ABSTRACT

AN EMPIRICAL ESTIMATION OF THE ADVERTISING RESPONSE FUNCTION

By

Don Edward Schultz

Advertising response functions could provide media planners with a step beyond traditional reach and frequency measures in the evaluation of advertising media plans. The purpose of this study was to provide empirical estimation of advertising response functions to increase the utility of this concept.

Using the conceptual base of Broadbent and Segnit and their definitions of advertising response functions, impressions and cumulative response,[1] a one-week study was conducted among college students. Broadbent and Segnit's definition of impressions was used as the independent variable and elements of Lavidge and Steiner's[2] hierarchy of effects model were used as the dependent variables.

A pre-test was administered on several brand and product categories in a single market. Respondents kept a diary of media usage for the study week. At the end of the period, a post-test was administered. During the study week, all media messages available to the respondents through radio, television, newspapers and magazines were monitored. By relating media usage to the available messages, advertising impressions by media by brand and category were determined. An analysis of the changes between pre- and post-test measures was then made at the cognitive (awareness) and conative (intent to purchase) level.

Using Broadbent and Segnit's formula for geometric curve fitting, theoretical frequency distributions were derived and compared against observed data. Goodness of fit tests were used to accept or reject the hypotheses plus t-tests of the regression coefficients and means.

In all cases, a convex geometric curve which is constantly increasing but at an always declining rate was found to be the slope of the points which most nearly approximated the cumulative response, based on impressions when measured at the cognitive and conative levels. In addition, the same convex geometric curve best illustrated the results for all empirical estimations of products or services or brands tested.

Traditional advertising wisdom has suggested that different types of products or services, and even different brands of products in the same category, would have differing slopes when the cumulative response was plotted. Such results were not found in this study. While each product or service plotted did have a different mean, when the cumulative response was plotted from the data, all products and brands were best represented by a generally convex shape. The convex geometric curve also provided the best fit of any of the slopes plotted. The convex geometric curve provided a much better fit to the data than did the s curve, the step function or the linear function.

Three major suggestions for future research were derived from the study. The time period of one week is too short. To accurately measure advertising response functions, a longer period of time is required. In addition, the effects of competitive advertising must be controlled in future studies. Present advertising research is primarily conducted on a unidimensional scale. Consideration should be given to multidimensional measurement of independent variables to more accurately measure advertising response functions in the future. Finally, the effects of multiple media exposure must be addressed.

On a cumulative basis, it is most difficult to separate for evaluation, the effects of individual media in an overall advertising media plan.

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[1] S. R. Broadbent and S. Segnit, "Response Functions in Media Planning," in The Thomson Medals and Awards for Advertising Research Reports, Ten Years of Advertising Media Research 1962-1971 (London: The Thomson Organization, Ltd., 1972), pp. 187-238.

[2] Robert J. Lavidge and Gary A. Steiner, "A Model for Predictive Measurements of Advertising Effectiveness," Journal of Marketing (October 1961): 59-62.

AN EMPIRICAL ESTIMATION OF THE ADVERTISING RESPONSE FUNCTION

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Communication Arts and Sciences--Mass Media

1977

ACKNOWLEDGMENTS

With the unusual circumstances under which this material was written, it is difficult to thank everyone who helped these past years. Special thanks should go to my parents and Margaret and Put who supported, both morally and financially, the decision to change careers in mid-life.

Of those involved in the dissertation, thanks should go to Kenward who convinced me it could be done throughout the entire period . . . to radio stations WFMK, WVIC and WILS whose financial assistance is gratefully acknowledged . . . to the many students at Michigan State University who participated, both as respondents and researchers in the study and to my committee composed of Charles Atkin, Martin Block, Gordon Miracle, Thomas Muth and Donald Taylor for their comments and suggestions.

Of all those involved, special thanks should go to Martin without whose guidance and support it would never have been possible. A skilled researcher, an untiring guide throughout the whole process and a unique friend, this is a tribute to an idea we both thought

would work. And, a special thanks to Rosemary for giving him up many hours while we discussed, tested and tried the concept.

Of all, however, most thanks should go to Margaret Ann, Steve, Brad and Jeff who lived without husband and father so this job could be done. Sometimes it was very rough, but they always saw the goal when sometimes I forgot it. My everlasting thanks to them and my hope that their support will be repaid in the future.

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CHAPTER I

INTRODUCTION AND PURPOSE

In 1976, it is estimated that corporations, firms and individuals in the United States will place more than $32 billion in advertising, most of which will go into media.[1] Yet, in spite of this huge expenditure, it appears most of the media plans and many media selection decisions by advertisers and advertising planners are made not on the basis of scientific planning but rather on intuitive or experiential evidence. While many media allocation or message frequency distribution models have been suggested, none have received broad industry acceptance.

Several media allocation models have been developed such as COMPASS, AD-ME-SIM and Simulmatics but all are dependent on some rather broad assumptions by the model builder and user for which empirical evidence is usually

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[1] Robert J. Coen, "Ad Dollar Gain in 1976 Biggest Ever," Advertising Age, July 5, 1976, pp. 1+.

lacking.[2] Because of the multiple marketing variables required by the media allocation models, no single method of media planning or selection has yet been proven effective.

Most information currently being gathered in advertising media research is in the measurement or estimation of the numerical size of the advertising audience. Stated as a raw number or often a percentage of the potential audience for an advertising message, this measure has been termed the "reach" or "cover" by the medium or if multiple media are used, the "total reach" or "cover" by the advertising message or schedule.[3]

Only the most basic formulas or guidelines have been developed to measure the number of times or "frequency" to which the audience is exposed to an advertising message. Even less knowledge is available in measuring the effects of repetitive exposures of the same message either through a single medium or multiple media. For the most part, present models and methodology are designed to measure the average frequency of exposures among the audience reached. Less effort has been devoted to determining the distribution of the message among the audience or the effects of multiple exposures although

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[2]Dennis Gensch, Advertising Planning (New York: American Elsevier, 1973), pp. 1-8.

[3]Ibid., pp. 12-27.

there have been some attempts.[4] In actual media planning, most frequency requirements for an advertising schedule are determined by estimates, experience, "rule-of-thumb" or a combination of all three.

The Problems of Media Planning

Media planning problems are much like those found in other areas of advertising planning or measurement. The task is to measure the effect of advertising on people. Unfortunately, tools sophisticated enough to accurately measure this sort of impact on humans have yet to be developed. But, there are other major problems also unique to the advertising media field.

As noted, most media measures have been developed to determine reach, or the total number of people who might see or hear an advertising message. This situation results from the fact that reach estimates are the basis for most advertising media rate charges. Thus, reach measurements have been the area of greatest commercial research concentration. Only in the last few years have advertising media buyers and sellers recognized the need for better measures of media duplication, which may create repetition and the importance of frequency distributions of advertising messages among their desired audiences. Yet, it appears that frequency and frequency

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[4] Ibid.

distribution measurement has the greatest potential for improving effectiveness and efficiency in advertising media planning and placement.

Media planning modelers have relied heavily on abstract theory and specially contrived examples to develop illustrations of their concepts.[5] In actual practice, mathematical formulae have been widely used in media planning schemes rather than empirical evidence. It has often been simpler and less expensive for the media researcher to construct ever more complex models of what is believed to be happening in advertising media reach and frequency than to investigate and verify the models in the marketplace. As a result, very sophisticated mathematical models have been developed but they have been based on very limited empirical evidence.

Media planners in actual practice have also tended to rely heavily on intuitive approaches to develop media schedules. As a result, for lack of an empirical base many media plans list rather vague objectives. For example, many times the needed reach and average frequency of a schedule is defined to fit a theoretical distributional slope without knowing whether or not that slope is proper in terms of effectiveness and efficiency. Further, some planners have found it safer to suggest an average frequency of say, three is needed in a schedule,

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[5]Ibid., overleaf.

than to suggest that the precise repetition of the message is not really known and it might well be that two or four or even seven exposures of the message are required to achieve maximum effectiveness of the message on the audience. At this point, the media planner, in an effort to support the recommended schedule, often falls back on experiential approaches which may or may not fit the situation in question.

Closely akin to the problem of the lack of empirical evidence on which to base media schedules is the fact that great difficulty is encountered in defining criteria or effect measures for advertising. Because so little is known about the effects of advertising messages and particularly the effect of repetitive message exposures, it is quite difficult to determine what should be measured. For example, is recall of an advertising message an accurate measure of advertising effectiveness? Or, should only sales results be counted as being effective advertising, or is there something in between? There has been little agreement in the advertising community about what should be measured. Not knowing what to measure has made it even more difficult for the media researcher to determine the effects of either reach or frequency in the construction of an ideal media schedule.[6]

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[6] Herbert Zeltner, "From Audience . . . to Attitude," Media/Scope, October, 1966, pp. 62-72.

Advertising, for the most part, still relies on very crude measurement tools. While the accepted disciplines of statistics and probability can be used to examine results, it is in the gathering of the data that advertising research is most suspect. Media planning, at this point, being primarily a mathematical exercise, relies heavily on the extension of numbers and figures which are sometimes gathered in crude ways. In many instances reliance is placed on recall or recognition of advertising messages although it seems highly improbable that any person would be able to fully recall all advertising messages to which they might have been exposed. The same problem exists in the gathering of even simple exposure data. The recent controversy between Target Group Index and Simmons was brought about through the wide variations obtained from studies supposedly measuring the same audience for various advertising vehicles.[7]

There is also a wide gulf between commercial and academic media research. Much commercial research is proprietary in nature. As a result, advertiser companies and their research organizations may have wider knowledge of media planning than has been made public. While this

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[7] Paul R. Winn and Thomas Neville, "The Search for a Good Measure of Magazine Readership: The TGI-Simmons Controversy," Journal of Advertising 5 (1976): 10-16.

problem of proprietary knowledge exists in the entire advertising field, it appears to be most significant in media planning.

An additional difference between academic and commercial research is that of applicability of academic research to marketplace problems faced by advertisers. Much academic research is being done in the area of mass communications and mass communication effects, but there appears to be a significant difference between that subject and advertising. For example, Krugman[8] and Robertson[9] have both suggested that there is a difference between advertising and other mass communication fields in terms of the involvement of the listener or viewer with the message. Typically, academic mass communication studies have concentrated on situations other than advertising so that they may not be applicable.

Finally, the general area of media planning has seemingly been neglected in the development of sophisticated approaches. While advertiser companies have made massive studies in logistics to provide better distribution of their products or thorough systems analyses of

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[8]Herbert E. Krugman, "The Impact of Television: Learning Without Involvement," Public Opinion Quarterly, Fall, 1965, pp. 349-56.

[9]Thomas S. Robertson, "Low-Commitment Consumer Behavior," Journal of Advertising Research 16 (April 1976): 19-24.

their production facilities to produce products in the most efficient manner, media planning, often involving sums as large as distribution and production budgets, goes through no such rigorous testing or analysis. Indeed, there appears to be no such methodology available even if it should be desired. While advertising media planning is one of the major tools available to the marketer, it appears to suffer from the lowest level of development of knowledge and empirical testing. With no solid basis to guide them advertising planners revert to what they know best when no evidence is available, intuition and experience.

The Study and Its Contributions

Presently, the most widely used measurement of advertising media, particularly in the broadcast field, is reach and frequency. While measures of reach have been steadily improved, frequency measurement has lagged far behind. Metheringham did much to bring frequency to the forefront in media planning with his reach and frequency calculation methodology in 1964. Those same basic tools are still industry standards today for most media.[10]

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[10] Richard A. Metheringham, "Measuring the Net Cumulative Coverage of a Print Campaign," Journal of Advertising Research 4 (December 1964): 23-28.

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In 1967, Broadbent and Segnit proposed a step beyond reach and frequency in the form of measurements of response functions. They defined response functions as

> a set of numbers defining the relative value to the advertiser of an individual in his target population receiving one, two . . . and so on advertising impressions.[11]

They suggested a more desirable way to measure the effect of advertising would be to assign values or response weights to the various frequencies which an individual in the target population might have an opportunity to see or hear an advertising message. Thus, by generating a frequency distribution of opportunities-to-see-or-hear an advertising message, alternative media schedules could then be evaluated on the basis of what they termed "effectiveness" rather than on strictly knowledge of reach and frequency and judgmental value of the importance of those two variables.[12]

There is great value in the measurement of response functions, particularly for the media planner. If a planner knew the distribution of advertising message frequencies of a proposed media schedule, much more accuracy could be gained in learning which and how many

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[11] S. R. Broadbent and S. Segnit, "Response Functions in Media Planning," in The Thomson Medals and Awards for Advertising Research Reports, Ten Years of Advertising Media Research 1962-1971 (London: The Thomson Organization, Ltd., 1972), pp. 187-238.

[12] Ibid.

persons were actually exposed to that message rather than just the average number. The knowledge of the shape of the response function distribution could be invaluable to media planners in developing an ideal schedule.

Similarly, if the value of an advertising message exposure could be determined, then the media planner could more closely define the exact media schedule desired. Waste, in the form of too many or too few exposures among the target population, could be minimized. Effectiveness of message exposure and efficiency of advertising media expenditures could be maximized with this analytical approach.

While Broadbent and Segnit suggested the use of response functions in 1967, the empirical estimation of their concept with any evidence has yet to be published. If estimation with empirical data could be accomplished, response functions could then become the practical media planning tool that Broadbent and Segnit envisioned. That empirical estimation is the main goal of this study.

One of the major difficulties in empirical estimation of the Broadbent and Segnit response function has been selection of the dependent variable used to measure the effect of advertising impressions. This study uses elements of the Lavidge and Steiner hierarchy of effects model[13] as criterion measures of the dependent variable or "cumulative response" measure in the Broadbent and Segnit conceptual scheme.

Lavidge and Steiner's model, first published in 1961, has been relatively well accepted in the commercial and academic fields as an accurate statement of the psychological changes or "steps" through which consumers move in response to advertising messages. The seven distinct steps in the Lavidge and Steiner model, moving from the cognitive or awareness stage to the conative or purchase stage, should serve as an adequate measure of the changes which occur as a result of advertising exposure. The Broadbent and Segnit impression measure will serve as the independent variable.

The general study methodology employed a pre-test questionnaire among respondents using the Lavidge and Steiner dependent variables in several product categories. A measurement period of one week followed with each respondent keeping an individual diary of media exposures. A post-test questionnaire was then administered to determine changes, if any, in the dependent variables being measured.

During the test week, advertising messages disseminated in the market through major media were

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[13] Robert J. Lavidge and Gary A. Steiner, "A Model for Predictive Measurements of Advertising Effectiveness," Journal of Marketing (October 1961): 59-62.

monitored. Using the respondent media diaries and monitored media information, exposures to advertising messages by individual were determined.

The major effect measured in the study was a respondent's change in the Lavidge and Steiner dependent variables based on the number of exposures to advertising messages for various products. Based on the media diaries, frequency distributions of advertising exposures by respondents were plotted. Using the method suggested by Broadbent and Segnit, theoretical frequency distributions were then calculated and plotted.

While frequency distributions can be described in several ways, in this study they are described by their graphical representation and shape. The curves constructed from empirical data were compared with those generated from theoretical frequency distributions for goodness of fit.

Limitations of the Study

The fact that the study was conducted with college students over a one-week period has created limitations. It should probably be considered the pilot for a longer and more complete study conducted among the general population. The generalizability of this work is limited by:

1. The sample base is college students who may or may not be representative of the general population.

2. The sample size for the study was small for some analytical purposes (N = 339).

3. The time frame of one week might not have been adequate for proper measurement of response functions, particularly in some product categories.

4. The possible decay factor in advertising was not addressed.

5. Not all advertising media were monitored, e.g., outdoor, signs, handbills, and word-of-mouth were deleted. This limitation may have been especially important in some product categories studied.

6. The diary method of reporting media exposure may not have accurately reflected respondent's true actions. This has been suggested in other media measurement studies.

7. Conflicting messages were not accounted for in the study. In the real world of competitive advertising, consumers are constantly bombarded with messages from competing products and competing media. While recognizing the situation, this study did not deal with this competitive situation.

8. Findings for individual product categories are probably not generalizable to other products, e.g., package goods and even individual brands of package goods may have different response functions from durable goods.

9. The poor state of the art in advertising effect research such as unidimensional measurement, measures of awareness, recall, preference, etc., limits the projectability of the findings to any other situation.

10. The creative aspect of the advertising message was not addressed. It was possible that the same message presented in a different manner might have generated different response functions from those found in this study.

In spite of the shortcomings of this study, the need for estimated through empirical testing of response functions is abundantly clear if for no other reason that the concept should be tested and either accepted or abandoned.

If response functions are not substantiated with empirical data, efforts should be made to develop other concepts more practical and usable. The need and demand for better media planning tools are clear. Media investment requirements by advertisers are much too great to continue to rely on the present inadequate planning tools.

Reach and frequency measurements are no longer sufficient evidence to support major advertising expenditures.

Response functions may offer a solution to the increasingly complex media problems which must be faced in the future. They appear to have great potential as input for media allocation models. Primarily though, they seem to offer the media planning step beyond present reach and frequency.

The Study Outline

The general outline of the study has been explained. A literature review and the hypothesis tested follows in Chapter II. In that review, relevant basic works in mass communication and advertising research are outlined, along with a brief explanation of the mathematical foundations of probability and theoretical frequency distributions.

Chapter III contains the details of the study itself including the sample selection, test instruments, timetable, response rates and discussion of the instruments used in gathering the information and the processing and analysis of the data.

Chapter IV contains the findings of the study along with the curves which were derived from the empirical and theoretical data. The summary and conclusions of the study are found in Chapter V, along with recommendations for extensions of this work and future research.

CHAPTER II

LITERATURE REVIEW AND HYPOTHESES

Introduction

Scholars and businessmen have sought empirical evidence on which to build advertising theory, but with little success. Part of the problem stems from the fact that with minor exceptions, most of the information which has been investigated and reported about advertising has been done with small field samples or through controlled laboratory experiments. Indeed, the primary empirical study on the effects of advertising on consumers is still based on the Bauer and Greyser work of 1968,[1] although media, messages and even the mores of the population have changed dramatically since that time.

While the research base for advertising is weak in many respects, there is solid material to support the approach taken in this study. Initially, investigation will center on the development of mass communication theory and its relationship to advertising. This will

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[1] Raymond A. Bauer and Stephen A. Greyser, *Advertising in America: The Consumer View* (Cambridge: Harvard Business School of Research, 1968).

be followed by a review of pertinent literature concerning possible major differences between more current mass communication studies and the research which has been conducted on advertising. A review of the basics of advertising media planning has been developed, followed by the mathematical basis for the study itself, the analysis of the data gathered for this report and concludes with the hypotheses which were tested.

Mass Communication Theory

Historically, mass communication theory has been suggested as being directly applicable to the field of advertising. While there was some substance for this connection in the past, such may not always be the case with more current studies. There are some elements of mass communication theory, however, which relate to the subject of advertising frequency effects. A review of pertinent studies and relevant information follows.

The Hypodermic Theory of Mass Communication

Early research on the effects of mass communication in the United States was conducted primarily in the field of advertising. Many of the concepts on which the field of mass communication were based was the direct result of the development of national magazines and widespread distribution of newspapers in the 1890-1910 period which made research studies possible. For the first time, researchers had an opportunity to study the varying effects of similar messages on large numbers of people.[2]

Drawing on the work of William James,[3] who approached psychology from the physiological standpoint, early researchers such as Harlow Gale[4] and Walter Dill Scott[5] conducted studies dealing with the effects of mass communication but employed the measurement of advertising as the basis for their work. While using crude methodology, initial conclusions by these researchers were that repetition of the advertising message was the key to successful communications. Indeed, Hess, writing in 1915, stated, " . . . constant repetition will finally win the mind."[6]

Prior to the development of radio and television communication, most writers continued to suggest that

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[2]Curtis Publishing Company, Selling Forces (Philadelphia: The Curtis Publishing Co., 1913).

[3]William James, Psychology (New York: Henry Holt & Co., 1892).

[4]Harlow Gale, Psychological Studies (Minneapolis: Harlow Gale, 1900).

[5]Walter Dill Scott, The Psychology of Advertising in Theory and Practice (Boston: Small, Maynard & Co., 1908).

[6]Herbert W. Hess, Productive Advertising (Philadelphia: J. B. Lippincott Co., 1915).

persuasive or informational advertising messages were heavily dependent on repetition for success.

It was from this research base in advertising that the field of mass communication investigation emerged. Using the concept of the "hypodermic or bullet" effect, early advertising and mass communication writers pictured the audience as relatively passive and defenseless. Communication through the mass media could shoot information into a target just as a syringe could physically inject something into the human body. With limited media available on which to base their studies, and apparent success with the concept, the idea was widely accepted although not tested rigorously.[7]

Development of the Mediated Effects Concept

The hypodermic or bullet theory of mass communication, so widely accepted by researchers, was supported in several instances by small-scale, laboratory experiments during the period after World War I. Acceptance of the concept reached its peak prior to and during World War II. The theory, however, began to be questioned seriously in the late 1940s and early 1950s. Star and Hughes in 1947 measured the effects of an attempt to

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[7]Wilbur Schramm, "Nature of Communications Between Humans," in The Process and Effects of Mass Communications, ed. Wilbur Schramm and Donald F. Roberts, 2nd ed. (Urbana, Ill.: University of Illinois Press, 1972), pp. 8-12.

persuade the citizens of Cincinnati, Ohio, to support the United Nations through a hypodermic mass communications approach. This program was a direct application of the hypodermic theory, and it failed miserably.[8]

However, there was still some doubt. For example, in 1949, Cortwright reported on a successful use of the hypodermic approach in a persuasion program using mass media to sell war bonds during World War II.[9] Evidence of failure of the hypodermic approach, however, soon began outnumbering successes. By the middle 1950s, Lazarfeld and his associates at Columbia University were attempting to test the concept of mediated effects of mass communications.[10] Further research and studies by

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[8]Shirley A. Star and Helen MacGill Hughes, "Report on an Educational Campaign: The Cincinnati Plan for the United Nations," American Journal of Sociology 55 (1950): 398+.

[9]Dorwin Cortwright, "Some Principles of Mass Persuasion: Selected Findings of Research on the Sale of U.S. War Bonds," in The Process and Effects of Mass Communication, ed. Wilbur Schramm and Donald F. Roberts, 2nd ed. (Urbana, Ill.: University of Illinois Press, 1972), pp. 426-47.

[10]Schramm, "Nature of Communications," pp. 8-12.

Sherif,[11] Hoveland et al.,[12] Schramm[13] and Broadbent.[14] All supported the new approach.

The mediated effects concept in contrast to the hypodermic approach simply meant that the receiver of a message was not a defenseless target when confronted with large amounts of information presented through the mass media. The individual could and did select what messages he wanted to hear and chose what he wished to take from each message that he received. Mediated effects also suggested that the individual in the audience reacted to the messages according to his own needs and desires. The consumer of mass communication messages could effectively block or filter messages which were of little or no interest to him.[15] Resultant studies in mass communications have effectively supported this position.

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[11]Carolyn W. Sherif, Musafer A. Sherif, and Roger E. Nebergall, Attitude and Attitude Change: The Social Judgment-Involvement Approach (Philadelphia: Saunders, 1965), pp. 164-73.

[12]E. T. Hoveland et al., The Order of Presentation in Persuasion (New Haven, Conn.: Yale University Press, 1957), p. 36.

[13]Wilbur Schramm, "How Communication Works," in The Process and Effects of Mass Communication (Urbana, Ill.: University of Illinois Press, 1954), pp. 3-26.

[14]D. E. Broadbent, Perception and Communication (London: The Paragon Press, 1958), Chapter 9.

[15]Schramm, "Nature of Communications," pp. 8-16.

As a result, most mass communication and mass media scholars support the concept of mediated effects.

There are problems in relating the mediated effects concept to the subject of advertising. While initial mass communication research in the early 1900s dealt with advertising messages, most present-day mass communication studies have dealt with other subjects of greater social concern, such as the use of drugs, influence of television viewing on children, television violence and political campaigns. Very few published mass communication studies have attempted to measure the effect of advertising messages, and almost none have been concerned with the effects of the frequency of advertising message dissemination or exposure. In spite of the lack of applicability, there has been a tendency to attempt to generalize mass communication studies to the area of advertising rather than conducting studies specifically related to the subject. There is serious question as to whether or not studies conducted in high interest areas of mass communication where the primary emphasis is on learning measurement truly fit the advertising situation. Although mass communication theory originally was based on advertising studies of repetition and the resultant effects, most current research has moved into areas far removed from advertising. As a result, the generalizability of mass communication studies to advertising may not be quite so direct as they once were. The high involvement of the viewer or listener, and the forced exposure methods of the experimental mass communication studies suggest these study methodologies may not be applicable in a competitive environment such as the marketplace. Krugman, Robertson, and others suggest they are not.

Why Advertising May Be Different

In 1976 Robertson suggested that

> . . . advertising has long needed new perspectives on communication effects. The prevailing "active audience" view, with its emphasis on selective processing and stepwise information processing, reflects only part of the total reality.[16]

Robertson, to a great extent, based his ideas on those developed by Krugman, who in 1965 suggested that television was a low-involvement communications medium, that the consumer responses to television advertising might take the form of passive learning while the individual was in a low-drive, relaxed state.[17] Krugman's concept generated revised thinking about the effects of message repetition in advertising media. The low involvement learning concept has led several researchers

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[16] Robertson, "Low-Commitment Consumer Behavior," p. 19.

[17] Krugman, "The Impact of Television," pp. 349-56.

to question whether mass communication studies requiring high involvement learning are applicable to advertising.

Originally, the active audience concept of advertising effects was developed by Bauer[18] and Klapper[19] in the early 1960s. They suggested that mass media advertising had limited powers although their concepts were derived from nonadvertising media research. The basic premise of the Bauer and Klapper approach was the fact that few people changed their mind over anything important because of exposure to mass communication messages. The receiver of an advertising message could "mediate" the effects and filter out or accept only what was wanted or desired.

The key to the Bauer and Klapper "active audience" concept, according to Robertson, is the word "important."[20] Based on Krugman's hypothesis that many advertising decisions are relatively unimportant and as such may not fit

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[18] R. A. Bauer and A. H. Bauer, "America, Mass Society and Mass Media," The Journal of Social Issues 16 (1960): 3-66.

[19] J. T. Klapper, The Effects of Mass Communication (New York: The Free Press, 1960).

[20] Robertson, "Low-Commitment Consumer Behavior," pp. 19-24.

the traditional patterns which have been discovered in mass communication research, the Bauer and Klapper theory becomes suspect.[21]

The previously discussed concept that advertising and traditional mass communication research are not interchangeable, and that the level of consumer involvement with the message is vital to effective media planning are central to this study. Because of this, Krugman's hypotheses of consumer involvement will be discussed in some detail for they relate directly to the importance of message exposure and frequency distribution as a key variable in the development of an advertising media plan.

Krugman developed his concept of low involvement learning by relating the work of Ebbinghaus in 1902 on the discovery of the U-curve for learning nonsensical and unimportant material,[22] Hoveland's report in 1957 on primacy and recency in persuasion and the importance of the need for understanding of the information by the person exposed,[23] and Zeilske's work in 1959 on the

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[21]Krugman, "The Impact of Television," pp. 346-56.

[22]H. Ebbinghaus, Grundzuge der Psychologie (Leipzeig, Germany: Veit, 1902).

[23]C. T. Hoveland et al., The Order of Presentation in Persuasion, p. 136.

remembering and forgetting of advertising messages.[24] The conclusion Krugman drew from these previous research studies was that learning of advertising messages might take place simply by viewing the television set even though the viewer was not greatly involved in the process. He hypothesized that in a low involvement situation such as television viewing, communication impact may be greatly different from that found in other communication situations. In previous studies, Krugman found that in high involvement situations perceptual defenses may be postponed while learning takes place, i.e., mediated effects. In the case of noninvolvement, however, the defenses may be completely absent. As a result, there may be low level learning which changes over time, which he suggested was the case with advertising.[25]

In 1966, taking the concept of low-involvement learning a step further, Krugman conducted laboratory experiments and found that involvement consisted of the number of "connections" which a person made with the message. In these studies, he found that magazines had a higher involvement than television viewing. Further, the study revealed that the conscious connections between

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[24] H. A. Zielske, "The Remembering and Forgetting of Advertising," Journal of Marketing (January 1959): 239-43.

[25] Krugman, "The Impact of Television," pp. 349-56.

stimulus and response were more important when directly related to experiences in the life of the respondent. Connections involving experiences were much stronger than those in which the respondent was asked to attach importance to the issues. Although the concept of high-involvement and low-involvement learning was supported by only three small laboratory experiments, Krugman's hypotheses were supported.[26]

In 1971, Krugman conducted a series of brain wave measurements on media involvement between print and television advertising. Based on these studies he concluded that the previous theory of learning from messages might not be as accurate an indication of the effect of advertising as the newer concept of learning from experience. He also found that while advertising messages may be of low involvement, learning does occur in some form even though the respondent may not be able to readily replay the advertising message after exposure.[27]

In 1975, Krugman investigated both magazine and television advertising response based on information gathered from syndicated sources over a number of years.

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[26]Herbert E. Krugman, "The Measurement of Advertising Involvement," The Public Opinion Quarterly, Winter, 1966-67, pp. 583-96.

[27]Herbert E. Krugman, "Brain Wave Measures of Media Involvement," Journal of Advertising Research 11 (February 1971): 3-9.

He found that only a small portion of the advertising in any issue of a magazine is fully perceived at any time. Using the same approach, he found only 12 percent of all television advertising message exposures could be recalled. Thus, although several of the product brands Krugman studied were successful in the marketplace, there was little evidence that advertising, as measured by the syndicated services, could be related to traditional recognition or recall testing approaches. He cited this as another example of the low-involvement by the consumer with advertising messages.[28]

In 1976, Robertson, basing his conclusions on the work of Krugman, Sawyer, Ray and others, stated he believed that the active audience advertising model had been projected far beyond appropriate levels based upon available evidence. He suggested that under conditions of high-commitment, the active audience may accurately reflect consumer behavior. But, under conditions of low-commitment, the consumer may well be in a passive state in terms of information seeking and may well learn more or get information based on trial rather than on acceptance of messages. Robertson's hypothesis not only supported Krugman's basic concept but he suggested extending it to all media as well. Robertson further

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[28]Herbert E. Krugman, "What Makes Advertising Effective?" Harvard Business Review, March-April, 1975, pp. 96-103.

suggested that exposure to an advertising message, under conditions of low commitment behavior, may be sufficient cause of effects even though not measurable by traditional advertising measurement techniques of recognition or recall. He argued that exposure to the advertising message may be the key variable under conditions of low commitment.[29]

The Case for Advertising Exposure and Frequency Measurement

By accepting the previously stated hypotheses of Krugman and Robertson of advertising effects in a low-commitment consumer behavior situation, knowledge of advertising exposure, frequency distributions and repetition effects become paramount in developing an effective media plan. A brief review of these subjects follows.

Advertisers have long recognized the value of repetition as an important ingredient in the overall effect of advertising media plans. However, the effect of various frequencies of message exposures has only recently been investigated.

The previously mentioned study by Zielske in 1959 found that advertising, unless continuously exposed, was

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[29] Robertson, "Low-Commitment Consumer Behavior," pp. 19-24.

forgotten.[30] If, however, Krugman, Robertson and others are correct in their hypotheses of low-involvement learning, then advertising may not actually be forgotten. The problem may be that correct measurement techniques have not been used to determine the actual effect of advertising messages.

One of the major problems in advertising research is that of measuring message effect over time. Ostheimer has suggested advertising exposures cannot be determined solely in terms of incremental effects but must also take into consideration the effect of a time dimension.[31]

Ray, Sawyer and Strong developed the concept of a repetition function which they defined as

> . . . the level, shape and slope of the relationship between repetitive consumer exposures to advertising and the effects of those exposures.[32]

They hypothesized that depending on the measure, the results of repetition of an advertising message may be positive, negative, or even nonexistent. In laboratory experiments, they found that in addition to the frequency effects, the results of advertising repetition was also

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[30]Zielske, "Remembering and Forgetting," pp. 239-43.

[31]R. H. Ostheimer, "Frequency Effects Over Time," Journal of Advertising Research 10 (February 1970): 19-22.

[32]M. L. Ray, A. G. Sawyer and E. C. Strong, "Frequency Effects Revisited," Journal of Advertising Research 11 (February 1971): 14-20.

dependent on marketing and product variables such as the product type, whether the product tested was a shopping or convenience good, whether color was used in the actual advertisement, the advertising campaign message, etc., to mention a few. While their laboratory tests supported the importance of frequency of exposure of the advertising message the large number of marketing variables in any individual advertising plan prevented them from being able to generalize from their studies.[33]

In 1972, Krugman developed the concept that three exposures to an advertising message might be enough for the advertiser to obtain maximum benefit. He was careful, however, to explain that the three exposures which he suggested were not exposures in the traditional advertising measurement sense. He defined his exposures as messages that got through to the consumer and created one of the responses listed below. Taken literally, Krugman's exposures could be defined generally as response functions. The three exposure concept as Krugman defined it was:

First Exposure:	A "What is it?" type of cognitive response.
Second Exposure:	A "What of it?" or evaluation response.

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[33] Ibid.

Third Exposure: A reminder to buy if not already bought and a beginning of disengagement and withdrawal of attention.[34]

In this approach, Krugman suggested that the consumer might experience what he termed the "First Exposure" at any time the advertising message is exposed. The "Second Exposure" may occur at any time later, even months afterwards, and the "Third Exposure" again at any time after the second, no matter what the time frame.[35]

In 1975, using the "Three Exposure" idea, Krugman suggested that the key to an effective media plan was the frequency distribution of the exposure of the advertising message. Relating actual advertising schedules to this concept, he hypothesized that in any media schedule, part of the frequency distribution is inadequate, because it does not create his previously defined "First Exposure." By the same token, excessive exposures are wasteful because the audience has already reached the "Third Exposure" stage and started to disengage from the message and lose attention. Krugman suggests that by knowing the frequency distribution of the advertising exposure pattern advertisers could maximize their media

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[34]Herbert E. Krugman, "Why Three Exposures May Be Enough," Journal of Advertising Research 12 (December 1972): 11+.

[35]Ibid.

plan by concentrating efforts to reach the "Second Exposure" where he believed the sale results.[36]

Robertson suggested that exposure to an advertising message may be correlated with message impact in a low commitment situation such as advertising. If this is the case, the key variable is exposure to the message in the traditional sense and not as Krugman has used it. In these situations, Robertson suggested that maximum exposure to the advertising message might well be the relevant objective of the media plan rather than the ability of the audience to recall the actual message.[37]

The need for a measurement technique such as the advertising response function appears clear for sound media planning. Unfortunately, techniques in the field of advertising media measurement are not nearly as advanced as are needed for the type of study which has been undertaken. Several problems were encountered when attempting to calculate advertising message exposure and frequency which the preceding review indicated are necessary. A review of current advertising media measurement, evaluation and planning techniques follows.

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[36]Krugman, "What Makes Advertising Effective?," pp. 96-103.

[37]Robertson, "Low-Commitment Consumer Behavior," pp. 19-24.

Advertising Media Measurement and Evaluation Theory and Practice

Most advertising media planning and evaluation techniques are based on general estimates of net reach, through the duplication formula developed by Agostini[38] in 1961 and the net coverage formula developed by Metheringham in 1964.[39] Metheringham developed an alternative formula to Agostini, using the concept of reach and frequency, originally for print but which has since been extended to broadcast advertising.

Most advertising planning and evaluation methodologies in use in industry today are based on these two procedures, with Metheringham being the most widely accepted. While several changes, revisions, and modifications of the original Metheringham formula have been suggested, it still ranks as the most widely used tool for evaluating alternative advertising media plans and schedules.

The second major theoretical work used as a basis for advertising evaluation is the hierarchy of effects model developed by Lavidge and Steiner in 1961. Suggested as a model for predictive measurements of

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[38] J. M. Agostini, "How to Estimate Unduplicated Audiences," Journal of Advertising Research 1 (March 1961): 11-14.

[39] Metheringham, "Measuring the Net Cumulative Coverage," pp. 23-28.

advertising effectiveness, it represents one of the more lasting advertising effect theories. In addition, the model offers a measurement of levels of response to advertising messages.[40]

The combined work of Agostini, Metheringham, Lavidge and Steiner, and Broadbent and Segnit is the foundation for this study. A brief description of each of these major concepts follows along with a description of how each will be used to estimate empirically the Broadbent and Segnit response function.

Agostini's Duplication Constant

One of the major hurdles in determining reach and frequency of an advertising schedule was the computation of duplication of readers among the media involved. The addition of the total circulation figures of a series of publications provides only the gross audience for a media schedule. Obviously, there were many readers who might be exposed to several magazines on an advertising schedule. Repeated exposure to the advertising message thus creates frequency. The question of importance to advertisers, however, was not of frequency but of net reach, i.e., the total unduplicated audience for an advertising message. Only by knowing the net reach of

[40]Lavidge and Steiner, "A Model for Predictive Measurements," pp. 59-62.

a media schedule could advertisers calculate an accurate cost-per-thousand, the primary media measurement tool of that time.[41]

Prior to the publication of Agostini's formula, audience duplication was usually done through massive calculations of pair-wise duplications of all media involved. For example, duplications among fifteen magazines taken two by two for all possible combinations resulted in 32,767 possible combinations with an equal number of calculations.[42]

Agostini suggested the construction of a series of square tables of two by two duplications and a constant which he termed K. The use of the Agostini formula offered a shortcut method of estimating unduplicated audiences. Although later research proved that K was not a constant in all cases, Agostini is credited with the first major published formula to attempt to solve the important problem of duplication estimation and calculation of net reach which is central to any media planning or evaluation model including response functions. The general formula Agostini developed was:

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[41] Agostini, "How to Estimate Unduplicated Audiences," pp. 11-14.

[42] Ibid.

$$C_n = \frac{(\Sigma A)^2}{\underset{n}{\Sigma} A + K\Sigma D}$$

where:

C_n = net coverage of a combination of n papers.

ΣA = gross coverage or the sum of the n audiences.

${}^{n}D$ = the total of the two by two duplicated audiences.

K = constant which represents the value of the section of the curve when the duplication between papers is divided by the sum of the audiences of the papers and the unduplicated audience of the same combination is divided by the sum of audiences of the papers and plotted on a graph (called Agostini's "magic" constant).[43]

While Agostini's constant K has been questioned since its inception and often called not a constant but a variable by such researchers as Hoffmans[44] and Claycamp

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[43]Ibid.

[44]Pierre Hoffmans, "Measuring the Cumulative Net Coverage of Any Combination of Media," Journal of Marketing Research 3 (August 1966): 269-78.

and McClelland,[45] there is general agreement that the empirical formula developed had a sound analytical base.

Thus, Agostini formalized the concept of reach and provided the formulation necessary to bring it into widespread practice in media planning.

Metheringham's Net Cumulative Coverage Formula

With Agostini's formula for simplified determination of duplication among publications established, Metheringham in 1964 proposed an alternative formula and developed a method of measuring the net cumulative coverage of a print schedule from the duplicated audiences of pairs of publications and pairs of issues.[46] Metheringham went far beyond Agostini's duplication formula by developing a method of estimating the net coverage and frequency distribution of a print schedule while making allowances for the cumulative effect of more than one insertion in any publication. Metheringham's suggestion that it was important to know the frequency distribution of the advertising exposures of a media schedule was an important step in advancing the field of media planning. He hypothesized that some frequency patterns should be

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[45] H. J. Claycamp and C. W. McClelland, "Estimating Reach and the Magic of K," Journal of Advertising Research 8 (June 1968): 44-51.

[46] Metheringham, "Measuring the Net Cumulative Coverage," pp. 23-28.

better than others in terms of the advertising strategy, an idea which is now widely accepted.[47]

Metheringham suggested that the simplest method of estimating net coverage of single insertions in a number of publications was first, the calculation of the "cover" or proportion of the relevant population reading the ith publication. This figure, subtracted from 1 generates what he terms the "non-cover" of the ith publication. The same steps are taken for all publications on the schedule and the non-cover summed. This figure is then divided by the number of publications taken r at a time. The actual formula is:

P_i = "cover" of the proportion of the relevant population reading the ith publication, where i = 1, 2, . . . n publications.

$q_i = 1 - p_i$ or "noncover"

$k_1 = \frac{\Sigma q_i}{n}$ or accumulated average noncoverage

$k_2 = \frac{\Sigma q_{ij}}{\binom{n}{2}}$ or accumulated pairwise noncoverage

$$s = \frac{k_1^2 - k_1 k_2}{k_2 - k_1^2}$$

[47]Ibid.

$$t = \frac{s}{k_1}$$

$$k_n = \frac{s\ (s + 1)\ (s + 2)\ .\ .\ .\ (s + n - 1)}{t\ (t + 1)\ (t + 2)\ .\ .\ .\ (t + n - 1)}$$

Net coverage = $1 - k_n$.[48]

By assuming that duplication within publications is approximately the same as the duplication between publications, Metheringham was able to generate net coverage estimates for multiple insertions in publications using the same general formula.[49]

Metheringham took the calculations a step further and estimated the frequency distribution of the schedule using the same basic formula, e.g., given the first two terms in the sequence, then all the subsequent terms could be calculated. While Metheringham's examples were developed only for print media, he suggested the same approach would probably apply to broadcast.[50]

Metheringham stated:

> . . . research shows that the proportion reading any issue is about constant over a short period. Research also shows that the proportion reading any two issues is constant.[51]

From this, Metheringham makes the assumption that the same would be true for broadcast media although

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[48]Ibid. [49]Ibid.

[50]Ibid. [51]Ibid.

limited empirical evidence based on Politz studies[52] was given in his original article. Many replications of Metheringham's formula have shown that it provides a fairly accurate estimate for both print and broadcast schedules, with some exceptions. The formula which Metheringham developed is now the standard calculation used in most media allocation and evaluation models.[53]

Based on Agostini and Metheringham's work, the presently used working formula in media planning is

Gross Exposures = Net Reach x Average Frequency

where Gross Exposures are defined in the same manner as Agostini's duplicated audience, Metheringham's gross cover and Broadbent and Segnit's impressions. Net reach equals Agostini's unduplicated audience and Metheringham's net cover. By knowing the total number of exposures through rating or circulation studies of the medium and the approximate reach, the average frequency can then be calculated.[54]

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[52] Alfred Politz Research, Inc., "A Study of Four Media--Their Accumulative and Repeat Audiences" (New York: Time, Inc., 1953).

[53] Metheringham, "Measuring the Net Cumulative Coverage," pp. 23-28.

[54] Ibid.

The increased availability of computers and new mathematical concepts have resulted in several new media allocation and message frequency distribution models being developed or suggested. These models have become increasingly important as more is learned about the effects of repetition of advertising messages and possible optimal levels of exposure frequencies. Much recent activity in media research has revolved around the use of probabilistic methods which provide the complete frequency distribution of audience exposures by fitting theoretical distributions to actual audience data covering a limited number of media issues. From this material, a theoretical distribution is developed to predict audience exposure to schedules using a larger number of issues. Many of these new media frequency estimation approaches are the result of Friedman's "TV proneness theory" where he suggested the use of the gamma or negative binomial density function to approximate the Poisson distribution to estimate the reach and frequency of television schedules.[55]

Other attempts have been made to define the complete frequency distribution of a media schedule. Gensch[56]

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[55]Lawrence Friedman, "Calculating TV Reach and Frequency," Journal of Advertising Research 11 (August 1971): 21-25.

[56]D. H. Gensch, "A Computer Simulation Model for Selecting Advertising Schedules," Journal of Marketing Research 6 (May 1969): 203-14.

and Metheringham[57] have both suggested initially estimating the individual exposure probability and the use of either the binomial distribution or Monte Carlo simulation.

Leibman and Lee[58] and Krugman[59] have recommended the use of a compound distribution, the Beta-binomial as a probabilistic method where the Beta distribution is used to model the probability of exposures to advertisements across viewing units and then the binomial used to develop the proportion of the audience in each frequency class.

In 1975, Headen, Klompmaker and Teel tested both the Beta-binomial and the Negative-binomial distribution empirically against spot television audience exposure patterns and found the Beta-binomial superior.[60] Later, using the Beta-binomial, they found radio audience

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[57]Richard A. Metheringham, Measuring the Audience of Magazines (New York: American Market Research Bureau, 1972).

[58]L. Liebman and F. Lee, "Reach and Frequency Estimating Services," Journal of Advertising Research 14 (August 1974): 23-25.

[59]Krugman, "What Makes Advertising Effective?," pp. 96-103.

[60]R. A. Headen, J. E. Klompmaker, and J. E. Teel, Jr., "An Empirical Examination of Spot TV Audience Exposure Patterns" (unpublished Manuscript, University of North Carolina at Chapel Hill, June 12, 1975).

exposures could be fairly accurately described when compared to empirical data.[61] The Beta-binomial approach is being applied to reach and frequency analysis of syndicated data also and several companies are now marketing these services using canned algorithms.

Zinn has recommended the use of the combination Hyper-Beta distribution which he developed.[62] J. Walter Thompson Company has suggested their model, "The Concept of Effective Reach" which combines frequency distribution analysis with marginal incremental analysis of the media expenditures to maximize the media plan.[63] Several other models and plans have been suggested but have not met with widespread acceptance or use.

While new approaches and concepts are being developed continuously, the use of the Metheringham formula for calculating reach, frequency and distribution is still the most popular and widespread tool available to most media planners. Metheringham is quite practical

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[61]Robert A. Headen, Jay E. Klompmaker, and Jesse E. Teel, Jr., "Increasing the Information Content of Reach and Frequency Estimates" (A Working Paper, University of North Carolina at Chapel Hill, undated).

[62]Michael Zinn, "New Techniques in Computing Reach Frequency Distributions and Optimal Schedules," paper read to 1976 Fall Advertising Research Foundation Conference, New York, November 1976.

[63]J. Walter Thompson Company, "The Concept of Effective Reach" (New York: J. Walter Thompson Company, 1973).

for calculating net reach, with some minor questions arising about the assumption of between and within media duplication but the formula appears to give a reasonably accurate picture of both the reach and frequency which a media planner might achieve with a proposed schedule.[64] Unfortunately, however, Metheringham's approach says nothing about the value of the frequency in the formula, leaving that to the judgment of the planner. No evidence is presented as to whether an average frequency of 1.75 or 4.65 is the most effective for a particular media plan. It is here that the concepts of response functions developed by Broadbent and Segnit become increasingly important in the extension of media planning knowledge.[65]

Broadbent and Segnit Formalize Response Functions

Advertising response functions have probably been present conceptually since advertisers and media first began to attempt to measure advertising effectiveness. While perhaps not called response functions, the idea behind the measure of the value of advertising impressions on an individual for an advertised product has been the goal of much advertising measurement

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[64]Metheringham, "Measuring the Net Cumulative Coverage," pp. 23-28.

[65]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

methodology. Although the response function concept is not new, the formalization of terminology on which there has been agreement has occurred in only the past twenty or so years.

The Thompson Organization, in their media paper competition for 1966, defined the topic in advertising as "The theoretical and practical problems and effects of introducing explicit theories or response functions into media planning."[66] This was an attempt to bring some order out of the use and misuse of the term "response function" and to formalize the theory base which existed in the media field relating to response functions. From that competition came the paper by Broadbent and Segnit, "Response Functions in Media Planning," which now forms the basis for this study.[67]

In the Thompson competition problem statement, the definition given was

> A response function is defined by the values which are attributed to successive impacts upon each member of an advertising audience. Different

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[66] Thompson Medals and Awards for Advertising Research Reports, <u>Ten Years of Advertising Media Research 1962-1971</u> (London: The Thompson Organization, Ltd., 1972), p. 187.

[67] Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

> approaches to the response function may, or may not, involve consideration of timing and intermedia relationships.[68]

It is within this framework that the Broadbent and Segnit concept was developed.

The Definition

The definition of a response function, as developed by Broadbent and Segnit, which will be used throughout this study is:

> . . . a set of numbers defining the relative value to the advertiser of an individual in his target population receiving one, two . . . and so on advertising impressions.[69]

Using this definition, Broadbent and Segnit attempted to move beyond reach and frequency as a basis for evaluating alternative media schedules and to offer a technique with much more preciseness and capability than that previously available.[70]

NOTE: In the Broadbent and Segnit definition, the term "impression" is used. For their proposal, impressions are defined as opportunities-to-see an

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[68] Thompson Medals and Awards for Advertising Research Reports, Ten Years of Advertising Media Research, p. 187.

[69] Broadbent and Segnit, "Response Functions in Media Planning," p. 190.

[70] Ibid., pp. 187-238.

advertising message.[71] In reality, there is probably some difference between an exposure, an opportunity-to-see and an impression by an advertising message. In industry, the terms are often used synonymously although not always correctly. In order to prevent misunderstanding, it should be noted that references to Broadbent and Segnit's work will use their term "impression," while the actual field work and reporting procedure used in this project are truly opportunities-to-see-or-hear or potential exposures to advertising messages. The problem is confounding but should not cause undue difficulty if it is understood that for practical purposes, the differences between the terms used by Broadbent and Segnit and the author are considered to be interchangeable in this project with the addition of the possible hearing of messages through the radio medium.

Why Frequencies?

While both reach and frequency are important in a media schedule, reach has been widely explored by media researchers while frequency remains something of a mystery.

Broadbent and Segnit approach the measure of frequency not on the basis of averages, which was the basis for the Metheringham calculation, but on the basis

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[71]Ibid., p. 194.

of the distribution. They argued that the way in which the opportunities-to-see-or-hear an advertising message were distributed over the audience was of more importance than the average number of messages received, which represented only the mean of the exposures. For example, it is more important for an advertiser to know how much of the population received two, three, four and so on exposures than simply that the average person received a certain number. This derived frequency distribution was held to be the key to the entire subject of media schedule evaluation.[72]

Assigning Response Weights

Broadbent and Segnit suggested the assignment of response weights to the various frequencies of exposure. While their work was entirely hypothetical, it seems reasonable to assume that differing numbers of exposures to an advertising message would have differing values.[73]

In order to illustrate their point, they arbitrarily assigned values to frequencies in their illustration and assumed that the value of the opportunity-to-see a message is dependent on the frequency. For example, they illustrate the point by assigning a value

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[72] Ibid.

[73] Ibid., p. 190.

of fifty to the first impression, seventy-five to the second impression, ninety to the third, one hundred to the fourth, and one hundred to each succeeding opportunity-to-see an advertising message. While intuitively appealing, they did not develop specific information to support this concept, although they did illustrate it with some historical data.[74]

The Effectiveness Figure

In order to illustrate their concept, Broadbent and Segnit developed a procedure for media schedule evaluation. They calculated a term which they call "effectiveness" or "E." This was done by multiplying the frequency distribution of opportunities-to-see by the assigned response weight. This calculation developed one central mean score for each schedule. By the calculating the "effectiveness" of various media schedules they could then be compared and the one with the greater "E" judged best.[75]

To calculate response functions, Broadbent and Segnit take the opportunities-to-see only as whole numbers with no fractional values. Thus, their response functions are sets of numbers, not continuous functions although they are represented as continuous for graphing purposes.[76]

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[74] Ibid.

[75] Ibid.

[76] Ibid., p. 191.

Cumulative Versus Additional Response Functions

The definition given for a response function by Broadbent and Segnit is for cumulative response or "the value of r exposures." Additional response functions could as easily be calculated, although Broadbent and Segnit believe they would not be as meaningful. Additional response functions are defined as "the added value given by each separate additional impression," or "the value of the r-th exposure. It is the difference between each individual term in the cumulative response function."[77] It is important to note the difference here, since Broadbent and Segnit build their geometric functions around cumulative response and not additional. It is the value of the individual exposure, not the increase, which is central to their theme.

Standardization

Since maximum exposure is normally considered 100 percent, Broadbent and Segnit have used the same base. This gives the advantage that each response is represented as a percentage of the maximum value obtainable. They consider this approach to be much better than arbitrarily taking the value of the first impression as one. It offers the further convenience of standardization of the response function at any point

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[77]Ibid.

of departure simply by adding or subtracting a constant from each term of the response function and multiplying each term by a constant.[78]

The problem of a cumulative response function which may theoretically occur without limit is overcome by taking the maximum possible exposures which cannot be exceeded and terming it one hundred. Broadbent and Segnit's standardization procedure has a number of other benefits in the quantification procedure of the response function.[79]

Problems in Broadbent and Segnit's Response Function Measure

Broadbent and Segnit recognize several problems which are inherent in the measurement of response functions. They are mentioned because they were major concerns when the work was done in 1967. In some instances, these problems have been overcome with time but others have not. Some of the problems Broadbent and Segnit defined are those which this empirical estimation attempts to answer.

Broadbent and Segnit defined the problems they saw in using response functions as follows. (Where appropriate, notation is made of information developed

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[78] Ibid.

[79] Ibid.

since their initial paper. In addition specific problems which this study addresses are also discussed.)

Value. The value of the response function depends on the objectives of the advertising campaign and the individual products involved. The primary question as Broadbent and Segnit saw it revolved around whether the importance of evaluation be placed on the derived shape of the impression distribution or the achievement of the advertising objectives.[80]

The value question posed is not necessarily significant in this study. The purpose of this study is to estimate empirically the underlying concepts of response functions and not to measure preset advertising goals.

Conflicting Objectives. Many advertising campaigns have different goals. In some, the objectives may be short-term such as immediate sales while in others, improved product image may be more important. In measuring response functions, it would appear that each advertising campaign might have individual objectives and thus lead to problems if projection of generalized response function values were attempted.[81]

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[80]Ibid., p. 192.

[81]Ibid., p. 193.

Since this study attempts to estimate empirically the underlying concepts of response functions, conflicting objectives present no major problem in operationalizing the data.

Individual Responses. Broadbent and Segnit cite as one of the major problems of their concept the measuring of individuals and their response functions to specific advertising campaigns. For example, if women are the target market, the response of men is less important to the response function calculation. The same is true for demographic variables. One of the primary problems cited is the difficulty in determining the value of each media exposure to each individual. The problem compounds when these values are totaled to develop one single response function.[82]

In most instances the design of this study does not overcome these inherent individual response problems. Although the study was conducted with individuals, the problem of individual response as defined by the media planner were not addressed. Individual responses were measured in the study, but because the goal of the study was somewhat different, the major measurement problems for individuals as Broadbent and Segnit suggest have not been specifically addressed.

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[82]Ibid., pp. 194-95.

Impressions. There was and still is no standard agreement on what an "advertising impression" is. This was recognized in the original work by Broadbent and Segnit and still exists today. As previously noted, the terms "impression," "exposure," and "opportunity-to-see" are often used interchangeably and often incorrectly. Broadbent and Segnit use the term "impression" as an opportunity-to-see throughout their work.[83] While it may create minor inaccuracies to do so, that terminology was taken to mean the same as advertising exposure or opportunities-to-see-or-hear throughout this study.

Impression Distribution. Broadbent and Segnit admit that an available methodology for determining advertising impressions or exposure distributions is inherent in their concept, yet they admit they had no such instrument at hand. As a result, all their calculations are, at best, approximate and, being conceptual in nature, go no further than to illustrate their points.[84]

To empirically estimate the Broadbent and Segnit response function, this study utilized a method of measuring advertising impression or opportunity-to-see-or-hear distributions. This approach removed one of the major obstacles Broadbent and Segnit faced in empirically estimating their idea.

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[83]Ibid., p. 194.

[84]Ibid., pp. 194-95.

Time Effects. No attempt has been made to deal with the effects of time in the Broadbent and Segnit response function. While they suggest there are inherent problems in the remembering and forgetting of advertising messages over time, no solution was offered.[85]

The empirical estimation of the Broadbent and Segnit model which this study attempted does not offer a solution to this problem either, although it is recognized as a major one. Solid foundations in the area of time decay of advertising messages are still lacking.

Who Are the Heavily Exposed? A major problem in measuring any frequency distribution is to evaluate the differences between those individuals who are heavily exposed to media messages and those who are lightly exposed. Conceptually, Broadbent and Segnit recognize this as a problem but do not attempt to deal with it.[86]

Much of the exposure problem is minimized in the study which has been conducted. Each individual has been quantified in terms of individual exposure patterns. This approach overcomes one of the major problems Broadbent and Segnit envisioned in their concept.

The Effect of Advertising. Another problem Broadbent and Segnit suggested was the effect of advertising

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[85]Ibid., p. 195.

[86]Ibid.

in the total marketing effort. While it has been recognized that advertising is only one ingredient in the marketing mix of a product or service, the exact estimation of that measure is difficult to make. Thus, the measurement of response functions in and of themselves may suggest that only impressions to advertising are being measured and not the effects of those advertising messages.[87]

This same measurement problem exists in the empirical estimation of response functions attempted in this study. The value of advertising exposures are difficult to separate from the overall selling effort of the brand or product in the marketplace. The study which follows falls heir to the same problem, although more direct measurement of advertising effects than Broadbent and Segnit thought possible are used.

Qualitative Media Weights. A major factor in measuring response functions is the differing value of an exposure from the various media, e.g., is a newspaper exposure more valuable than one on television, or is radio more effective than magazines, etc. Broadbent and Segnit offer no concrete solution but suggest the response function may well be a dosage model of advertising.[88]

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[87] Ibid., pp. 195-96.

[88] Ibid., p. 196.

This study was designed primarily to measure all media with emphasis on radio. The answer to the question of qualitative media weight is not addressed in this study since cumulative responses and advertising impressions were aggregated for purposes of analysis.

Forecasting. Broadbent and Segnit suggest that forecasting is not possible with response functions. The primary value of this tool is believed to be the more accurate choice among media alternatives.[89]

The lack of forecasting capability is true in the study which was conducted. Because the measurement was for a past point in time, the results are not projectible. It may be, however, that media measurement was made in a more precise manner than has been done before which may one day make forecasting possible.

The Advantages of Response Functions

While the problems of response functions loom large, they are inherent in any media evaluation procedure. Broadbent and Segnit suggested four major advantages to the use of response functions for media schedule evaluation. They were:

Alternative to Tradition. Whether response functions are used or not, most of the problems previously

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[89]Ibid.

cited are still present in media planning. Broadbent and Segnit's suggestion of the use of the response function does not solve all the media evaluation problems but overcomes many of them. This is particularly true when the decisions revolve about better measurements of frequency distributions and effectiveness of alternative media schedules. Response functions also help avoid such time-honored approaches to media evaluation as judgment and intuition.[90]

Unification. Broadbent and Segnit suggest that the use of response functions might bring about more unification to media planning so that all members of the advertising team are dealing with one common topic, response functions, rather than the mass of media terminology which has often been used. Further, by defining response functions precisely and being able to graphically represent the frequency distribution, the advantages of one schedule over the other should be readily apparent to all involved in the media decision. Response functions are considered a major step forward in media schedule evaluation. Certainly, if the response function can be estimated empirically, then the use of simple reach and average frequency measures should give

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[90]Ibid., p. 197.

way to more sophisticated media evaluation alternatives for the media planner.[91]

A Tool Not a Model. Broadbent and Segnit are careful to point out that their approach suggests the response function be used as a tool for media planning and not a model. They base this on the fact that all data and illustrations used in their concept are purely hypothetical.[92] The study which follows is the first known empirical estimation of their approach.

Sensitivity Evaluation. Broadbent and Segnit suggest that only through use and empirical estimation can the effect of response functions be measured. The shape of the response function may be influenced by several factors but only through actual use of response functions in real world practice can the shape be determined. They question whether differing response functions would occur thus making different media decisions apparent had they not been used.[93] Empirical estimation is one method of finding answers to this question.

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[91] Ibid.

[92] Ibid., p. 198.

[93] Ibid.

Theoretical Shapes--The Basis for Analysis

The basis for the Broadbent and Segnit approach is the use of theoretical frequency distributions to describe response functions. They suggest it is possible to use raw numerical response functions and to avoid mathematical or theoretical functions although this may often result in major inaccuracies. In their opinion, the understanding of the meaning of differing theoretical shapes when discussing response functions is vital. They believe only by being able to evaluate the various shapes can the value of response functions in media planning be maximized.[94]

In addition, through the use of a theoretical review, families of functions may be identified since each member of the family is specified by a number or parameter. General rules may even be possible with this approach and statements of the ranges of response functions may emerge. They believe that through this theoretical approach, it may be possible to make precise what might otherwise be too vague for use in media evaluation practice.[95]

In order to reduce the number of possible response function shapes, Broadbent and Segnit suggest the use of

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[94]Ibid., p. 198. [95]Ibid.

transformations. They do not concern themselves with differences in:

> The starting point, e.g., whether a function rises from a value of 0 or 20 for a person who has received no impressions.
>
> The range of values taken, e.g., whether a function takes values in the range 0 to 100 or 20 to 70.[96]

Through these transformations, they contend that similar decisions would be made regardless of the scale used and that the response function measured would not be truly different. This is a convenient way of relating varying measurements since it is the shape of the response function plotted which is important and not the measurement scale. Through the use of this approach, Broadbent and Segnit are certain to obtain similar results no matter what scale is used.[97]

Linear Response. A linear response is defined as "a straight line through the origin, reaching 100 at some number of impressions beyond the largest number our schedule could produce."[98] In these linear cases, the slope of the lines does not matter since they are equivalent. Nor does it matter whether straight lines start from values other than 0 for they are also equivalent.[99]

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[96]Ibid., p. 199.

[97]Ibid., pp. 199, 223.

[98]Ibid., p. 200.

[99]Ibid.

Broadbent and Segnit suggest:

> A useful form of this RF takes the value s at s impressions (s = 0, 1, 2 . . .). When this is the case, effectiveness, or E, is simply the average number of impressions on the target population.[100]

While other slopes may provide other values for effectiveness they are completely equivalent when used to select the best media schedule.[101]

The Step Function Response. The step function is described simply by the fact that the value of response is 0 for zero, one, two . . . impressions up to some critical number. At that point, the value of the response leaps to one hundred and stays at that value for all additional impressions. For example, up until the fourth exposure is reached, no response takes place. At the fourth exposure, however, complete response occurs and continues at that level with each additional exposure.[102]

Variance. While variance as a response function is not generally used, Broadbent and Segnit include it as a response function for statistical convenience. It is usually the variance which best describes the spread or scatter of a distribution. Since primary interest is in the shape of the distribution, rather than in the absolute values, this function is extremely important.[103]

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[100]Ibid.

[101]Ibid.

[102]Ibid., p. 201.

[103]Ibid., p. 202.

In response functions, impressions nearer the mean are usually considered more important than ones on the higher end of the distribution. It is more valuable in response functions to move an individual from zero to one exposure than it is to move an individual down from nine exposures to eight.[104]

The S-Shaped Response Function. Although the S-shape distribution is often suggested as the most obvious shape for response functions, Broadbent and Segnit disagree. They suggest most arguments favoring the S-shaped curve are based on intuition or the impression that the shape would lead to a low-variance impression distribution if used to develop or choose a media schedule.[105]

They reject the intuitive approach, citing Wasson's statement that

> The choice of the sigmoid curve . . . seems to be many a mathematician's assumption of the nature of advertising response, but it is never validated. Usually it is asserted as the "curve of learning" in spite of the fact that experimental psychologists have been unable to find such a typical curve.[106]

Broadbent and Segnit also argue that the S-curve does not necessarily provide a desirable impression distribution for an advertising schedule. The mean number

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[104]Ibid. [105]Ibid., pp. 202-03.

[106]C. R. Wasson, "Real Models in Advertising or Phoney Games?," Journal of Marketing (April 1963).

of impressions in a media schedule is not fixed. Different schedules at the same budget level can produce different impression means. Because one individual is moved up from a small number of impressions to a larger one does not necessarily mean that a person with a large number of impressions is necessarily moved down the same amount in the overall distribution.[107]

Broadbent and Segnit further suggest that the frequency distribution which results in an S-shaped curve does not necessarily lead to the proper evaluation of the variance. They state:

> There is unfortunately no logical connection between a reduction in spread being thought beneficial and the S-shape. Just because we "want people to receive four impacts" say, there is no need to make the additional response at four higher than at two or three. It is only necessary that the cumulative response be higher at four.[108]

They offer mathematical proof that any convex response function has the capability of being credited with higher effectiveness if the schedule has the same mean but lower variance. To quote:

> If the gain in moving people up at the lower end of the impression distribution is intended to be more than the loss of moving them down at the upper end, then we require only that the additional response should be greater at the lower end.[109]

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[107] Broadbent and Segnit, "Response Functions in Media Planning," p. 204.

[108] Ibid.

[109] Ibid., p. 205.

It is only in the convex portion that the S-shaped function achieves the desired result. If the majority of impressions were located in the concave part, larger variance would indicate higher effectiveness which is just the opposite of what is desired in a media plan. In addition, if the mean of the impression distribution is exactly at the point of inflection indicating a symmetrical function, the moving of one individual from the right of the distribution toward the mean, and another from the left toward the mean would result in no change in effectiveness.[110]

Convex Functions. As previously stated, Broadbent and Segnit suggest any convex function benefits concentration of the impression distribution. Moving an individual up the lower part of a response function generates greater benefit to the advertiser than moving an individual down an equivalent amount from the upper part of the distribution.[111]

Broadbent and Segnit state:

> A convex function which always has a positive slope (i.e., additions always lead to increased effectiveness) also insures that increases in the mean number of impressions or increases in the number received by any individual are always credited with higher

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[110]Ibid.

[111]Ibid., p. 206.

> values for effectiveness. This appeals to common sense since we do not believe advertising normally decreases response.[112]

The Geometric Response Function. Broadbent and Segnit suggest the geometric response function as a practical and useful form of the convex response function. They define the geometric response function by the parameter f which is the value of the first impression compared to total response. Thus f can also be described as the proportion of the population not yet effectively covered, who are covered by the next impression in the series. Since f defines the ratio of the value of any impression after the first, it can be written as $r = 1 - f$.[113]

Additional response is thus a geometric series in which Broadbent and Segnit require both f and r lie between zero and one in value. As such, the geometric response function can cover a wide range of impression possibilities. As f approaches zero it begins to resemble a linear response function. At $f = 1$, it is equivalent to total reach. Between the two extremes, a complete range of functions may be generated, all determined by the single f parameter.[114]

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[112] Ibid.

[113] Ibid., pp. 206-07.

[114] Ibid.

Broadbent and Segnit tested the geometric response function empirically against real data by graphing and found a good fit. They concluded that the geometric response function was not only practical and useful but a mathematically convenient form of the convex response function.[115]

The Decreasing Response Function. While lacking empirical support there is a possibility that response to advertising could decrease after reaching a certain number of impressions. For example, in a bell-shaped cumulative response function, at some point, the increased impressions could conceivably begin to do harm. Broadbent and Segnit suggest the decreasing function must be a rare phenomenon and do not recommend it as a model of the way in which advertising actually works but rather as an example of response function possibilities and potential impression distributions.[116]

The bell-shaped response function illustrates a distribution giving higher effectiveness to a schedule with smaller scatter than an increasing convex response function. This advantage, however, is offset by the lack of ability of this function to increase the value of the mean. For example, at some point on the bell-shaped curve, effectiveness actually decreases with additional

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[115] Ibid.

[116] Ibid., pp. 207-08.

impressions which is realistically not practical. Broadbent and Segnit suggest the apparent advantage shown by the bell-shaped response curve is illusory and misleading.[117]

Although Broadbent and Segnit do not suggest it, there has been speculation by such authors as Appel,[118] Grass and Wallace[119] and Greenberg and Suttoni[120] that there is a wear-out factor in advertising. It may well be that the bell-shaped response function illustrates this phenomenon although there is no empirical evidence to support this contention.

Other Forms of Response Functions. Broadbent and Segnit recognize the possibility of other forms of response functions such as the continuous and exponential,

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[117] Ibid.

[118] Valentine Appel, "On Advertising Wear Out," Journal of Advertising Research 11 (February 1971): 11-13.

[119] Robert C. Grass and Wallace H. Wallace, "Satiation Effects of TV Commercials," Journal of Advertising Research 9 (September 1969): 3-8.

[120] Allan Greenberg and Charles Suttoni, "Television Commercial Wearout," Journal of Advertising Research 13 (October 1975): 47-54.

but they suggest the linear, step, convex and geometric response functions are the most logical examples of their concept.[121]

Attempts at Field Verification

To test their concepts, Broadbent and Segnit attempted to use existing materials from several previous field experiments. They confess that the ten examples to which they fit data may not have been true response functions as they have defined them plus there were other problems. As a result, they claim no empirical support for their concepts but rather that the data supplied information on which to develop indications of the shapes which response functions might take in actual practice. It may well be that the importance of Broadbent and Segnit's work lies in the suggested shapes of response functions, for this forms the basis of their concept.

Based on their attempts at response function measurement, Broadbent and Segnit suggest five methods by which data for testing might be collected. They were:

1. Coupon return analysis which they consider poor because response may continue although coupon cutting may stop.

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[121] Broadbent and Segnit, "Response Functions in Media Planning," p. 209.

2. Single interviews were not recommended because of the problems of measurement of campaign effectiveness and media exposure habits, e.g., heavy media users could bias the results.

3. Double interviews were recommended where two measurements are made with the media campaign between them. They believed this to be the most effective measurement technique although they acknowledge that it has weaknesses for continuous campaigns for established products.

4. Experiments were suggested because they allow for the calculation of the real effect of advertising to be measured. They do not, however, account for heavy and light advertising exposure in the real world.

5. The study of the individual is considered the most valid of all the approaches. They concede problems of gathering data and recording information but believe it to be the most effective method to truly measure advertising response functions.[122]

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[122] Ibid., pp. 219-21.

Summary

Broadbent and Segnit summarize the conclusions they reached on response functions from theory and practice as follows:

> The mean of the impression distribution, or the total number of impressions, or cost per thousand, or effectiveness using a linear response function (all these are equivalent) is usually the single most important fact about a schedule.
>
> The intuitive argument for the commonly used S-shaped function is not supported by the data examined. The argument that this function always leads to efficient schedules is shown to be false.
>
> It is proved that a convex increasing function does lead to efficient schedules in the sense that an increase in the mean and greater concentration about this mean are credited with greater effectiveness.
>
> The geometric response function is a function of this type, is supported by such evidence as is available and has many practical advantages in actual use. It covers a wide range of objectives. We recommend its use.
>
> Aids are given to estimating the single parameter of the geometric response function.
>
> Five ways in which response data can be collected are described, of which three are recommended.[123]

The Lavidge and Steiner Hierarchy of Effects Model

The major problem in empirically estimating the Broadbent and Segnit concept of response functions and the cumulative effect which they use as the dependent variable in their geometric distribution graphing has

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[123] Ibid., p. 189.

been in finding a suitable model which could be used as an indicator of response to media advertising. The Lavidge and Steiner model, first published in 1961, was selected for use in the study. Because it is a predictive model designed to measure the effectiveness of advertising, elements of the Lavidge and Steiner model seem appropriate for use as dependent variables in the study conducted.[124] The Lavidge and Steiner hierarchy of effects model takes into account both long- and short-term advertising effects. Because response to advertising may not be immediate or result from single advertising exposures, the model seems to offer potential for determining the effects of advertising response functions as described by Broadbent and Segnit.[125] A brief description of the Lavidge and Steiner model follows with particular attention devoted to how it was used to identify the variables measured.

Advertising and The Seven Steps

Lavidge and Steiner suggest that consumers do not normally leap from disinterested members of the marketplace into active purchasers of a product in one great step. Rather, they suggest consumers move through a series of steps or are involved in a process in which

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[124] Lavidge and Steiner, "A Model for Predictive Measurements," pp. 59-62.

[125] Ibid.

they move from unawareness of the product to the final step which they consider to be purchase. Advertising is considered a force which moves consumers up this series of steps. Lavidge and Steiner describe the various levels of consumers in relation to a product or service:

1. Unaware of the existence of the product or service.
2. Aware of existence of the product or service.
3. Know the product or service attributes.
4. Like the product or service.
5. Prefer the product or service.
6. Conviction to buy the product or service.
7. Purchase of the product or service.[126]

Lavidge and Steiner described the model originally as a set of steps but stressed that the steps were not equidistant. In some instances, the steps are far apart while in others they might be very close together. They further suggest that different products may require longer periods of time between each step than others, a concept much like the Broadbent and Segnit hypothesis of unique values of response functions for different products.[127]

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[126] Ibid., pp. 59-60.

[127] Ibid.

The Three Functions of Advertising

According to Lavidge and Steiner, the six steps previously outlined indicate three major functions of advertising:

1. The first two, awareness and knowledge, relate to information or ideas.
2. The second two steps, liking and preference, have to do with favorable attitudes or feelings toward the product.
3. The final two steps, conviction and purchase, are to produce action--the acquisition of the product.[128]

Lavidge and Steiner further related these three advertising functions to what they term

> . . . classic psychological models which divide behavior into three components or dimensions:
> 1. The cognitive component--the intellectual, mental, or "rational" states.
> 2. The affective component--the "emotional" or "feeling" states.
> 3. The conative or motivational component--the "striving" states relating to the tendency to treat objects as positive or negative goals.[129]

Lavidge and Steiner stressed that the issues were more than just semantic. In many cases, actions taken to stimulate motivation may be quite different from those producing knowledge which may be quite different from actions which are needed to produce favorable attitudes.[130] In the study which follows, responses which directly

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[128]Ibid.

[129]Ibid.

[130]Ibid.

relate the Lavidge and Steiner concepts to those proposed by Broadbent and Segnit have been carefully developed and measured.

Summary

Lavidge and Steiner offer three concepts which they suggest as the basis for measurement of advertising. They are:

1. Realistic measurements of advertising effectiveness must be related to an understanding of the functions of advertising. It is helpful to think in terms of a model where advertising is likened to a force which, if successful, moves people up a series of steps toward purchase.
2. Measurements of the effectiveness of the advertising should provide measurements of changes at all levels on these steps . . . not just at the levels of the development of product or feature awareness and the stimulation of actual purchase.
3. Changes in attitudes as to specific image components can be evaluated together with changes in over-all images to determine the extent to which changes in the image components are related to movement on the primary purchase steps.[131]

The concept of levels of advertising effects developed by Lavidge and Steiner in the hierarchy of effects model provide the dependent variables which were used to measure the Broadbent and Segnit cumulative response functions. The Lavidge and Steiner steps were sufficiently discrete so that movement upward could be charted and related to advertising impressions which are required to empirically estimate the Broadbent and Segnit

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[131]Ibid., pp. 61-62.

response functions. It seemed feasible through a pre-testing procedure to locate respondents on the Lavidge and Steiner scale based on their replies to a pre-test instrument concerning selected products. Further, the Lavidge and Steiner model offered opportunities to measure movement on the scale and relate that movement directly to advertising exposures. The Lavidge and Steiner and Broadbent and Segnit concepts created a good match that could logically be used to quantify response functions. A successful blending of the two could develop a new approach to media planning and evaluation.

The Mathematical Basis for the Study

At this point, much has been said about media planning and the potential of the response functions. A strong case has been made for the Broadbent and Segnit model which relies heavily on frequency distributions as a basis for evaluation of alternative media schedules. The only theory base not discussed is that of the mathematical concepts involved. A brief review follows.

Introduction

As previously discussed, some people are exposed to more advertising media messages than are others. This simple fact makes it difficult to develop mathematical calculations to determine advertising exposure, opportunity-to-see-or-hear or impressions (assuming in this case, all are the same). As Friedman has suggested, television viewing is not a random process.[132] It is believed that Friedman's "proneness" theory can be applied to most forms of advertising media. If so, then more robust mathematical procedures may be used to calculate frequency distributions than have previously been thought possible.

A discussion of probability and theoretical probability distributions follows to substantiate the basis for the study which was undertaken and the analysis of the data which follows.

Theoretical Probability Distributions

Probability is normally considered as the long-run relative frequency of occurrence for some event or experiment, such as the tossing of a fair coin. Hughes and Grawoig offer the following formal mathematical definition:

> If an outcome occurs f times out of n trials, its relative frequency is f/n; the value which is approached by f/n when n becomes infinite is called the limit of the relative frequency. The probability of an outcome O_i is defined as the limit of its relative frequency; that is:

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[132] Friedman, "Calculating TV Reach and Frequency," pp. 21-25.

$$P(O_i) = \lim_{n \to \infty} f/n$$ [133]

Therefore the relative frequency of the occurrence of an event is the ratio of the number of times the event occurred in relation to the total number of events. If all possible events are grouped together, then a distribution of relative frequencies may be obtained.[134] The conversion of a distribution of relative frequencies into a distribution of probabilities can then be easily accomplished.

There are two general types of probability distributions, theoretical and empirically derived. The shape of a probability distribution may vary greatly based on the set of events or phenomenon it represents.[135]

Theoretical probability distributions are mathematical models for actual frequency distributions. As such, by use of mathematical functions or rules the probability distribution can be generated.[136]

Empirical probability distributions because they are usually sample distributions cannot be described by a

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[133]Ann Hughes and Dennis Grawoig, Statistics: A Foundation for Analysis (Reading, Mass.: Addison-Wesley Publishing Co., 1971), pp. 2-3.

[134]Paul G. Hoel and Raymond J. Jessen, Basic Statistics for Business and Economics (New York: John Wiley & Sons, 1971), pp. 18-19.

[135]Ibid., pp. 87-89.

[136]Ibid.

mathematical function. They require actual enumeration of each event to generate the entire probability distribution.[137]

Theoretical probability distributions are divided into two major categories, discrete and continuous. Discrete probability distributions describe events or variables that can take only discrete, nonnegative integer values. Discrete probability distributions generally are used to describe counting processes which may be either finite or infinite, but are limited to whole numbers.[138]

A continuous variable takes on uncountably infinite values, such as distance and time, and is involved in measuring processes. Its limit is usually the preciseness of the measuring instrument. Continuous variables are considered to be capable of assuming any value in some interval of values and thus are discussed in terms of intervals rather than discrete points.[139]

Theoretical probability distributions can be described in several ways. For example, probability distributions can be described in terms of their graphical representation and shape.[140] They can also be described algebraically using a mathematical probability function. Probability functions are rules for assigning

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[137] Ibid.

[138] Ibid., pp. 16-18.

[139] Ibid.

[140] Ibid., pp. 101-04.

the selection of chances to the outcomes of a particular experiment. The probability function describes the mathematical behavior of a theoretical probability distribution.[141]

Probability distributions are often described in terms of $f(x_i)$ which represents the distribution of a random variable X. The distribution of $f(x_i)$ is also referred to as the mass or frequency density function. The general probability density function for a one-dimensional discrete random variable must possess two properties:

1. $0 \leq f(x_i) \leq 1$
2. $\sum_i f(x_i) = 1$[142]

The general probability density function for a one-dimensional continuous random variable must possess the following properties:

1. $f(x) \geq 0$
2. $\int_{-\infty}^{\infty} f(x)dx = 1$[143]

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[141]Hughes and Grawoig, <u>Statistics</u>, pp. 44-50.

[142]Ibid.

[143]Ibid., pp. 48-49.

Probability density functions of these general forms then are used to describe the theoretical probability distributions which are developed for use in this study.

Theoretical probability distributions can be illustrated in several ways, such as distributional shape, probability density function along with any associated parameters, expected value, and variance. To simplify the discussion of probability distributions and their application, the above characteristics along with the so-called common "families" of theoretical probability distributions will be the only ones considered. The following probability families have been suggested as appropriate to the measurement of response functions.[144]

Discrete Probability Distributions

Discrete probability distribution families are those that describe various counting processes.

Binomial Family. The binomial family is an algebraic generalization of the Bernoulli family where the positive integer n is added to represent the number of trials. The application of the binomial family is similar to the Bernoulli family. The probability density function for the binomial family is as follows:

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[144] P. W. Zehna, Probability Distribution and Statistics (Boston: Allyn and Bacon, Inc., 1970), p. 126.

$$f(x;n,p) = \binom{n}{x} p^x q^{n-x} \qquad x = 0, 1, 2 \ldots n$$

The parameters are the same as those for the Bernoulli family. The function generates values for X in the range of 0 to n.[145]

<u>Geometric Family</u>. The geometric family describes the distribution of the number of trials needed to achieve success. An example of the application of the distribution might be estimating the number of cycles a machine might operate before a failure. The probability density function for the geometric family is:

$$f(x;p) = pq^{x-1}$$

The parameters are again the same as the Bernoulli family. The function generates values for X in the range of 1 to infinity.[146]

<u>Negative Binomial Family</u>. The negative binomial family describes the number of repetitions necessary to achieve r successes. An application of the distribution is in inventory management. The total demand for an item of a given type is normally assumed to be a random phenomenon. In cases where the average demand is large and there is little past history, the total number of units demanded is often assumed to be distributed according to

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[145] Ibid., pp. 127-29. [146] Ibid., pp. 129-31.

the negative binomial distribution.[147] The probability density function for the negative binomial family where success has a probability of p, failure a probability of q and trials are repeated until the kth success occurs, is given by:

$$f(x;r,p) = \binom{x-1}{k-1} p^k q^{x-k} \qquad x = k,\ k+1,\ k+2\ .\ .\ .$$

where:

$$\binom{x-1}{k-1} = \frac{(x-1)!}{(k-1)!\ (x-k)!}$$

The parameters remain the same, except for the addition of k which indicates the number of successes. The function generates values in the range from 0 to infinity.[148]

Poisson Family. The Poisson family is a limiting form of the binomial family. The parameter of the Poisson family is λ, which is the mean number of occurrences of an event per unit of time over a given number of trials. The distribution assumes different shapes depending on the value of λ. When λ is less than 1, the distribution is highly skewed to the right, and becomes more symmetrical as λ increases. The Poisson family describes

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[147] Ibid., pp. 131-33.

[148] Hughes and Grawoig, Statistics, pp. 98-100.

situations when the concern is with the number of times an event occurs over some time interval. The probability density function for the Poisson family is:

$$f(x;\lambda) = \lambda\ e^{-\lambda}\ \frac{\lambda^{x}}{x!} \qquad x = 0,\ 1,\ 2\ .\ .\ .$$

The parameter λ is defined earlier. The function generates values for X in the range of 0 to infinity.[149]

<u>The Beta Binomial Family</u>. The Beta Binomial family can be described as a three-parameter Bernoulli distribution where the parameters n and p are defined. For example, an individual household will be exposed to r advertisements in a schedule of n television commercials. Because the population is heterogeneous, the random variable p has a distribution in that population which follows a Beta distribution with the parameters a and b (discussed in the next section). The probability mass function in this distribution can be given by:

$$P(r) = \frac{\binom{n}{r}\ \beta(a + r,\ n + b - a - r)}{\beta(a,\ b - a)}$$

where:

$$a > 0,\ b > 0$$

$$r = 0,\ 1,\ 2,\ .\ .\ .,\ n$$

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[149]Zehna, <u>Probability Distribution and Statistics</u>, pp. 133-37.

n = number of spots in the schedule and $\beta(k,t)$ is the Beta function defined by:

$$\beta(k,t) = \int_0^1 x^{k-1}(1-x)^{t-1}dx$$ [150]

<u>Hypergeometric Family</u>. The Hypergeometric family is best described as the determination of the probability of an occurrence in a described frequency distribution such as the Beta Binomial. It is usually the result of calculations of previously estimated events then distributed throughout the population being described. For a group of n objects, m A's and w $\bar{A}$'s $(m + w = n)$ a sample r is chosen. We then have $\binom{n}{r}$ possible samples. Of these $\binom{m}{x}\binom{w}{r-x}$ have exactly x A's. Therefore

$$P\ (x\ A's) = \frac{\binom{m}{x}\binom{w}{r-x}}{\binom{n}{r}}$$

The formula above describes how the probability is distributed among a possible 2-by-2 table. For each value of x a different table results. For example (see page 87).

While other discrete probability distributions exist, the families mentioned here represent the more commonly used distributions and those directly applicable

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[150] Headen, Klompmaker, and Teel, "An Empirical Examination," pp. 15-16.

to the study or previous media frequency distribution research. The key factor for this study, however, is the continuous probability distribution.

TABLE 1

HYPERGEOMETRIC EXAMPLE

	A	$\bar{A}$	Totals
In sample	x	r - x	r
Not in sample	m - x	w - r + x	n - r
Totals	m	w	n

SOURCE: Mosteller, Rourke, and Thomas, Probability with Statistical Applications, pp. 98-99.

Continuous Probability Distributions

Five major continuous probability distribution families will be discussed here although others exist. Block has developed an excellent summary of these distributions and the list which follows is his.[151]

Uniform Family. The simplest continuous probability distribution family is the uniform family. The uniform distribution is applicable when all events have an equal likely chance of occurring. Zehna described the uniform

[151]Martin P. Block, "The Potential Impact of Broadband Communication Technology on Consumer Marketing Communication: A Computer Simulation Experiment" (Ph.D. dissertation, Michigan State University, 1975), p. 183.

family as being a suitable model for random experiments with bounded random variables. The essential range of values coincides with the interval (α, β).[152] The distributional shape of the uniform family is graphically represented as a horizontal line inside the range of its parameters. The probability density function for the uniform family is expressed as follows:

$$f(x;\alpha,\beta) = \frac{1}{\beta - \alpha}$$

The parameters α and β set the lower and upper boundary for the random variable X.[153]

Exponential Family. The exponential family provides density functions for nonnegative random numbers. The exponential like the Poisson family is often used to describe the occurrence of an event across time intervals. According to Naylor et al., if the probability that an event will occur in a small time interval is small, and if the occurrence of the event is statistically independent of other events, then the time interval between the occurrence of events is exponentially distributed.[154]

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[152] Zehna, Probability Distribution and Statistics, p. 141.

[153] Block, "The Potential Impact of Broadband Communication," pp. 123-24.

[154] T. H. Naylor, J. L. Balintfy, D. S. Burdick, and Kong Chu, Computer Simulation Techniques (New York: John Wiley & Sons, 1966), p. 81.

The probability density function for the exponential family may be expressed as follows:

$$f(x;\lambda) = \lambda e^{-\lambda x}$$

The λ parameter must be greater than 0. The function generates the random variable X in the range 0 to infinity.[155]

Gamma Family. The gamma family represents a more general family of distributions for nonnegative random variables. The gamma distribution has two parameters, α which is the number of successes per interval or unit space, and its reciprocal β, which is the average number of successes per interval $(\frac{1}{\lambda})$. The gamma distribution is related to both the Poisson and exponential distributions. The exponential becomes a special case of the gamma distribution when $\alpha = 1$. As α increases, the distribution becomes less and less skewed until it almost reaches the normal distribution. One of the most powerful properties of the gamma family is its ability to change shape from an extremely skewed exponential distribution to an almost normal distribution by changing only the α parameter.[156]

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[155] Block, "The Potential Impact of Broadband Communication," pp. 184-85.

[156] Ibid., pp. 185-87.

Zehna suggests that the gamma family is so broad that it "is a fairly safe assumption to make as a model for an experiment described by almost any nonnegative random variable."[157] The probability density function for the gamma distribution may be expressed as follows:

$$f(x;\alpha,\beta) = \frac{x^{\alpha-1}\ e^{-x/\beta}}{b^{\alpha}\Gamma(\alpha)}$$

The α and β parameters have been previously described and both must be greater than 0. The Γ notation indicates a one-parameter integral called the gamma function as demonstrated below:

$$\Gamma(p) = \int_0^{\infty} x^{p-1}e^{-x}dx$$

In this particular function, p must be greater than 0. The gamma probability density function generates a random variable X in the range from 0 to infinity.[158]

Normal Family. The last continuous probability distribution family is the most widely used. Many continuous variables such as height and weight are normally distributed. The normal family while the most familiar is also the most important probability model in

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[157] Zehna, Probability Distribution and Statistics, p. 148.

[158] Block, "The Potential Impact of Broadband Communication," pp. 185-87.

statistical analysis. The probability density function for the normal family may be expressed as follows:

$$f(x;\mu,\sigma^2) = \frac{1}{\sqrt{2\pi\sigma}e} \; \frac{1}{2\sigma^2}\,(x - \mu)^2$$

The normal or Gaussian family is a two-parameter family, with the familiar mean, μ, and variance, σ^2.[159] Of particular interest to this study is the fact that the familiar s or "learning-curve" is usually viewed as representing the initial portions of the cumulative normal distributions.

There are other continuous probability distributions but none are directly applicable to this study, so they will not be considered.

Some Preliminary Comments on Possible Distribution Slopes

The plotting of the response function data could result in several hypothetical slopes. These slopes when connected would result in curves with varying shapes. Broadbent and Segnit have suggested the shapes and possible meanings of each of these slopes and resulting curves.[160] The potential curves are:

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[159] Ibid., pp. 189-90.

[160] Broadbent and Segnit, "Response Functions in Media Planning," pp. 198-209.

(1) The "Initial Impact" or convex curve

(2) The "Constant Impact" or straight line curve

(3) The "Threshold Impact" or S-shaped curve

(4) The "Critical Number" or step function curve

(5) The "Wear-Out/Irritation" or bell-shaped distribution curve.

While the meanings of all curves are speculative, they appear to be logical deductions.

NOTE: As previously stated, while the terms "impressions," "exposures" and "opportunities-to-see-or-hear" advertising messages are not synonymous, Broadbent and Segnit have used impression and opportunity-to-see interchangeably.[161] Since this study was an attempt to quantify their concept of response functions, the terminology used in the balance of this study considers the three terms to have the same meaning for consistency.

Initial Impact Curve

The Initial Impact response function when plotted would result in points, the slope of which would be a convex geometric curve. In this response function each subsequent impression would contribute proportionately

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[161]Ibid., p. 194.

less to the total cumulative response. Cumulative response would always be increasing but at an always declining rate.

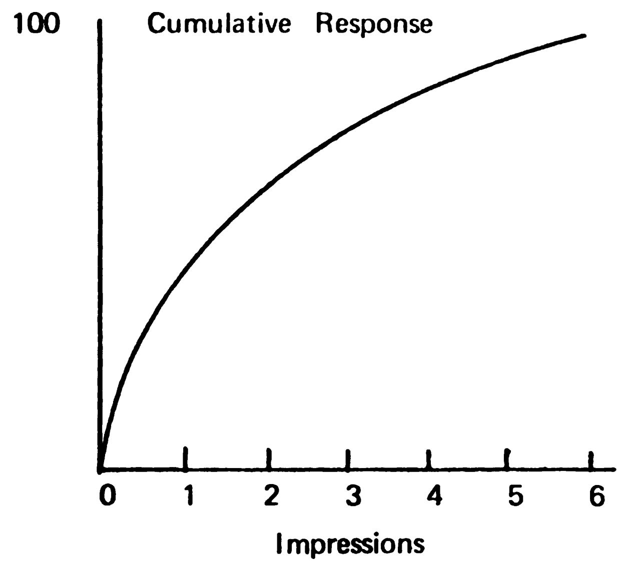

Fig. 1. Initial Impact Curve

Constant Impact Curve

The Constant Impact shape suggests that the response function continues to build at a steady linear rate as additional impressions are received, e.g., each impression is of more value than the previous one in a linear progression.

Threshold Impact Curve

The Threshold Impact is similar to the traditional learning curve in that responses start slowly until a threshold is reached, then rise rather quickly and reach

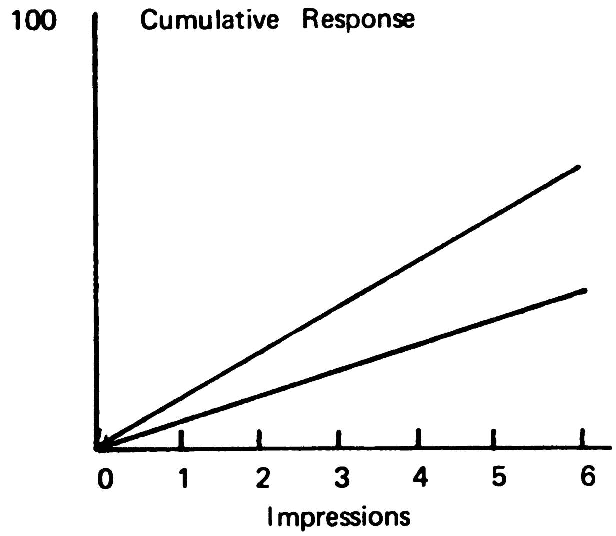

Fig. 2. Constant Impact Curve

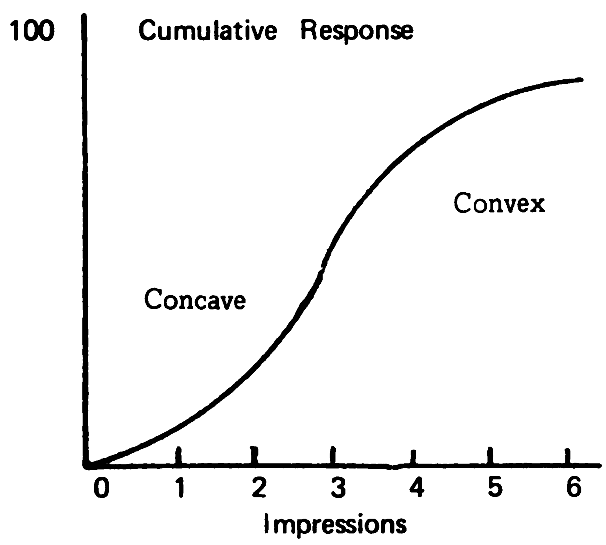

Fig. 3. Threshold Impact Curve

a constant level at some point. This slope suggests that advertising must reach a certain threshold level before it becomes effective.

The Critical Number Curve

The Critical Number or Step Function response slope would suggest that up until some given point, no response at all would occur. However, after a certain number of impressions, response would be immediate and complete and continue at that rate.

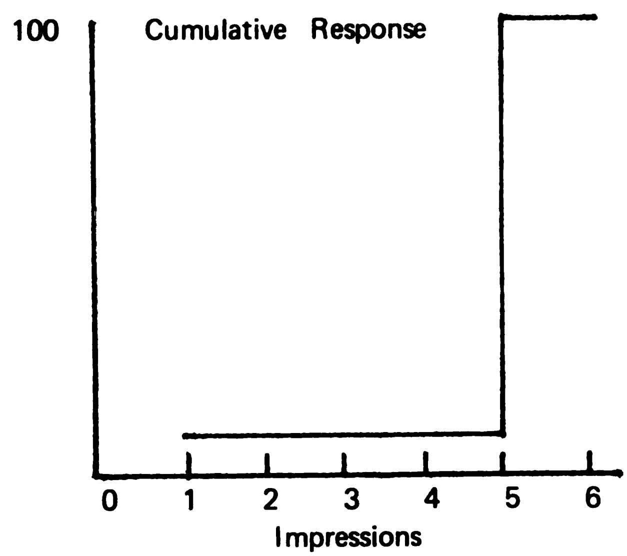

Fig. 4. The Critical Number Curve

Wear-Out/Irritation Curve

The Wear-Out/Irritation slope suggests that responses build up to a certain point, but after a certain number of impressions, the response function actually starts to generate negative response. While not probable since advertising is usually considered to be a positive influence this curve might suggest that the advertising message was wearing out or that it had reached a level of irritation which might cause an audience to have a negative response rather than positive to repeated impressions.

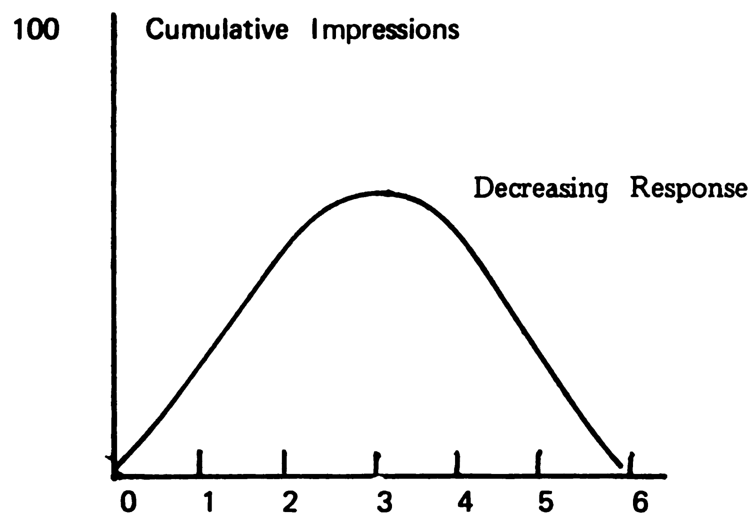

Fig. 5. Wear-Out/Irritation Curve

Summary of the Literature Review

The preceding literature review has covered most areas which are central to this study. First, the basis of mass communication theory was discussed and its relationship to advertising compared. It was pointed out that there appears to be a potential difference between mass communication and advertising theory based on the concept of low-involvement of the audience.

Second, the basic areas of advertising media planning were reviewed including the Broadbent and Segnit concept of response functions which this study attempted to empirically quantify. In addition, the Lavidge and Steiner hierarchy of effects model was reviewed. Elements from this model were used as the dependent variables in the research.

Next, the mathematical base necessary for the understanding of probability and theoretical probability distributions were discussed since these techniques have been used in the analysis of the data which have been gathered. Finally, some comments and illustrations of possible or potential response function shapes which might result from the plotting of response functions were discussed.

The Hypotheses

The preceding literature review, while developing and forming a base for the study, points up the absence of empirical estimates of advertising response functions.

Because advertising usually seeks to differentiate brands in a category, industry wisdom suggests that not all products or services have the same appeal to all media audiences. Based on this, one would suspect major differences in the slopes and resulting shapes of curves plotted for various product categories or brands within categories. Indeed, most media planners would probably argue intuitively that such differences in response function slopes exist although lacking empirical evidence.

Based on the above intuitive approach and the published literature, the hypotheses to be tested were based on the assumption that response functions as described by Broadbent and Segnit could be empirically estimated and plotted on a graph to show frequency distributions based on the gathered data. From previous evidence, it was believed that the plot of the gathered response function data would be curvilinear rather than linear and as a result, linear correlation would not accurately represent the relationship between the gathered data and the response functions being measured.

The following hypotheses were tested with the data gathered and analyzed from the study described in the following chapter.

Hypothesis One

As outlined in the earlier section of this chapter, Broadbent and Segnit[162] have suggested that the

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[162]Broadbent and Signet, "Response Functions in Media Planning," pp. 187-238.

slope of the response function when measured and plotted would result in a geometric curve which is always increasing but at a continuously decreasing rate.

Thus, the research hypothesis is stated:

H-1:

> The relationship between the number of impressions and the cumulative response from the gathered data, when plotted on a graph, will be represented by a convex shape which is always increasing but at a continuously decreasing rate.

Hypothesis Two

Using elements of the Lavidge and Steiner hierarchy of effects model[163] where the cognitive level was defined as awareness of advertising messages, Hypothesis 2 is stated in two parts.

Research Hypothesis 2-a is stated as:

H-2-a:

> The slope of the curve measuring the cognitive effect of advertising impressions will be convex.

The research hypothesis of the second section is thus stated:

H-2-b:

> The slope of the curve measuring the cognitive effect of advertising impressions will rise more rapidly than will that of the conative measure indicating a more rapid accumulation of the cognitive response measure than the conative measure.

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[163] Lavidge and Steiner, "A Model for Predictive Measurements," pp. 59-62.

Hypotheses Three, Four and Five

As previously stated, there is no known published empirical evidence indicating that the slopes of response functions when charted would result in similarly appearing curves. Traditional advertising wisdom suggests that the curves plotted for different categories or brands of products would be separate and unique as discussed.

Thus, research Hypothesis 3 is stated as:

H-3:

Each of the products or brands, whose cognitive effect of advertising in the measured media is plotted, will have a unique slope when the cumulative response is plotted against the number of impressions.

Research Hypothesis 4 is stated as:

H-4:

The slope of the cumulative response function plot, based on advertising impressions, will be steeper for a more frequently purchased product than the slope of the plot of the cumulative response function, based on advertising impressions for a product which is purchased less frequently.

Research Hypothesis 5 is stated as:

H-5:

The slope of the curve measuring the cognitive effect of advertising determined by the cumulative response function plot, based on advertising impressions, for a new or novel product or service will be steeper than any slope plotted for a known, existing or previously heavily advertised product or service.

The methodology used to test these hypotheses is found in Chapter III.

CHAPTER III

METHODOLOGY

The empirical estimation of the Broadbent and Segnit concept consisted of a field study of response to media advertising conducted among Michigan State University students in January and February, 1976. The study was a pre-test, post-test design with a one-week interval between the two test instruments. During the one-week interval, all respondents kept a media diary to record media usage. In addition, all major advertising media messages entering the market were monitored during the test period. Details of each step follow.

The Specialized Use of the Radio Medium in the Study

While all major media, newspapers, radio, television and magazines, were included in the study design to empirically estimate the advertising response function, the initial study plan called for special emphasis on the radio medium. Radio was chosen for a specialized test to determine if response functions could be determined for a single product in a single advertising medium. Radio was selected because it offered the following advantages:

1. Most radio advertising is local in nature. The test product advertised was local.

2. Radio is a frequency oriented advertising medium. For a one-week test, it offered advantages not found in other media.

3. Radio impressions could be measured through monitoring and through cooperation of the participating stations.

4. Radio stations cooperated in the study. Radio stations WVIC, WILS, and WFMK in the Lansing/ East Lansing market furnished support for the study, broadcast test commercials at no cost and furnished logs of all commercials broadcast during the measured week.

5. A unique or novel product, the MSU Overseas Study Program meeting, was used as a controlled radio advertising media product during the study period. Overseas Study had not previously been advertised on radio in the market.

6. Sample respondents, MSU students, were heavy radio users which offered an opportunity to

measure response functions for a single product in a single medium.

Initially, the study was designed to place primary emphasis on the measurement of response functions in the radio medium. Because of the length of time of the study and other limitations encountered, the study was expanded to include the four major media. It was possible, however, to measure the response function for a single product in the radio medium. Although information gathered was limited, the study does suggest that response functions can be empirically estimated for individual media and suggests a methodology for future research. The information gathered seems especially helpful since there is little published research available on the effects of frequency of radio advertising impressions.

Because the initial study plan was to measure only the response functions to radio advertising, study instruments placed primary emphasis on obtaining a sample of respondents who made use of the radio medium. While this was a requirement to be included in the sample, it is not believed that this bias had an effect on the results of the study since few respondents were rejected because they did not use the radio medium.

The Timetable

The following timetable was used for the response function study.

January 5-16, 1976	Development of study format and preliminary test instruments.
January 21, 1976	Pre-test of study instruments with MSU Winter Term, 1976 Radio/Television Advertising Class
January 26, 1976	Review of revised study instruments with MSU Winter Term, 1976 students in Marketing Research Seminar
February 1-2, 1976	Sample selection
February 4, 1976	Interviewer training with MSU Winter Term, 1976 students in Advertising Research Course
February 5, 1976	Preliminary qualification telephone calls by interviewers.
February 6-8, 1976	Pre-test questionnaire and diary placement with sample by interviewers.
February 9, 1976	Sample respondents began keeping media diary. Media monitoring began in market.
February 11, 1976	Reminder calls by interviewers to sample respondents to encourage diary keeping.
February 15, 1976	Diary keeping ended for sample respondents. Telephone calls made by interviewers to arrange for post-test questionnaire administration and diary pick-up. Media monitoring in market ended.
February 16-17, 1976	Diaries retrieved from sample respondents and returned to survey headquarters.

February 18, 1976	All completed materials returned, ready for coding and keypunch.
February 20-21, 1976	Coding began on pre-test and post-test questionnaires. Code books developed for all materials.
February 23, 1976	Coding of diaries began.
March 8, 1976	Coding of diaries completed.
March 15, 1976	Pre- and post-test questionnaire coding began.
March 29, 1976	Completion of pre- and post-test questionnaires coding.
May 7, 1976	Data processing began.

General Study Methodology

The study methodology followed very closely standard advertising industry media measurement techniques. The study design consisted of selection of a random sample from the student population of Michigan State University. The sample selected was then qualified for the research study with ownership or access to a radio set as the prime qualifier. The pre-test questionnaires were administered to the sample to establish existing knowledge, advertising awareness and product preferences. Each respondent in the sample kept a media diary to record media usage during the test period. A post-test questionnaire was administered to the sample to determine knowledge of advertising awareness or product preference after the media usage. This was used to relate changes in product knowledge, awareness or preference based on advertising media usage.

While the study methodology was not unlike that used in industry for media habit, brand preference and usage studies, and measurement of advertising recall, the combining of pre- and post measures with known media advertising message usage was designed especially to measure the advertising response function.

The methodology used in the study was modeled after the American Research Bureau/RKO General Broadcasting study, "The Individual Diary Method of Radio Audience Measurement" (hereafter called "The Detroit Study"), conducted in Detroit, Michigan in February, 1964,[1] and the All-Radio Methodology Study (hereafter called "ARMS I") conducted by the Radio Advertising Bureau in 1965.[2]

Development and Pre-Test of the Instruments

A step-by-step procedure of the methodology and the steps taken in the gathering of the data for analysis follows.

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[1]American Research Bureau/RKO General Broadcasting, The Individual Diary Method of Radio Audience Measurement (New York: American Research Bureau/RKO General Broadcasting, 1965).

[2]ARMS I (All-Radio Methodology) (New York: Radio Advertising Bureau, 1965).

Development and Pre-test of the Instruments

Using the American Research Bureau "Detroit Study"[3] and "ARMS I"[4] materials, preliminary pre- and post-test questionnaires were developed.

Products which were felt to be particularly applicable to the proposed university sample were selected for testing based on a priori knowledge and judgment.

Local radio stations were contacted and levels of advertising scheduled for particular product classes during the proposed test period obtained. This step was taken to determine if sufficient advertising would be broadcast during the test period to make measures of advertising response functions feasible.

Based on the above information, preliminary test materials were developed. These materials consisted of a pre-test and a post-test instrument. An evaluation of the instrument was arranged with thirty-eight Michigan State University students enrolled Winter Term, 1976 in the Radio/Television Advertising course. While the pre-tests were self-administered, students were sufficiently acquainted with media research techniques to evaluate the proposed questionnaires.

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[3]American Research Bureau, The Individual Diary Method.

[4]ARMS I.

Evaluation of the proposed data-gathering instruments mandated several changes in the product categories, ordering of questions and the masking of the survey purpose.

The changes which were made from the initial questionnaires to those which were used in the final survey are evident from an inspection of Appendices A and B.

The Diary Format

To measure media usage, a media diary was kept by the sample respondents during the study week. An example is included and is labeled Appendix C.

The media diary was modeled from standardized media diaries used by media research firms and the formats used successfully by the Radio Advertising Bureau in their ARMS I study[5] and the American Research Bureau in their "Detroit Study."[6] Adaptations were made from both these studies to conform to the sample requirements and the differing purposes of this study.

The respondent was asked to list when and to which specific magazine, radio or television station or magazine they read, saw or listened during each day of the study week. Only the day, starting and stopping

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[5] Ibid.

[6] American Research Bureau, The Individual Diary Method.

time and specific medium name or call letters were required. Direct mail exposures were handled through the post-test questionnaire.

Although the interviewers instructed each respondent on how to keep the diary, directions were also included on the front of the diary. Additionally, the interviewers who originally placed the diary included their name and telephone number when placing the diary. If the respondent had a question during the diary week, the interviewer was available by telephone.

The diary was for a seven-day period. Respondent diary keeping began on arising on Monday, February 9 and ceased on retiring on Sunday, February 15, 1976.

Out-of-home viewing or listening was required. If respondents left town during the study period, that, too, was requested.

Diary Placement Instrument

Since the study was originally conceived to determine the advertising response function only to radio advertising, the person selected at random from the MSU Student Directory (see sampling procedure) was qualified for the study by telephone. All respondents were required to have access to a working radio set. Qualification was handled by a screening questionnaire, included as Appendix D. The format of the screening questionnaire was highly structured to remove as much interviewer placement difficulty as possible.

In the screening questionnaire, a series of background questions were asked. This enabled the interviewer to gain demographic and classification data. During the same call, the interviewer made arrangements to personally administer the pre-test questionnaire and place the diary with the respondent. The screening questionnaire call was quite successful. A response rate of approximately 87.6 percent from the sample selected was achieved.

The Media Diary Placement and Questionnaire

Once the respondent had agreed to participate and a time and place had been set for the interviewer and respondent to meet, few difficulties were encountered.

When the interviewer met with the respondent, the Media Diary Placement and Questionnaire form was administered (see Appendix B). This instrument served as the pre-test questionnaire.

The interviewer knew the name of the respondent and many of the demographic facts from the screening and qualifying call. This information was usually completed in advance on each questionnaire but verified at the time of the interview.

Once the interviewer had administered the pre-test portions of the study to the respondent, detailed instructions were given the respondent on how to use and complete the media diary. The respondent was shown the diary and the methodology explained and questions answered. When the interviewer had satisfied himself that the respondent understood the diary form, the first personal interview was terminated.

The Products Included in the Study

It was believed the success of the study would be heavily dependent on the products selected for study. Since the respondent group among whom the experiment was conducted (MSU students) was not typical of the general population, the products used in the study were selected on the basis of their usage and appeal to the sample to be selected. A second determinant was the estimated amount of advertising for the product category which would be directed toward the respondent group and through measurable media.

Ideally, the experiment should have been conducted using products which were unknown to the sample group. This might have given a better direct measure of the response function. Such products were not available for this study. As in most advertising test situations, there are few products or services which are totally unknown to all consumers which have broad enough appeal to measure advertising response functions. Additionally, the study time constraint of one week imposed limitations on measuring advertising response functions for many products.

Initially, eight product categories were judgmentally selected for possible use in the study. The selection of the products was based on knowledge of student purchasing patterns, localization of the product, whether the student logically would receive media advertising impressions for the products selected and advance knowledge of product promotional activity on local radio stations during the study period. The eight products screened were:

(1) Banks

(2) Pizza establishments

(3) Beer

(4) Movies

(5) Entertainment in bars/restaurants or other attractions

(6) Wine

(7) Automobiles

(8) Hi-fi/stereo shops

In an additional pre-test, Winter Term, 1976 Michigan State University students enrolled in the Radio/Television Advertising were asked to indicate for which of the products or services they had heard advertising recently and the media in which that advertising had appeared. The results are shown on the following page (Table 2).

Based on pre-test results, pizza establishments, beer, and movies were eliminated from the products to be studied, based on their biased concentration of advertising impressions in certain media and low showing on radio recall. Table 2 illustrates the numerical response.

Consideration was given to the inclusion of very high involvement products, services or causes, such as drug abuse, smoking, or political events but these were discarded. Advertising for these types of products, services or causes usually requires a period of learning, and the respondent must become very involved in the subject. Such involvement is not usually the case for widely advertised products, particularly in the consumer goods field and particularly those directed toward the student population. Products or services were selected about which the respondent should have general knowledge but might not have current advertising experience. For example, respondents were either aware or not aware of advertising for the Plymouth "Aspen" or Dodge "Volare." No middleground was possible in advertising awareness. This step was taken to aid in making the data as discrete as possible for measurement and analysis.

TABLE 2

ADVERTISING AWARENESS FOR PRELIMINARY SELECTED PRODUCT CATEGORIES FOR RESPONSE FUNCTION STUDY

Media	Number of Mentions of Advertising Recently Seen or Heard by Category								Total
	Banks	Pizza	Beer	Movies	Entertainment on or off Campus	Wine	Auto	Hi-Fi	
Newspaper	4	22	3	18	21	0	2	8	78
Radio	10	4	3	5	6	6	6	4	44
TV	11	1	26	10	0	5	22	2	77
Magazines	0	0	0	0	0	0	3	1	4
Totals	25	27	32	33	27	11	33	15	203

NOTE: Numbers indicate raw scores to question "Have you seen or heard any advertising recently for (each of the product categories was listed individually)? "If yes, in what medium?" Survey conducted among students of Advertising Radio/ Television course, Winter Term, 1976, Michigan State University. Thirty-eight total students participating. Numbers may add to more than total due to multiple answers.

The selection of products was also influenced by the construction of a matrix to classify the various products to be studied. The matrix was:

TABLE 3

PRODUCT MATRIX

	Frequently Purchased	Infrequently Purchased
Locally Advertised or Marketed	Entertainment/Bars	Banks
Nationally Advertised or Marketed	Wine	Automobiles
Regionally Advertised or Marketed	None	Hi-Fi/Stereo Shops

Products selected for the study were of two types: frequently purchased and infrequently purchased. Local, national and regionally advertised or marketed products were chosen because of their varying advertising weights. For example, local banks or bar/restaurant advertising would appear only in local media such as newspapers, radio and perhaps television. Nationally advertised products such as automobiles and wines might appear in all advertising media. Regional products or services such as hi-fi/stereo shops might appear in all advertising media, even regional magazines.

The Unique Test Product

In addition to the above categories, an additional product/service was included in the study, the MSU Overseas Study Program (OSS) meeting. The Overseas Study Program meeting does not fit the product matrix because it was developed specifically as a test product for the study.

The Overseas Study Program at MSU is a specialized study program in foreign countries. It is under direct MSU supervision or that of a participating university and offers credits at Michigan State University toward graduation. More than thirty such programs were offered all over the world during 1976, most of which took place during the summer months. The MSU Overseas Study Program has been in operation for several years and is a nonprofit arm of the university.

The Overseas Study Program had been promoted sporadically to students in the past through campus posters, word-of-mouth, through cooperating departments and with a minimal amount of student newspaper advertising. It was not a highly visible organization or activity on the campus.

Arrangements were made with the Overseas Study Program office to set up a special meeting on Monday, February 16, 1976 to explain and discuss the study programs available during 1976. The only advertising and promotion of this meeting was through local commercial radio advertising. Special commercials were developed for the meeting and were placed on participating radio stations during the test week, thus the February 16th Overseas Study meeting was a pure radio promotion. The only methods students had of learning of the meeting was through radio advertising or word-of-mouth on the campus.

The Reminder Call and Call Form for Interview Pick-Up

Each interviewer was asked to telephone sample respondents where they had placed diaries on Wednesday, February 11, 1976 (the mid-point in the diary keeping) as a reminder to keep the diary and to answer any questions. No form was furnished or developed for this call and no record was kept on how many sample respondents were called or reached for this suggested reminder.

On Saturday, February 14 and Sunday, February 15, 1976, interviewers called respondents to make arrangements to retrieve the media diaries and to administer the post-test questionnaire. A form for this telephone call was furnished the interviewer. It is included as Appendix E.

Interviewers began picking up diaries on Monday, and Tuesday, February 16 and 17, 1976. All completed diaries were returned by Wednesday, February 18, 1976.

The interviewer was instructed to continue calling the respondent until contact was made, the diary retrieved and the post-test administered.

Media Usage Post-Test Questionnaire

The interviewer personally met with the respondent and retrieved the diary. While instructed not to allow additions or corrections to the diary, the interviewer quickly glanced through the diary to assure that it had been completed and that the respondent had cooperated in the study.

The Post-Test Questionnaire form was then administered by the interviewer. A copy of that instrument is included as Appendix F. The post-test was designed as a follow-up questionnaire to the pre-test and was designed primarily to measure changes or effects, which with proper analysis, might be attributed to measured media advertising during the test week.

Initial questions in the post-test questionnaire were designed to put the respondent at ease and to allow for unsolicited comments about the study and advertising in particular. Specific questions were asked concerning direct mail advertising received by the respondent during the test week. This was an attempt to control for that medium in the overall study.

The balance of the post-test questionnaire directly related to a post-test measurement of questions asked in the pre-test instrument. In addition to questions on advertising, buying behavior questions were asked about purchases made during the test week or any brand preferences which might have developed.

The Advertising Monitor Form

While not a part of the material used by the interviewer or the respondent, the advertising monitor form was an integral part of the study. A copy of this form is included as Appendix G.

All local, regional and national advertising media appearing in the Lansing/East Lansing area were monitored during the week of February 9-15, 1976. The form was used to monitor the broadcast media. It was kept on an hourly basis and included a listing of the time, product category, brand and advertiser/retailer for each commercial appearing on radio or television in the market during the test period. More than 1,200 hours of broadcast on three television stations (WJIM-TV, Lansing, WILX-TV, Jackson, and WJRT-TV, Flint/Saginaw/ Bay City, all of which can be received in the market without cable attachment) plus seven local radio stations (WILS-AM, WILS-FM, WJIM-AM, WJIM-FM, WVIC-AM, WVIC-FM, WITL-AM, WITL-FM, and WFMK) were monitored on a moment-by-moment basis. Arrangements were made with the stations involved to obtain station advertising logs for the period so that monitor forms could be checked against these logs. These media logs were used as a determination of respondent impressions from commercial advertising messages. Monitoring was completed on approximately 90 percent of the stations and broadcast hours and complete records were achieved with stations logs.

In addition, copies of all newspapers and magazines which appeared in the media diaries were obtained. They were evaluated for the measured product categories. This gave a complete listing of all advertising messages available to respondents in the measured media during the study week.

The above instruments were the primary ones used in the study. No major difficulties were encountered in the use of the instruments and, with the exception of some minor coding section errors and disarray in replies from the pre-test to the post-test, the instruments appear to have been quite effective in eliciting the desired information. Coding keypunch and data handling were the major problems since massive amounts of data were collected.

The Sample

The initial sample for the study was selected from the student population of Michigan State University as listed in the Student Directory, Fall, 1975. The Student Directory is a publication of the University and lists names, local and permanent addresses, and local telephone numbers for each student registered for Fall Term, 1975. The publication is available for sale and is a public record of students.

Using the Student Directory as the sample universe, a random number between one and ten was selected for page intervals. The number selected was "3" and as a result, every third page in the directory was used, using page one in the Directory as a starting point.

A second random number was selected, in this case "22." This was the start interval. A third random number, "12," was selected as the skip interval between names on each new page, i.e., after the 22nd name on each new page was selected, twelve names were counted and the 12th name was then selected for the sample, again assuming it met the sample qualifications described below.

Qualifications for inclusion in the sample were stipulated as follows: (1) the student must have had a telephone number listed and (2) must reside either on-campus or in East Lansing. These qualifications were included since a telephone was required for the initial qualification call and Michigan State has a fairly large number of students who live either in surrounding communities or Lansing proper and commute to school.

Because the study was concerned only with Lansing/East Lansing media, out-of-city students were automatically disqualified. Additionally, because interviewers in many cases did not have transportation, the study was limited to the campus and East Lansing areas. Even with these restrictions, approximately 70 percent of all MSU students were within the sample frame.

Based on the above qualifications, if the student randomly selected did not meet the qualifications outlined above, the name of the student immediately following the name selected was called. This procedure was used until a qualified respondent was selected. From that point, an additional 12 names were counted and the procedure repeated until a total of 772 names had been selected. These names made up the original sample base.

Interviewing and the Interviewers

All interviewers were students from the Winter Term, 1976 Advertising Research class at Michigan State University. Most students were senior level and were either Advertising or Marketing majors. All had received a minimum six weeks' instruction in the fundamentals of advertising/marketing research prior to the project.

The class consisted of sixty-two students, all of whom participated as interviewers. Training of the interviewers was conducted on Wednesday, February 11, 1976, by Don Schultz and Martin Block. Training required approximately two hours.

Objectives of the study were outlined but interviewers were told that the study was concerned with the effect of advertising on the respondent but no specific details were given. This was done to prevent interviewer bias. No mention was made of the radio promotional effort on behalf of the Overseas Study Program.

Students were given packets of materials with the Diary Placement Call form (Appendix D), Media Diary Form (Appendix C) and Media Diary Placement and Questionnaire (Appendix B) and asked to read through the materials. Complete directions were then given on how to conduct the interviews and the purposes of the various forms. A question-and-answer session was held with the interviewers to clarify any point.

After the trainers were satisfied that the interviewers were familiar with the forms, each interviewer was given a list of twelve names from the previously drawn sample. Each interviewer was asked to place a minimum of seven (7) diaries from the list given. If the seven were placed before the entire twelve-name list was used, the remaining names were returned to the survey headquarters. If, after trying all twelve names, seven interviews had not been arranged, the interviewer contacted survey headquarters for additional names.

Additional names were given interviewers to replace those in the sample who were no longer students at MSU, had moved, graduated, could not be reached or refused to cooperate. The placement rate was 53.6 percent and 378 pre-test questionnaires were administered and diaries placed.

As was to be expected, some interviewers placed more diaries than others. On the average, each interviewer placed 6.1 diaries.

Response Results

Of the 378 interviews conducted and where diaries were placed, 350 or 92.6 percent were completed and returned for tabulation. The final sample base was 339 cases since, as expected, some returned questionnaires and diaries were unusable or incomplete.

A recap of the sample usage follows:

Names selected initially	772
Names not used	67
Names in sample frame	705
Names selected moved, no longer in school, disconnects, wrong numbers, etc.	89
Potential sample available for contact	616
Names unable to contact after four (4) telephone calls or quota filled before call-backs completed	102
Number of sample actually contacted	514

Not in town for entire survey period, returning home for weekend, etc.	16
Potential sample respondents	498
Not qualified for sample (no radio or did not listen to radio)	31
Qualified respondents	467
Refused to participate after qualification	58
Sample base originally agreeing to survey	409
Did not meet for interview and/or diary placement	24
Respondents who agreed to and met with interviewers for pre-test and diary placement	385
Pre-test interviews terminated or respondent withdrew before accepting diary	7
Completed pre-test interviews and diaries placed	378
Non-completed post-test interviews, incomplete diaries, etc.	28
Total	350

A verification program was conducted on the diary and post-interview section of the study by a graduate student in the Department of Advertising. Ten percent (10%) of all completed diary respondents were personally called to verify that they had participated in the study and had kept the diary. A less than 2 percent error was found based on this verification process which was the result of interviewer falsification. The results are well within the acceptable range for studies of this type.

Processing the Data

The amount of data gathered for analysis was very large. After final sorts and merges, the data bank used in the analysis consisted of eleven cards for each of the 339 respondents used in the final analysis. Because of the volume of information gathered, all data instruments were prepared especially for computer usage. All analysis was planned for the Michigan State University CDC 6500 computer facility. The processing of the data was based on the capabilities of that system.

Questionnaires, test and recording instruments were designed as much as possible for coding directly to key-punching to minimize error. The data consisted of two basic sets, the respondent data and media data. Different processing approaches were used with each.

The respondent data included the pre-test and post-test questionnaires and media usage diaries. Media data consisted of the record of all commercial advertising messages which appeared in the Lansing/East Lansing market in measured media (newspapers, magazines, radio and television) during the test week. Each is described separately.

Analysis of the Data

The data used in the study consisted of two types, that gathered from respondents concerning (1) their response to questions on product or service awareness, brand preference and purchase behavior through the pre- and post-test instruments and their media usage during the test week and (2) the advertising messages available to respondents through newspaper, radio, television or magazines during the test week. Since the purpose of the study was to compare response changes based on pre- and post-test instruments to the available advertising messages, the information gathered consisted of two logically separate groups of data which were combined to make the comparisons and analysis desired.

The steps which were followed are enumerated to illustrate how the gathered data were analyzed.

Frequency Distributions

Using the cards keypunched from the original data, the information from the Media Usage Study Diaries was sorted into a frequency distribution. An analysis was made of the media used by the respondents during the test week. Since the media vehicles varied widely (there were initially over one hundred separate magazines listed in the diaries kept by the respondents during the test week), an analysis was first made of the media used by the sample based on frequency of mention. A FORTRAN program was written and run to obtain the frequency distribution of reading, listening or viewing of each individual medium which appeared in the respondent diaries.

Based on the frequency distributions by newspaper, magazine, radio, and television station, media which had sufficient usage which could be logically considered to have had a potential influence on the total respondent base was obtained. Media which contained no advertising such as professional journals were eliminated as were publications from foreign countries. Based on the sample, media used in the analysis was required to have a frequency of usage among a minimum of seven of the 339 respondents (2% of total) to be included in the list. The media used in the final analysis based on the frequency distribution were:

Newspapers:	Michigan State University State News	
	Lansing, Michigan State Journal	
	Detroit, Michigan Free Press	
	New York, New York New York Times	
Magazines:	Newsweek	Madamoiselle
	Time	Fortune
	Sports Illustrated	National Geographic
	Reader's Digest	TV Guide
	Playboy	Harper's
	Penthouse	Vogue
Radio Stations:	WVIC-AM	WILS-AM
	WVIC-FM	WILS-FM
	WJIM-AM	WITL-AM
	WJIM-FM	WITL-FM
	WFMK	WJR
Television Stations:	WJIM-TV, Lansing	
	WILX-TV, Jackson	
	WJRT-TV, Flint/Saginaw/Bay City	

The frequency distribution for readership, listening or viewing of media other than those listed was not felt to be sufficiently high to significantly influence the results of the study.

A FORTRAN program was written and run which developed a frequency distribution for the Diary Placement Interview (the pre-test instrument) and the Post-Test Questionnaire (the post-test instrument). This program provided the distributions of awareness, brand preference or purchase behavior for the individual product or service categories being studied. The categories for which these frequency distributions were obtained were banks, overseas study programs, on-campus entertainment, off-campus entertainment, wines, automobiles and hi-fi/stereo shops. This computer run gave the number of responses to questions about the product categories being studied by individual respondents.

Procedure

The final sample base consisted of 339 respondent cases with eleven computer cards per case. In order to handle this large amount of data and to prepare it for analysis, a special FORTRAN computer program was written and used with each of the four major measured media (newspapers, radio, television and magazines). These programs will be found in Appendix H.

The primary purpose of the above programs was to generate frequency distributions illustrating the number of advertising messages available to the respondent population and the number of messages which were potentially received. That is, the number of impressions for each specific category and each specific brand was determined for each individual respondent. The procedure is illustrated by the following figure.

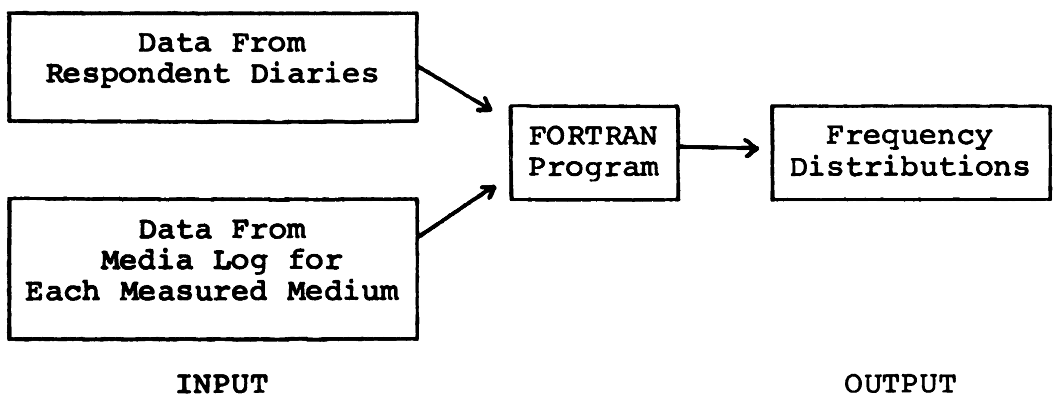

Fig. 6. Flow chart

The data from each respondent diary was measured against the media log for each of the measured media. (The term "media log" will be used hereafter to refer to all media advertising records for newspaper, radio, television and magazine messages available to the respondent population during the test week based on the monitoring process previously described.) This program resulted in a frequency distribution of the messages (which appeared in print or were broadcast) and the impressions received during the test week by respondents.

Each brand and category was then inspected and several brands and categories were eliminated from further analysis because of too little advertising by the particular brand or category during the test week or too few impressions on the respondent population due to their media usage.

It was determined from these frequency distributions that the entire categories of wines and on-campus entertainment should be eliminated from further analysis. In addition, only certain brands within the remaining categories had sufficient numbers in the distribution cells to warrant further consideration. The brands actually analyzed are enumerated in the Findings section of this study.

Following the frequency distribution runs described above, the pre-test, post-test and frequency data were then combined and analyzed using standard SPSS programs for analysis of crossbreaks.

Revision of Analysis Plan

In the initial study outline, chi-square tests for goodness of fit were the statistical procedures planned for use in determining the acceptance or rejection of the hypotheses to be tested. It was believed that chi-square analysis using the mean and variance of the observed data to generate theoretical or expected data would be a sufficiently powerful statistical technique against which the hypotheses could be tested. This proved not to be the case.

Initially, a chi-square computer program was written which provided for the calculation of the theoretical frequency distribution based on the observed data. This chi-square program was run to test the first hypothesis. Based on the results, it was determined that the chi-square test was not statistically powerful enough to accept or reject the hypotheses being tested. The independent nature of the sample, the small sizes in some of the sample cells, and the narrow range of movement in the cumulative response measure all suggested that another method was required for the fitting of the curves.

Use of the Broadbent and Segnit Geometric Curve Fitting Procedure

Several alternatives were investigated which were available through existing computer programs or which could be accomplished through use of the computer. All were rejected. The curve fitting procedure used in the analysis was that suggested by Broadbent and Segnit in their original article. While it required hand calculation, it did serve to further test their basic concept of curve fitting. It consists essentially of a form of least squares method of estimating the geometric response function. An outline of the procedure follows.[7]

Broadbent and Segnit suggest the use of a technique to fit a geometric response function to experimental data. Given the data on the response C_s at the s-th cumulative impression, when the geometric response function is standardized the formula becomes:

$$C_s = 1-r^s$$

$$\text{i.e., } \log(1-C_s) = s \log r$$

A plot of log $(1-C_s)$ should be made against s whose result should be a straight line through the origin. Since $r \leq 1$, $\log r \leq 0$, the line should slope downward or be horizontal, because the log of r represents the slope of the line.

By assuming the data came from a geometric response function for which h was the saturation level and g was the range, then

$$(h-C_s) = gr^s$$

$$\text{i.e., } \log(h-C_s) = \log g+s \log r$$

by multiplication, the formula was transformed to

$$C_s = h - gr^s$$

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[7]Broadbent and Segnit, "Response Functions in Media Planning," pp. 234-35.

Using the above formula, the C_s term was then calculated from the observed data using the base number of respondents to obtain a percentage who either remained loyal to the brand from the pre-test to the post-test or changed from another brand or product on the pre-test to the brand or product being analyzed on the post-test. In Broadbent and Segnit's example, they referred to this as "Awareness %." (Additional details on how the base number of respondents was determined are in the Findings in Chapter IV.)

Using the maximum observed percentage of the actual data as the saturation level (for in these cases, response was limited by the data collected), or the h term, the C_s was then subtracted from that calculated percentage. From that number the log $(h-C_s)$ was calculated to obtain the term Y for use in the least squares method of calculating the a and b weights. Hughes and Grawoig offer the standard formula for these equations as

$$b = \frac{N\Sigma xy - (\Sigma X) \quad (\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

$$a = \bar{y} - b(\bar{x})$$ [8]

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[8] Hughes and Grawoig, "Statistics: A Foundation," pp. 322-23.

The only difficulty in using the method was the calculation of negative logarithms in calculating the Y term. The X term was calculated using the number of impressions on the respondents from the frequency distribution previously obtained.

Since a curve fitting procedure was involved, the b and a terms, which were both negative logs in these equations were then transformed to positive terms and became the following

$$b = \log r$$

$$a = \log g$$

The formula was then solved where

$$C_s = h - gr^s$$

and where h is the highest expected value, g was the transformed log of a, r was the transformed log of b and s was the exponent of log r determined by the number of impressions received from the gathered data. The result was the expected or theoretical value expressed as a percentage of the total sample.[9]

The preceding procedure was used to fit all geometric curves which were calculated and plotted in the analysis of the data.

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[9]Broadbent and Segnit, "Response Functions in Media Planning," pp. 234-35.

In order to fit the other curves and to test for goodness of fit, the linear and the s-curve were fit using procedures described by Hughes and Grawoig.

The s-curve was assumed to be the cumulative normal section of a normal distribution. First the mean and standard deviation were calculated. Then the probabilities of a random variable having the normal distribution were determined by obtaining the appropriate areas under the density function or the calculation of z scores. All other expected frequencies were calculated in the same manner. Using the z scores, the table of areas for a normal distribution was entered and the percentage of the distribution expected to fall within the area defined calculated. Cumulative percentages were then determined. Knowing the maximum and minimum values of the observed points, the cumulative percentage of X can then be calculated to give the data points expected in a normal distribution.[10]

The linear curve was fit using the least squares method from Hughes and Grawoig. In addition, the step function curve was fit using the method suggested by the same authors with a minor variation in the selection of the point at which the step was made.[11]

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[10]Hughes and Grawoig, "Statistics: A Foundation," pp. 230-35.

[11]Ibid., pp. 318-24.

Chi-Square Goodness of Fit Test

Having obtained a more precise estimate for the theoretical frequency distribution, then using the expected value for each of the impressions and the observed value, a simple chi-square goodness of fit test was performed using the formula from Hughes and Grawoig.[12]

$$X^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

where degrees of freedom were determined by the maximum value of the previously calculated h, used as the upper limit determination of impression numbers less one. In the curves which were plotted, impression limits were determined at levels of seven, eight, nine, ten, eleven and twelve impressions, depending on the product category.

The chi-square calculation was used to determine the significance of the goodness of fit of the curves which were observed against those theoretically derived.

The slope of each line was determined from the calculation of the regression coefficients or slopes previously described. For example

$$Y = a + b\,x$$

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[12] Ibid., p. 229.

where a is the intercept of the estimated curve and b is the slope. Since the plot is a geometric curve and not linear, a log transformation is required as previously described from Broadbent and Segnit. This transformation results in the regression coefficients transformed to r and the intercepts to g per Broadbent and Segnit.[13]

Inferences were then made from the slopes of the points using the standard error of the regression coefficients which had been previously calculated using the Hughes and Grawoig formula

$$SE_b = \frac{SE_{y \cdot x}}{SE_x \sqrt{N-1}}$$

where $SE_{y \cdot x}$ is determined by

$$SE_{y \cdot x} \sqrt{\frac{\Sigma x^2 \Sigma y^2 - (\Sigma XY)^2}{(N-2)\Sigma x^2}}$$

where SE_x is determined by

$$SE_x = \frac{SD}{\sqrt{N}}$$

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[13]Broadbent and Segnit, "Response Functions in Media Planning," pp. 232-35.

where SD is determined by

$$\frac{1}{N}\sqrt{N(\Sigma X^2) - (\Sigma X)^2}$$

where N = number of cases.[14]

Tests for Significance

The t-test for significance was used in the analysis to determine the significance between the means of two populations being compared. The formula used is the standard one from McNemar

$$t = \frac{\bar{x}_1 - \bar{x}_2}{SD_m} \text{ [15]}$$

where SD_m is the pooled variance common to the two populations. The formula, however, has been adapted slightly so that the calculation made is not between the means of the distributions but between the regression coefficients which are the exponents of the log used to determine the slope of the line in the theoretical distribution. The formula is a simple substitution into the standard t:

$$t = \frac{b_1 - b_2}{SD_b} \text{ [16]}$$

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[14]Hughes and Grawoig, "Statistics: A Foundation," pp. 324-27.

[15]Quinn McNemar, Psychological Statistics (New York: John Wiley & Sons, 1962), pp. 102-03.

[16]Ibid., p. 143.

where SD_b is the pooled standard errors of the regression coefficients. Standard tables for t were then used to determine significance.

Summary

The general outline of the study was given and reference made to the various instruments which were used. Based on the study results, it appears that the data collection materials were acceptable and provided the information needed for analysis.

The sample from the student population of Michigan State University was discussed and details given on how the sample was selected. Standard procedures were used and the respondents reacted favorably to the study instruments.

A brief outline of the data handling was discussed. References were made to FORTRAN programs which were written to handle the data input from both the respondent questionnaires, media diaries and the advertising messages which were monitored in the measured media during the test week. In addition, details were given on how the data were manipulated into a usable form for final analysis.

Initially, chi-square goodness of fit tests were planned to determine theoretical frequency distributions. Based on the data and the need for more preciseness, the Broadbent and Segnit method of fitting geometric response functions to observed data was used. This formula provided the additional rigor needed to test the results for significance.

Adaptations of the standard t-tests were used to determine significance of the findings. Standard t calculations did not provide sufficient power to test the hypotheses. The use of regression coefficients in the t-tests was necessary to achieve a sufficient rigorousness from the tests for purposes of this study.

Chapter IV reports the findings of the study and elaborates on how the methodology outlined in the previous pages was used in the analysis of the data.

CHAPTER IV

FINDINGS

As discussed in Chapter II, the sample respondents for the study were drawn from the student population of Michigan State University, Winter Term, 1976. MSU is a large university with a highly diversified student population. It was important to insure a representative sample was selected. An improper sample base in a study involving media habits and usage could result in misleading results. The sample drawn appears to be representative of the total university student community as is indicated by the information below.

Description of the Sample

The initial sample base, described in Chapter III, consisted of 378 respondents. These respondents completed a pre-test interview and agreed to keep a media usage diary for one week. Of the original 378 in the sample, 350 completed the Diary Placement Interview form, kept the Media Usage Study Diary and completed the Post-Test Questionnaire to make up the sample base. Prior to further analysis, a computer run frequency distribution for these 350 respondents was made. The following figures are based on the total sample of 350 respondents who returned all three study forms. The final total base of 339 cases on which all analysis is based was the result of incomplete or missing data in some parts of the three instruments which was discovered during the computer program previously mentioned.

The sample figures below are based on the original 350 respondents who completed all instruments. While not matching exactly, these figures should be indicative of the 339 actual cases which made up the base for the final analysis.

Males accounted for 51.1 percent of the sample, females 48.9 percent. Forty-eight of the respondents were married, or 13.7 percent of the sample, 84.6 percent were unmarried and 1.7 percent refused or did not reply to the question.

Class standing of the sample was fairly evenly split among the four college classes and graduate students as shown by Table 4. In addition, the sample was representative of the various areas of study in the university. A total of sixty-six different fields of study was represented with the largest group amounting to only 8 percent of the sample. This group listed their major as No Preference which is usually composed of Freshmen and transfer students. Other majors representing 4 percent or more of the sample were from Agriculture, Natural Resources, Hotel, Restaurant and Institutional Management, Business Administration, Human Ecology and Education. The distribution of the field of study appears representative of the university in terms of sample size when compared to actual enrollment in these schools and colleges.

TABLE 4

CLASS STANDING OF SAMPLE

Class	Number in Sample	Percentage in Sample
Freshman	78	22.3
Sophomore	83	23.7
Junior	78	22.3
Senior	64	18.3
Graduate	45	12.9
Refused/ No Answer	2	.6
Total	350	100.0

Of the sample, 44.9 percent, or 157 of the respondents, held an outside job of some sort. The majority of the students who worked spent either ten or twenty hours per week in an outside job with fifteen students, or 4.3 percent of the sample, holding down a full-time job (forty hours per week) in addition to attending classes.

Over 70 percent of the sample lived on the university campus with only 100 of the respondents living off-campus. Several types of dwellings were represented as indicated below. The majority of the sample, 73.7 percent, shared a room with another person or persons whether they lived on or off-campus.

TABLE 5

TYPE OF HOUSING UNIT OF RESPONDENTS

Type	Number in Sample	Percentage of Sample
Married Housing	33	9.4
House	39	11.1
Apartment	41	11.7
Co-Op	2	.6
Fraternity/Sorority	14	4.0
Dormitory	217	62.0
Duplex	1	.3
Missing/No Answer	2	.6
Total	350	100.0

Media Habits and Media Usage of the Sample

One of the requirements to be included in the study was owning or having access to a radio set. This was used as a screening device to assure radio users were widely represented in the study. While only access to a radio set was required, 81.7 percent of the sample owned the radio set which they used or had access to for listening purposes. Only 63 respondents relied on another person's radio for their listening.

Of the sample, 209 respondents, or 59.7 percent of the sample, owned the television set which they used. Of this group, only 54 respondents or 15.4 percent had their sets connected to a cable system. Thus, the access to television station signals outside the immediate Lansing/East Lansing area did not appear to pose a problem in terms of television exposure calculations.

Newspaper reading habits among the respondents were carefully checked because of the unusual situation which exists on the Michigan State University campus. The student-operated newspaper, The State News, is available in dormitories, classroom buildings and offices across the campus at no cost. The newspaper is somewhat unique for a student newspaper in that it is published five days per week (Monday through Friday during the regular school term), is a full size, morning edition and carries campus, state, local, national and international news. During the test period, the newspaper averaged ten to sixteen pages per issue.

Since The State News is readily available to all MSU students at no cost, it was assumed respondents who had an interest in a newspaper would make use of this publication on a regular basis. Respondents were thus questioned about their usage of newspapers other than The State News on the pre-test questionnaires. Other newspapers were normally available to the respondents either through subscription or purchase at a newstand or coin box.

Two hundred and thirty, or 65.7 percent of the sample, indicated that they read a newspaper other than The State News. Of that group, 140, or 60.9 percent, read either the Sunday or daily edition of The Detroit Free Press. Thirty-two respondents read the Lansing State Journal and twenty-two read the New York Times. The balance of the newspaper readership was spread widely among smalltown or other miscellaneous newspapers.

One hundred and sixty-nine, or 48.3 percent of the sample, subscribed to a magazine. Eighty-five, or 24.3 percent of the sample base, subscribed to two magazines, 12.3 percent of the total representing eighty-eight respondents subscribed to three magazines, 6.6 percent subscribed to four or more magazines and eight respondents subscribed to five or more magazines.

News magazines were the most widely subscribed to category among the respondents with forty-two subscribing to Newsweek and forty to Time. Other magazines subscribed to were widely spread with primary emphasis on special interest categories.

In addition to determining to what magazines the respondents subscribed, information was also obtained on which magazines were regularly purchased on a nonsubscription basis. Just over 30 percent of the respondents purchased magazines regularly with fifty-three respondents, 15.1 percent of the total, purchasing two or more magazines on a regular basis. Only eighteen respondents, or 5.1 percent, reported purchasing more than three magazines regularly, six reported purchasing four magazines and two purchased five or more magazines on a regular basis.

Of those magazines purchased on a regular basis by the respondents, preferences varied widely. Newsweek was purchased by twenty-five respondents, or 47 percent of those purchasing a magazine regularly. Cosmopolitan was second in preference, being purchased by twenty of the fifty-three respondents. Time was third with fourteen respondents purchasing that publication on a regular basis. All other magazines were purchased by ten or less of the sample on a regular basis.

In addition to their reading habits, respondents were questioned about their use of the broadcast media. In terms of sheer hours of listening or watching, radio was more widely used than was television as indicated below. As shown in Tables 6 and 7, 66.3 percent of the respondents reported they listened to radio more than

TABLE 6

HOURS OF TELEVISION WATCHING PER DAY AS REPORTED BY RESPONDENTS ON PRE-TEST QUESTIONNAIRE N = 350

Number of Hours	Number of Respondents	Percentage of Respondents
Don't Watch	75	21.4
Less Than One Hour	138	39.4
More Than One Hour But Less Than Three Hours	97	27.7
Three to Four Hours	29	8.3
More Than Four Hours	8	2.3
No Answer	3	.9
Total	350	100.0

TABLE 7

HOURS OF RADIO LISTENING PER DAY AS REPORTED BY RESPONDENTS ON PRE-TEST QUESTIONNAIRE N = 350

Number of Hours	Number of Respondents	Percentage of Respondents
Don't Listen	12	3.4
Less Than One Hour	106	30.3
More Than One Hour But Less Than Three Hours	120	34.3
Three to Four Hours	51	14.6
More Than Four Hours	61	17.4
Total	350	100.0

one hour per day while only 38.3 percent of the sample reported watching television more than one hour per day. This finding supported the assumption about the wide incidence of radio listening among the student population.

In addition to asking how much radio the respondent listened to each day, the favorite radio station was asked of each sample member. More than 89 percent of the respondents listed stations which were either monitored as a part of the study or were noncommercial stations. Approximately 8 percent of the respondents could not list a favorite radio station. Only 3.2 percent of the respondents listed as their favorite station, one on which advertising broadcast during the test week was not monitored. It appears that the monitored stations in the market provided a substantial majority of the advertising impressions on radio and that the small number of listeners to unmonitored stations did not affect the results of the study.

Summary of the Sample

Based on analysis of the respondents in the sample, the respondent group appears representative of the sample universe of Michigan State University students. In terms of sex, marital status, area of study, housing, and media habits, the group which made up the study sample represents a cross-section of the universe with no apparent biases.

Media habits and media usage of the sample population also appears to be representative of the general student population. Based on comparisons of student media usage and that generally recognized as being the average for the general population as a whole, the sample appears representative. Because of the unusual nature of the student newspaper, The State News, newspaper usage habits of the sample may be a bit above that found on other college campuses or among the general population.

Study Findings

The study was originally designed only to attempt to empirically estimate and test the Broadbent and Segnit concept of advertising response functions[1] and to test hypotheses drawn from their proposal. As the processing and analysis of the gathered data were conducted, however, some intriguing concepts emerged which are also discussed in the Findings section of this report.

Limitations were encountered in implementing the study design as originally conceived. The situations which created these limitations are discussed first, followed by a description of the necessary adjustments required to properly conduct a meaningful analysis of the gathered data. As these necessary adjustments were made, interesting possibilities for future research

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[1]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

emerged. The accumulation and aggregation of the data which were required for analysis suggests future approaches for measurement of advertising response functions. Two of the more important issues, media weight required for measurement and the effect of competitive media activity are discussed as the revised handling of the data is explained.

Following the discussion of the limitations in measuring the advertising response functions, the testing of each hypothesis proposed in Chapter II is discussed in detail. In some instances, alternative measures are used to assure that the hypothesis is rigorously tested. All testing of hypotheses is supported with explanatory tables, figures, and other appropriate descriptions of the statistical tests used to determine the significance of the findings.

Following the discussion of the Findings, Chapter V is devoted to a summary of the pertinent results of the study and conclusions drawn from the results.

Limitations in the Measurement of Advertising Response Functions as Proposed by Broadbent and Segnit and Necessary Adjustments

The empirical estimation of advertising response functions as proposed by Broadbent and Segnit[2] and on

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[2]Ibid.

which this study was based as previously outlined, met with several data handling and analysis limitations which were unforeseen at the time the study was planned, and the information used as the data base, gathered. While empirical estimation of the Broadbent and Segnit response function concept has been accomplished, future researchers should be aware of the limitations which were discovered in the procedures used in this study. Each is discussed in detail.

Lack of Sufficient Media Impressions on the Audience

While it appears that the respondents in the sample were literally bombarded with advertising messages during the study week, sufficient numbers of advertising impressions in certain categories in which measurement was planned were not achieved. As a result, the minimum number of advertising impressions required to make use of accepted statistical techniques to determine significance of the effects of the media messages were lacking in several instances. The minimum number felt to be necessary for accurate calculations was set at ten per cell because of the use of individual brands within rather broad categories. Two situations appear to have contributed to this lack of measurable advertising impressions among certain members of the respondent population.

Lack of Media Weight

The major problem in locating sufficient advertising impressions in certain of the product category cells among sample respondents appears to be simply a lack of media weight during the test week by advertisers whose products were included in the study. Based on a pre-test of the questionnaires, it was believed that sufficient advertising media weight was being placed in the market by wines and local banks in the four media being monitored to achieve significant exposures to their advertising messages by the sample respondents. Such was apparently not the case. In most media, particularly radio, very heavy advertising schedules are apparently required to achieve sufficient impressions on the audience so that recognized statistical procedures may be used with gathered data to determine the significance of the results.

In some instances, while advertisers in the test categories placed advertising schedules in the measured media, those advertising schedules were not of sufficient weight, particularly among the sample respondents being measured, to deliver the required number of impressions to measure advertising functions statistically. For example in the banking category, although advertising schedules appeared in three of the four measured media (radio, television and newspaper) for Michigan National

Bank, only 10 percent of the study sample could have received a radio advertising impression, only 10.3 percent of the study sample could have received a television advertising impression and only 11.8 percent could have received an advertising impression from the schedule which appeared in the monitored newspapers. This low overall advertising impression rate occurred in spite of the fact that portions of the sample could have received as many as two advertising impressions from the radio advertising schedule, five from the television schedule and five from newspapers during the test week. Although some respondents in the sample could have received up to twelve advertising impressions in the measured media during the test period for Michigan National Bank, the great majority, or approximately 90 percent, received none at all. This suggests that the weight of a media schedule by an advertiser can have a great effect on the advertising response function based entirely on whether or not the media audience receives the message.

Length of Time of the Study

There appears to be little question that the one week time period of the study design resulted in a low number of advertising impressions on sample respondents in some of the categories studied. A longer time period would have likely generated more advertising impressions on the respondents, particularly in those categories where media advertising schedule weights were not heavy initially. Lengthening the time period over which the study was conducted would have likely resulted in more advertising impressions in the various measurement cells which were analyzed. Larger numbers of advertising impressions in some categories could have resulted in more meaningful information for analysis. This was particularly true in some product categories which were ultimately discarded from the study due to the small impression base which prevented accepted statistical methods from being used for analysis.

It does not necessarily follow however that lengthening the period of the study would have resulted in substantial changes in the advertising response functions being measured. This conclusion appears correct if the effects of competitive media advertising and multiple advertising exposure effects are considered.

While the lack of advertising media weight and length of time of the study seems to have prevented the generation of sufficient sample sizes for statistical analysis in some categories, with one exception, the Overseas Study Program radio schedule, no attempt was made to control or influence the number of advertising impressions potentially available to be received by the sample respondents. No contact was made with any of the advertisers in the categories measured in the study and no attempt was made to influence the media habits of the sample. The study was conducted in as much a "real world" setting as was possible.

While it is assumed there may have been some bias in media usage by the sample respondents simply due to the fact that a media usage study diary was being kept, the amount of time devoted to media during the study week did not appear to be greatly different from the media usage averages reported on the pre-test instrument. Indeed, television viewing was somewhat higher during the test week among the sample respondents than normal possibly because of the showing of the 1976 Olympic Games during most prime-time viewing hours on the ABC television network. In spite of the potential bias of the media diary and the Olympics on television, advertising impressions achieved through the four measured media were still not sufficient in several measured categories to achieve sample bases necessary to conduct proper statistical tests for significance of results.

Effects of Competitive Advertising

Although advertising media message weight and the length of study time in the sample design created some limitations in the planned analysis of the data, the ability to control for the effects of competitive advertising in the measurement of advertising response functions appears even more serious.

The study design was constructed so that measurement of advertising responses was on a unidimensional scale. In other words, the measurement of response functions was attempted by measuring only the effects or effectiveness of advertising placed by the advertiser for his brand or product. Indeed, Broadbent and Segnit suggest in their paper, through the examples of measurement of response functions in the field, that advertising response functions deal only with the effects of single brands or single campaigns. All examples of response function measurement described by or suggested by Broadbent and Segnit in their article are unidimensional. No allowance is made for competitive advertising or its effects on the sample respondents being measured.[3]

Analysis of the data gathered in the study revealed what is a most logical phenomenon, the effect of competitive advertising. While multidimensional measurement of response functions seem intuitively appealing, it has apparently been either discounted or ignored by advertisers and researchers who have previously attempted to measure response functions. From the study conducted, it appears that media audiences are constantly being bombarded with advertising messages

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[3]Ibid., pp. 209-21.

for all types of products and services including those which are directly competitive to the product whose response function is being measured. Although this lack of measurement or control for competitive effects has not been considered in previous advertising response function measurement, at least in published articles, it appears to create a serious problem in the calculations conducted. If competitive activity, in terms of messages and exposure to competitive media messages by the audience, is not considered or controlled for, the calculation of advertising response functions on a unidimensional scale could prove misleading.

Based on analysis of the Findings from this study, it is suggested that future measurement of advertising response functions not be conducted on a unidimensional scale as suggested by Broadbent and Segnit.[4] Rather, response functions, to be truly calculated and prove useful in media planning, must be measured multidimensionally. Consideration must be given to the effects of competitive advertising as it impinges on the advertising response function for specific brands and categories. The audience, in this particular study, received as many or more competitive advertising messages for other products or brands as they received for the product or brand being measured. This phenomenon is

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[4] Ibid.

clearly illustrated by the following table (p. 162). As shown, seventy-nine of the respondents mentioned Chevrolet when asked what brand of automobile they first recalled having seen or heard advertising for during the test week. This is normally considered "top-of-mind-awareness" in commercial advertising research. This type of measurement is sometimes used to evaluate or calculate very low levels of advertising response functions or response to advertising impressions. In Table 8 the number of radio advertising impressions which could have been received by the study respondents is shown for both Chevrolet and Ford for the study week based on their media exposures. Almost the same number of those who listed Chevrolet advertising awareness first also could have received advertising impressions for Ford. On average, Chevrolet respondents could have received more Chevrolet advertising impressions during the test week than did respondents who mentioned Ford advertising as coming to mind first. The distribution is skewed toward higher Chevrolet impression levels for Chevrolet respondents.

The unanswered question in advertising response function measurement becomes, had those measured Chevrolet respondents had available no advertising impressions from Ford, would the number naming Chevrolet as the first remembered brand increase or remain as it was measured?

TABLE 8

RESPONDENTS MENTIONING CHEVROLET ADVERTISING AWARENESS FIRST
POST TEST ONLY N = 79

	Number of Radio Advertising Impressions During Test Week														Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	13+	
Chevrolet	42	2	3	2	1	1	2	1	3	0	2	4	1	15	79
Ford	41	12	5	6	5	5	1	1	1	0	1	0	0	1	79

Additionally, had the Chevrolet brand aware respondents been exposed to more Ford advertising impressions, would the sample number measured have increased, decreased or stayed the same? This study, because of the unidimensional nature of the design, cannot give answers to these questions. The results of the study do generate questions which should be answered in future studies of advertising response function measurement.

It appears logical from this study that advertising response functions cannot and should not be measured in a vacuum. Competitive advertising messages are being received and processed by media audiences on a continuous basis. To attempt to measure advertising response functions on a unidimensional rather than a multidimensional scale appears to create serious limitations on the results which such a measure can provide.

Advertising Impressions from Multiple Media

In addition to the limitations of measuring advertising response functions created by competitive advertising in the media, the additional question of adequately allowing for multiple media impressions on respondents also appears formidable. Returning briefly to Friedman's "TV Proneness" concept,[5] the argument is raised that

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[5]Lawrence Friedman, "Calculating TV Reach and Frequency," pp. 21-25.

because some people watch more television than others, they are exposed to more advertising impressions from television than are people who do not watch as much. This same proneness phenomenon appears to exist in all advertising media which are available to audiences in addition to television. Because some members of the audience use media more extensively than do others, they are "prone" to receive more advertising impressions.

In the study conducted, this media proneness concept appears to have been supported. Respondents availed themselves to varying amounts of media in which advertising was available. In the pre-test questionnaire this idea was supported by the varying numbers of magazines and newspapers read, subscribed to or purchased by the sample and the varying amounts of estimated usage of radio and television by the respondents. (See previous description of Media Habits and Media Usage in this chapter.) Indeed, in this study, based on the media diary analysis, some respondents received no advertising impressions from all four of the measured media for any of the product categories measured during the test week. This appears to be the direct result of varying levels of media usage among the sample respondents.

The limitation of advertising response function measurement, based on findings of this study, appears not to be just one of determining the number of advertising impressions which could have been received by the respondent for a particular product or brand. To accurately reflect the advertising response function, the varying weights of advertising impressions by the particular medium and the effects of multiple impressions through several media must also be considered and the effects of each analyzed. Unless all media are measured, an assumption that an advertising response function for a multi media schedule was the result of advertising weight in one medium and not the result of a combination of media interacting upon each other may prove groundless. The following table (Table 9) illustrates the multiple media impression situation which occurred with Ford automobile advertising in just one week in this study.

TABLE 9

RESPONDENTS MENTIONING AWARENESS OF FORD ADVERTISING FIRST POST-TEST ONLY N = 65

	Number of Advertising Impressions Which Could Have Been Received for Ford During Test Week by Medium							Total
	0	1	2	3-5	6-8	9-12	13+	
Radio	37	9	1	11	2	2	3	65
Television	34	20	7	2	2	0	0	65
Newspapers	41	11	5	1	6	1	0	65
Magazines	53	1	3	3	3	2	0	65

In Table 9, the number of respondents totals the number who, when asked what advertising they had seen or heard for automobiles during the study week, mentioned Ford first. While a large number received no Ford advertising impressions from the measured media at all during the test week, several probably could have received impressions from multiple media. For example, for the twenty respondents who could have received one impression from television, it is likely that some of these respondents also could have received impressions from radio, newspapers and/or magazines as well.

The effect of multiple advertising impressions from varying media creates a limitation in measuring the advertising response function as proposed by Broadbent and Segnit. Only the respondent being interviewed can accurately tell which message had the most effect or if the response was the result of a combination of messages or if the response was actually the result of some other nonmeasured advertising impression. In fact, it may even be impossible for the respondent to accurately relate the advertising impression and from which medium or media the impression was received. The previously mentioned concepts of Krugman[6] and Robertson[7] suggest

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[6]Krugman, "The Impact of Television Learning," pp. 349-56.

[7]Robertson, "Low-Commitment Consumer Behavior," pp. 19-24.

that knowledge and learning about advertising occur in low involvement situations. Under these circumstances, it may be that even the respondent is unable to separate the effect of multiple impressions and give a clear-cut answer to which media or which message created the response. Indeed, respondents may not be able to answer why the particular advertising was most remembered. No matter what the cause and effect of advertising response, the problem of multiple advertising impressions through various media is clearly evident in the findings of this study. It is a subject which deserves additional attention from future researchers.

Cumulative Advertising Impressions

The third limitation of the study should be recognized as it was by Broadbent and Segnit in their original proposal. In all cases, the findings of this study are based on cumulative not additional advertising responses.

To repeat, Broadbent and Segnit define the difference between cumulative and additional advertising responses as:

> The additional RF is the added value given by each separate, additional impression. It has been called the value of the r-th exposure. It is the difference between each individual term in

> the cumulative RF. Conversely, the cumulative RF is obtained by adding in succession the terms in the additional RF.[8]

Broadbent and Segnit also carefully point out that their original definition for a response function is based on cumulative and not additional response. This same cumulative response is used in the calculations and figures which follow.

All initial calculations are based on raw numbers of responses and not percentages. Where percentages are required, they have been calculated from the raw numbers, thus giving a single base for all mathematical calculations and statistical tests which have been used in the analysis. The base for the study is 339 cases as previously described.

Changes in the Plan of Data Analysis

Because of the unanticipated limitations encountered such as lack of sufficient media impressions in certain of the cells required for analysis, the effects of competitive advertising and multiple media advertising impressions, changes were made in the planned analysis of the data. Each of the analysis changes is explained in detail below and explanations of how the gathered data were analyzed is furnished.

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[8]Broadbent and Segnit, "Response Functions in Media Planning," p. 191.

The hypotheses were tested with rigorous statistical techniques although these tests were not those originally envisioned in the study plan.

Deletion of Categories, Products and Brands from the Analysis

Due to the low media advertising schedules weight placed by certain of the advertisers in the media and the resulting low number of advertising impressions which could have been received by the sample population during the test period, banks, wines and on-campus entertainment were deleted from the final analysis. Sufficient advertising impressions were not received by the sample population in order to statistically test the advertising response function in these categories.

In addition, the analysis of certain individual products and brands was also restricted by the lack of media advertising weight and advertising impressions which could have been received by sample respondents. The data analysis which follows is based on the following brands or establishments in each category:

Automobiles:	Chevrolet Ford
Off-Campus Entertainment:	Silver Dollar Saloon Rainbow Ranch Lizzard's Alle-Ey Dooley's

Hi-Fi/Stereo Shops:	Tech Hi-Fi Stereo Shoppe Marshall Music Highland Appliance
Overseas Study Program:	Overseas Study Program

Sufficient data were gathered in the above categories to test the hypotheses of the study statistically.

Necessary Aggregation of Response Functions and Media Advertising

The initial study plan was designed to measure response functions for various brands and products in each category and to measure only the response function for radio advertising. Due to the lack of sufficient advertising impressions received by respondents for some of the individual products and brands through the radio advertising medium, it became necessary to aggregate most brands and products in each category so that recognized statistical tests for significance of results could be used. Aggregation of response functions from measured advertising media was also required so that statistical techniques which would indicate significance of the findings would be possible. The data and analysis which follow provide a rigorous test of the proposed hypotheses. It also sufficiently estimates empirically and tests the concept of advertising response functions for use in media planning as proposed by Broadbent and Segnit.[9]

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[9] Ibid., pp. 187-238.

In the data which follow, except where noted, all brands and products listed above have been aggregated by product category, i.e., the automobile category consists of Chevrolet and Ford total response, Off-Campus Entertainment includes Silver Dollar Saloon, Rainbow Ranch, Lizzard's, Alle-Ey and Dooley's, etc. In addition, all advertising media impressions have also been aggregated except where indicated, i.e., radio, television, newspaper and magazine were considered as aggregate advertising media impressions. In some instances sufficient information was available for measurement by the radio medium as planned. These response function measurements are so noted.

Because the measurement period was only one week, advertising impressions for most single brands or products in most media among most respondents in the sample did not exceed a potential total of twelve impressions. There were, however, a nominal number of respondents who could have received a substantially greater number of advertising impressions for specific brands or products. In order to simplify analysis, advertising impressions were aggregated on the basis of one to twelve impressions and a final grouping made of all impressions in any single medium for any single product of 13+ impressions. In some instances, particularly the automobile category, advertising impressions which could have been received were as great as sixty or more for the measured week among some respondents but since this occurred among a very limited number of respondents and in only the automobile category, the aggregation of all impressions in excess of thirteen into one group was reasonable for purposes of analysis.

Compensating for Pre-Test to Post-Test Changes

As previously stated, one of the limitations in measuring the response function as outlined by Broadbent and Segnit, was the handling of the effects of competitive advertising in a product category. For example, on the pre-test questionnaire only one product or brand category answer was possible. If a respondent was asked to give the name of the automobile for which they remembered seeing or hearing advertising, only the first answer was accepted. If Chevrolet was the reply, Ford was not. The problem was compounded, however, on the post-test questionnaire. For example, for a respondent who named Chevrolet on the pre-test questionnaire, two answers were possible on the post-test measure. These could have been a repeat of the Chevrolet answer first given or another brand of automobile. The same potential pattern was true for all other brands or products in the study. The actual change possible between a pre-test answer and a post-test answer for any product or brand was not a maximum of two but a maximum of three as is illustrated by the matrix below for automobile advertising awareness using Chevrolet as an example:

TABLE 10

CHEVROLET EXAMPLE OF POSSIBLE REPLIES TO QUESTION OF AUTOMOBILE ADVERTISING AWARENESS BETWEEN PRE-TEST AND POST-TEST MEASURES

Analysis Group	Pre-Test Answer	Post-Test Answer
Group 1	Chevrolet	Chevrolet
Group 2	Other Brand	Chevrolet
Group 3	Chevrolet	Other Brand
Group 4	Other Brand	Other Brand

In order to handle potential replies in the analysis, respondents were divided into the four categories shown above. Group 1 consisted of those respondents in the sample base who gave the same brand or product answer on both the pre-test instrument and post-test instrument. Group 2 consisted of those respondents who gave another brand on the pre-test but responded with the brand being analyzed on the post-test instrument. Group 3 was made up of those respondents who listed the test brand first on the pre-test instrument but switched to another brand when replying to the post-test questionnaire. Group 4 was made up of those respondents who did not list the test brand on either the pre-test or the post-test instrument.

For purposes of analysis, Groups 1 and 2 were considered to be responding to the advertising of the brand being tested. Group 1 respondents remained loyal to the brand given on the pre-test and post-test during the test week. Group 2, possibly because of the influence of the advertising impressions received from the media during the test week, named the test brand on the post-test questionnaire which was a change from the pre-test to the post-test measure. In other words, this group responded to some form of advertising or promotion which caused a switch in brands named.

Groups 3 and 4, for purposes of analysis, were considered to have not responded or responded negatively to the advertising for the brand being analyzed. Group 3, which listed the brand being analyzed on the pre-test instrument, listed another brand on the post-test thus resulting in a loss of mention for the brand. Group 4, because they did not list the brand being analyzed on either the pre-test instrument or the post-test instrument were apparently not affected by the brand's advertising if they received any advertising impressions for that brand.

Testing the Hypotheses

In evaluating the results of the tests of the following hypotheses, several terms have been used for convenience of discussion. Each term is defined below.

All Categories.--This term includes all the categories on which sufficient data were available for valid analysis. These include the response functions in the automobile category for Ford and Chevrolet, in the off-campus entertainment category for Silver Dollar Saloon, Rainbow Ranch, Lizzard's, Alle-Ey and Dooley's, in the hi-fi/stereo shop category for Tech Hi-Fi, Stereo Shoppe, Marshall Music and Highland Appliance and the Overseas Study Program category.

Cognitive Response.--The cognitive or awareness response is taken to be those individuals found in Groups 1 and 2 as previously described under the Pre-Test to Post-Test Changes. This measure includes only those responses measured at the cognitive or awareness level on the test instruments.

Conative Response.--The conative or intent to purchase response is taken to be those individuals found in Groups 1 and 2 as previously described under the Pre-Test to Post-Test Changes. This measure includes only those responses measured at the conative or intent to purchase level on the test instruments.

All Media.--This term includes cumulative responses aggregated from all media monitored in the study and included in measurements previously described. Included are those radio, television, newspapers and magazines previously enumerated.

As previously described, cumulative responses for categories have been aggregated as have cumulative responses for measured media impressions. These include those individual brands, products and media as described earlier in this chapter. In the case of media, the term "radio" is taken to mean all radio impressions and cumulative responses measured for the study sample for all radio stations measured. This same sort of aggregated total is also assumed for the newspaper, television and magazine media.

Hypothesis One

Research Hypothesis 1 was previously stated in Chapter II. In this instance, it is also the null hypothesis.

> H-1:
>
> The relationship between the number of impressions and the cumulative response from the gathered data, when plotted on a graph, will be represented by a convex shape which is always increasing but at a continuously decreasing rate.

In order to test this hypothesis, all cumulative responses for all categories in all media were aggregated. Using this observed data, the slopes of the lines were calculated and the points plotted on a graph. Using the Broadbent and Segnit[10] approach and Hughes and Grawoig[11] least squares methods of determining theoretical frequency distributions as outlined in Chapter III these points were then plotted on a graph to illustrate the goodness of fit for the geometric, linear, step-function and s-curves.

While it was hypothesized only that the response function plotted from the gathered data would fit a theoretically derived geometric curve, since this was the basis of the Broadbent and Segnit concept of response functions, the step-function, linear and sigmoid curves were also fit and tested with chi-square goodness of fit test to the observed data.

Traditional advertising wisdom has often suggested that a step-function, a linear response or a sigmoid curve might best represent the advertising response function. Therefore, it would be interesting to see how a theoretically derived step-function, linear function and sigmoid curve might fit the observed data but these steps would not be essential to accept or reject the hypothesis previously stated.

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[10]Broadbent and Segnit, "Response Functions in Media Planning," pp. 234-35.

[11]Hughes and Grawoig, "Statistics: A Foundation," pp. 318-24.

The Geometric Curve

The geometric curve, as illustrated in Figure 7, provided the best fit of any of the curves plotted. The chi-square goodness of fit test value obtained was 0.066 with eleven degrees of freedom indicating that the observed and the theoretical distributions were very closely related. This finding is statistically significant at the 0.005 level. This led to the acceptance of the null hypothesis which in this case is also the research hypothesis that the sample distribution agrees with the theoretical distribution. (See Technical Appendix for actual points plotted on the graph.) The very low chi-square value obtained indicated a very good fit of the data, a fact which is illustrated in the figure which follows (Figure 7).

In Chapter II, the convex curve, indicated in the plot below, was tentatively labeled the "Initial Impact" curve. Broadbent and Segnit suggested that in this response function curve, each subsequent impression would contribute proportionately less to the total cumulative response. Cumulative response would always be increasing but at an always decreasing rate.[12]

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[12]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

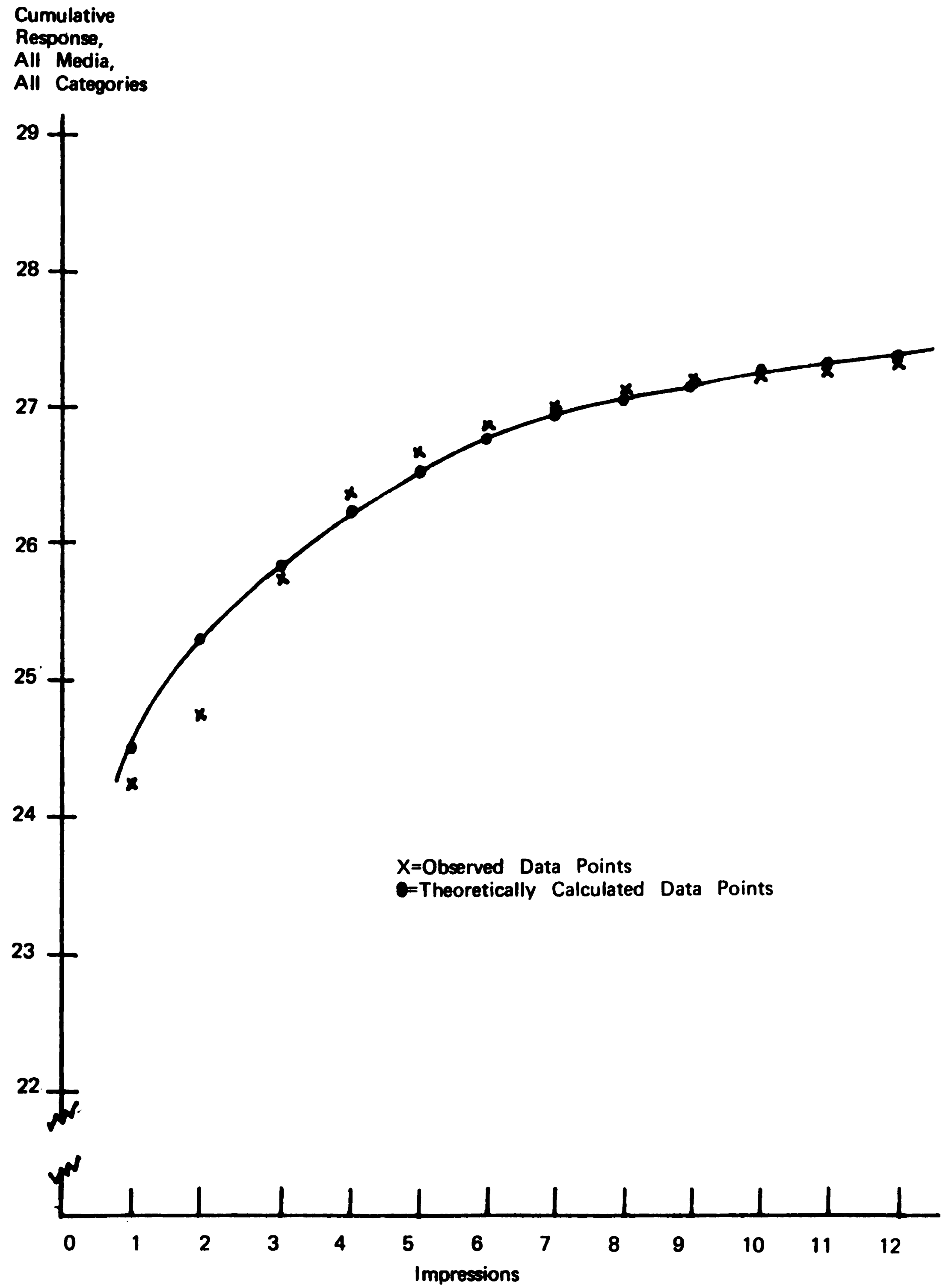

Fig. 7. Plot of Geometric Response Function, Cumulative Response, Based on Impressions for All Product Categories in All Media

As previously stated, although not necessary to accept or reject the hypothesis being tested, goodness of fit tests were calculated on the linear curve, the step-function curve and the sigmoid curve. Results of those calculations are shown below.

The Linear Curve

The linear curve, as illustrated in Figure 8, does not provide as good a fit of the observed data to the theoretically calculated distribution as does the geometric curve plotted in Figure 7. The chi-square goodness of fit test value was 2.579 with eleven degrees of freedom. This value is statistically significant at the 0.005 level of confidence. It should be noted, however, that the value of the chi-square goodness of fit test does not indicate that the linear curve provides as good a fit of theoretically derived data as does the geometric curve.

The linear response function curve in Chapter II was referred to as the "Constant Impact" curve. The shape of this curve suggested that the response function continued to build at a steady linear rate as additional impressions were received, e.g., each impression was of more value than the previous one in a linear progression. The graphing seems to visually bear that out.

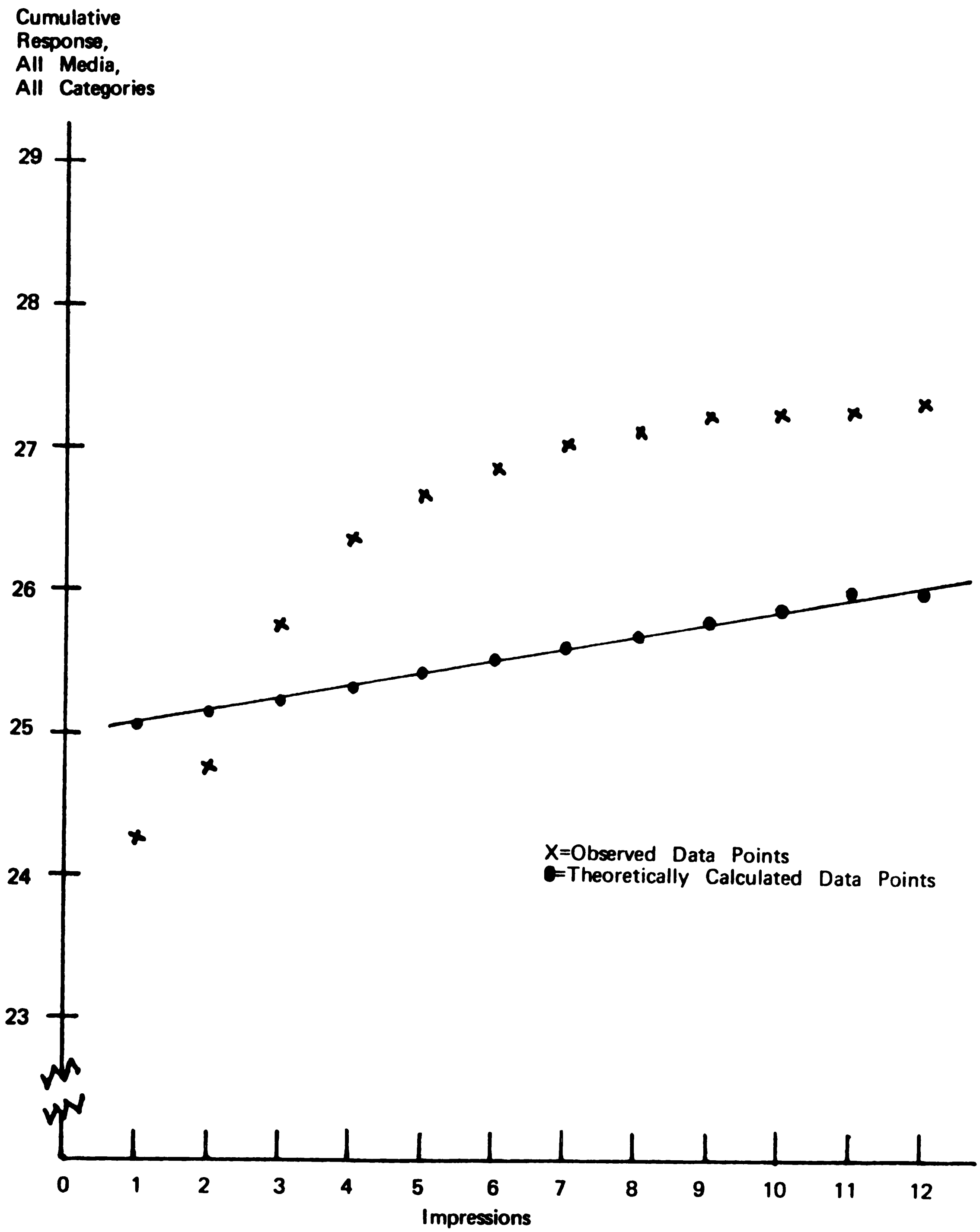

Fig. 8. Plot of Linear Response Function, Cumulative Response, Based on Impressions for All Product Categories in All Media

The Step-Function Curve

The step-function curve, as illustrated in Figure 9, provides a statistically acceptable fit of the observed data to the theoretical distribution. The chi-square value in the goodness of fit calculation was 1.050 with eleven degrees of freedom. Again, a chi-square value of 2.60 with eleven degrees of freedom or more was required at the .005 level to state that the relationship between the observed data and that theoretically calculated was not significant. While the observed and theoretical distributions were not as closely related in the step-function as were the distributions in the geometric function, they were much more closely related than were the data in the curve plotted for the linear response function. Of all the curves plotted, the geometric and step-function appear to be the ones with the best fit.

The step-function curve plotted above was labeled the "Critical Number" curve in Chapter II. The slope suggested that up until some given point, no response would occur at all. However, after a certain number of impressions, the response would be immediate and complete and continue at that rate. The plotting of the graph confirms that point visually.

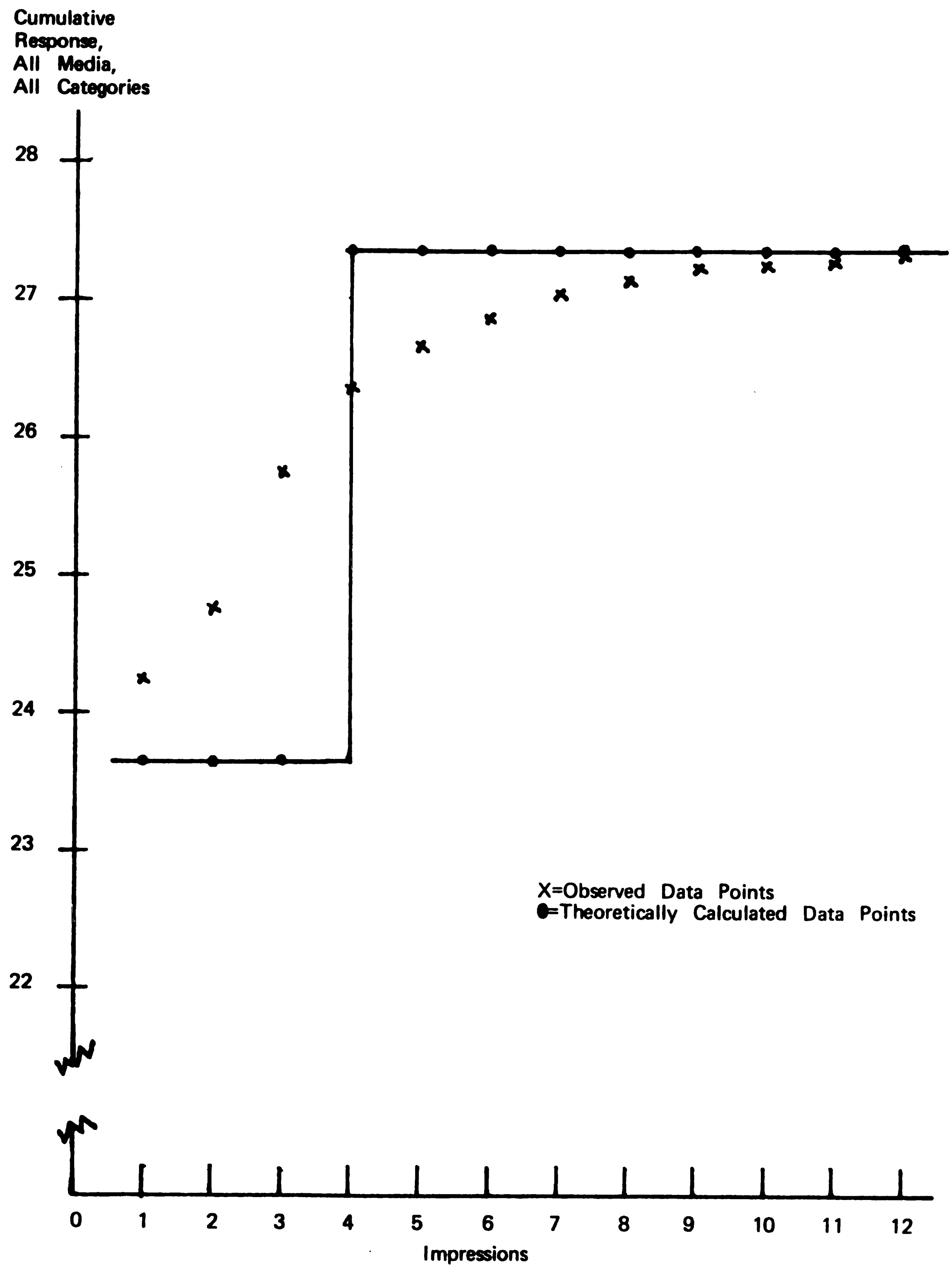

Fig. 9. Plot of Step-Function Response Function, Cumulative Response, Based on Impressions for All Product Categories in All Media

The Sigmoid or S Function Curve

The S-curve, as illustrated in Figure 10, also provides a statistically acceptable fit to the data calculated for a theoretical distribution. The chi-square value in the goodness of fit test, with eleven degrees of freedom, was 1.687. A chi-square value of 2.60 at the .005 level with eleven degrees of freedom would have been required to reject a null hypothesis that the observed and theoretically derived curves were not related at a level of statistical significance. It should be noted that, while the relationship of the S-curve between the observed and theoretically derived data are statistically significant, it is less closely related to the observed data than either the geometric or step-function curves plotted.

Recalling again the possible curves which could be obtained as outlined in Chapter II, the S-curve was labeled the "Threshold Impact" curve. It was suggested that this curve is similar to the traditional learning curve in that responses start slowly until a threshold is reached, then rise rather quickly and reach a constant level at some point. It was suggested that this type of curve would indicate that advertising must reach a certain threshold level before it became effective.

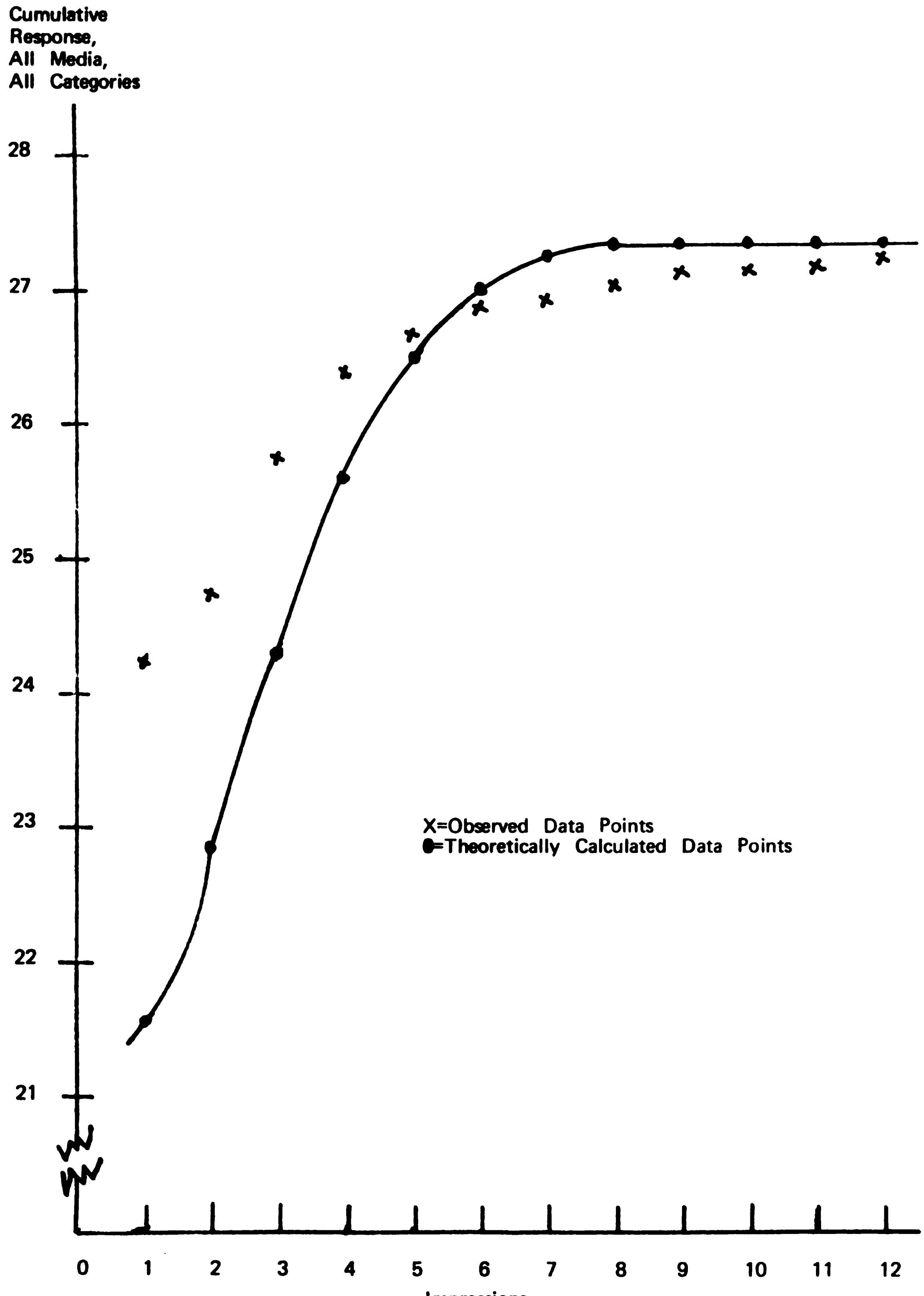

Fig. 10. Plot of S or Sigmoid Response Function, Cumulative Response, Based on Impressions for All Product Categories in All Media

Discussion

The null hypothesis is rejected and research Hypothesis 1 is accepted based on the chi-square goodness of fit test results and the plot of the data on the figure. There is a significant relationship between the observed data and the frequency distribution calculated from the formula suggested by Broadbent and Segnit.[13] The relationship plotted on a figure is convex as the research hypothesis suggested and while cumulative responses were available from the study data (only through twelve impressions), the shape of the curve plotted supports the research hypothesis.

It could be argued that the null hypothesis could not be totally rejected since the chi-square goodness of fit tests also indicated a significant relationship between the observed data and a theoretical frequency distribution for the linear curve, the step-function and the S-curve. As shown below the chi-square values for the various curves were different (see p. 187).

The difference in the chi-square goodness of fit test between the geometric curve and the others calculated indicated that while the others would have been statistically significant had they been tested, the geometric curve would still provide a substantially

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[13]Ibid., pp. 207-08.

better fit than any of the other curves plotted. This can be partially explained by three facts.

TABLE 11

CHI-SQUARE GOODNESS OF FIT VALUE CALCULATED FOR CURVES WITH ELEVEN DEGREES OF FREEDOM

Curve	Chi-square Value
Geometric	0.066
Step-Function	1.050
S-Curve	1.687
Linear	2.579

1. The number of impressions on which the curves were plotted necessarily condensed the plotted points and tended to smooth out the differences between observed and theoretical values of the curves plotted. Had more impressions been available for plotting, the differences between the curves might have been more visually and statistically apparent.

2. The range of the cumulative response was quite limited between the four curves plotted. Because the response to all curves was compressed due to the limitations of the study previously discussed, this probably contributed to the smoothing of differences between the observed and theoretical distributions.

3. Some curves plotted tended to flatten perceptibly at the upper end of the impression measure. This was due in part to the limit on the number of respondents in the sample and the length of time of the study. Had the sample been larger and the period measured longer, more marked differences might have been obtained between the four slopes plotted although the convex curve research hypothesis is fully supported by the data.

In their original article, Broadbent and Segnit suggested the possibility of a bell-shaped curve which might indicate "Saturation or Wear-Out of an advertising response."[14] While this idea is intriguing, it was not pursued in this analysis. The chi-square goodness of fit values obtained for the linear, step-function and s-curves suggests that there is minimal possibility that a bell-shaped curve would provide a statistically significant goodness of fit between the observed and theoretical data. Since the cumulative response function for the observed data never declines, it would be practically impossible for the bell-shaped curve to represent a statistically significant fit with the theoretical distribution. As a result a fit of the bell-shaped

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[14]Ibid.

curve is rejected out of hand and is not plotted nor was a chi-square analysis performed for goodness of fit.

Hypothesis Two

Research Hypothesis 2 was previously stated in Chapter II in two parts. Elements of the Lavidge and Steiner hierarchy of effects model, where the cognitive level was defined as awareness of advertising messages, were used as dependent variables. The first research hypothesis which in this case is also the null hypothesis was stated as:

> H-2-a:
>
> The slope of the curve measuring the cognitive effect of advertising impressions will be convex.

The second research hypothesis is then stated as:

> H-2-b:
>
> The slope of the curve measuring the cognitive effect of advertising impressions will rise more rapidly than will that of the conative measure indicating a more rapid accumulation of the cognitive response measure than the conative measure.

Stated in the null form:

> The slope of the curve measuring the cognitive effect of advertising impressions will not rise more rapidly than will that of the conative measure indicating a more rapid accumulation of the cognitive response measure than the conative measure.

To test this hypothesis, the relationship between the slope of the cognitive response measure theoretical frequency points for automobiles was tested against the slope of the conative measure slope for the same categories from the study data. The relationship between the cognitive and conative measures of the gathered data for the hi-fi/stereo category was also compared. Two separate steps were taken to test the null hypothesis.

1. The theoretical distribution between cognitive and conative response was plotted on a graph. The theoretical distribution for the cognitive measures for both the automobile category and the hi-fi/stereo category were calculated, using the previously described techniques. Figure 11 illustrates the relationship between the theoretical distribution of the cognitive and conative measures for the automobile category. Figure 12 illustrates the plot of the theoretical distribution for the cognitive and conative measures for the hi-fi/stereo category. As can be seen from the plots of the distributions, all slopes plotted are convex in shape.

   To test the null hypothesis of H-2-a, chi-square goodness of fit tests were performed on the observed and theoretical distributions. For the hi-fi/stereo category, at the cognitive

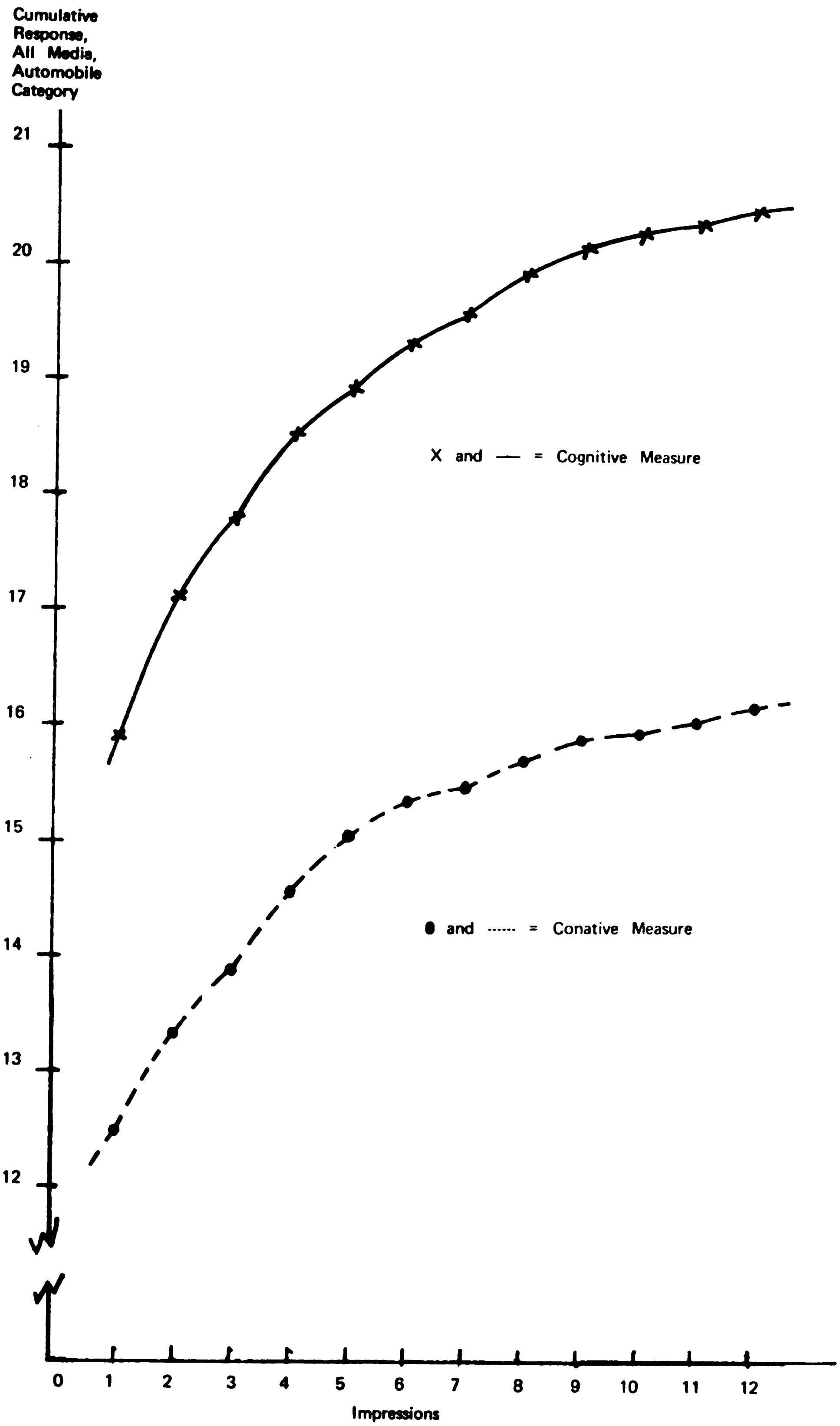

Fig. 11. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive and Conative Measures, Automobile Category

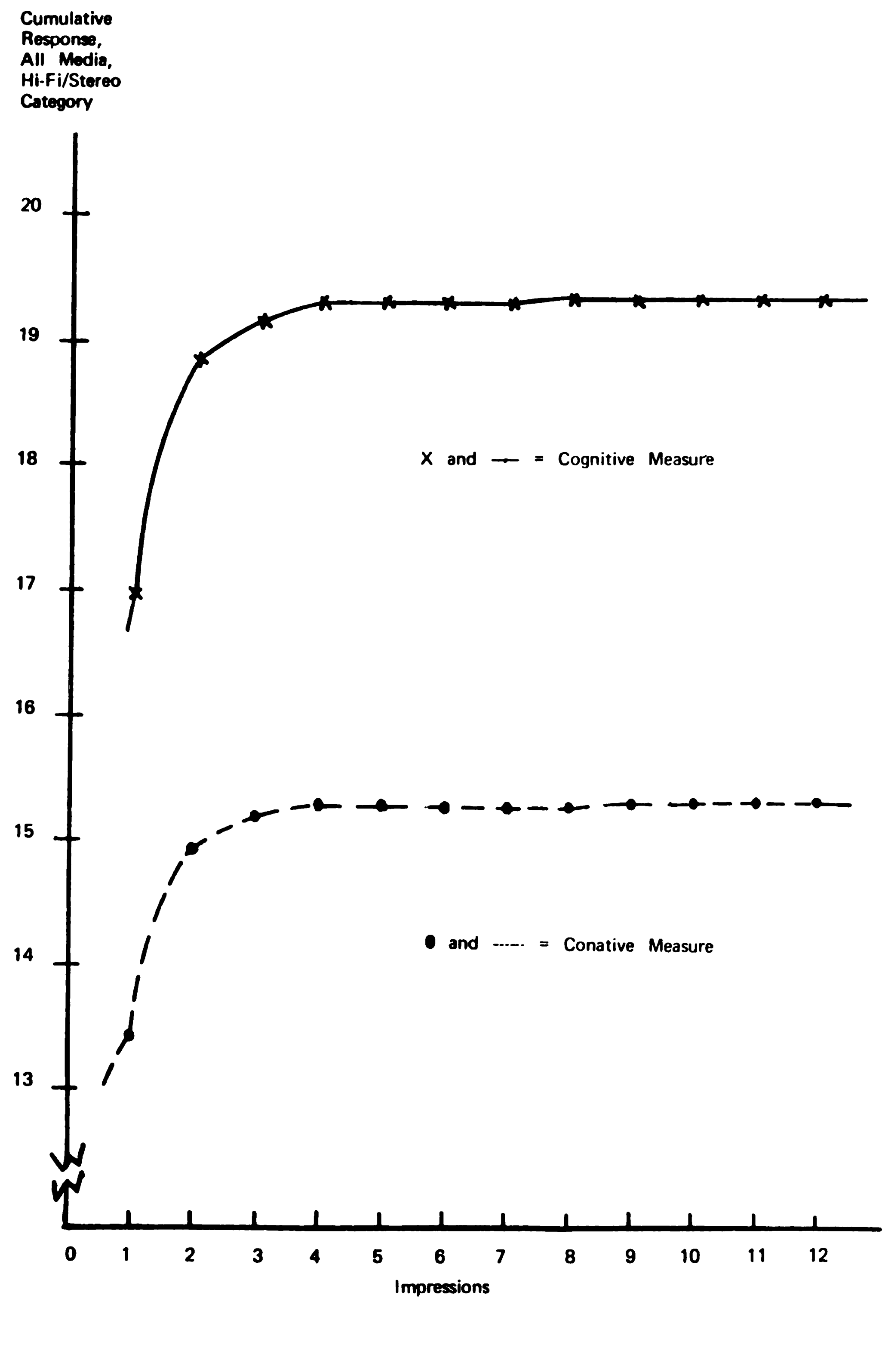

Fig. 12. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive and Conative Measures, Hi-Fi/Stereo Category

level the value computed was 0.889 with six degrees of freedom, and 0.540 at the conative level with eight degrees of freedom. In the automobile category, the chi-square value was 0.045 with eleven degrees of freedom at the cognitive level, and 5.114 with eleven degrees of freedom at the conative level. Only the chi-square value at the conative level in the automobile category was significant at the 0.005 level of confidence. As a result, the null hypothesis H-2-a which is also the research hypothesis H-2-a is accepted. The slope of the curve measuring the cognitive effect of advertising impressions does fit a theoretically derived geometric curve. Thus, the research hypothesis is supported as indicated by the tests conducted on the automobile and hi-fi/stereo categories as outlined above.

2. To test Hypothesis H-2-b, standard t-tests were conducted between the slopes of the automobile category at the cognitive and conative level and the slopes of the cognitive and conative level responses for the hi-fi/stereo category as well. Regression coefficients were used in the calculation of the t-tests since they provided a much more precise estimate of the value of the

distribution than did the means of the observations. With twenty-six degrees of freedom, the value of t for the comparison of the automobile cognitive and conative slopes was 0.0362. For the hi-fi/stereo category, the value of t was calculated to be 0.0864. Neither of these values was statistically significant at the 0.005 level. Thus, the null hypothesis is accepted and the research hypothesis that the slope of the curve measuring the cognitive effect of advertising impressions will rise more rapidly than will that of the conative measure is rejected. Although not required to accept or reject the H-2-b null hypothesis, t-tests were conducted on the means of the two distributions. Again, with twenty-six degrees of freedom, the value of t between the means of the automobile cognitive response function and the conative response function was 5.66. The value of t for the cognitive and conative means of the hi-fi/stereo category was 2.436. Both these t-values are statistically significant at the 0.05 level. (Specific theoretically derived data used in plotting the graphs in these tests will be found in the Technical Appendix.)

The case for the acceptance of the null Hypothesis H-2-b over the research hypothesis is increased when it is shown that the means of the two distributions are similar yet the slopes of the two distributions are not.

Discussion

The results of the plots and statistical tests conducted on research Hypothesis H-2-a and H-2-b raise some interesting questions. As can be seen from the plots, the slope of the response function at the cognitive and conative level is approximately the same. The primary difference between both the cognitive and conative automobile response functions and that for the hi-fi/stereo functions is in the change in the intercept and not the slope of the function. Traditional advertising wisdom has suggested that the slope of the conative response function would be less steep since the conative measure required a deeper commitment and more decision-making on the part of the respondent. The results of this study do not indicate that this concept is supported based on the data gathered and analyzed.

The results of the t-tests indicate that there is no significant difference in the regression coefficients of the slopes measured. This lack of significance is interpreted as indicating that the slopes of the curves are monotonic. The members of the sample who responded to the cognitive level measure may well have also responded at the conative level measure. This suggests respondents may tend to remember impressions more for products on which a preference has been established. This phenomenon may occur at the same rate in the response function based on impressions.

It is also suggested that response functions at the cognitive and conative level are approximately the same for a product category in terms of the increase in cumulative response functions based on advertising impressions. The only difference noted in the results of the plots, based on the theoretical frequency distribution, was that the mean of the cognitive level was higher on the cumulative response function measurement than was the conative mean. Both, however, increased at approximately the same geometric rate.

Hypothesis Three

Research Hypothesis 3 was previously stated in Chapter II as:

> H-3:
>
> Each of the products or brands, whose theoretically derived cognitive effect of advertising in the aggregated measured media is plotted, will have a unique slope when the cumulative response is plotted against the number of impressions.

Stated in the null form:

> Each of the product or brands, whose cognitive effect of advertising in the measured media is plotted, will not have a unique slope when the cumulative response is plotted against the number of impressions.

To test this hypothesis, two statistical tests were conducted. In addition, a figure was plotted of the theoretically derived cognitive level of the cumulative response measures based on impressions for the automobile, hi-fi/stereo and off-campus entertainment categories in all media. Each is discussed.

1. A figure was plotted for the theoretical distribution of the cumulative response to impressions at the cognitive level for automobiles, hi-fi/stereo and off-campus entertainment categories. This is illustrated in Figure 13. As can be seen from the plot of the slopes, the convex curve best represented the response function for each category at the cognitive level when all media were aggregated. Due to the low number of impressions received by the sample group in some categories, less than twelve impressions were plotted in some instances.

   The slope of the lines between the three product categories is not greatly different. Visual inspection does not lend support to the

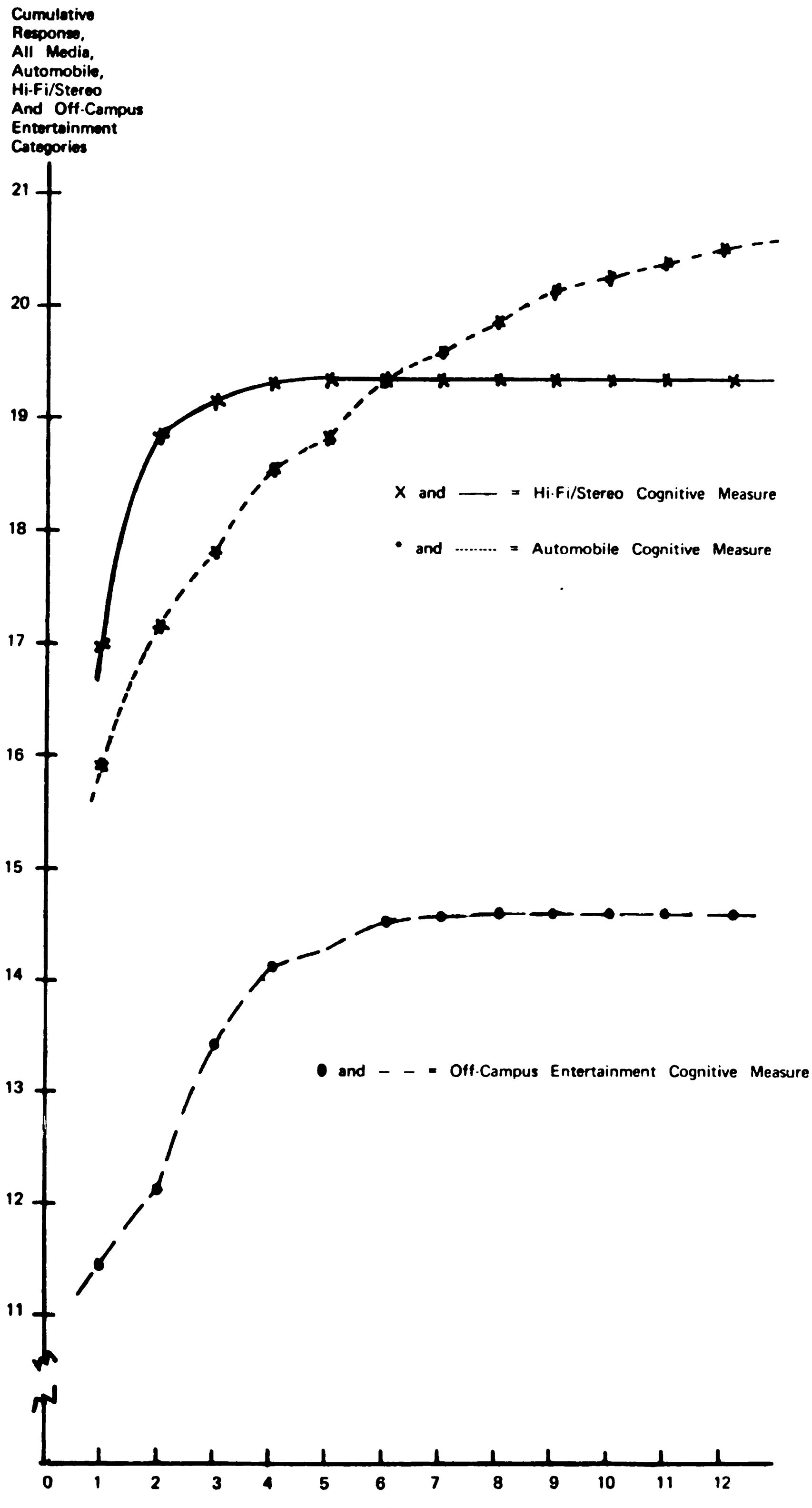

Fig. 13. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive Measure, Automobile, Hi-Fi/Stereo and Off-Campus Entertainment Categories

research hypothesis that all product categories have different slopes when cumulative response is measured against impressions at the cognitive level.

2. In order to statistically test the null hypothesis, t-tests were conducted on the slopes and means of the automobile and hi-fi/stereo categories and on the hi-fi/stereo and off-campus entertainment categories. The value calculated for t when comparing the slopes of the automobile and hi-fi/stereo cumulative response based on impressions at the cognitive level, using regression coefficients for added preciseness, was 0.0252. The value of t comparing the slopes of the hi-fi/stereo and off-campus entertainment distributions at the cognitive level based on cumulative response, again using regression coefficients, was calculated to be 0.0553. (Support for these calculations will be found in the Technical Appendix.)

When comparing the means of the two distributions, the t value for the comparison of the means of the automobile and hi-fi/stereo categories was calculated to be 0.0215. The t value for the comparison of the means of the hi-fi/stereo and off-campus entertainment categories was calculated to be 2.83.

With twenty-six degrees of freedom in the calculations for both the slopes and the means, none of the findings were statistically significant at the 0.02 level. Thus, the null hypothesis that the slopes of the curves for different brands or products are the same is accepted and the research hypothesis is rejected. There appears to be no support for the hypothesis that individual products or brands, whose cognitive effect of advertising in the measured media, have a slope unique from that of other products when the cumulative response is plotted against the number of impressions among the study population using the theoretically derived frequency distributions.

Although not required to accept or reject the hypothesis as stated and tested, it could be argued that different results might have been obtained had only one advertising medium been tested rather than using the aggregated media data. In order to investigate the possibility of a difference occurring in a single medium, two t-tests were conducted between theoretically derived response functions measured against impressions for two separate products advertised in the radio medium. Results of those tests are summarized below.

Two t-tests were conducted between cumulative response functions measured against impressions for two separate products in the radio medium.

A t-test was conducted to determine the difference in regression coefficients for the theoretical frequency distribution calculated for cumulative response to the cognitive level measure of Chevrolet and Ford advertising in the radio medium. The t-test yielded a value of 2.68 at seventeen degrees of freedom indicating that a probability of 0.025 existed that the theoretical difference between the measures was indeed different and statistically significant.

A t-test was also conducted on the theoretical cognitive response measures of the Chevrolet cumulative response against impressions and compared against the theoretical frequency distribution for the overseas study program on the same basis. Only the response to radio advertising was measured.

The t-test yielded a value of 2.55 at nineteen degrees of freedom. This value showed significance at the 0.01 to 0.005 level.

Discussion

The results of the t-tests on the slopes and means of the theoretically derived cumulative response measure based on impressions, when impressions from all media were accumulated, for the automobile and hi-fi/stereo and the hi-fi/stereo and off-campus entertainment categories indicated an acceptance of the null hypothesis and a rejection of the research hypotheses that the slopes for products and categories would significantly differ.

The comparison of the automobile and hi-fi/stereo category slopes and means involved two relatively high cost, consumer durable products. The automobile category, however, is of much higher cost than the hi-fi/stereo products against which it was compared. In addition, automobiles tend to be national products while most hi-fi/stereo shops tend to be local or regional at best. In some instances, hi-fi/stereo shops could almost be considered a service organization rather than a product since in many cases components of various brands are offered by one dealer. Most automobile dealers tend to represent only one or two major automobile brands.

The hi-fi/stereo and off-campus entertainment comparison is even more directly opposite. Off-campus entertainment is strictly local in nature and for the most part, a frequently purchased product or service. Hi-fi/stereo shops, as previously mentioned, tend to offer a product which is purchased much less frequently than off-campus entertainment. In addition, the amount required for investment in hi-fi or stereo equipment is usually greater than off-campus entertainment.

While the t-tests conducted on the slopes and means of the above categories indicated a rejection of the research hypothesis, the additional t-tests conducted comparing the same cognitive measure for individual brands in the automotive category and a single brand in the automotive category with the overseas study program proved significant when only the response to the radio medium was calculated. This seemingly inconsistent result may well point up an important point in the future measurement of response functions. If it is true that individual products or brands do have unique slopes when measured in a single advertising medium but that the slopes tend to become the same when all media are combined, the previous suggestion that unidimensional measurements of advertising response functions may create serious hazards, is further supported. This result may also point up the previously mentioned problem of measuring response functions without giving consideration to multiple media impressions.

Because of the study design, it is impossible to completely control or account for the effects of other media messages in the response function for which the measurement was obtained. Even the novel product, the overseas study program, is limited because all advertising, except radio, could not be controlled during the test week. A general newspaper advertisement appeared in The State News during the study week and posters continued to be used on the campus.

Another factor which may contribute to the significant findings in the Ford-Chevrolet and Chevrolet-overseas study radio comparison result could well be in the copy approach taken in the individual medium of radio by the advertiser. Since the cognitive level was measured, it may be a phenomenon of the individual commercials for each of the products measured on radio which contributed to the differing slopes of the theoretical distributions which were calculated. The study design does not control for this effect.

Based on the t-tests and the graphing of the off-campus theoretical frequency distribution, when compared to the other distributions for other categories previously described, the research hypothesis is rejected and the null hypothesis accepted. Apparently, all products have the same cumulative response function slope when compared against impressions and media is aggregated. If this is so, then advertising media planners, by knowing the slope of any one product or category, could speculate on the response function for any other type of product or category in all media with some accuracy.

Hypothesis Four

Research Hypothesis 4 was previously stated in Chapter II as:

H-4:

> The slope of the cumulative response function plot, based on advertising impressions, will be steeper for a more frequently purchased product than the slope of the plot of the cumulative response function, based on advertising impressions for a product which is purchased less frequently.

Stated in the null form:

> The slope of the cumulative response function plot, based on advertising impressions, will not be steeper for a more frequently purchased product than the slope of the plot of the cumulative response function, based on advertising impressions for a product which is purchased less frequently.

To test this hypothesis, the relationship between the cognitive response measure theoretical distribution of off-campus entertainment (a frequently purchased product or service) was compared with the theoretical distribution calculated for the overseas study program (an infrequently purchased product or service). A t-test using regression coefficients for added preciseness was conducted to determine the acceptance or rejection of the null hypothesis.

At twenty-six degrees of freedom, the t-test yielded a value of 0.1892 which is not statistically significant. This finding indicates that there was little variability among the theoretical distributions calculated for the two categories. Therefore, the research hypothesis is rejected in favor of the null hypothesis that there is no difference in the slope of the response function for a frequently purchased product and an infrequently purchased product or service based on this study.

To further test the hypothesis, a t-test was conducted between the regression coefficients calculated for the theoretical frequency distribution of the cumulative response for automobiles when measured against impressions and the theoretical distribution of response functions previously described for the cognitive level of the overseas study program. A t-value of 0.429 with seventeen degrees of freedom was found in this relationship comparison test. With this t-value there does not appear to be a significant difference in the relationship of the two distributions. This t-test further supports the rejection of the research hypothesis and acceptance of the null. (Support for these calculations may be found in the Technical Appendix.)

Finally, two figures were charted which visually indicate that the null hypothesis should be accepted. Figure 14 illustrates the plot of the theoretical distributions based on impressions for the off-campus entertainment category and the overseas study program.

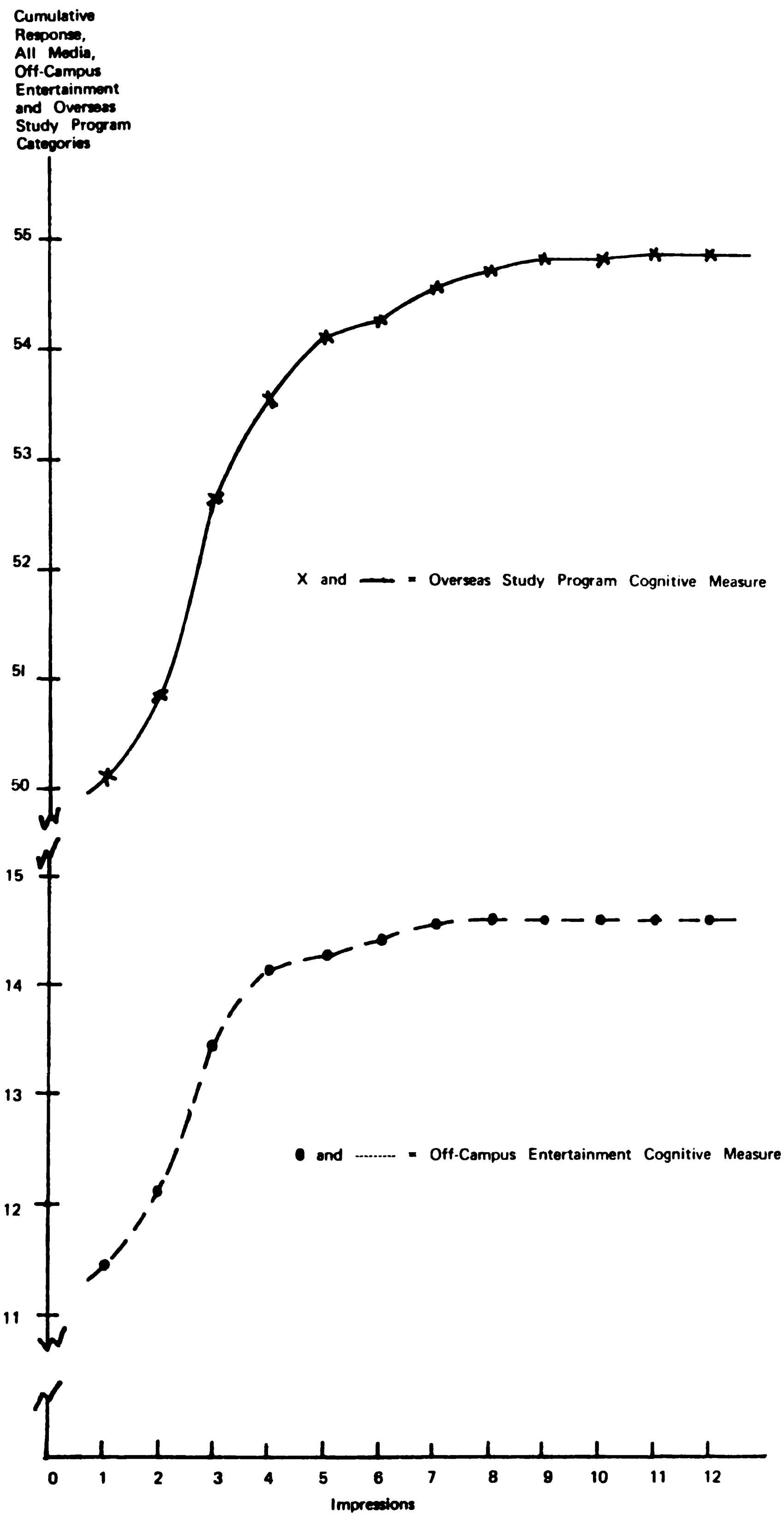

Fig. 14. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive Measure, Off-Campus Entertainment and Overseas Study Categories

Visually, the slope of the points appears to be quite similar. In addition, a graphing of the theoretical distributions for the automobile category and the off-campus category is shown in Figure 15. Again, the slope of the points visually indicates a close relationship between the two measures. This close relationship does not support the research hypothesis that the slopes would be significantly different.

In both Figures 14 and 15, the convex curve again best represented the theoretical frequency distributions plotted for the cumulative response function when measured against impressions for the cumulative automobile, off-campus entertainment and overseas study program at the cognitive level.

Discussion

Based on the t-tests for the automobile and overseas study program theoretically derived cumulative response functions at the cognitive level when compared against the theoretically derived off-campus entertainment response function, the null hypothesis of no significant difference in the slope of a more frequently purchased product and a less frequently purchased product must be rejected and the null hypothesis accepted instead. The values for the t-test on the slopes were very low indicating that the theoretical frequency distributions calculated for each of the categories tested were quite

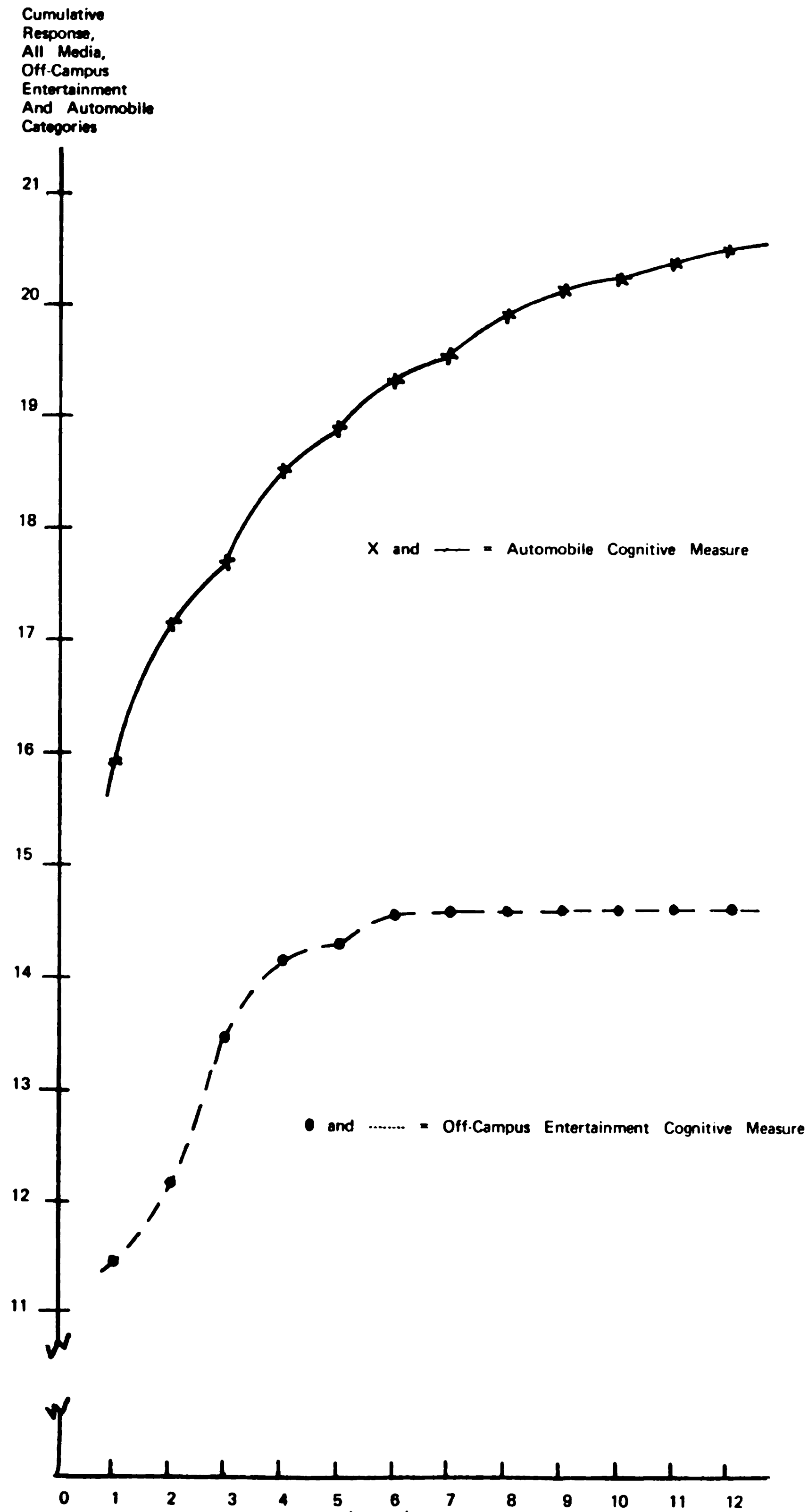

Fig. 15. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive Measure, Off-Campus Entertainment and Automobile Study Categories

similar. The primary difference appears to be in the means of the distributions and not the slopes. This fact is further substantiated by visual inspection of the plot of the theoretical frequency distributions for each of the response functions when plotted against the impressions at the cognitive level.

The widely accepted industry concept that frequently purchased products or services, particularly those which are low cost and low risk require less consumer involvement with the advertising message was not supported in this study. It appears that high-priced, infrequently purchased products have similar response functions to those products or services which are frequently purchased. This would suggest that response functions, particularly at the cognitive level, are the same for all types of products. There appears to be little "learning" required by the respondent and that all advertising impressions tend to build cumulative response at approximately the same rate.

Hypothesis Five

Research Hypothesis 5 was previously stated in Chapter II as:

> H-5:
>
> The slope of the curve measuring the cognitive effect of advertising determined by the cumulative response function plot, based on advertising impressions, for a new or novel product or service will be steeper than any slope plotted for a known, existing or previously heavily advertised product or service.

Stated in the null form:

> The slope of the curve measuring the cognitive effect of advertising determined by the cumulative response function plot, based on advertising impressions, for a new or novel product or service will not be steeper than any slope plotted for a known, existing or previously heavily advertised product or service.

Only one product in the study was considered new or novel, the overseas study program. As a result, the theoretically derived cumulative response, based on impressions at the cognitive level for the overseas study program was individually tested against comparable theoretical frequency data for the automobile and hi-fi/stereo categories. Since automobiles and hi-fi/stereo shops had been heavily advertised in the Lansing/East Lansing market, particularly to the student population, a significant difference should have been noted in the theoretical frequency distributions calculated and plotted. A t-test was selected as the appropriate statistical test for significance of difference between the regression coefficients of the variables being measured.

The t-test value for the comparison of the regression coefficients of automobiles, when compared to the regression coefficients of overseas study, was 0.458 at twenty-six degrees of freedom. The t-test conducted on the regression coefficients of the cognitive measure of the hi-fi/stereo category and the overseas study program was 0.203 with twenty-six degrees of freedom. Neither of the values was significant at the 0.005 level of acceptance. The null hypothesis, on the basis of these statistical tests, was thus accepted and the research hypothesis rejected.

In addition to the t-tests, the theoretical frequency distributions for cumulative responses for both the overseas study and the automobile category and the overseas study and the hi-fi/stereo category were plotted at the cognitive response level measure based on impressions. The figure illustrating the plot and resulting slope of the lines for the automobile and overseas study category is illustrated in Figure 16.

As can be seen, the slope of the curve drawn from the points in the frequency distribution between the overseas study cumulative response and the cumulative automobile category is approximately the same. Both slopes are convex although the intercept of the overseas study is higher on the cumulative response measure than is that of the automobile category. Thus while the means of the populations may have been significant, the t-values of the slopes were not.

Figure 17 illustrates a plot of the points derived from a theoretical frequency distribution calculated from observed data for the cumulative hi-fi/stereo category and the overseas study category measured at the cognitive level based on impressions. As can be seen from this

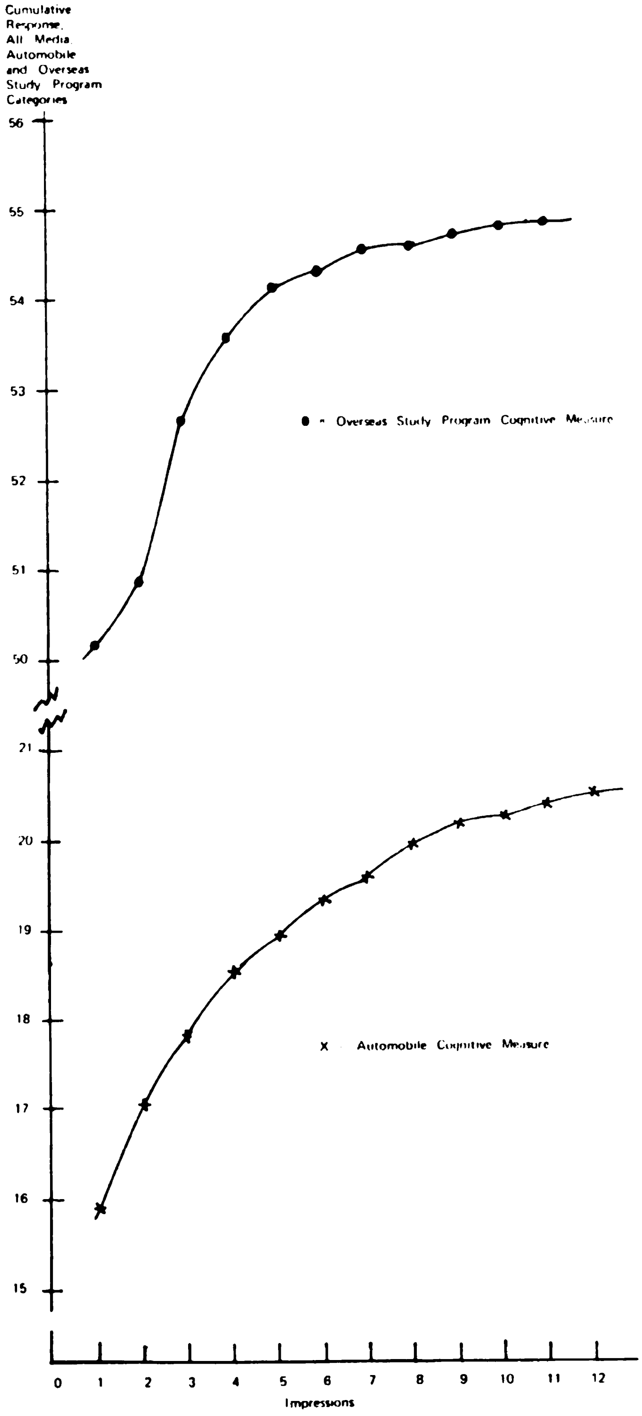

Fig. 16. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive Measure, Automobile and Overseas Study Program Categories

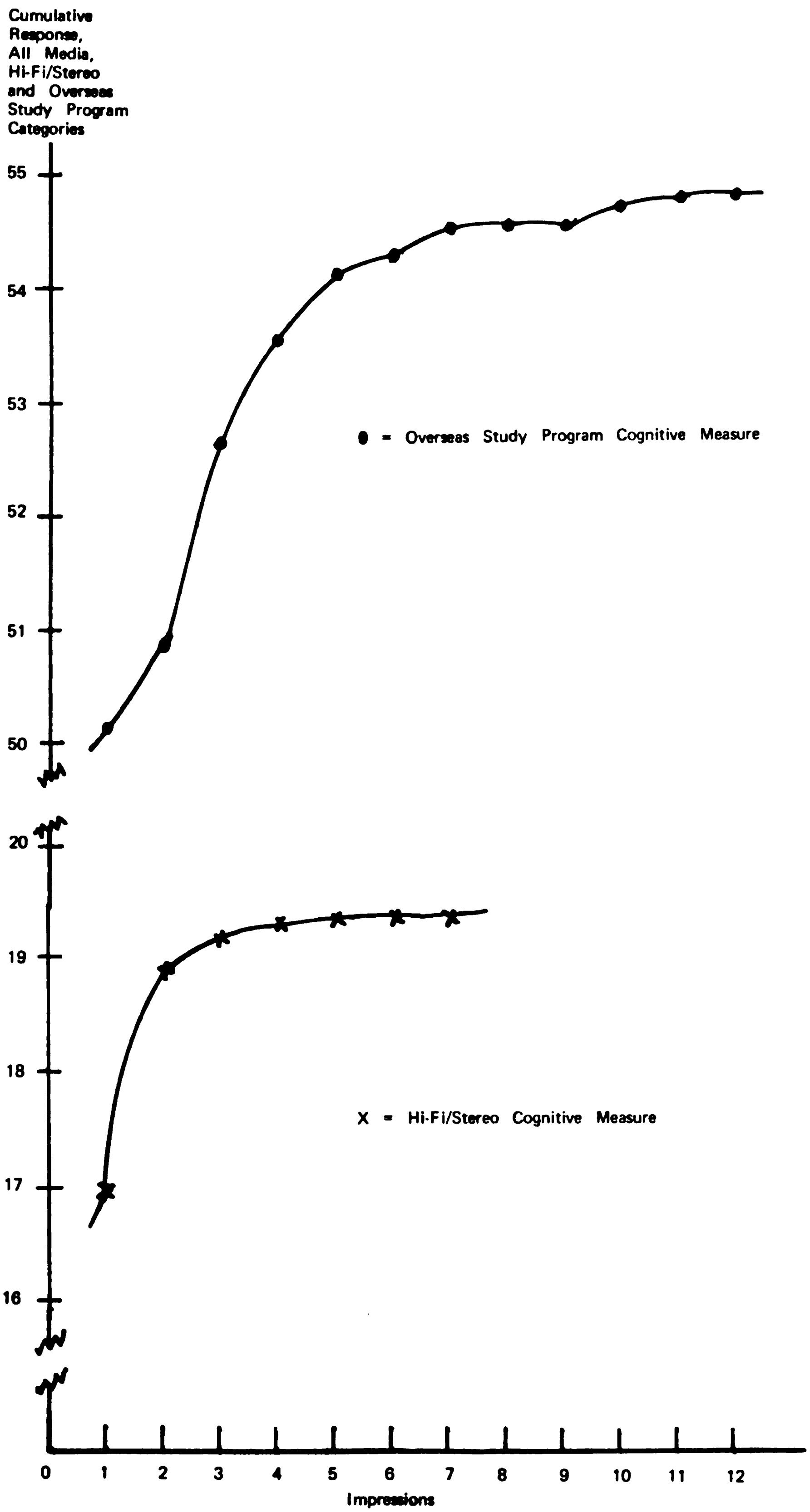

Fig. 17. Plot of Theoretical Cumulative Response Based on Impressions, Cognitive Measure, Hi-Fi/Stereo and Overseas Study Program Categories

figure, almost the opposite result was obtained from the study data as was stated in the research hypothesis. In other words, the cumulative response slope was actually steeper for the cumulative hi-fi/stereo category (a known, existing and heavily advertised category) when compared to the new or novel overseas study category.

Based on the plot of the two figures and the results of the t-tests, the research hypothesis is rejected in favor of the null hypothesis. In the study conducted, there was no significant difference between the slope of the curve measuring the cognitive effect of advertising for a new or novel product when compared to a known, existing or heavily advertised product.

Discussion

Conceptually, it would seem reasonable that a new or novel product, such as the overseas study program, would have a more rapid rise in the cognitive level of cumulative response than would a product which had been advertised regularly and often heavily to the population being studied. This should be brought about simply by the fact that the product, being advertised for the first time, should generate greater cumulative response more quickly if for no other reason than the newness or novelty of the advertising impression. Such was not the case in this study. Well-known and recognized product categories which have been advertised to the sample population for a long period of time had approximately the same slope as did the new or novel product. There was a large difference in the intercept of the cumulative response line for the new product when compared to the existing product and probably also in the means but the slope of the response line was similar.

When the two existing product categories are viewed in comparison to the new or novel category in terms of the plot of the theoretical distribution, another interesting fact becomes apparent. The plot for the hi-fi/stereo cumulative response category levels perceptably very quickly after a limited number of impressions when compared to the overseas study plot. Conversely, when the overseas study category is plotted in comparison with the automobile category, it is the overseas study category which appears to flatten while the automobile response function appears to continue an upward slope. This may be due in part to the number of impressions received by the sample population for each of the categories. The hi-fi/stereo category distribution maximized at approximately eight impressions on the respondent population. In the overseas study impression plot, respondents received as many as twelve impressions during the test week as did respondents' exposures to automobile impressions. It may be that the number of impressions had an effect on the flattening of the

hi-fi/stereo slope but it should not have affected the degree with which that slope rose initially based on impressions. Several conjectures can be made about the slope of the curves plotted to measure this hypothesis which will be covered in more detail in the Summary and Conclusions section which follows in Chapter V.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter will summarize the study which was conducted, including the purpose and methodology. The findings will be reviewed along with the results of the testing of the hypotheses. Based on these findings, suggestions will be made for future research in the area of advertising response function measurement and usage. The chapter concludes with implications of the study findings for industry use of response functions in media planning.

Review of the Study and Methodology

The purpose of the study was to attempt to empirically estimate advertising response functions as suggested by Broadbent and Segnit[1] and to test hypotheses drawn from their concept.

A literature review was conducted on present knowledge of mass communication theory and its relationship to advertising. It was suggested that current mass

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[1]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

communication and advertising theory may not be interchangeable based on Krugman's concept of the low involvement of the advertising audience with the message presented.[2]

The basic areas of media planning were reviewed, including the current state-of-the-art in industry. Broadbent and Segnit's concept of response functions as a potential method of improving advertising media planning were discussed in detail.[3] The Lavidge and Steiner hierarchy of effects model was reviewed since elements of this model were used as the dependent variables in the study which was conducted.[4] Finally, a review of the pertinent mathematical concepts of probability, theoretical probability and frequency distributions were presented since they formed the basis for analysis.

The study was conducted in January/February, 1976 in East Lansing, Michigan with a sample base of 339 students at Michigan State University. The study design consisted of the administration of a pre-test instrument to the sample respondents, a week-long test period in

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[2]Krugman, "The Impact of Television: Learning Without Involvement," pp. 349-56.

[3]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

[4]Lavidge and Steiner, "A Model for Predictive Measurements of Advertising Effectiveness," pp. 59-62.

which respondents kept a media diary of their exposures to radio, television, newspaper and magazines and the administration of a post-test instrument at the conclusion of the measurement period. Changes in responses to questions about selected advertised product categories at the cognitive and conative level were measured, using the pre- and post-test questionnaires.

All media advertising messages appearing in radio, television, newspapers and magazines in the Lansing/East Lansing market for the selected product categories being studied, were recorded during the study week. The impression distribution of the available media messages was calculated. These advertising media frequency distributions of impressions were then compared to the change or nonchange measured in the responses by the sample group to the pre- and post-test questionnaires. This resulted in frequency distributions derived from empirical data obtained from the sample respondents. These data were then plotted at both the cognitive and conative level of response.

To properly test the hypotheses which had been developed, product categories were aggregated in terms of response functions. As suggested by Broadbent and Segnit, only the cumulative measure of advertising response functions based on impressions was calculated.[5]

[5]Broadbent and Segnit, "Response Functions in Media Planning," pp. 187-238.

Only those respondents who gave the same reply to questions regarding products within a category, or changed their reply from another to the one being measured in the pre- to post-tests, was included in the frequency distribution analysis of impressions for that particular category.

Using the frequency distributions for product category media messages plotted from empirical data at the cognitive and conative level, theoretical frequency distributions were then mathematically calculated. A least squares method of calculating the theoretical frequency distributions, using the Broadbent and Segnit approach, was used[6] plus formulae from Hughes and Grawoig.[7]

Statistical tests were used to determine the significance of the hypotheses proposed. Standard t-tests of regressions coefficients of the various theoretical frequency distributions were the basis for the determination of the relationship between the distributions being compared plus t-tests on the means of the distributions. Finally, all theoretical distribution frequencies used in testing the hypotheses were graphed

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[6]Ibid.

[7]Hughes and Grawoig, Statistics: A Foundation for Analysis, pp. 230-35.

to illustrate the differences between empirical and theoretical frequency distributions obtained from the data. Chi-square goodness of fit tests were used to determine the significance of the relationship between the observed and theoretical distributions.

Hypothesis Testing and Results

Five hypotheses, derived from the Broadbent and Segnit concept of response functions, were tested. It was hypothesized that all response functions plotted would be convex in slope rather than linear, s-curved or step-functions. In addition, other hypotheses were suggested for response function slopes for various types of product categories which were measured. These hypotheses proposed that the slopes of the curves plotted for the response function based on impressions would be different from each other at the cognitive and/or conative response level.

Of the hypotheses tested, only the research hypothesis suggesting the convex shape of the curve resulting from the plot of the response functions slopes was accepted based on the statistical tests conducted. All other research hypotheses were rejected in favor of the null, most at a very high level of statistical significance.

Results of the study indicate that the slope of the response function curve, when plotted, is indeed a convex shape which is always increasing, but a continuously decreasing rate. The slope of the other curves plotted at the cognitive and/or conative level for individual products or categories showed no significant difference in relationship when the theoretical frequency distributions were calculated, plotted and compared. No statistical significance was found to conclude that the slope of the curves of the cumulative response function based on impressions was different among frequently or infrequently purchased products or categories, new or novel and established products or categories, nor were response function distributions measured at the cognitive or conative level of response significantly different statistically.

While the Broadbent and Segnit concept of response functions was empirically estimated, limitations in the original study plan were found. Initially, the plan was to measure response functions only for the radio medium. The lack of sufficient media exposures by the sample population required instead that all media impressions be aggregated so that accepted statistical techniques could be used in the analysis of the data. It appears that response functions can be measured using the techniques in this study, only for very heavy media schedules in short time frames.

Broadbent and Segnit suggest that response functions be used in media planning on a unidimensional basis.[7] An analysis of the results of this study suggests that response functions must be measured multidimensionally to accurately reflect the effects of competitive advertising impressions which are constantly being received by media audiences. In addition, a limitation on the measurement of response functions occurred when several media were used in an advertising schedule. It is most difficult to separate the response functions for individual media in a multi-media schedule with the study plan used.

Suggestions for Future Research

The results of this study indicate that response functions can be measured and that they quite possibly may serve as an effective tool in the development of more effective advertising media schedules. Additional research is needed, however, to expand on the results of the study which was conducted. The study also indicated some limitations in the response function concept as outlined by Broadbent and Segnit and the quantification procedure used in this particular effort. The following suggestions are made for future researchers.

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[7] Ibid.

1. The time period for the measurement of response functions must be longer than one week. Even with advertising media schedules in local media which are considered of normal weight, respondents in this study did not receive sufficient impressions for response function measurement in some instances. Within the time frame used, it appears that only very heavy media schedules could effectively be measured and then, probably only on a multi-media basis.

It is suggested that future research be conducted over a longer period of time. The use of multiple sample groups keeping media diaries and using an averaging process, the methodology of the major broadcast rating firms, would not appear practical. The averaging of weekly diaries would only compound the limitation brought about by multiple media exposures and the lack of control over the needed ability to measure response functions independently.

2. Controls should be instituted for multiple media exposures by the audience. Multi-media controls were used in this study and they are strongly recommended for future researchers. Not done in this study, but strongly suggested for the future, is some form of intermedia comparison of advertising impressions by respondent. With this comparison, additional conclusions might be drawn about the effect of individual media impressions on the audience.

3. The subject of multidimensional measurement of response functions must be addressed. The effect of competing messages on the media audience creates serious questions on assigning values to individual media and their proportion of the effect of the total response function on the sample.

One method which is suggested is the use of a technique which would establish the advertising base knowledge level of the sample in the pre-test situation. In other words, it is important to know how much and from where the pre-test knowledge level of advertising messages came. Simple recall or top-of-mind awareness measures do not give precise enough knowledge of this base within the consumer. Without knowing the exact advertising impression level initially, it is most difficult to determine what changes occurred.

In addition, the effect of competing messages during the measurement period must be acknowledged in some manner. Individual advertising media schedules cannot be measured alone. The effect of seeing or hearing competing messages must be considered and its effect on the response of the audience. It is believed that some forms of multidimensional scaling may provide an answer to these problems. It is strongly suggested that future investigators evaluate their measurement instruments on a multidimensional, rather than unidimensional scale.

Implications for Industry

The study has provided some suggestions for consideration by present media planners and those interested in the advertising media planning area. It is believed that the following suggestions have been substantiated by this study which could lead to immediate usage in industry.

1. Present methods of measuring advertising impressions or the value of advertising schedules are seriously questioned. Measurement of immediate recall or top-of-mind awareness may provide misleading information in the evaluation of a media schedule.

The study conducted indicates that because of multiple media impressions on the audience and the multidimensional nature of advertising response functions, the mere ability to recall an advertising message may suggest only immediacy and not effectiveness.

Krugman's concept of low involvement[8] and Robertson's argument for low commitment learning of advertising messages[9] appears to have merit. In many instances, the ability to recall advertising messages may not be the proper measurement technique for evaluating

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[8] Krugman, "The Impact of Television: Learning Without Involvement," pp. 344-56.

[9] Robertson, "Low Commitment," pp. 19-24.

advertising schedules. The use of multidimensional techniques may prove more effective than those unidimensional techniques presently widely used in industry. Knowing the effect of advertising impressions in several dimensions seems a logical method of evaluating advertising schedules rather than attempting to measure only the effect of say, a television schedule or a print campaign. There may well be interaction among the several media involved in a schedule, not to mention the effect of competing messages which have been discussed previously.

While more sophisticated techniques of measurement of media schedules are constantly called for by media planners, the use of multidimensional techniques in the field of media seem to be definitely worthwhile and could provide important answers to questions on advertising schedule development.

2. The fact that all the response functions plotted in this study were convex may prove to be most important in media planning. There have long been questions about the shape of the distributional frequencies of media schedules. Much time and effort have gone into the development of ever more sophisticated models to attempt to replicate what is thought to be happening in advertising media frequency distribution. This study suggests that all response functions measured

were convex. If this finding could be extended through additional studies of wider scope and broader base, the effort to create media models to estimate frequency distribution might not be as important as current research efforts indicate. The knowledge that a convex curve best represents the slope of the points in a cumulative response function distribution could be a most useful tool in future media schedule evaluation.

3. Perhaps one of the most important suggestions of the study is the fact that there appears to be little or no difference in the accumulation rates of various media schedules for differing types of products. Traditional knowledge in the advertising field has suggested that all products are different and that, because of this, each should generate a differing response function curve when the slope of the points were plotted on a graph. Such was not the case in this study. It appears that all advertising for all types of products accumulates at approximately the same rate.

Media audiences seem to achieve cognitive level measurements on advertising at about the same rate as they do conative. This would have serious implications for media scheduling if it were shown that this same effect occurred on a widespread scale. Certainly, media planners should evaluate present schedules in a different light if accumulation rates are the same for all types of products and there is no period of learning which has been assumed for some products.

Additionally, if accumulation rates are approximately the same for all types of products, serious consideration should be given to additional studies in the flighting of advertising schedules. Even in the one week period measured in this study, rapid accumulation occurred at the cognitive and even conative level among some respondents. It may well be that short bursts of advertising providing rapid accumulation of the response function curve might be a most effective media strategy.

Finally, there may be evidence from the results of this study that the effects of advertising schedules can be influenced by media weight alone and that the number of media messages may be the key factor in media scheduling. With rapid accumulation of cumulative response functions based on impressions, advertising schedules placing emphasis on massive media weight may prove more effective than those relying on other approaches. Indeed, the hypodermic approach to advertising media may well be a strategy which could prove effective for many advertisers. Response functions certainly should prove an important method of media planning in these cases.

APPENDICES

APPENDIX A

PRE- AND POST-TEST FORMS USED WITH RADIO/TELEVISION ADVERTISING CLASS, WINTER TERM, 1976

APPENDIX A

PRE- AND POST-TEST FORMS USED WITH RADIO/TELEVISION ADVERTISING CLASS, WINTER TERM, 1976

MEDIA DIARY PLACEMENT AND QUESTIONNAIRE

Instructions

It is important you get the respondent's agreement to participate and keep the diary. You may stress that this is part of your classwork and an important part of your grade, but you should also assure them that the results are part of a scientific study being made only on the MSU campus.

You may also tell him that the study is being sponsored by several of the local media to aid them in influencing the media habits of the student community so that they might better serve their needs.

The respondent has agreed to keep the diary. If, however, the respondent becomes reluctant to carry out the assignment or says they will not complete the diary, thank them for their time and place the diary elsewhere. There is no need for you to spend your time on a respondent who will not cooperate.

Be sure to complete the entire Pre-Test Questionnaire with the respondent. Most answers are short and it should not take longer than 15 minutes or so to complete the entire form.

DIARY PLACEMENT INTERVIEW

Interviewer Name____________________ Date____________

Time of Day______________

INTRODUCTION

Hi. Thanks for agreeing to participate in our experiment. I think you'll find it is fun.

First, I'd like to ask you a few questions.

Name________________________

Address____________________________

Telephone________________

(1) SEX ( ) MALE ( ) FEMALE

(2) Class Standing ( ) FR ( ) SO ( ) JR ( ) SR

( ) GRAD

(3) Major____________________

(4) (a) Do you work? ( ) YES ( ) NO

If yes, ask . . .

(b) When_________________________________

(5) (a) Do you live on campus or off-campus?
( ) CAMPUS ( ) OFF-CAMPUS

If Off-Campus, ask . . .

( ) APT
( ) CO-OP
( ) FRATERNITY
( ) OTHER_________(specify)

(b) Individual or share room? ( ) INDIVIDUAL
( ) SHARE ROOM

(c) Is the radio yours? ( ) YES ( ) NO

(d) Is the TV yours? ( ) YES ( ) NO

(e) Are you on the cable? ( ) YES ( ) NO

(6) Do you receive a newspaper other than the State News?

( ) YES   ( ) NO

If YES, which ones?

( ) Detroit Free Press
( ) State Journal
( ) Detroit News
( ) Chicago Tribune
( ) New York Times
( ) Christian Science Monitor
( ) Wall Street Journal
( ) Other________________ (specify)

(7) Do you subscribe to any magazines?

( ) YES   ( ) NO

If YES, which ones?

(8) How often do you watch TV (per day)?

( ) Less than 1 hour
( ) 1 hour to 2 hours
( ) 3 hours to 4 hours
( ) 4 hours or more

(9) About how much do you listen to radio each day?

( ) Less than 1 hour
( ) 1 hour to 2 hours
( ) 3 hours to 4 hours
( ) 4 hours or more

(10) When do you most often listen to the radio?

( ) Before 8 AM
( ) 8 AM to 12 Noon
( ) Noon to 4 PM
( ) 4 PM to 6 PM
( ) 6 PM to 8 PM
( ) 8 PM to Midnight
( ) After Midnight

(11) Which radio station do you listen to most?

( ) WFMK
( ) WVIC
( ) WKAR
( ) WILS
( ) WJIM
( ) WITL
( ) WJR

(b) Which is the best for news?

( ) WFMK
( ) WVIC
( ) WKAR
( ) WILS
( ) WJIM
( ) WITL
( ) WJR

(12) About how much time do you spend each day reading a newspaper?

( ) Less than 5 minutes
( ) 5 min. to 15 min.
( ) 15 min. to 30 min.
( ) more than 30 minutes

(13) About how much time do you spend each week reading magazines?

( ) Less than 15 minutes
( ) 15 min. to 29 min.
( ) 30 min. to 1 hour
( ) more than 1 hour

Now I'd like to ask you a few questions about your use of advertising.

(14) Which medium do you rely on most for advertising information?

( ) Radio
( ) Television
( ) Newspapers
( ) Magazines
( ) Other_________(specify)

(15) Do you think most advertising is truthful?

( ) YES ( ) NO

(16) Do you consider most advertising informative?

( ) YES ( ) NO

(17) Do you consider advertising to be persuasive--that is--do you think people purchase things because of advertising?

( ) YES ( ) NO

(18) Thinking back over the past few weeks, have you seen or heard any advertising for a bank?

( ) YES ( ) NO

If NO, go to (19). If YES, ask . . .

(a) What bank?
- ( ) E. Lansing State Bank
- ( ) First National Bank of E. Lansing
- ( ) Michigan National
- ( ) American Bank & Trust
- ( ) Bank of Lansing
- ( ) Dart National
- ( ) Other ___________ (specify)

(b) Where did you see or hear it?
- ( ) Newspaper
- ( ) Radio
- ( ) Television
- ( ) Magazines

(c) What did it say?

(d) Where do you bank?

(19) Have you seen or heard any advertising for pizza recently?

( ) YES ( ) NO

If NO, go to (20). If YES, ask . . .

(a) What pizza?
- ( ) Domino's
- ( ) Bell's
- ( ) Pizza Express
- ( ) Little Ceasar's
- ( ) Other ______________ (specify)

(b) Where did you see or hear it?
- ( ) Newspaper
- ( ) Radio
- ( ) Television
- ( ) Magazine

(c) What did it say?

(d) What pizza do you prefer?

(e) What pizza do you usually buy?

(20) Have you seen or heard any advertising for beer recently?

( ) YES ( ) NO

If NO, go to (21). If YES, ask . . .

(a) What brand of beer?
( ) Stroh's
( ) Miller
( ) Budweiser
( ) Schlitz
( ) Busch
( ) Falstaff
( ) Altes
( ) Other_____________(specify)

(b) Where did you see or hear the ad?
( ) Newspapers
( ) Television
( ) Radio
( ) Magazine

(c) What did it say?

(d) What brand of beer do you usually buy?
( ) Stroh's
( ) Miller
( ) Budweiser
( ) Schlitz
( ) Busch
( ) Falstaff
( ) Altes
( ) Other_____________(specify)

(21) Have you seen or heard any advertising for a movie recently?

( ) YES ( ) NO

If NO, go to (22). If YES, ask . . .

(a) What was the name of the movie?

(b) Where did you see or hear the advertisement?
( ) Newspapers
( ) Radio
( ) Television
( ) Magazine

(c) What did the advertisement say?

(d) Have you seen this movie?
( ) YES ( ) NO

(e) Do you plan to see this movie?
( ) YES ( ) NO

(f) What was the last movie you attended?

(22) Have you seen or heard any entertainment directed specifically to the college community advertised in the past couple of weeks?
( ) YES ( ) NO

If NO, go to (23). If YES, ask . . .

(a) What entertainment was that?

(b) Where did you see or hear the ad?
( ) Newspaper
( ) Radio
( ) Television
( ) Magazine

(c) Did you or do you plan to attend?
( ) YES ( ) NO

(d) Have you ever gone there before?
( ) YES ( ) NO

(23) Have you seen or heard any advertising for wine recently?
( ) YES ( ) NO

If NO, go to (24). If YES, ask . . .

(a) What brand of wine was that?

(b) Where did you see or hear the advertisement?
( ) Radio
( ) Television
( ) Newspapers
( ) Magazine
( ) Other___________(specify)

(c) What did the advertisement say?

(d) What brand of wine do you usually buy?

(24) Have you seen or heard any advertising for automobiles lately?
( ) YES ( ) NO

If NO, go to (25). If YES, ask . . .

(a) What automobile was it for?

(b) Where did you see or hear the ad?
( ) Radio
( ) Television
( ) Newspapers
( ) Magazines
( ) Other___________(specify)

(c) What did the advertisement say?

(d) If you were to buy an automobile tomorrow, what kind would you buy?

(25) Have you seen or heard any advertising for a stereo or hi-fi shop recently?
( ) YES ( ) NO

If NO, go to (26). If YES, ask . . .

(a) What stereo or hi-fi shop was the advertisement for?
( ) Tech Hi-Fi
( ) Stereo Shoppe
( ) Marshall's
( ) Leonard's
( ) Highland
( ) Other_____________(specify)

(b) Where did you see or hear the advertisement?
- ( ) Radio
- ( ) Television
- ( ) Magazine
- ( ) Newspaper
- ( ) Other___________(specify)

(c) What did the advertisement say?

(d) If you were to shop for a stereo or hi-fi tomorrow, which place would you visit first?
- ( ) Stereo Shoppe
- ( ) Tech Hi-Fi
- ( ) Marshall's
- ( ) Leonard's
- ( ) Highland
- ( ) Other___________(specify)

(26) End of questionnaire. See next page.

I'm going to ask you to keep a media diary for a week. Here's the diary. I'll explain how it works.

There are separate pages for each day starting with Monday, February 9. All you do is jot down each day when you watch TV, listen to radio or read a newspaper or magazine. It will only take a few minutes each day to do it and it will be very helpful to the project.

As you can see, there is a separate section for Magazines, Newspapers, Radio, and Television. We suggest you keep the diary beside your radio so you will be reminded to jot down your media patterns.

Whenever you use an advertising medium, just jot down what it was, and the amount of time you spent with the medium.

For example, whenever you turn your radio on, just jot down the time you turned it on and when you turned it off. There is a place to note whether it was day or night and a place for the call letters of the station. Also, please put in the type or name of the program if it had one. For example, if you listened to J. P. McCarthy on WJR on Monday morning from 7:30 am until 8:15 am, you put down the time periods, mark AM, WJR, and J. P. McCarthy. If there is no specific program title or it was just music, put down the kind of music played.

The same type of information is requested for TV, magazines, and newspapers.

Note at the bottom of each section, if you didn't use that medium that day you simply check the box.

Take a couple of minutes and look over the diary and let me know if you have any questions.

(GIVE RESPONDENT DIARY AND LET THEM LOOK AT PAGES. PROBE FOR QUESTIONS ON HOW TO COMPLETE THE INFORMATION REQUESTED.)

You're to keep the diary for a week. Next Monday, I'll give you a call and make arrangements to pick it up.

In the meantime, if you have any questions on the diary or how to fill it out, my telephone number is in the back. Give me a call and I'll be happy to help you.

We really appreciate your help with the study.

Are there any questions you have on the diary?

(PROBE.)

OK. I'll give you a call in a week and pick up the diary.

Thanks for your help.

MEDIA USAGE POST-TEST QUESTIONNAIRE INSTRUCTIONS

When you pick up the diary, be sure to jot the name of the respondent on the back.

Check the diary to make sure it is complete. If there are incomplete sections or days, ask if they failed to mark their diaries or forgot to check that they did not use media on that day.

UNDER NO CONDITIONS SHOULD YOU ALLOW THE RESPONDENTS TO COMPLETE OR ADD MEDIA USAGE DATA AFTER THE WEEK IS OVER.

The above question is only to assure that all nonusage days are marked properly.

After you have the diary, tell the respondent you'd like to ask a few questions to complete the survey.

Use the survey form attached.

POST-DATA QUESTIONNAIRE

Interviewer's Name____________________ Date______________
Time of Day______________________

Complete the following information:

Respondent's Name______________________
Respondent's Address___________________
Respondent's Telephone_________________

I'd like to ask you a few questions to complete our survey. It won't take long.

(1) Did you find the diary form easy to use?
( ) YES ( ) NO

(2) Do you have any suggestions which might make it easier to use another time?

(3) Did you add any media to your usage during the past week which were out of the ordinary? For example, did you buy a different than usual newspaper or magazine?

(4) Was last week what you consider a fairly normal week for you in terms of media usage?
( ) YES ( ) NO

If YES, go to (5). If NO, ask . . .

What was unusual?

(5) Were you in town the entire week?
( ) YES ( ) NO

If YES, go to (6). If NO, ask . . .

(a) When did you leave?

(b) Did you note this in the diary?
( ) YES ( ) NO

(6) No doubt you were exposed to a great deal of advertising this past week. Does any advertisement or commercial you saw last week stick out in your mind?

( ) YES ( ) NO

If NO, go to (7). If YES, ask . . .

(a) What ad or commercial was it?

(b) When did you see or hear it?

(c) On what media was it?

( ) Newspaper
( ) Radio
( ) Television
( ) Magazine

(7) Thinking back over last week, did you receive any advertising material through the mail?

( ) YES ( ) NO

If NO, go to (8). If YES, ask . . .

(a) What was it for?

(b) Did you respond to take advantage of the offer?

( ) YES ( ) NO

Now, I'd like to ask you just a few questions about some products.

(8) (a) When I mention banks, which one comes to your mind first?

( ) E. Lansing State Bank
( ) First National Bank of E. Lansing
( ) Michigan National
( ) American Savings & Trust
( ) Bank of Lansing
( ) Dart National
( ) Other

(b) Did you visit a bank this past week?

( ) YES ( ) NO

If NO, go to (9). If YES, ask . . .

(c) Which bank did you visit?

(9) (a) When I mention pizza, which one comes to mind first?

( ) Domino's
( ) Bell's
( ) Pizza Express
( ) Little Ceasar's
( ) Other

(b) Did you buy pizza this past week?

( ) YES ( ) NO

If NO, go to part (d). If YES, ask . . .

(c) What pizza did you buy?

( ) Domino's
( ) Bell's
( ) Pizza Express
( ) Little Ceasar's
( ) Other

(d) What pizza do you prefer?

(10) (a) When I mention beer, what brand comes to mind first?

( ) Stroh's
( ) Budweiser
( ) Schlitz
( ) Miller
( ) Busch
( ) Falstaff
( ) Altes
( ) Other

(b) Did you buy beer this week?

( ) YES ( ) NO

If NO, go to part (d). If YES, ask . . .

(c) What brand did you buy?

( ) Stroh's
( ) Budweiser
( ) Schlitz
( ) Miller
( ) Busch
( ) Falstaff
( ) Altes
( ) Other

(d) What brand of beer do you prefer?

( ) Stroh's
( ) Budweiser
( ) Schlitz
( ) Miller
( ) Busch
( ) Falstaff
( ) Altes
( ) Other

(11) (a) When I mention movies, which one comes to mind first?

(b) Have you ever seen that movie?
( ) YES ( ) NO

If YES, go to (12). If NO, ask . . .

(c) Do you plan to see that movie this weekend?
( ) YES ( ) NO

(12) (a) When I mention local entertainment places directed toward MSU students, what place comes to mind first?

(b) Did you go to an entertainment place this past week?
( ) YES ( ) NO

If NO, go to part (d). If YES, ask . . .

(c) Which place was that?

(d) What is your favorite entertainment place?

(13) (a) When I mention wine, what brand comes to mind first?
( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Anades

(b) Did you buy any wine this week?
( ) YES ( ) NO

If NO, go to part (d). If YES, ask . . .

(c) What brand did you buy?

( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Anades

(d) What brand do you prefer?

( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Anades

(14) (a) When I mention automobiles, which one comes to mind first?

(b) Did you visit an automobile dealer this week?

( ) YES ( ) NO

If NO, go to (15). If YES, ask . . .

(c) What auto dealer did you visit?

(d) If you were to purchase an automobile tomorrow, what would you buy?

(15) (a) When I mention stereo or hi-fi shops, which one comes to mind first?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Other____________(specify)

(b) Did you visit a stereo or hi-fi shop this past week?

( ) YES ( ) NO

If NO, go to (END). If YES, ask . . .

(c) Which shop did you visit?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Other__________(specify)

(d) If you were going to purchase a stereo or hi-fi set today, which place would you visit first?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Other__________(specify)

Thanks for your help!

(END)

APPENDIX B

PRE-TEST QUESTIONNAIRE USED IN STUDY

APPENDIX B

PRE-TEST QUESTIONNAIRE USED IN STUDY

MEDIA DIARY PLACEMENT AND QUESTIONNAIRE

INSTRUCTIONS:

ADMINISTER THIS QUESTIONNAIRE PERSONALLY! DO NOT GIVE IT TO THE RESPONDENT TO FILL OUT.

If the respondent doesn't understand the question, re-ask the question once more in exactly the same words.

It is important you get the respondent's agreement to participate and keep the diary. You may stress that this is part of your classwork and an important part of your grade, but you should also assure them that the results are part of a scientific study being made only on the MSU campus.

You may also tell him that the study is being sponsored by several of the local media to aid them in determining the media habits of the student community so that they might better serve their needs.

The respondent has agreed to keep the diary. If however, the respondent becomes reluctant to carry out the assignment or says they will not complete the diary, thank them for their time and place the diary elsewhere. There is no need for you to spend your time on a respondent who will not cooperate.

Be sure to complete the entire Pre-Test Questionnaire with the respondent. Most answere are short and it should not take longer than 15 minutes or so to complete the entire form.

Under the brand or product categories, many times the respondent will give several responses. Record the first response.

Be sure all questions are answered. If the respondent doesn't know, be sure and note that. (i.e. check the appropriate box.)

If you have any questions or problems, call Dr. Martin Block at 353-9317.

DIARY PLACEMENT INTERVIEW

Interviewer's Name______________________________ 1-3

Date___________________ 2,1,0 4-6

Time of Day__________________ 7-8

INTRODUCTION

Hi. Thanks for agreeing to participate in our experiment. I think you'll find it is fun.

First, I'd like to ask you a few questions.

Name______________________________

Address___________________________

Telephone_________________________

(1) ( ) Male ( ) Female 9

(2) ( ) Married ( ) Single 10

(3) Class standing ( ) Fr ( ) So ( ) Jr ( ) Sr ( ) Gr 11

(4) Major_____________________________ 12-13

(5) (a) Do you work? ( ) YES ( ) NO 14

If NO, go to (6). If YES, ask. . .

(b) What days?___________________ 15-16

Hours?______________________

(6) (a) Do you live on campus or off campus? ( ) Campus ( ) Off Campus 17

If OFF CAMPUS, ask. . .

( ) Married Housing
( ) House
( ) Apartment
( ) Co-op 18
( ) Fraternity/Sorority
( ) Other____________ (specify)

(b) Individual or share room? ( ) Individual ( ) Share 19

(7) (a) Is the radio yours? ( ) YES ( ) NO 20

(b) Do you own a TV? ( ) YES ( ) NO 21

If NO, go to (8). If YES, ask. . .

(c) Are you on the cable? ( ) YES ( ) NO 22

NOTE: **In the questionnaire below, seek free response.** DO NOT give names or time **parameters listed in** questionnaire which might influence the answers.

(8) Do you read a newspaper other than the STATE NEWS? ( ) YES ( ) NO 23

If NO, go to (9). If YES, ask. . .

Which ones?
( ) Detroit Free Press--Sunday
( ) Detroit Free Press--Daily
( ) State Journal
( ) Detroit News
( ) Chicago Tribune
( ) New York Times
( ) Christian Science Monitor
( ) Wall Street Journal
( ) Other______________(specify)

24-25

(9) (a) Do you suscribe to any magazines? ( ) YES ( ) NO 26

If NO, go to (b). If YES, ask. . .

which ones? ____________________ 27-28
____________________ 29-30
____________________ 31-32
____________________ 33-34
____________________ 35-36

(b) Do you regularly buy a magazine? ( ) YES ( ) NO 37

If NO, go to (10). If YES, ask. . .

Which ones?____________________ 38-39
____________________ 40-41
____________________ 42-43
____________________ 44-45
____________________ 46-47

(10) How much TV do you watch per day?
( ) Don't watch
( ) Less than 1 hour
( ) 1 hour to 2 hours & 59 minutes
( ) 3 hours to 4 hours
( ) more than 4 hours

48

(11) About how much radio do you listen to each day?
( ) Don't listen
( ) Less than 1 hour
( ) 1 hour to 2 hours & 59 minutes
( ) 3 hours to 4 hours
( ) more than 4 hours

49

(12) What is your favorite radio station?

(If more than one, rank in order.)

( ) WFMK
( ) WVIC
( ) WKAR
( ) WILS
( ) WJIM
( ) WITL
( ) WJR
( ) WEAK
( ) WMSN
( ) Other ______________
(specify)

50-51

(13) Which one station do you believe is best for news?

( ) WFMK
( ) WVIC
( ) WKAR
( ) WILS
( ) WJIM
( ) WITL
( ) WJR
( ) WEAK
( ) WMSN
( ) Don't Know
( ) Other ______________
(specify)

52-53

* INTERVIEWER INSTRUCTIONS *

When the portion of the questions regarding advertising that has been "seen" by the respondent are asked "What did they say?" probe for answers. Do not suggest copy points. Do not give cues. You are interested only in free recall. For example, you may say, "do you remember anything about the ad you saw or heard." You may not say "Was it about the Teller 24" or other questions of a similar nature.

(14) Thinking back over the past few weeks, have you seen or heard any advertising for a bank?

( ) YES ( ) NO

54

If NO, go to (d). If YES, ask. . .

(a) What bank was that?

( ) East Lansing State Bank
( ) First Nat'l Bank of E. Lansing
( ) Michigan National
( ) American Bank & Trust
( ) Bank of Lansing
( ) Dart National
( ) Other ______________
(specify)

55

(b) Where did you see or hear the ad?

( ) Newspaper
( ) Radio
( ) Television
( ) Magazines
( ) Other ______________
(specify)

56

(c) What did it say?______________________________
____
____
____
______________________________ 57-58
____
____

(d) Where do you bank? ______________________________ 59

(15) Have you seen or heard any advertising fo an overseas study meeting?

( ) YES ( ) NO 60

If NO, go to (d). If YES, ask. . .

(a) What country was the study program for?

( ) England
( ) France
( ) Germany
( ) Japan 61
( ) Brazil
( ) Several countries
( ) Other______________________
(specify)

(b) Where did you see or hear the advertising?

( ) Newspapers
( ) Television
( ) Radio
( ) Magazines 62
( ) Other______________________
(specify)

(c) What did it say?______________________________
____
____
______________________________ 63-64
____
____

(d) Would you be interested in an overseas study program of any kind?

( ) YES ( ) NO 65

If NO, go to (16). If YES, ask. . .

(e) What country would be of interest to you?

( ) England
( ) Germany
( ) France
( ) Japan
( ) Brazil
( ) Other ______________
(specify)

66

(16) **Have you seen or heard any advertising** for off-campus bars, restaurants, or any **places of entertainment directed** specifically to the college community recently?

(NOT MOVIES) ( ) YES ( ) NO 67

If NO, go to (17). If YES, ask. . .

(a) What place or attraction was that?

( ) Silver Dollar
( ) Moon's
( ) Rainbow Ranch
( ) Lizard's
( ) Alle-Eye
( ) Coral Gables
( ) Dooley's
( ) Peanut Barrel
( ) Other ______________
(specify)

68-69

(b) What did the advertising say? ______________

____

____

____

____

____

70-71

(c) Where did you see or hear the advertising?

( ) Newspaper
( ) Television
( ) Radio
( ) Magazines
( ) Other ______________
(specify)

72

(d) Did you or do you plan to attend?

( ) YES ( ) NO 73

(e) Have you ever gone there before?

( ) YES ( ) NO 74

(17) (a) How about advertising for on-campus entertainment? (NOT MOVIES)

( ) YES ( ) NO 75

If NO, go to (18). If YES, ask. . .

(b) What entertainment was that?____________

______________________________ 76-77

____

(c) Where did you see or hear the advertising?

( ) Newspaper
( ) Radio
( ) Television 78
( ) Radio
( ) Other________________
(specify)

(d) What did the advertising say?____________

____

____

______________________________ 79-80

____

____

____

______________________________ 1-3

2 2 0
4-6

(18) Have you seen or heard any advertising for wine recently?

( ) YES ( ) NO 7-8

If NO, go to (d). If YES, ask. . .

9

(a) What brand of wine was that?

( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers 10-11
( ) Almedan
( ) Blue Nun
( ) Lambrusco
( ) Mateus
( ) Andre
( ) Other________________
(specify)

(b) Where did you see or hear the advertising?

( ) Radio
( ) Television 12
( ) Newspapers
( ) Magazine
( ) Other________________
(specify)

(c) What did the advertising say? ____________

________________________________ 13-14

____

____

____

(d) Do you usually buy wine? ( ) YES ( ) NO 15

If NO, go to (26). If YES, ask. . .

(e) What is your favorite brand?

( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Andre
( ) Almedan 16-17
( ) Blue Nun
( ) Lambrusco
( ) Mateus
( ) Other ____________________ (specify)

(19) Have you seen or heard any advertising for automobiles lately?

( ) YES ( ) NO 18

If NO, go to (d). If YES, ask. . .

(a) What automobile was it for? ____________

________________________________ 19-20

(b) Where did you see or hear the advertising?

( ) Radio
( ) Television
( ) Newspapers 21
( ) Magazines
( ) Other ____________________ (specify)

(c) What did the advertising say? ____________

____

________________________________ 22-23

____

____

____

(d) If you were to buy a new automobile tomorrow, what would you buy?

________________________________ 24-25

____

(20) **Have you seen or heard any advertising for a stereo or hi-fi shop recently?**

( ) YES ( ) NO — 26

If NO, go to (d). If YES, ask. . .

(a) What stereo or hi-fi shop was the advertising for?

( ) Tech Hi-Fi
( ) Stereo Shoppe
( ) Rogers
( ) Marshall's — 27-28
( ) Leonard's
( ) Highland
( ) Hi-Fi Buys
( ) Other ______________
(specify)

(b) Where did you see or hear the advertising?

( ) Radio
( ) Television
( ) Magazine — 29
( ) Newspaper
( ) Other ______________
(specify)

(c) What did the advertising say? ______________

____
______________________________ 30-31
____
____
____
____

(d) If you were to shop for a stereo or hi-fi tomorrow, which place would you visit first?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Marshall's
( ) Leonard's
( ) Highland — 32-33
( ) Roger's
( ) Hi-Fi Buys
( ) Other ______________
(specify)

END OF QUESTIONNAIRE.

I'm going to ask you to keep a media diary for a week. Here's the diary. I'll explain how it works.

There are separate pages for each day starting with Monday, February 9. All you do is jot down each day when you watch TV, listen to radio or read a newspaper or magazine. It will only take a few minutes each day to do it and it will be very helpful to the project.

As you can see, there is a separate section for Magazines, Newspapers, Radio, and Television. We suggest you keep the diary beside your radio so you will be reminded to jot down your media patterns.

Whenever you use an advertising medium, just jot down what it was, and the amount of time you spent with the medium.

For example, whenever you turn your radio on, just write down the time you turned it on and when you turned it off. There is a place to note whether it was day or night and a place for the call letters of the station. Also, please put in the type or name of the program if it had one. For example, if you listened to J. P. McCarthy on WJR on Monday morning from 7:30 am until 8:15 am, you put down the time periods, mark AM, WJR, and J.P. McCarthy. If there is no specifed program title or it was just music, put down the kind of music played.

The same type of information is requested for TV, Magazines, and Newspapers.

Note at the bottom of each section, if you didn't use that medium that day, you simply check the box.

Take a couple of minutes and look over the diary and let me know if you have any questions.

(GIVE RESPONDENT THE DIARY AND LET THEM LOOK AT PAGES. PROBE FOR QUESTIONS ON HOW TO COMPLETE THE INFORMATION REQUESTED.)

You're to keep the diary for a week. Next Monday, I'll give you a call and make arrangements to pick it up.

In the meantime, if you have any questions on the diary or how to fill it out, my telephone number is on the back. Give me a call and I'll be happy to help you.

We really appreciate your help with the study.

Are there any questions you have on the diary.

(PROBE.)

OK. I'll give you a call in a week and pick-up the diary.

Thanks for your help.

APPENDIX C

MEDIA DIARY

APPENDIX C

MEDIA DIARY

MICHIGAN STATE UNIVERSITY

MEDIA USAGE STUDY DIARY

INSTRUCTIONS

GENERAL

Thanks for participating in the MSU Media Usage Study. This is a scientific study and your help is appreciated. Your name will not be used in any way and your diary will be included in the total study so that your responses and media patterns will become a part of the total survey results.

We want to learn how you normally use the media that is available to you. For that reason, please don't read, watch or listen more than you normally do. We are interested in your usual habits and use of the media.

HOW TO KEEP YOUR DIARY

1. There are two separate pages for each day of the week starting with Monday, February 9. On the pages, you will find a separate section for
   - •Newspapers
   - •Television
   - •Magazines
   - •Radio

usage. Under each section you will find spaces for you to record your media usage each day. For example, you are to jot down when, how long, to what station, and the name or type of program on radio and television.

For magazines and newspapers, you should jot down each newspaper or magazine you read each day, the issue date, whether it was the first or last time you had seen that issue and approximately how many pages you looked at.

2. NOTE: If you did not use that particular media that day, just check the box at the end of the section indicating no usage.
3. You should keep the diary for each day during the week. It is important to be as accurate as possible. To help you, each day appears on two facing pages, starting with Monday.
4. As a reminder, we suggest you keep the diary by your radio or TV set. That way you will be reminded to jot down your media usage whenever you turn the set on or off.
5. The diary is easy to keep, but if you should have a question, call the interviewer who gave you the diary. The name and telephone number is on the back of the diary.
6. That's all there is to the diary. Just a record of when and which media you used during the week. At the end of the week, your interviewer will call you to make arrangements to pick up the diary. Please wait for the call. The interviewer has been instructed to pick up the diary personally so don't mail it or leave it some place for pick up.

Thanks for your help.

Remember, if you have any questions, call your interviewer. His name and phone number are listed on the back.

MONDAY

Today's NEWSPAPER Reading

(At Home and Away from Home)

NEWSPAPERS

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

Today's TELEVISION Watching

(At Home and Away from Home)

TELEVISION

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	AM	PM	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

MONDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue?		How many of the pages did you look at?		
		Yes	No	Less than ⅓	⅓ to ⅔	More than ⅔

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time				Station	Name or Type of Program	Where did you listen?	
Start	Stop	A M	P M	Call Letters		At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

TUESDAY

N E W S P A P E R S

Today's NEWSPAPER Reading

(At Home and Away from Home)

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

T E L E V I S I O N

Today's TELEVISION Watching

(At Home and Away from Home)

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	A M	P M	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

TUESDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue?		How many of the pages did you look at?		
		Yes	No	Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time				Station	Name or Type of Program	Where did you listen?	
Start	Stop	AM	PM	Call Letters		At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

WEDNESDAY

Today's NEWSPAPER Reading
(At Home and Away from Home)

NEWSPAPERS

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

Today's TELEVISION Watching
(At Home and Away from Home)

TELEVISION

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	AM	PM	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

WEDNESDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time				Station	Name or Type of Program	Where did you listen?	
Start	Stop	AM	PM	Call Letters		At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

THURSDAY

NEWSPAPERS

Today's NEWSPAPER Reading

(At Home and Away from Home)

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

TELEVISION

Today's TELEVISION Watching

(At Home and Away from Home)

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	AM	PM	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

THURSDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time: Start	Stop	A M	P M	Station: Call Letters	Name or Type of Program	Where did you listen? At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

FRIDAY

Today's NEWSPAPER Reading

(At Home and Away from Home)

NEWSPAPERS

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

Today's TELEVISION Watching

(At Home and Away from Home)

TELEVISION

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	A M	P M	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

FRIDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue?		How many of the pages did you look at?		
		Yes	No	Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time				Station	Name or Type of Program	Where did you listen?	
Start	Stop	AM	PM	Call Letters		At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

SATURDAY

Today's NEWSPAPER Reading

(At Home and Away from Home)

NEWSPAPERS

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue?		How many of the pages did you look at?		
		Yes	No	Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

Today's TELEVISION Watching

(At Home and Away from Home)

TELEVISION

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	AM	PM	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

SATURDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time: Start	Stop	A M	P M	Station: Call Letters	Name or Type of Program	Where did you listen? At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

SUNDAY

NEWSPAPERS

Today's NEWSPAPER Reading

(At Home and Away from Home)

Please list any newspapers you looked at, either at home or away from home.

Name of Newspaper	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Newspaper Today, Check Here ☐

TELEVISION

Today's TELEVISION Watching

(At Home and Away from Home)

Please list any watching, either at home or away from home.

Time				Station		Name or Type of Program	Where did you watch?	
Start	Stop	A M	P M	CH #	Call Letters		At Home	Away From Home

► If You Didn't Watch Any Television Today, Check Here ☐

SUNDAY

Today's MAGAZINE Reading

(At Home and Away from Home)

Please list any magazines you looked at, either at home or away from home.

Name of Magazine	Issue Date	Is this the first time you ever looked at this issue? Yes	No	How many of the pages did you look at? Less than 1/3	1/3 to 2/3	More than 2/3

► If You Didn't Read Any Magazines Today, Check Here ☐

MAGAZINES

Today's RADIO Listening

(At Home and Away from Home)

Please list any listening, either at home or away from home.

Time: Start	Stop	A M	P M	Station: Call Letters	Name or Type of Program	Where did you listen? At Home	Away From Home

► If You Didn't Listen To Any Radio Today, Check Here ☐

RADIO

Thank you for participating in the MSU Media Usage Study. If you have any problems or questions concerning the completion of your Diary, please call the person named below.

NAME____________________________.

PHONE NUMBER_____________________.

APPENDIX D

SCREENING TELEPHONE CALL FORM

APPENDIX D

SCREENING TELEPHONE CALL FORM

DIARY PLACEMENT CALL

Questionnaire No. ____ ____ 1-3

Date ____________ 110 4-6

Hello! My name is ______________________. I'm a student in the College of Communication Arts and Sciences. ____ 7-8

We're conducting a study of the media habits of MSU students. Your name was selected at random for this experiment. May I ask you a few questions?

(1) Do you listen to radio? ( ) Yes ( ) No ____ 9

IF NO, TERMINATE INTERVIEW........

A radio is required for the experiment. Thank you.for your time.

IF YES, ASK....

(2) Is it: ( ) in your room ____ 10

( ) home ____ 11

( ) car ____ 12

(3) (a) Do you have a television set? ( ) Yes ( ) No ____ 13

IF NO, GO TO 4......

IF YES, ASK.....

(b) Is it a color set? ( ) Yes ( ) No ____ 14

(c) Are you on the cable? ( ) Yes ( ) No ____ 15

(4) Is your: name ______________________?

phone ______________________?

address ______________________?

(5) Sex: ( ) Male ( ) Female ____ 16

(6) Marital Status: ( ) Married ( ) Single ____ 17

(7) Class standing: ( ) Freshman ____ 18

( ) Sophomore

( ) Junior

( ) Senior

( ) Graduate

(Please turn page)

(8) Major ______________________ ______ 19-20

(9) (a) Do you work? ( ) Yes ( ) No ______ 21

IF NO, GO TO 10....

IF YES, ASK....

(b) What days? __________ Hours? __________

(10) (a) Do you live on campus or off-campus? ______ 22-23

( ) Campus ( ) Off-campus ______ 24

IF CAMPUS, GO TO 11....

IF OFF-CAMPUS, ASK....

(b) ( ) Married House ______ 25
( ) House
( ) Apartment
( ) Co-op
( ) Fraternity/Sorority
( ) Other ______________ Specify)

(c) Individual or share room? ______ 26
( ) Individual
( ) Share room

You have qualified for our study. The experiment will require you to fill out a few forms. When and where can I meet you to go over them?

Day ______________________________

Time ______________________________

Place ______________________________

Thanks, I'll see you ______________________.

Interviewer Name ______________________.

1st call ( ) ______ 27
2nd call ( )
3rd call ( )
4th call ( )
Disconnect ( )
No longer there ( )

APPENDIX E

CALL FORM FOR INTERVIEWER PICK-UP

APPENDIX E

CALL FORM FOR INTERVIEWER PICK-UP

CALL FORM FOR INTERVIEW PICK-UP

This form should be used on Sunday, February 15 or Monday, February 16 to make arrangements to pick up the diaries you have placed. Be sure to call first to make arrangements, since you must have the respondent give you post-test data to complete the survey.

Suggested telephone call format

Hi, this is ____________________, the person who asked you to keep the media diary.

I'd like to pick the diary up when it is convenient for you. I'd like to get your reaction to the diary so I want to pick it up personally.

When can we get together for a few minutes?

NOTE: DO NOT LET THE RESPONDENT SAY THEY WILL LEAVE IT FOR YOU OR YOU MAY PICK IT UP WHEN THEY ARE NOT THERE. ONE OF THE KEY PARTS OF THE SURVEY IS THE POST TEST WHICH MUST BE ADMINISTERED AFTER THE DIARY HAS BEEN COMPLETED.

IF THE RESPONDENT HESITATES, TELL THEM YOU ARE REQUIRED TO PICK UP THE DIARY AND GET REACTIONS PERSONALLY FOR POSSIBLE FUTURE USES OF THE DIARY ON OTHER COLLEGE CAMPUSES.

ALL DIARIES AND POST TEST QUESTIONNAIRES ARE DUE IN NO LATER THAN WEDNESDAY, FEBRUARY 18. FOR THIS REASON, YOU MUST PICK UP THE QUESTIONNAIRES NO LATER THAN TUESDAY, FEBRUARY 17.

NAME ____________________

PLACE ____________________

TIME ____________________

APPENDIX F

POST-TEST QUESTIONNAIRE

APPENDIX F

POST-TEST QUESTIONNAIRE

MEDIA USAGE POST-TEST QUESTIONNAIRE INSTRUCTIONS

When you pick up the diary, be sure to jot the name of the respondent on the back.

Check the diary to make sure it is complete. If there are incomplete sections or days, ask if they failed to mark their diaries or forgot to check that they did not use media that day.

UNDER NO CONDITIONS SHOULD YOU ALLOW THE RESPONDENTS TO COMPLETE OR ADD MEDIA USAGE DATA AFTER THE WEEK IS OVER.

The above question is only to assure that all non-usage days are marked properly.

After you have the diary, tell the respondent you'd like to ask a few questions to complete the survey.

Use the survey form attached.

POST-TEST DATA QUESTIONNAIRE

1-3

Interviewer's Name____________________

Date____________________ 4 1 0 4-6

Time of Day____________________ 7-8

Complete the following information:

Respondent's Name____________________

Respondent's Address____________________

Respondent's Telephone____________________

I'd like to ask you a few questions to complete our survey. It won't take long.

(1) Did you find the diary form easy to use? ( ) YES ( ) NO 9

(2) Do you have any suggestions which might make it easier to use another time?

(3) Were you in town the entire week? ( ) YES ( ) NO 10

If YES, go to (4). If NO, ask. . .

(a) When did you leave?____________________

(b) Did you note this in the diary?

( ) YES ( ) NO 11

(4) No doubt you were exposed to a great deal of advertising this past week. Does any advertisement or commercial you saw last week stick out in your mind?

( ) YES ( ) NO 12

If NO, go to (5). If YES, ask. . .

(a) What ad or commercial was it?____________________ 13-14

(b) When did you see or hear it?____________________ 15-16

(c) On what media was it?

( ) Newspaper
( ) Radio
( ) Television
( ) Magazine
( ) Other________________ (specify)

17

(5) Thinking back over last week, did you receive any advertising material through the mail?

( ) YES ( ) NO

18

If NO, go to (6). If YES, ask. . .

(a) What was it for?____________________

19-20

(b) Did you respond or take advantage of the offer?

( ) YES ( ) NO

21

Now, I'd like to ask you just a few questions about som products.

* INTERVIEWER INSTRUCTIONS *

When the portion of the questions regarding advertising that has been seen by the respondent are asked, "what did they say?" probe for answers. Do not suggest copy points. Do not give cues. You are interested only in free recall. For example, you may say, "do you remember anything about the ad you saw or heard." You may not say "was it about the Teller 24" or other questions of a similar nature.

(6) (a) When I mention banks, which one comes to mind first?

( ) East Lansing State Bank
( ) First National Bank of E.L.
( ) Michigan National
( ) American Bank & Trust
( ) Bank of Lansing
( ) Dart National
( ) Other________________ (specify)

22

(b) Did you visit a bank this past week? ( ) YES ( ) NO

23

If NO, go to (7). If YES, ask. . .

(c) Which bank did you visit?______________

24

(7) Did you see or hear any advertising for an overseas study program this past week?

( ) YES ( ) NO

25

If NO, go to (8). If YES, ask. . .

(b) Where did you see or hear the advertising?

( ) Newspaper
( ) Radio
( ) Television
( ) Magazine
( ) Direct Mail
( ) Class Notice
( ) Friend
( ) Other________________
(specify)

20

(c) What did the advertising say? (PROBE)_____

27-28

If mention is made of a meeting, ask. . .

(d) Do you plan to attend?

( ) YES ( ) NO

29

(8) (a) When I mention on-campus entertainment, other than movies, what comes to mind first?

30-31

(b) Did you or do you plan to attend this attraction?

( ) YES ( ) NO

32

If NO, go to (9). If YES, ask. . .

(c) How did you learn about this event or attraction?

( ) Newspaper
( ) Radio
( ) Television
( ) Magazine
( ) Direct Mail
( ) Friend
( ) Other________________
(specify)

33

(9) (a) When I mention off-campus bar-restaurant or entertainment place, directed toward MSU students, what place comes to mind first?

( ) Silver Dollar Saloon
( ) Moon's
( ) Rainbow Ranch
( ) Lizard's
( ) Alle-Eye
( ) Coral Gables
( ) Dooley's
( ) Peanut Barrel
( ) Other________________
(specify)

34-35

(b) Did you go to an entertainment place this past week? ( ) YES ( ) NO — 36

| If NO, go to (e). If YES, ask. . . |

(c) Which place was that?________________ — 37-38

____

(d) Where did you see or hear about the attraction? — 39

( ) Newspaper
( ) Radio
( ) Television
( ) Magazine
( ) Friend
( ) Other________________ (specify)

(e) What is your favorite off-campus entertainment place?________ — 40-41

____

____

(10) (a) When I mention wines what brand comes to mind first? — 42-43

( ) Blue Nun
( ) Lambrusco
( ) Mateus
( ) Andre
( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Almedan
( ) Other________________ (specify)

(b) Did you buy any wine this week? ( ) YES ( ) NO — 44

| If NO, go to (d). If YES, ask. . . |

(c) What brand did you buy? — 45-46

( ) Andre
( ) Blue Nun
( ) Lambrusco
( ) Mateus
( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Almedan
( ) Other________________ (specify)

(d) Do you usually buy wine? ( ) YES ( ) NO — 47

| If NO, go to (11). If YES, ask. . . |

(e) What brand do you prefer?

( ) Blue Nun
( ) Lambrusco
( ) Mateus
( ) Gallo
( ) Boone's Farm
( ) Taylor
( ) Christian Brothers
( ) Almedan
( ) Andre
( ) Other________________
(specify)

48-49

(11) (a) When I mention automobiles, which one comes to mind first?________
________________________________ 50-51

(b) Did you visit an automobile dealer this week?

( ) YES ( ) NO 52

If NO, go to (d). If YES, ask. . .

(c) What auto dealer did you visit?____________
________________________________ 53-54
____

(d) If you were to purchase a new automobile, what would you buy?______
________________________________ 55-56
____

(12) (a) When I mention stereo or hi-fi shops, which one comes to mind first?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Roger's
( ) Hi-Fi Buys
( ) Other________________
(specify)

57-58

(b) Did you visit a stereo or hi-fi shop this past week?

( ) YES ( ) NO 59

If NO, go to (d). If YES, ask. . .

(c) Which shop did you visit?

( ) Stereo Shoppe
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Roger's
( ) Hi-Fi Buys
( ) Other________________
(specify)

60-61

(d) If you were going to purchase a stereo or hi-fi set today, which place would you visit first?

( ) Stereo Shoppe
( ) Roger's
( ) Tech Hi-Fi
( ) Leonard's
( ) Marshall's
( ) Highland
( ) Hi-Fi Buys
( ) Other________________
(specify)

62-63

(END)

Thanks for your help!

APPENDIX G

BROADCAST MONITORING FORM

APPENDIX G

BROADCAST MONITORING FORM

ADVERTISING MONITORING FORM

Student Number____________________

STATION__________ HOUR__________ DATE__________ DAY__________

TIME*	COMMERCIAL (BRAND, PRODUCT, ETC.)		
	PRODUCT CATEGORY	BRAND	ADVERTISER/RETAILER

* Minutes Past the Hour

APPENDIX H

FORTRAN PROGRAMS FOR SORT BY MEDIUM

PROGRAM RADIO

PROGRAM TELEVISION

PROGRAM NEWSPAPER

PROGRAM MAGAZINES

APPENDIX H

```
PROGRAM RADIO        73/73    OPT=1                    FTN 4.6+428        11/23/76 .09.23.11        PAGE    1

            PROGRAM RADIO(INPUT,OUTPUT,TAPE6,TAPE7,TAPE8)
            INTEGER DID,DDAY,DMEC,DSHR,DSMIN,DEHR,DEMIN,DSTA
            INTEGER LDAY,LHR,LMIN,LPROD,LADV,LMED,LSTA
            INTEGER NID,NMED,NBANK(3),NOSS,NON(7),NOFF(6),NAUTO(8),NSS(5)
            INTEGER MTIME(7,6,110),MADV(7,6,110),MSTA(6)
            INTEGER MBANK(3),MON(7),MOFF(6),MAUTC(8),MSS(5)
            INTEGER KKK(7,6)
            DATA MSTA/1,2,  4,5,7,11/,MBANK/1,3,0/,MON/1,3,4,6,10,19,0/
            DATA MOFF/1,3,4,5,7,0/,MAUTO/1,3,6,7,9,14,51,0/,MSS/1,2,4,6,0/
            DATA MTIME/4620*0/,MADV/4620*0/
            DATA NBANK/3*0/,NON/7*0/,NOFF/6*0/,NAUTO/8*0/,NSS/5*0/
            DATA KKK/42*0/
            NOSS=0
        801 FORMAT(I3,1X,I1,3X,I1,5I2)
        802 FORMAT(I1,2I2,I1,1X,I2,I1,I2)
        803 FORMAT(I3,*6*,I1,17I4/I3,*7*,I1,13I4)
        903 FORMAT(1X,I3,*6*,I1,17I4,2X,I3,*7*,I1,13I4)
        950 FORMAT (1X,I4)
        951 FORMAT (1X,7 (I6,2X))
        952 FORMAT (1X, 6(I6,2X))
         10 READ(6,802) LDAY,LHR,LMIN,LPROD,LADV,LMED,LSTA
            IF (EOF(6)) 70,15
         15 IF (LDAY.LT.1.OR.LDAY.GT.7) GO TC 10
            DO 16 I=1,7
            IF (LSTA.EQ.MSTA(I)) GO TO 17
         16 CONTINUE
            GO TO 10
         17 KKK(LDAY,I)=KKK(LDAY,I)+1
            J=KKK(LDAY,I)
            IF (J.LT.1) GO TO 10
            IF (J.GT.200) GO TO 10
            IF (LPROD.EQ.1) GO TO 20
            IF (LPROD.EQ.2) GO TO 22
            IF (LPROD.EQ.3) GO TO 24
            IF (LPROD.EQ.4) GO TO 26
            IF (LPROD.EQ.6) GO TC 28
            IF (LPROD.EQ.7) GO TO 30
            GO TO 10
         20 DO 21 K=1,2
            IF (LADV.EQ.MBANK(K)) GO TO 40
         21 CONTINUE
            GC TC 41
         22 GO TC 42
         24 DO 25 K=1,6
            IF (LADV.EQ.MON(K)) GO TO 44
         25 CONTINUE
            GC TO 45
         26 DO 27 K=1,5
            IF (LADV.EQ.MOFF(K)) GO TO 46
         27 CONTINUE
            GC TC 47
         28 DO 29 K=1,7
            IF (LADV.EQ.MAUTC(K)) GO TC 48
         29 CONTINUE
            GC TO 49
         30 DO 31 K=1,4
            IF (LADV.EQ.MSS(K)) GO TO 50
         31 CONTINUE
            GC TC 50
         40 MADV(LDAY,I,J)=10+K
            GO TO 60
         41 MADV(LDAY,I,J)=13
            GC TO 60
         42 MADV(LDAY,I,J)=21
         43 MADV(LDAY,I,J)=22
            GO TO 60
         44 MADV(LDAY,I,J)=30+K
            GO TO 60
         45 MADV(LDAY,I,J)=37
            GO TO 60
         46 MADV(LDAY,I,J)=40+K
            GC TC 60
         47 MADV(LDAY,I,J)=46
            GO TO 60
         48 MADV(LDAY,I,J)=60+K
            GC TC 60
         49 MADV(LDAY,I,J)=68
```

```
      GO TO 60
   50 MADV(LDAY,I,J)=70+K
      GO TO 60
   51 MADV(LDAY,I,J)=75
   60 MTIME(LDAY,I,J)=(60*LHR)+LMIN
      GO TO 10
   70 DO 160 I=1,7
      PRINT 950, I
      DO 165 J=1,110
      PRINT 951,(MADV(I,K,J),K=1,6)
  165 CONTINUE
  160 CONTINUE
      DO 170 I=1,7
      PRINT 950, I
      DO 175 J=1,110
      PRINT 951,(MTIME(I,K,J),K=1,6)
  175 CONTINUE
  170 CONTINUE
   74 READ(7,801) DIO,DDAY,DMED,DSHR,DSMIN,DEHR,DEMIN,DSTA
      IIO=DIO
      GO TO 76
   75 READ(7,801) DIO,DDAY,DMED,DSHR,DSMIN,DEHR,DEMIN,DSTA
   76 IF (EOF(7)) 130,77
   77 IF (DMED.NE.6) GO TO 75
      IF (DIO.NE.IIO) GO TO 120
      IF (DDAY.LT.1.OR.DDAY.GT.7) GO TO 75
      DO 78 II=1,6
      IF (DSTA.EQ.MSTA(II)) GO TO 79
   78 CONTINUE
      GO TO 75
   79 DSTA=II
      ISTART=(60*DSHR)+DSMIN
      IEND=(60*DEHR)+DEMIN
      IF (IEND.LT.ISTART) IEND=1500
      DO 80 ITIME=1,110
      IF (MTIME(DDAY,DSTA,ITIME).GE.ISTART) GO TO 85
   80 CONTINUE
      GO TO 75
   85 IF (MTIME(DDAY,DSTA,ITIME).GT.IEND) GO TO 75
      IF (MADV(DDAY,DSTA,ITIME).GT.70) GO TO 110
      IF (MADV(DDAY,DSTA,ITIME).GT.60) GO TO 108
      IF (MADV(DDAY,DSTA,ITIME).GT.40) GO TO 106
      IF (MADV(DDAY,DSTA,ITIME).GT.30) GO TO 104
      IF (MADV(DDAY,DSTA,ITIME).GT.20) GO TO 102
      IF (MADV(DDAY,DSTA,ITIME).GT.10) GO TO 100
      GO TO 75
  100 JJJ=MADV(DDAY,DSTA,ITIME)-10
      NBANK(JJJ)=NBANK(JJJ)+1
      GO TO 80
  102 NOSS=NOSS+1
      GO TO 80
  104 JJJ=MADV(DDAY,DSTA,ITIME)-30
      NON(JJJ)=NON(JJJ)+1
      GO TO 80
  106 JJJ=MADV(DDAY,DSTA,ITIME)-40
      NOFF(JJJ)=NOFF(JJJ)+1
      GO TO 80
  108 JJJ=MADV(DDAY,DSTA,ITIME)-60
      NAUTO(JJJ)=NAUTO(JJJ)+1
      GO TO 80
  110 JJJ=MADV(DDAY,DSTA,ITIME)-70
      NSS(JJJ)=NSS(JJJ)+1
      GO TO 80
  120 NIO=DIO
      NMED=1
      WRITE(8,803) NIO,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
     1(NOFF(K),K=1,6),NIO,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
      PRINT 903, NIO,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
     1(NOFF(K),K=1,6),NIO,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
      DO 122 K=1,3
      NBANK(K)=0
  122 CONTINUE
      DO 123 K=1,5
      NSS(K)=0
  123 CONTINUE
      DO 124 K=1,6
      NOFF(K)=0
```



```
  124 CONTINUE
      DO 125 K=1,7
      NON(K)=0
  125 CONTINUE
      DO 126 K=1,8
      NAUTO(K)=0
  126 CONTINUE
      NOSS=0
      GO TO 74
  130 CALL EXIT
      END
```

```
      PROGRAM TV (INFUT,OUTPUT,TAPE6, TAPE7,TAPE8)
      INTEGER CIO,DDAY,DMEC,DSHR,DSMIN,DEHR,DEMIN,DSTA
      INTEGER LDAY,LHR,LPIN,LFROD,LACV,LPEC,LSTA
      INTEGER PIO,NPED,NBANK(3),NOSS,NCN(7),NOFF(6),NAUTO(8),NSS(5)
      INTEGER MTIME(7,3,110),MADV(7,3,110),MSTA(3),MOS(3)
      INTEGER MBANK(3),MON(7),MOFF(6),MAUTC(8),MSS(5)
      INTEGER KKK(7,6)
      DATA MSTA/19,20,21/,MBANK/1,3,0/,MCN/1,3,4,6,10,13,0/
      DATA MOFF/1,3,4,5,7,0/,MAUTO/1,3,6,7,9,13,51,0/,MSS/1,2,4,6,0/
      DATA MTIME/2310*0/,MADV/2310*0/
      DATA MOS/6,10,12/
      DATA NBANK/3*0/,NCN/7*0/,NOFF/6*0/,NAUTO/8*0/,NSS/5*0/
      DATA KKK/42*0/
      NOSS=0
  801 FORMAT(I3,1X,I1,3X,I1,5I2)
  802 FORMAT(I1,2I2,I1,1X,I2,I1,I2)
  803 FORMAT(I3,26X,I1,17I4,I3,27X,I1,13I4)
  903 FORMAT(1X,I3,26X,I1,17I4,2X,I3,27X,I1,13I4)
  950 FORMAT (1X,I4)
  951 FORMAT (1X,7 (I6,2X))
  952 FORMAT (1X, 6(I6,2X))
   10 READ(6,802) LDAY,LHR,LMIN,LPRCC,LADV,LMED,LSTA
      IF (EOF(6)) 70,15
   15 IF (LDAY.LT.1.CR.LDAY.GT.7) GO TO 10
      DO 16 I=1,3
      IF (LSTA.EQ.MSTA(I)) GO TO 17
   16 CONTINUE
      GO TO 10
   17 KKK(LDAY,I)=KKK(LDAY,I)+1
      J=KKK(LDAY,I)
      IF (J.LT.1) GO TO 10
      IF (J.GT.200) GO TO 10
      IF (LPROC.EQ.1) GO TO 20
      IF (LPROC.EC.2) GO TC 22
      IF (LPROD.EC.3) GO TO 24
      IF (LPROD.EC.4) GC TO 26
      IF (LPROD.EQ.6) GO TO 28
      IF (LPROC.EQ.7) GO TO 30
      GC TO 10
   20 DO 21 K=1,2
      IF (LADV.EC.MBANK(K)) GO TO 40
   21 CONTINUE
      GO TO 41
   22 GO TO 42
   24 DC 25 K=1,6
      IF (LADV.EQ.MON(K)) GC TC 44
   25 CONTINUE
      GO TO 45
   26 DO 27 K=1,5
      IF (LADV.EQ.MOFF(K)) GO TO 46
   27 CONTINUE
      GO TO 47
   28 DO 29 K=1,7
      IF (LADV.EQ.MAUTC(K)) GO TO 48
   29 CONTINUE
      GO TO 49
   30 DO 31 K=1,4
      IF (LADV.EQ.MSS(K)) GO TO 50
   31 CONTINUE
      GO TO 50
   40 MADV(LDAY,I,J)=10+K
      GO TO 60
   41 MADV(LDAY,I,J)=13
      GO TO 60
   42 MADV(LDAY,I,J)=21
   43 MADV(LDAY,I,J)=22
      GC TC 60
   44 MADV(LDAY,I,J)=30+K
      GO TO 60
   45 MADV(LDAY,I,J)=37
      GO TO 60
   46 MADV(LDAY,I,J)=40+K
      GO TO 60
   47 MADV(LDAY,I,J)=46
      GO TO 60
   48 MADV(LDAY,I,J)=60+K
      GC TC 60
```

```
 49  MADV(LDAY,I,J)=60
     GO TO 60
 50  MADV(LDAY,I,J)=70+K
     GO TO 60
 51  MADV(LDAY,I,J)=75
 60  NTIME(LDAY,I,J)=(60*LHF)+LMIN
     GO TO 10
 70  DO 160 I=1,7
     PRINT 950, I
     DO 165 J=1,110
     PRINT 951,(PACT(I,K,J),K=1,6)
165  CONTINUE
160  CONTINUE
     DO 170 I=1,7
     PRINT 950, I
     DO 175 J=1,110
     PRINT 951,(PTIME(I,K,J),K=1,6)
175  CONTINUE
170  CONTINUE
 74  READ(7,801) DIC,DDAY,DMEC,DSHR,DSMIN,DEHR,DEMIN,DSTA
     IID=DID
     GO TO 76
 75  READ(7,801) DID,DDAY,DMEO,DSHR,DSMIN,DEHR,DEMIN,DSTA
 76  IF (EOF(7)) 130,77
 77  IF (DMED.NE.1) GO TO 75
     IF (DID.NE.IID) GO TO 120
     IF (DDAY.LT.1.OR.DDAY.GT.7) GO TO 75
     DO 78 II=1,3
     IF (DSTA.EQ.NOS(II)) GO TO 79
 78  CONTINUE
     GO TO 75
 79  DSTA=II
     ISTART=(60*DSHR)+DSMIN
     IEND=(60*DEHR)+DEMIN
     IF (IEND.LT.ISTART) IEND=1500
     DO 80 ITIME=1,110
     IF (NTIME(DDAY,DSTA,ITIME).GE.ISTART) GO TO 85
 80  CONTINUE
     GO TO 75
 85  IF (NTIME(DDAY,DSTA,ITIME).GT.IEND) GO TO 75
     IF (MADV(DDAY,DSTA,ITIME).GT.70) GO TO 110
     IF (MADV(DDAY,DSTA,ITIME).GT.60) GO TO 108
     IF (MADV(DDAY,DSTA,ITIME).GT.40) GO TO 106
     IF (MADV(DDAY,DSTA,ITIME).GT.30) GO TO 104
     IF (MADV(DDAY,DSTA,ITIME).GT.20) GO TO 102
     IF (MADV(DDAY,DSTA,ITIME).GT.10) GO TO 100
     GO TO 75
100  JJJ=MADV(DDAY,DSTA,ITIME)-10
     NBANK(JJJ)=NBANK(JJJ)+1
     GO TO 80
102  NOSS=NOSS+1
     GO TO 80
104  JJJ=MADV(DDAY,DSTA,ITIME)-30
     NON(JJJ)=NON(JJJ)+1
     GO TO 80
106  JJJ=MADV(DDAY,DSTA,ITIME)-40
     NOFF(JJJ)=NOFF(JJJ)+1
     GO TO 80
108  JJJ=MADV(DDAY,DSTA,ITIME)-60
     NAUTO(JJJ)=NAUTO(JJJ)+1
     GO TO 80
110  JJJ=MADV(DDAY,DSTA,ITIME)-70
     NSS(JJJ)=NSS(JJJ)+1
     GO TO 80
120  NID=DID
     NMED=1
     WRITE(8,803) NID,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
    1(NOFF(K),K=1,6),NID,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
     PRINT 903, NID,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
    1(NOFF(K),K=1,6),NID,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
     DO 122 K=1,3
     NBANK(K)=0
122  CONTINUE
     DO 123 K=1,5
     NSS(K)=0
123  CONTINUE
     DO 124 K=1,6
```



```
     NOFF(K)=0
124  CONTINUE
     DO 125 K=1,7
     NON(K)=0
125  CONTINUE
     DO 126 K=1,8
     NAUTO(K)=0
126  CONTINUE
     NOSS=0
     GO TO 74
130  CALL EXIT
     END
```

```
      PROGRAM NEWS (INPUT,OUTPUT,TAPE6, TAPE7,TAPE8)
      INTEGER OID,ODAY,OMED,OPAPER
      INTEGER LDAY,LPROD,LADV,LMED,LPAPER
      INTEGER AID,NPED,NBANK(3),NOSS,NON(7),NOFF(6),NAUTO(8),NSS(5)
      INTEGER MADV(7,5, 70),MPAPER(5),MPD(5)
      INTEGER MBANK(3),MON(7),MOFF(6),MAUTO(8),MSS(5)
      INTEGER KKK(7,6)
      DATA MPAPER/2,3,6,8,10/,MPD/2,3,5,7,1/
      DATA MBANK/1,3,0/,MON/1,3,4,6,10,19,0/
      DATA MOFF/1,3,4,5,7,0/,MAUTO/1,3,6,7,9,13,51,0/,MSS/1,2,4,6,0/
      DATA MADV/2450*0/
      DATA NBANK/3*0/,NON/7*0/,NOFF/6*0/,NAUTO/8*0/,NSS/5*0/
      DATA KKK/42*0/
      NOSS=0
  801 FORMAT(I3,1X,I1,3X,I1,I1)
  802 FORMAT (1X,2I2,I1,1X,I2,I1)
  803 FORMAT(I3,28*,I1,17I4/I3,29*,I1,13I4)
  903 FORMAT(1X,I3,28*,I1,17I4,2X,I3,29*,I1,13I4)
  950 FORMAT (1X,I4)
  951 FORMAT (1X,7 (I6,2X))
  952 FORMAT (1X, 6(I6,2X))
   10 READ(6,802) LDAY,LPAPER,LPROD,LADV,LMED
      IF (EOF(6)) 70,15
   15 LDAY=LDAY-8
      IF (LDAY.LT.1.OR.LDAY.GT.7) GO TO 10
      IF (LPAPER.EQ.1.AND.LDAY.EQ.7) LPAPER=2
      DO 16 I=1,5
      IF (LPAPER.EQ.MPAPER(I)) GO TO 17
   16 CONTINUE
      GO TO 10
   17 KKK(LDAY,I)=KKK(LDAY,I)+1
      J=KKK(LDAY,I)
      IF (J.LT.1) GO TO 10
      IF (J.GT. 70) GO TO 10
      IF (LPROD.EQ.1) GO TO 20
      IF (LPROD.EQ.2) GO TO 22
      IF (LPROD.EQ.3) GO TO 24
      IF (LPROD.EQ.4) GO TO 26
      IF (LPROD.EQ.6) GO TO 28
      IF (LPROD.EQ.7) GO TO 30
      GO TO 10
   20 DO 21 K=1,2
      IF (LADV.EQ.MBANK(K)) GO TO 40
   21 CONTINUE
      GO TO 41
   22 GO TO 42
   24 DO 25 K=1,6
      IF (LADV.EQ.MON(K)) GO TO 44
   25 CONTINUE
      GO TO 45
   26 DO 27 K=1,5
      IF (LADV.EQ.MOFF(K)) GO TO 46
   27 CONTINUE
      GO TO 47
   28 DO 29 K=1,7
      IF (LADV.EQ.MALTO(K)) GO TO 48
   29 CONTINUE
      GO TO 49
   30 DO 31 K=1,4
      IF (LADV.EQ.MSS(K)) GO TO 50
   31 CONTINUE
      GO TO 50
   40 MADV(LDAY,I,J)=10+K
      GO TO 60
   41 MADV(LDAY,I,J)=13
      GO TO 60
   42 MADV(LDAY,I,J)=21
   43 MADV(LDAY,I,J)=22
      GO TO 60
   44 MADV(LDAY,I,J)=30+K
      GO TO 60
   45 MADV(LDAY,I,J)=37
      GO TO 60
   46 MADV(LDAY,I,J)=40+K
      GO TO 60
   47 MADV(LDAY,I,J)=46
      GO TO 60
```

```
 48   MADV(LDAY,I,J)=60+K
      GO TO 60
 49   MADV(LDAY,I,J)=64
      GO TO 60
 50   MADV(LDAY,I,J)=70+K
      GO TO 60
 51   MADV(LDAY,I,J)=75
 60   CONTINUE
      GO TO 10
 70   DO 160 I=1,7
      PRINT 950, I
      DO 165 J=1,70
      PRINT 951,(MADV(I,K,J),K=1,9)
165   CONTINUE
160   CONTINUE
 74   READ(7,801) DID,DDAY,DMED,DPAPER
      IID=DID
      GO TO 76
 75   READ(7,801) DID,DDAY,DMED,DPAPER
 76   IF (EOF(7)) 130,77
 77   IF (DMED.NE.1) GO TO 75
      IF (DID.NE.IID) GO TO 120
      IF (DDAY.LT.1.OR.DDAY.GT.7) GO TO 75
      DO 78 II=1,9
      IF (DPAPER.EQ.MPD(II))  GO TO 79
 78   CONTINUE
      GO TO 75
 79   DNEW=II
      DO 80 ITIME=1, 70
      IF (MADV(DDAY,DNEW,ITIME).NE.0) GO TO 85
 80   CONTINUE
      GO TO 75
 85   IF (MADV(DDAY,DNEW,ITIME).GT.70) GO TO 110
      IF (MADV(DDAY,DNEW,ITIME).GT.60) GO TO 108
      IF (MADV(DDAY,DNEW,ITIME).GT.40) GO TO 106
      IF (MADV(DDAY,DNEW,ITIME).GT.30) GO TO 104
      IF (MADV(DDAY,DNEW,ITIME).GT.20) GO TO 102
100   JJJ=MADV(DDAY,DNEW,ITIME)-10
      NBANK(JJJ)=NBANK(JJJ)+1
      GO TO 80
102   NOSS=NOSS+1
      GO TO 80
104   JJJ=MADV(DDAY,DNEW,ITIME)-30
      NON(JJJ)=NON(JJJ)+1
      GO TO 80
106   JJJ=MADV(DDAY,DNEW,ITIME)-40
      NOFF(JJJ)=NOFF(JJJ)+1
      GO TO 80
108   JJJ=MADV(DDAY,DNEW,ITIME)-60
      NAUTO(JJJ)=NAUTO(JJJ)+1
      GO TO 80
110   JJJ=MADV(DDAY,DNEW,ITIME)-70
      NSS(JJJ)=NSS(JJJ)+1
      GO TO 80
120   NID=DID
      NMED=1
      WRITE(9,803) NID,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
     1(NOFF(K),K=1,6),NID,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
      PRINT 903, NID,NMED,(NBANK(K),K=1,3),NOSS,(NON(K),K=1,7),
     1(NOFF(K),K=1,6),NID,NMED,(NAUTO(K),K=1,8),(NSS(K),K=1,5)
      DO 122 K=1,3
      NBANK(K)=0
122   CONTINUE
      DO 123 K=1,5
      NSS(K)=0
123   CONTINUE
      DO 124 K=1,6
      NOFF(K)=0
124   CONTINUE
      DO 125 K=1,7
      NON(K)=0
125   CONTINUE
      DO 126 K=1,8
      NAUTO(K)=0
126   CONTINUE
      NOSS=0
      GO TO 74
```



```
130   CALL EXIT
      END
```

```
      PROGRAM MAGS (INPUT,OUTPUT,TAPE6, TAPE7,TAPE8)
      INTEGER CIC,OCAY,OMEC,CMAG
      INTEGER LCAY,LFRCD,LACV,LMED,LMAG
      INTEGER MID,MMED,MBANK(3),NOSS,MCN(7),MOFF(6),MAUTO(8),MSS(5)
      INTEGER MADV (13,70), MMAG(13),MCATE(13,70)
      INTEGER MBANK(3),MON(7),MOFF(6),MAUTC(8),MSS(5)
      INTEGER KKK(13),C1,D2,D3
      DATA MMAG/1,4,6,11,13,16,22,24,29,30,31,65,80/
      DATA MBANK/1,3,0/,MON/1,3,4,6,10,19,0/
      DATA MOFF/1,3,4,5,7,0/,MAUTO/1,3,6,7,9,13,51,0/,MSS/1,2,4,6,0/
      DATA MADV/910*0/,MDATE/910*0/
      DATA NBANK/3*0/,NCN/7*0/,NOFF/6*0/,NAUTO/8*0/,NSS/5*0/
      DATA KKK/13*0/
      NOSS=0
  801 FORMAT (I3,5X,I1,I2,1X,I1)
  802 FORMAT (3I1,I2,I1,1X,I2,I1)
  803 FORMAT(I3,2-2,I1,17I4,I3,2X,I1,13I4)
  903 FORMAT(1X,I3,2-2,I1,17I4,2X,I3,2X,I1,13I4)
  950 FORMAT (1X,I4)
  951 FORMAT (1X,13(I6,2X))
  952 FORMAT (1X, 6(I6,2X))
   10 READ (6,802) LC1,LD2,LD3,LMAG,LPROD,LADV,LMED
      IF (ECF(6)) 70,15
   15 IF (LD1.EQ.0.AND.LD2.EC.0) GC TO 620
      LDATE=LD1
      GO TO 630
  620 LDATE=LD3
  630 DC 16 I=1,13
      IF (LMAG.EC.MMAG(I))GC TC 17
   16 CONTINUE
      GO TO 10
   17 KKK (I)=KKK(I)+1
      J=KKK(I)
      IF (J.LT.1) GC TC 10
      IF (J.GT. 70) GO TO 10
      IF (LPROD.EQ.1) GO TO 20
      IF (LFROC.EC.2) GC TC 22
      IF (LPROC.EQ.3) GO TO 24
      IF (LPROC.EC.4) GC TC 26
      IF (LPROC.EC.6) GO TO 28
      IF (LPROD.EQ.7) GO TO 30
      GC TO 10
   20 DO 21 K=1,2
      IF (LADV.EC.MBANK(K)) GC TC 40
   21 CONTINUE
      GO TO 41
   22 GC TO 42
   24 DC 25 K=1,6
      IF (LADV.EC.MCN(K)) GC TC 44
   25 CONTINUE
      GO TO 45
   26 DO 27 K=1,5
      IF (LADV.EC.MCFF(K)) GC TO 46
   27 CONTINUE
      GO TO 47
   28 DO 29 K=1,7
      IF (LADV.EC.MALTC(K)) GC TO 48
   29 CONTINUE
      GO TO 49
   30 DO 31 K=1,4
      IF (LADV.EC.MSS(K)) GO TO 50
   31 CONTINUE
      GO TO 50
   40 MADV(I,J)=10+K
      GO TO 60
   41 MADV(I,J)=13
      GC TC 60
   42 MADV(I,J)=21
   43 MADV(I,J)=22
      GO TO 60
   44 MADV(I,J)=30+K
      GC TO 60
   45 MADV(I,J)=37
      GO TO 60
   46 MADV(I,J)=40+K
      GO TO 60
   47 MADV(I,J)=46
```

```
      GO TO 60
   48 MADV (I,J)=60+K
      GO TO 60
   49 MADV(I,J)=68
      GO TO 60
   50 MADV(I,J)=70+K
      GC TO 60
   51 MADV(I,J)=75
   60 MDATE(I,J)=LDATE
      GO TO 10
   70 DO 165 J=1,70
      PRINT 951, (MACV(K,J),K=1,13)
  165 CONTINUE
   74 READ(7,801) DID,DMED,DMAG,DDATE
      IID=CID
      GO TO 76
   75 READ(7,801) CID,DMED,DMAG,DDATE
   76 IF (ECF(7)) 130,77
   77 IF (DMED.NE.3) GC TO 75
   81 IF (DID.NE.IID) GC TC 120
      DO 78 II=1,13
      IF (DMAG.EQ.MMAG(II)) GO TO 79
   78 CONTINUE
      GO TO 75
   79 DNEW=II
      DO 80 ITIME=1, 70
      IF (MADV(DNEW,ITIME) .NE.0) GO TO 85
   80 CONTINUE
      GC TC 75
   85 IF (MADV(DNEW,ITIME).GT.70) GO TO 110
      IF (MADV(DNEW,ITIME).GT.60) GO TC 108
      IF (MADV(DNEW,ITIME).GT.40) GO TC 106
      IF (MADV(DNEW,ITIME).GT.30) GO TC 104
      IF (MADV(DNEW,ITIME).GT.20) GO TC 102
      IF (MADV(DNEW,ITIME).GT.10) GO TO 100
  100 JJJ=MADV(DNEW,ITIME)-10
      NBANK(JJJ)=NBANK(JJJ)+1
      GO TO 80
  102 NOSS=NOSS+1
      GO TO 80
  104 JJJ=MADV(DNEW,ITIME)-30
      NON(JJJ)=NON(JJJ)+1
      GO TO 80
  106 JJJ=MADV(DNEW,ITIME)-40
      NOFF(JJJ)=NCFF(JJJ)+1
      GO TO 80
  108 JJJ=MADV(DNEW,ITIME)-60
      NAUTO(JJJ)=NAUTO(JJJ)+1
      GC TO 80
  110 JJJ=MADV(DNEW,ITIME)-70
      NSS(JJJ)=NSS(JJJ)+1
      GC TO 80
  120 NID=CID
      NMED=1
      WRITE(8,803) NID,NMED,(NBANK(K),K=1,3),NCSS,(NCN(K),K=1,7),
     1(NOFF(K),K=1,6),NID,NMED,(NAUTC(K),K=1,8),(NSS(K),K=1,5)
      PRINT 903, NID,NMED,(NBANK(K),K=1,3),NCSS,(NCN(K),K=1,7),
     1(NOFF(K),K=1,6),NID,NMED,(NAUTC(K),K=1,8),(NSS(K),K=1,5)
      DO 122 K=1,3
      NBANK(K)=0
  122 CONTINUE
      DO 123 K=1,5
      NSS(K)=0
  123 CONTINUE
      DO 124 K=1,6
      NCFF(K)=0
  124 CONTINUE
      DO 125 K=1,7
      NCN(K)=0
  125 CONTINUE
      DO 126 K=1,8
      NAUTO(K)=0
  126 CONTINUE
      NCSS=0
      GO TC 74
  130 CALL EXIT
      END
```

APPENDIX I

TECHNICAL APPENDICES FOR H-1 THROUGH H-5

APPENDIX I

TECHNICAL APPENDIX H-1

The actual calculations from the Broadbent and Segnit formula, $C_s = h - gr^s$, solving for C_s resulted in the following actual data points which are plotted and illustrated Figures 7 through 10.

Impressions	Observed C_s	Theoretical Geometric C_s	Theoretical Linear C_s	Theoretical Step-Function C_s	Theoretical S-Curve C_s
1	24.24	24.60	25.04	23.63	21.45
2	24.75	25.30	25.13	23.63	22.83
3	25.75	25.83	25.22	23.63	24.28
4	26.37	26.23	25.31	27.35	25.58
5	26.67	26.54	25.43	27.35	26.49
6	26.87	26.77	25.52	27.35	27.00
7	27.02	26.95	25.60	27.35	27.24
8	27.14	27.09	25.69	27.35	27.32
9	27.23	27.19	25.81	27.35	27.35
10	27.26	27.27	25.90	27.35	27.35
11	27.29	27.33	26.00	27.35	27.35
12	27.35	27.37	26.01	27.35	27.35
		$X^2 = 0.066$	$X^2 = 2.579$	$X^2 = 1.050$	$X^2 = 1.687$

TECHNICAL APPENDIX H-2

The actual calculations from the Broadbent and Segnit formula, $C_s = h - gr^s$, solving for C_s resulted in the following data points which are plotted and illustrated in Figures 11 and 12.

Impressions	Theoretical C_s Cognitive Automobile	Theoretical C_s Conative Automobile	Theoretical C_s Cognitive Hi-Fi/Stereo	Theoretical C_s Conative Hi-Fi/Stereo
1	15.90	12.48	16.96	13.51
2	17.14	13.30	18.88	14.96
3	17.79	13.89	19.17	15.19
4	18.53	14.57	19.32	15.28
5	18.91	15.04	19.35	15.28
6	19.32	15.34	19.35	15.28
7	19.59	15.46	19.35	15.28
8	19.94	15.72	19.38	15.28
9	20.15	15.90	19.38	15.31
10	20.24	15.93	19.38	15.34
11	20.38	16.05	19.38	15.34
12	20.50	16.19	19.38	15.34

TECHNICAL APPENDIX H-3

The actual calculations from the Broadbent and Segnit formula, $C_s = h - gr^s$, solving for C_s resulted in the following data points which are plotted and illustrated in Figure 13.

Impressions	Theoretical C_s Cognitive Off-Campus	Theoretical C_s Cognitive Automotive	Theoretical C_s Cognitive Hi-Fi/Stereo
1	11.45	15.36	16.96
2	12.12	15.59	18.88
3	13.42	15.79	19.17
4	14.13	15.96	19.32
5	14.28	16.11	19.35
6	14.54	16.23	19.35
7	14.57	16.34	19.35
8	14.60	16.43	19.38
9	14.60	16.51	19.38
10	14.60	16.57	19.38
11	14.60	16.63	19.38
12	14.60	16.68	19.38

TECHNICAL APPENDIX H-4

The actual calculation from the Broadbent and Segnit formula, $C_s = h - gr^s$, solving for C_s resulted in the following data points which are plotted and illustrated in Figures 14 and 15.

Impressions	Theoretical C_s Cognitive Off-Campus	Theoretical C_s Cognitive Overseas	Theoretical C_s Cognitive Automobile
1	11.45	50.15	15.90
2	12.12	50.83	17.14
3	13.42	52.65	17.79
4	14.13	53.54	18.53
5	14.28	54.13	18.91
6	14.54	54.28	19.32
7	14.57	54.57	19.59
8	14.60	54.72	19.94
9	14.60	54.81	20.15
10	14.60	54.81	20.24
11	14.60	54.87	20.38
12	14.60	54.87	20.50

TECHNICAL APPENDIX H-5

The actual calculation from the Broadbent and Segnit formula, $C_s = h - gr^s$, solving for C_s resulted in the following data points which are plotted and illustrated in Figures 16 and 17.

Impressions	Theoretical C_s Cognitive Automobile	Theoretical C_s Cognitive Overseas	Theoretical C_s Cognitive Hi-Fi/Stereo
1	15.90	50.15	16.96
2	17.14	50.83	18.88
3	17.79	52.65	19.17
4	18.53	53.54	19.32
5	18.91	54.13	19.35
6	19.32	54.28	19.35
7	19.59	54.57	19.35
8	19.94	54.57	19.38
9	20.15	54.72	19.38
10	20.24	54.81	19.38
11	20.38	54.81	19.38
12	20.50	54.87	19.38

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