheses were sustained.

However, in the product lines category, Class II also scored the second greatest mean in every one of the six tests of product lines.

Similarly, in the company names category, Class V had the second highest mean in every case except one, T-2 company names, as reported on Table 11. Inspection for smallest mean difference values will indicate, however, that in this case the scores were very close. It was felt a likely cause of this effect would be some sort of mental connection between the name of the company and the product which is associated with it.

The implication is that if you remember one, you are likely to remember the other. If this effect is not happenstance, which it might well be, it would be useful
to know in which direction the effect works best; whether being given the company name and attempting to recall the product, or being given the product and attempting to recall the company.

Because there are very few products or services which do not have a number of competing manufacturers, it would probably be more practical to let the logo suggest the name of the company and let the subject recall the product. This would not be true, however, for specific trade names of products rather than product lines. That is, many companies produce light bulbs, but only one company produces Soft-White lightbulbs.

Further investigation into the matter could prove of use to businesses.

Usefulness

The third trend to arouse curiosity in this researcher related to the problem of usefulness, first mentioned on page 12 as a possible contaminant. There was a weak trend among both the adults and children to recall the names of the companies more frequently than the product lines.

On the T-1 test in the company names category, the sum of the cell means was 18.73. (This was derived from data presented on Table 1, and its text.) In the T-1 product lines category, reported on Table 3, the sum of cell means was 18.21, smaller than the company names mean.

On the K-1 test, company names category, the sum
of mean scores for each class was 9.50, as can be observed from data related to Table 6. In the K-1 product lines category, however (Table 8, page 44), the sum of the cell means was only 9.00, again smaller than for company names.

This trend, quite weak on the immediate posttest, gained greater support on the forty-eight hour test. The summed means for the T-2 company names data was 18.03, while the summed means for the T-2 products data was only 14.39. The K-2 test also reflected an increased differential of the summed means for the categories. The K-2 company summed mean was 11.30, while for products the means totaled only 10.52.

The third posttest showed similar results. For the T-3 company names, the summed means totaled 15.69, versus 14.38 for the product lines. The K-3 company names summed means totaled 11.44, versus 10.32 for the K-3 product lines total. Thus the trend existed in every test.

The most plausible explanation for this effect seems to relate back to usefulness. In order to have a common level of usefulness for both adults and children, it was decided that product uselessness would suffice. This method of control of the "usefulness" contaminant seems to have resulted in the data trend noted above. The products were so removed from everyday life, that it seems the subjects encountered relative difficulty in learning them, compared to learning the company names.
The names of the companies, though no more useful, were probably of greater interest to the subjects. Interest was not considered as a contaminant, but probably should have been. Animal names, such as Bird, Bear or even Fox River, and geographic names such as Troy, Tri-State or Allegheny, though not of burning fascination, held the attention of the subjects somewhat better than the product lines information. There is no proof that they were learned more easily, but under the conditions of the experiment they were certainly recalled more readily.

This does not, of course, change the validity of the test results, since there was no comparison between company names and product lines hypothesized. The experimental results only reflect which designs of logotypes act as best triggers of recall, not what sort of company name or product line is more interesting to consumers.

The problem of interest might well be of consideration to new companies which have not yet taken names, or any company introducing new lines of products.

IMPLICATIONS

There are two areas of implications which can be speculatively derived from this project, for both businessmen and researchers.

Business

For companies which deal in products or services which cannot be readily differentiated, it seems that
emphasis should be directed towards differentiating its product from that of the competition. For this product identification task, functional representation design achieved the most promising results for the creation of a pragmatic logotype.

On the other hand, if the company is going to remove emphasis from the product line image and place it on the company image, realistic art would seem to produce the best results, in light of the findings of this study. This might be true for the logotype of a large, diversified company which uses separate symbols for its divisions or its individual products.

Research

Much remains unknown about the effectiveness of advertising graphics. This report is on one relatively small point.

It does raise the questions of consumer interest in company names and the possibility of some mental linking of company names and product line, as mentioned in this chapter.

Another area of exploration, which was first considered by this writer during interviews with subjects, is the effect that color might have on changing the order of differential power noted for the various designs of logotypes in this experiment.

Because business and the consumer must ultimately
benefit from increasingly effective communications, and while advertisers continue to invest large sums of capital in efforts to maintain their distinct identities, investigations into the relative efficiency of their communicative efforts must continue.

SUMMARY

Although the importance of the logotype has been historically recognized and its purpose well defined, it has until now remained largely what one might consider an artistic creature. This approach has left some shortcomings in the minds of some researchers. While many aspects of graphic communications have been studied, the design of the logotype had not been scrutinized for its effect on the recall of associated information.

The purpose of this study was to determine whether different basic designs of logotypes would produce significant differences in recall of company names and product lines previously associated with the logotypes.

A more pragmatic purpose was to establish an order of ease of learning, both of company names and product lines, among the various classes of logotypes.

One hundred ninety-eight college students and one hundred forty-five children served as subjects for experimental testing. They viewed a slide show of logotypes which they had not known before, and were given the name and product of the company associated with each.
The logotypes had been divided equally into five classes: realistic art, stylized art, letters and numbers, functional representations, and geometrics. Four hypotheses were proposed in relation to the subjects and the logotypes. Realistic Art was considered to be the best potential trigger of company names recall, and functional representations to be the best for product lines. It was also hypothesized that there would be no difference between children and adults, except for quantitative level of recall, and that the two classes would persist as the best reminders of information for at least two weeks.

Three paper-and-pencil posttests were made to determine recall: immediate, forty-eight hour, and two-week. The subjects reviewed the slides and selected answers from a multiple-choice questionnaire. The resulting data from each test for each subject were between no and five correct answers for each of the five cells, for each of the two answer categories (company and product).

The data were subjected to a two-step analysis for statistical significance. Analysis of variance among the logotype classes was performed to determine if any class did significantly better as a recall trigger. A t-test then compared the hypothesized class to each of the other four classes. The same t-test also compared the mean adult and mean child scores for each of the three time intervals.
All of the hypothesized effects and relationships were statistically confirmed at the .005 level of significance, with the exception of one t-test comparing class means.

The results indicate that realistic art provides a better trigger of company name recall than do the other classes of logotypes; and functional representations provide the best trigger for recall of product lines.

They also indicate that aside from the level of recall, there is no differential between adults and children with respect to recall stimulated by various designs of logotypes.

Implications for businesses include the necessity for determining what the logotype is to do for the company, while offering a set of basic trends from which the search for the best logotype for that company can begin.

Implications for advertising research include the necessity for further investigation of the parameters of effective graphic communication in marketing.
REFERENCES


APPENDICES

A. DEFINITIONS OF STATISTICAL TERMS

In presenting the data analysis in this paper, the crucial values are the F-ratio and the t-ratio, for these are the ultimate proof or rejection of the hypotheses. Because certain readers may desire to know more of the analysis, other key values used in computing the ratios have also been given. The values are described very briefly below, and their abbreviations as used on the tables given. The abbreviations are standard forms used in statistics texts.

Analysis of Variance Terms (F-test)

The abbreviation S.S. is for Sums of Squares, which are used in computing the Mean Squares, and are derived from the scores of the subjects both within the cells and among themselves. The df is a reference to the number of degrees of freedom, which is either the number of subjects minus one, in the subjects row; or the number of cells (five) minus one, in the logotype classes row.

It is the number of unrestricted variables in a frequency distribution. Division of the Sum of the Squares (S.S.) by the degrees of freedom (df) adjacent to it, yields the Mean Square, M.S., for that row. The Mean Square
for either the subjects or logotype classes rows, divided by the Mean Square for the Residuals, yields the F-ratio for the row in question.

**T-test Terms**

The t-test compares, in this case, distributions of scores for two cells. The cells in this experiment are generally the logotype classes, except where total mean scores are being compared between test groups. The classes column designates the pair of cells under analysis, using an abbreviation found directly below the table. The t-ratio is, for these purposes, an index computed for the two cells, which can be compared to a table of the t-distribution to determine at what level of probability the two cell means do not reflect true differences between the cells. This is the level of significance, set at .005 as an arbitrary desired level for this experiment. The mean, an often repeated term in this paper, is the average score for a group of subjects for a particular cell, category, or any other unit. Mean Differences, noted on the tables of this report, are the mean of the first class listed in the classes column, minus the mean of the second class. The first class listed is always the class hypothesized as having the greatest mean score for that category. Thus when the mean difference is positive, the first cell listed is greater than the second cell. Total mean score refers to the mean
score for a group on a given posttest. The standard deviation, S.D., is used to compute the t-ratio. It indicates, though is not a direct measure of, the degree to which the cell scores tend to cluster about the mean.

The degree of freedom, df, is similar to the term used in the F-test, except that the particular t-test employed used a computed degrees of freedom to compensate for the number of subjects involved, which is greater than the number for which an ordinary (Student's) test is normally used.
B. STATISTICAL FORMULAS

As noted in the body of this document, the statistical analyses performed on the raw data from the experiment were done by computer and not by the experimenter. Assistance in selection of the appropriate formulas and computer programs was given by Mr. Thomas Peeples of the Florida Technological University Computing Services section, and by Dr. K. Phillip Taylor of the experimenter's thesis committee.

The source of both analysis of variance and t-tests was Introduction to the Theory of Statistics, by Mood and Graybill (1963). Both tests had been adopted by the Honeywell Corporation for their software package MOD I (TR) Scientific Subroutines Software Manual (July, 1968). Honeywell cited Mood and Graybill for the formulas, on pages 372 and 303 for the F-test and t-test respectively.

The analysis of variance was designated as Subroutine STANV2 by Honeywell (1968:5-5). It was specified for computation of analysis of variance for two-way classifications.

The t-test was specified by Honeywell (1968:2-1) for computation of mean, variance and T-ratio for two groups of data, and designated Subroutine STMEAN. Mathematical notation for both of the subroutines are given
in the Honeywell publication.
C. TESTING INSTRUMENTS

The pages following this introduction are reproductions of the three test instruments used in this experiment. The first, designated K,T-1 was used by both child and adult groups on the immediate posttest. K,T-2 was a rearrangement of the material in the immediate posttest, accomplished with the use of a random numbers table. It was used for the forty-eight-hour posttest, again by both groups. Obviously, the K,T-3 test is a further rearrangement of the previous tests, and was used for the two-week posttest.

At the time of testing, the instruments were pre-numbered and designated (by striking out) as either a "T" or "K" test, insuring the separation of the data during the coding processes.

As a further note, the slides used in the experimental procedure are in the possession of the Department of Communications of Florida Technological University. The data deck of computer punch cards is in the possession of this writer. The deck contains raw data cards for each subject in each test, and the scoring comparison cards used for grading of the raw data cards.
As each slide is shown in turn, place an X beside the name of the company which the slide represents. Then place an X beside the product of the company. You may go back to answer for any previous slide, but the slide will not be shown again. Only one answer is correct in each column for each slide.

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 A. Global Enterprises</td>
<td>A. rare metals</td>
</tr>
<tr>
<td>B. American Tool</td>
<td>B. plastic moulding</td>
</tr>
<tr>
<td>C. Lee Myles Company</td>
<td>C. packaging materials</td>
</tr>
<tr>
<td>D. Honeycomb research</td>
<td>D. aircraft instruments</td>
</tr>
<tr>
<td>E. Light Alloy Company</td>
<td>E. aluminum ingots</td>
</tr>
<tr>
<td>22 A. Louis Arthur Consult.</td>
<td>A. fabric knitting</td>
</tr>
<tr>
<td>B. Light Metals Company</td>
<td>B. metric sized tools</td>
</tr>
<tr>
<td>C. Universal Machines</td>
<td>C. shipbuilding</td>
</tr>
<tr>
<td>D. Eagle Manufacturing</td>
<td>D. bolts and nuts</td>
</tr>
<tr>
<td>E. Mitchell &amp; Thompson</td>
<td>E. electric motors</td>
</tr>
<tr>
<td>33 A. Fox River Company</td>
<td>A. synthetic jewels</td>
</tr>
<tr>
<td>B. Light Metals Co.</td>
<td>B. plastics</td>
</tr>
<tr>
<td>C. Remington Associates</td>
<td>C. business advisors</td>
</tr>
<tr>
<td>D. Republic Mfg.</td>
<td>D. electric motors</td>
</tr>
<tr>
<td>E. Louis Arthur Consult.</td>
<td>E. grinding wheels</td>
</tr>
<tr>
<td>41 A. Miami &amp; Tampa Mfg.</td>
<td>A. jewelry wholesalers</td>
</tr>
<tr>
<td>B. Mitchell &amp; Thompson</td>
<td>B. grinding wheels</td>
</tr>
<tr>
<td>C. Bird Technology</td>
<td>C. plastic mouldings</td>
</tr>
<tr>
<td>D. Tri-State Technology</td>
<td>D. metric sized tools</td>
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<tr>
<td>E. Mohawk &amp; Troy, Inc.</td>
<td>E. thread grindings</td>
</tr>
<tr>
<td>53 A. Anderson Tungsten</td>
<td>A. housing developers</td>
</tr>
<tr>
<td>B. Remington Associates</td>
<td>B. shipbuilding</td>
</tr>
<tr>
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</tr>
<tr>
<td>E. Light Metals Co.</td>
<td>E. thread grindings</td>
</tr>
</tbody>
</table>
63
A. North American Mfg.  
B. Smith & Royal Co.  
C. National Industries  
D. Honeycomb Research  
E. Mitchell & Thompson

A. jewelry wholesalers  
B. plastics  
C. housing developers  
D. advertising agency  
E. plastic mouldings

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A. North American Mfg.  
B. Light Alloy Company  
C. Grizzly Enterprises  
D. Coalition Construction  
E. Mohawk & Troy, Inc.

A. thread grindings  
B. jewelry wholesalers  
C. rare metals  
D. interior paneling  
E. aluminum ingots

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A. Honeycomb Research  
B. Global Enterprises  
C. Universal Machines  
D. Steadman Industries  
E. Mitchell & Thompson

A. air conditioning syst.  
B. aluminum ingots  
C. advertising agency  
D. aircraft instruments  
E. rare metals

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C. Seagull Corporation  
D. Republic Mfg.  
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B. bolts and nuts  
C. synthetic jewels  
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B. Light Alloy Company  
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D. Los Angeles Alloy  
E. Lynn-Albany Co.

A. aluminum ingots  
B. plastic mouldings  
C. thread grindings  
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E. recycled paper

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A. American Testing Cons.  
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B. aluminum ingots  
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D. shipbuilding  
E. packaging materials

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C. Anderson Tungsten
D. Seagull Corporation
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A. North American Mfg.
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A. Grizzly Enterprises
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E. Seagull Corp.

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A. Louis Arthur Consult.
B. Universal Machines
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D. American Tool
E. Eagle Mfg.

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A. Steadman Industries
B. Tri-State Technology
C. Smith & Royal Co.
D. Mohawk & Troy, Inc.
E. Eagle Mfg.

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A. Fox River Company
B. Coalition Construction
C. Honeycomb Research
D. Mitchell & Thompson
E. Bird Technology

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A. metric size tools
B. recycled paper
C. plastics
D. plastic mouldings
E. interior paneling

A. fabric knitting
B. advertising agency
C. air conditioning syst.
D. plastics
E. aircraft instruments

A. packaging materials
B. bolts and nuts
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C. air conditioning syst.
D. books and journals
E. plastics

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C. housing developers
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D. Lee Myles Company
E. American Tool

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B. Steadman Industries
C. Smith & Royal Co.
D. Standard Industries
E. Stetson Industries

231
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B. Light Alloy Co.
C. Universal Machines
D. Eagle Manufacturing
E. Lee Myles Co.

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A. Remington Associates
B. National Industries
C. Tri-State Technology
D. Light Alloy Company
E. Fox River Company

254
A. Mohawk & Troy Inc.
B. Mitchell & Thompson
C. Miami & Tampa Mfg.
D. Metric Technology Co.
E. Myles & Thompson, Inc.
Again, mark the company and product that you think is represented by the slide as the slide is shown. These are the same slides you saw before, but will appear in a different order. Again, there is only one correct answer, and the slides will not be reshown. You will have the same length of time as you had before.

COMPANY
14
A. Reliable Associates
B. Remington Associates
C. Republic Mfg.
D. Fox River Co.
E. Honeycomb Research

PRODUCT
A. electric motors
B. advertising agency
C. bolts & nuts
D. business advisors
E. recycled paper

25
A. Louis Arhtur Consult.
B. Eagle Manufacturing
C. Republic Mfg.
D. American Tool
E. Universal Machines

PRODUCT
A. advertising agency
B. aircraft instruments
C. electric motors
D. thread grindings
E. plastic mouldings

32
A. Grizzly Enterprises
B. Lee Nyles Company
C. American Tool
D. Anderson Tungsten
E. Seagull Corporation

PRODUCT
A. grinding wheels
B. rare metals
C. shipbuilding
D. metal cutters
E. books and journals

43
A. Remington Associates
B. Anderson Tungsten
C. Republic Manufacturing
D. Mohawk & Troy, Inc.
E. Light Metals Co.

PRODUCT
A. synthetic jewels
B. shipbuilding
C. housing developers
D. thread grindings
E. aluminum ingots

51
A. Universal Machines
B. Eagle Manufacturing
C. Lee Nyles Company
D. Coalition Construction
E. Light Alloy Co.

PRODUCT
A. housing developers
B. air conditioning syst.
C. plastic mouldings
D. aircraft instruments
E. chemicals
A. Republic Mfg.  
B. Grizzly Enterprises  
C. Pergamon Press  
D. Global Enterprises  
E. North American Mfg.

A. books and journals  
B. bolts and nuts  
C. packaging materials  
D. advertising agency  
E. rare metals

A. Louis Arthur Consult.  
B. Eagle Mfg.  
C. Universal Machines  
D. Mitchell & Thompson  
E. Light Metals Co.

A. fabric knitting  
B. bolts and nuts  
C. electric motors  
D. metric sized tools  
E. shipbuilding

A. Light Metals Co.  
B. American Tool  
C. Mitchell & Thompson  
D. Light Alloy Co.  
E. Lee Myles Co.

A. plastic moulding  
B. metal cutters  
C. advertising agency  
D. recycled paper  
E. fabric knitting

A. Miami & Tampa Mfg.  
B. Mitchell & Thompson  
C. Metric Technology  
D. Myles & Thompson  
E. Mohawk & Troy Inc.

A. interior paneling  
B. aluminum ingots  
C. packaging materials  
D. recycled paper  
E. chemicals

A. Light Metals Co.  
B. Fox River Co.  
C. Louis Arthur Co.  
D. Republic Mfg.  
E. Remington Mfg.

A. synthetic jewels  
B. business advisors  
C. electric motors  
D. grinding wheels  
E. plastics

A. Grizzly Enterprises  
B. North American Mfg.  
C. Light Alloy Co.  
D. Mohawk & Troy  
E. Coalition Construction

A. jewelry wholesalers  
B. rare metals  
C. metal cutters  
D. aluminum ingots  
E. interior paneling

A. Republic Mfg.  
B. Seagull Corp.  
C. Anderson Tungsten  
D. American Tool  
E. Coalition Construction

A. plastics  
B. recycled paper  
C. metric sized tools  
D. interior paneling  
E. plastic mouldings

page two
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<tbody>
<tr>
<td>141</td>
<td>A. Mitchell &amp; Thompson</td>
<td>B. Tri-State Technology</td>
<td>C. Bird Technology</td>
<td>D. Miami &amp; Tampa Mfg.</td>
<td>E. Mohawk &amp; Troy Inc.</td>
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<td>174</td>
<td>A. American Testing Cons.</td>
<td>B. Albany Transfer</td>
<td>C. Anderson Tungsten</td>
<td>D. American Tool</td>
<td>E. Alleghany Tungsten</td>
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<td>184</td>
<td>A. Stetson Industries</td>
<td>B. Seagull Corporation</td>
<td>C. Steadman Industries</td>
<td>D. Smith &amp; Royal Co.</td>
<td>E. Standard Industries</td>
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<th>89</th>
<th>A. shipbuilding</th>
<th>B. books and journals</th>
<th>C. plastics</th>
<th>D. interior paneling</th>
<th>E. electric motors</th>
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<tr>
<td>141</td>
<td>A. thread grindings</td>
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<td>155</td>
<td>A. aluminum ingots</td>
<td>B. air conditioning syst.</td>
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<td>163</td>
<td>A. housing developers</td>
<td>B. plastic mouldings</td>
<td>C. advertising agency</td>
<td>D. jewelry wholesalers</td>
<td>E. plastics</td>
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<td>174</td>
<td>A. advertising agency</td>
<td>B. aircraft instruments</td>
<td>C. interior paneling</td>
<td>D. rare metals</td>
<td>E. aluminum ingots</td>
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<tr>
<td>184</td>
<td>A. thread grindings</td>
<td>B. grinding wheels</td>
<td>C. books and journals</td>
<td>D. foundry</td>
<td>E. advertising agency</td>
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<tr>
<td>191</td>
<td>A. metal cutters</td>
<td>B. plastics</td>
<td>C. books &amp; journals</td>
<td>D. air conditioning syst.</td>
<td>E. recycled paper</td>
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</table>
A. Tri-State Technology
B. National Industries
C. Remington Associates
D. Light Alloy Co.
E. Fox River Company

A. shipbuilding
B. advertising agency
C. business advisors
D. foundry
E. grinding wheels

A. Honeycomb Research
B. Coalition Construction
C. Fox River Company
D. Mitchell & Thompson
E. Bird Technology

A. plastic mouldings
B. aircraft instruments
C. recycled paper
D. shipbuilding
E. housing developers

A. Light Alloy Co.
B. Light Metals Co.
C. Lynn-Albany Co.
D. Louis Arthur Cons.
E. Los Angeles Alloy Co.

A. thread grinding
B. metal cutters
C. aluminum ingots
D. plastic mouldings
E. recycled paper

A. Light Alloy Company
B. Global Enterprises
C. American Tool
D. Lee Myles Co.
E. Honeycomb Research

A. plastic moulding
B. aircraft instruments
C. packaging materials
D. rare metals
E. aluminum ingots

A. American Tool
B. Republic Mfg.
C. Global Enterprises
D. Bird Technology
E. Seagull Corporation

A. metric sized tools
B. synthetic jewels
C. books and journals
D. bolts and nuts
E. plastic mouldings

A. Tri-State Technology
B. steadman Industries
C. Mitchell & Thompson
D. Smith & Royal Co.
E. North American Mfg.

A. fabric knitting
B. jewlery wholesalers
C. packaging materials
D. bolts & nuts
E. aluminum ingots
As before, place an X beside the name of the company which you think the slide represents. Then place an X beside the name of the product. You may go back to any previous question, but the slide will not be reshown. There is only one correct answer in each column for each slide.

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<th>COMPANY</th>
<th>PRODUCT</th>
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<tr>
<td>A. Anderson Tungsten</td>
<td>A. metric sized tools</td>
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<td>B. Coalition Construction</td>
<td>B. interior paneling</td>
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<td>C. Seagull Corporation</td>
<td>C. plastics</td>
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<td>D. Republic Manufacturing</td>
<td>D. plastic mouldings</td>
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<td>C. Honeycomb Research</td>
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<td>D. Mitchell &amp; Thompson, Inc.</td>
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<td>E. National Industries</td>
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<td>B. Myles &amp; Thompson, Inc.</td>
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<td>C. Mitchell and Thompson</td>
<td>C. packaging materials</td>
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<td>D. Metric Technology</td>
<td>D. interior paneling</td>
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<td>D. bolts and nuts</td>
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<td>E. Global Enterprises</td>
<td>E. plastic mouldings</td>
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<tr>
<td>A. Steadman Industries</td>
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<td>C. Stetson Industries</td>
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<td>E. Global Enterprises</td>
<td>E. Mitchell &amp; Thompson</td>
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**Thread Grindings**
- A. Steadman Industries
- B. Standard Industries
- C. Stetson Industries
- D. Seagull Corporation
- E. Smith & Royal Co.

**Books and Journals**
- A. thread grindings
- B. books and journals
- C. foundry
- D. advertising agency
- E. grinding wheels

**Thread Grindings**
- A. American Tool
- B. Light Alloy Co.
- C. Honeycomb Research
- D. Global Enterprises
- E. Lee Myles Company

**Aircraft Instruments**
- A. thread grindings
- B. books and journals
- C. foundry
- D. advertising agency
- E. grinding wheels

**81**
- A. Tri-State Technology
- B. Eagle Manufacturing
- C. Mohawk and Troy, Inc.
- D. Smith and Royal Co.
- E. Steadman Industries

**Recycled Paper**
- A. aircraft instruments
- B. plastic mouldings
- C. rare metals
- D. packaging materials
- E. aluminum ingots

**92**
- A. Pergamon Press
- B. Bird Technology
- C. American Tool
- D. Republic Mfg.

**Packaging Materials**
- A. aircraft instruments
- B. plastic mouldings
- C. rare metals
- D. packaging materials
- E. aluminum ingots

**104**
- A. American Tool
- B. American Testing
- C. Anderson Tungsten, Inc.
- D. Alleghany Tungsten
- E. Albany Transfer Co.

**Aircraft Instruments**
- A. thread grindings
- B. books and journals
- C. foundry
- D. advertising agency
- E. grinding wheels

**115**
- A. Honeycomb Research
- B. Universal Machines
- C. Mitchell & Thompson
- D. Steadman Industries
- E. Global Enterprises

**Packaging Materials**
- A. aircraft instruments
- B. plastic mouldings
- C. rare metals
- D. packaging materials
- E. aluminum ingots

**121**
- A. Tri-State Technology
- B. Miami & Tampa Mfg.
- C. Mohawk & Troy, Inc.
- D. Bird Technology
- E. Mitchell & Thompson

**Grinding Wheels**
- A. thread grindings
- B. books and journals
- C. foundry
- D. advertising agency
- E. grinding wheels

**Page Two**
A. Remington Associates
B. Fox River Company
C. Tri-State Technology
D. National Industries
E. Light Alloy Company

A. advertising agency
B. grinding wheels
C. business advisors
D. shipbuilding
E. foundry

A. Pergamon Press
B. North American Mfg.
C. Grizzly Enterprises
D. Republic Mfg.
E. Global Enterprises

A. advertising agency
B. bolts and nuts
C. rare metals
D. packaging materials
E. books and journals

A. Fox River Company
B. Reliable Assoc.
C. Republic Mfg.
D. Richardson Assoc.
E. Remington Associates

A. air conditioning syst.
B. plastics
C. advertising agency
D. fabric knitting
E. aircraft instruments

A. Seagull Corporation
B. American Tool
C. Grizzly Enterprises
D. Lee Myles Company
E. Anderson Tungsten

A. metal cutters
B. housing developers
C. books and journals
D. rare metals
E. shipbuilding

A. Coalition Construction
B. Universal Machines
C. Eagle Manufacturing
D. Light Alloy Company
E. Lee Myles Company

A. housing developers
B. aircraft instruments
C. chemicals
D. air conditioning syst.
E. plastic mouldings

A. North American Mfg.
B. Mitchell & Thompson
C. Lee Myles Company
D. Steadman Industries
E. Tri-State Technology

A. bolts and nuts
B. aluminum ingots
C. packaging materials
D. jewelry wholesalers
E. fabric knitting

A. Remington Associates
B. Republic Manufacturing
C. Anderson Tungsten
D. Light Metals Co.
E. Mohawk & Troy, Inc.

A. housing developers
B. shipbuilding
C. aluminum ingots
D. synthetic jewels
E. thread grindings
Page four

205
A. Coalition Construction  A. shipbuilding
B. Fox River Company  B. aircraft instruments
C. Honeycomb Research  C. plastic mouldings
D. Bird Technology  D. recycled paper
E. Mitchell & Thompson  E. housing developers

213
A. Fox River Company  A. synthetic jewels
B. Light Metals Company  B. grinding wheels
C. Republic Mfg.  C. plastics
D. Louis Arthur Consult.  D. business advisors
E. Remington Associates  E. electric motors

224
A. Lynn-Albany Co.  A. thread grindings
B. Louis Arthur Consult.  B. metal cutters
C. Light Alloy Co.  C. recycled paper
D. Light Metals Co.  D. aluminum ingots
E. Los Angeles Alloy Co.  E. plastic mouldings

235
A. Eagle Manufacturing  A. air conditioning syst.
B. Coalition Construction  B. thread grindings
C. Lee Myles Company  C. plastic mouldings
D. Universal Machines  D. electric motors
E. Light Alloy Co.  E. advertising agency

242
A. Mitchell & Thompson  A. fabric knitting
B. Universal Machines  B. metric sized tools
C. Eagle Manufacturing  C. shipbuilding
D. Louis Arthur Consult.  D. electric motors
E. Light Metals Co.  E. bolts and nuts

251
A. Light Metals Co.  A. plastic mouldings
B. Mitchell & Thompson  B. advertising agency
C. Lee Myles Company  C. recycled paper
D. American Tool Co.  D. metal cutters
E. Light Alloy Co.  E. fabric knitting

Thank you very much for your cooperation during this experiment.