WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

A QUANTITATIVE APPROACH TO MAGAZINE ADVERTISEMENT FORMAT SELECTION

277-67

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ABSTRACT

This paper is based on the proposition that, while advertisers are most concerned with the sales effect of advertising, an advertisement must be seen by the consumer before it can have any influence on him. It is proposed that the attention-getting power of an advertisement is measured by its readership and that readership is the effect of the format of the advertisement. Six Starch Magazine Advertisement Readership models based on format descriptors are constructed by means of multiple regression analysis on 1,070 advertisements appearing in Life magazine. Finally, an interactive computer program is described which accepts from its user a readership obejctive function (a function of the readership scores for the advertisement and its cost), format restrictions, and a budget constraint, and then selects that advertisement format, which, while conforming to all restrictions, maximizes the objective function.

I. INTRODUCTION

The advertising for a product is that collection of advertisements promoting it. The ads in such a collection are certainly not independent; they are parts of campaigns emphasizing particular themes. On the other hand, every advertisement must be complete unto itself before it can be published. The advertiser's goal for any ad must be to say the "right" things to the "right" people and to have them perceive what is said. There are five fairly distinct questions to be answered: (1) What are the "right" things to say? (2) Who are the "right" people" (3) What is the best way to reach them? (4) When is the best time to reach them? (5) What is the best way to produce a high probability of message perception? Quantitative methods have been applied most successfully in answering questions three and four. Considerably less progress has been made in answering the first two questions. It is the purpose of this paper to suggest an approach to answering question five.

The advertisement goal stated above includes nothing related to sales or profit. Yet most would agree that "what [the advertiser] is really concerned about is whether one advertisement or one advertising campaign will produce more sales -- or fewer sales -- than another advertisement or another campaign."[1] One must realize, however, that before an advertisement can produce a sale, it must attract the consumer's attention. Only when this has been accomplished can the content of the advertisement have any effect whatsoever on the consumer. For present

purposes, an advertisement is considered to be composed of two elements: content -- the message contained in the ad, and format -- those attributes of an ad that attract the consumer's attention. The work reported here is that of developing a technique for selecting advertisement formats. The selection of content, although not totally independent of format, is not addressed here.

In order to proceed, two problems must be solved. First, how does one measure the attention-getting power of an advertisement, and second, what constitutes the format of an advertisement. It is proposed here that the degree to which the consumer's attention is attracted toward an advertisement is equivalent to the readership of that advertisement. The format of an advertisement, then, is that collection of its attributes which account for its readership. This implies, of course, that readership is completely, or at least largely, dependent upon the ad itself rather than upon the interaction between the advertisement and consumer. It seems reasonable to assume that the consumer's attitude toward the advertised product, his image of it, and his product usage history would exert considerable influence on the attention-getting power of the ad. There are, however, at least two published studies[2,3] which indicate that various attributes of the advertisement itself account for a large part of its readership.

Advertisement Readership Measurement

Readership measures of magazine advertisements are made by various commerical organizations. Those used here were made by Daniel Starch

and Staff who use a technique known as the recognition method; one of several approaches to advertisement readership.[4] Starch scores are widely used by advertising agencies and marketing personnel for measuring advertisement readership. Three ratings are available:

Noted -- the percent of readers who remembered that they had seen the advertisement in the particular issue.

Seen-Associated -- the percent of readers who have seen or read any part of the ad which clearly indicated the product or advertiser.

Read Most -- the percent of readers who read 50% or more of the written material in the ad.

For magazines of general interest, the three scores are measured for both men and women readers. For magazines like Business Week only men's scores are measured, and for magazines like Ladies' Home Journal only women's scores are measured. Scores are based on between 100 and 200 interviews, depending upon the publication.

For each Life Magazine readership study, interviews are conducted with 150 men and 150 women. The interviewers are told that the respondents must be 18 years of age or older, and further that

> "You are assigned a specific number of interviews (quota) with men and women and we also want you to interview people of varied ages, different income levels and occupations. Interview in all types of residential areas. Do not concentrate on one neighborhood one week and another the next. Obtain a good cross-section of respondents each week."

The company feels that over a period of many issues the demographic characteristics of readers who are interviewed parallel the characteristics of the primary audience of this magazine.[5]

Reproducibility of Readership Scores

The selection of Starch interviewees is nonprobabilistic, and for this reason, the question has been raised as to whether the method would give reproducible results. According to Boyd and Westfall,[6] the Advertising Research Foundation

> "replicated the methods used by the Starch organization to obtain their readership ratings. A single issue of Life was selected and a probability sample of over six hundred readers of the issue using his regular techniques. The correlation of women's noted scores on the ninety-six full-page and larger ads (measured both by ARF and Starch) was + 0.92."

II. READERSHIP MODELS

The advertisement readership studies cited earlier suggest several attributes that affect readership. Using variations of these attributes and others, linear models of each of the six (three for men, three for women) Starch readership measures were constructed by means of multiple regression analysis. The source of data was Life magazine: for 1,070 of the 1,197 advertisements, one-half page or larger, appearing in Life between February 7, and July 31, 1964, values for the twelve variables listed in Table 1 were measured. All advertisements appearing in this interval were used as data except: (1) those which promoted contests, special offers, etc.; (2) multiple product advertisements; and (3) advertisements for which any variable value could not be determined. It should be noted that while Table 1 is a list of "format" variables in the sense defined earlier, fewer than half would fit the ordinary definition of the word. Explanations of all variables, except Number of Ads in Issue, which is simply the number of advertisements, one-half page or larger, competing for the reader's attention, are presented in Tables 2 through 12.

Form of the Model

Each of the readership models is of the form

$$R_n = C + \sum_i a_i x_i + \sum_j d_j y_{j_k} + \varepsilon$$

where R_n is one of the set of six readership measures and where the x's are continuous and the y's discrete independent advertisement format variables, as presented earlier. Each discrete variable has several states; $d_{j_k} = 1$ if the jth discrete variable takes on its kth state, $d_{j_k} = 0$, otherwise. The a_i are coefficients of the continuous variables, y_{j_k} is the contribution to R_n of the kth state of the jth discrete variable, C is a constant term, and ε is the error in predicting R_n.

The Starch readership score models, i.e. regression coefficients, appear with indications of statistical significance in Tables 13-25. Variable states omitted from the regression as a means of preventing the matrix singularity which would otherwise be caused by using dummy variables are indicated by dashes. Because the readership models have been constructed as a means to an end rather than an end in themselves, a discussion of them will be limited to one brief statement about the relationship of each independent variable to readership.

(1) As expected, there are marked differences in product class readership both between men and women and among different product classes. (Refer to Table 13.)

(2) The past advertising expenditure for a product does not seem to affect readership to any great extent. It is apparent, however, that the effect is nonlinear. (Refer to Table 14.)

(3) For each Starch score, the greater the number of ads in the issue, the lower the score. The effect decreases from the "noted" score to "seen-associated" to "read most", and is greater for men than for women. (Refer to Table 15.)

(4) The contribution of advertisement size to readership decreases in the following order: double-page, "other," single-page, horizontal half-page, and vertical half-page. The score-to-score and men-to-women relationships are as in (3) above. (Refer to Table 16.)

(5) The greater the number of colors in an advertisement, the greater its readership, except in the case of the "read most" score, where color has little effect. Color effects women more than it does men. (Refer to Table 17.)

(6) The elimination of white page margins (bleed) increases readership, but very little. (Refer to Table 18.)

(7) An advertisement of one page or less will receive higher readership scores if it appears on a right-hand page rather than on a left-hand page. (Refer to Table 19.)

(8) The contribution to readership of the position of an advertisement in an issue descends in the following order: outside back cover, inside front cover, inside back cover, first, second, third, and fourth quarters. The secore-to-score and men-to-women relationships are as in (3) above. (Refer to Table 20.)

(9) In general, an advertisement will receive higher readership scores if it contains a photograph rather than an illustration, either of which is better than neither. The effect is greatest in the "noted" score and smallest in the "read most" score. (Refer to Table 21.)

(10) As the number of words of text in an advertisement becomes greater than fifty, readership goes down. This is most true in the case of the "read most" score. (Refer to Table 22.)

(11) The prominence of brand identification in an advertisement seems to have little effect on readership. (Refer to Table 23.)

(12) Headline prominence has little effect on readership, except in the case of the "read most" score, where the total absence of a headline can increase text-reading significantly. (refer to Table 24.)

Model Validation

In order to test the predictive ability of the readership models, they have been used to predict scores for 43 advertisements appearing in the February 26, 1965 issue of Life. The set of advertisements used for validation appeared nearly eight months after the most recent advertisements used as input to the regression -- that is, they are totally independent of the original 1,070 advertisements. Since the test used here is probably the most stringent to which a predictive model can be put, the performance of the six models on the test advertisements should be a good indication of their predictive power. Figure 1 presents plots of predicted versus measured scores for the set of test advertisements with corresponding coefficients of multiple correlation and multiple determination.

In brief, it seems fair to say that four of the models, all except

the two for the "read most" score, are relatively good. In each of these four models 68% or more of the variance in the readership score has been accounted for. The two "read most" models, on the other hand, are not very good. This is probably explained by considering the meaning of the "read most" score. A person reading an advertisement will read more than half of its text only if the first half is of sufficient interest to him. What is obviously lacking is some sort of content analysis. Current research in this area has already shown that "read most" scores can be predicted fairly accurately when variables based on the appeals promoted by the ad are included.

Table 1

Variables used in Regression Analysis

Product Class

Past Advertising Expenditure

Number of Ads in Issue

Size

Number of Colors

Bleed-No Bleed

Left or Right Page

Position in Magazine

Layout

Number of Words

Brand Prominence

Headline Prominence

Table 2

Product Class

	State
Beer, Ale, Liquor	1
Passenger Cars	2
Automotive Accessories, Gas, Oil, Tires, Trucks, Other	3
Building Materials, Paint, Wallpaper, Flooring	4
Food	5
Household Furnishings and Supplies	6
Insurance and Finance	7
Machinery, Metals, Industrials, Business Machines, Public Utilities	8
Pharmaceuticals	9
Radio, Television, Electronics, Audio Equipment	10
Tobacco and Related Products	11
Men's Clothing	12
Women's Clothing	13
Men's Toilet Goods	14
Women's Toilet Goods	15
Clothing Accessories, General Toilet Goods	16
All Others	17

Table 3

Past Advertising Expenditure*[7]

Expenditure Range (X $100,000)	State
0-4	1
5-10	2
11-18	3
19-29	4
30+	5

*promotional expenditure for the product in national media during the calendar year preceding advertisement publication.

Table 4

Size**

	State
One Page	1
Two Pages	2
One-half Page (vertical)	3
One-half Page (horizontal)	4
All Others	5

** Note that this variable reflects both size and orientation

Table 5

Number of Colors

	State
Black and White	1
Two Colors	2
Full Color	3

Table 6

Bleed - No Bleed*

	State
Advertisement does not use Bleed	1
Advertisement makes use of Bleed	2

* Bleed is the elimination of white page margins.

Table 7

Left or Right Page

	State
Does not apply (two-page ad, covers, etc.)	1
Half-or Full-page Ad on Left-hand Page	2
Half-or Full-page Ad on Right-hand Page	3

Table 8

Position in Magazine	State
First Quarter	1
Second Quarter	2
Third Quarter	3
Fourth Quarter	4
Inside Front Cover	5
Inside Back Cover	6
Outside Back Cover	7

Table 9

Layout

	State
One Large Illustration	1
One Small Illustration	2
More than One Small Illustration	3
One Large Photograph	4
One Small Photograph	5
More than One Small Photograph	6
One Large Illustration and One Small Illustration	7
One Large Illustration and More than One Small Illustration	8
One Large Illustration and One Small Photo	9
One Large Illustration and More than One Small Photo	10
One Large Photo and One Small Illustration	11
One Large Photo and More than One Small Illustration	12
One Large Photo and One Small Photo	13
One Large Photo and More than One Small Photo	14
One Small Illustration and One Small Photo	15
One Small Illustration and More than One Small Photo	16
One Small Photo and More than One Small Illustration	17
More than One Small Illustration and More than One Small Photo	18
No Photograph or Illustration	19

Table 10

Number of Words

	State
Fewer than Fifty Words	1
Fifty or More Words	2

Table 11

Brand Prominence

Brand name or sponsor is --	State
Not Present	1
Difficult to Detect	2
Easy to Miss	3
Easy to Detect	4
Almost Impossible to Miss	5

Table 12

Headline Prominence

Headline is --	State
Not Present	1
Difficult to Detect	2
Easy to Miss	3
Easy to Detect	4
Almost Impossible to Miss	5

Table 13

Product Class Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	11.5905**	12.3707**	4.7943**	-19.1961**	-19.9756**	-6.7268**
2	19.5057**	21.4411**	7.6697**	-21.1663**	-22.5102**	-6.5595**
3	11.6762**	12.6520**	6.5064**	-24.5510**	-26.6543**	-6.7979**
4	9.0203**	6.4002*	2.8277	-1.6464	-6.2085*	-0.9433
5	----	----	----	----	----	----
6	-1.2471	-0.9323	0.4598	-0.3434	-0.1651	0.6443
7	1.9910	0.9861	1.9819**	-16.5995	-19.0118**	-4.6676**
8	3.9241**	3.6092**	2.8454**	-10.4453**	-12.8830**	-2.5963**
9	3.0698*	2.2312	1.5013*	-4.7141**	-5.8439**	-1.4719
10	8.3489**	8.5984**	3.5805**	-8.5532**	-9.5103**	-2.7763**
11	5.7084**	6.3266**	0.2650	-18.8901**	-19.4298**	-7.1611**
12	14.7261**	14.5064**	6.2608**	-9.7710**	-10.8504**	-1.3181
13	-5.6468*	-11.4612**	-1.1344	10.3582**	9.3084**	6.4042**
14	12.3581**	12.9834**	6.1198**	-16.4946**	-17.2523**	-3.6097**
15	-12.8196**	-17.8393**	-2.9818**	0.3378	-1.6648	1.7306*
16	4.5563**	4.7286**	1.9580*	-5.1551**	-6.3054**	-2.3381**
17	6.7455**	6.6168**	4.1819**	-9.8776**	-10.8927**	-1.4170*

† Refer to Table 2

* Significant at the 5% level

**Significant at the 1% level

Table 14

Past Advertising Expenditure Coefficients

State †	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	----	----	----	----	----	----
2	-0.9371	-0.5519	-1.3266**	2.7711**	2.8644**	0.6504
3	0.8117	1.5566	-0.9377*	-0.3117	-0.0667	-1.1339*
4	1.9080*	2.5815**	-0.5631	2.1297*	2.6874**	-0.3627
5	2.7438**	3.3250**	0.3980	5.6850**	6.5165**	0.7878

† Refer to Table 3

* Significant at the 5% level

**Significant at the 1% level

Table 15

Number of Ads in Issue Coefficients

Men Readers			Women Readers		
Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
-0.1395**	-0.1233**	-0.0802**	-0.1056**	-0.0959**	-0.0524**

**Significant at the 1% level

Table 16

Size Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	----	----	----	----	----	----
2	16.7655**	15.1207**	4.0288**	12.9481**	12.7032**	1.8483
3	-6.8914**	-5.8631**	-1.3969**	-9.4308**	-8.6512**	-2.3281**
4	-6.5803**	-5.8516**	-0.5948	-9.1647**	-8.5328**	-2.3898*
5	8.4876**	6.9813**	2.2357	8.7862**	8.9503**	2.6052

† Refer to Table 4

* Significant at the 5% level

** Significant at the 1% level

Table 17

Number of Colors Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	-7.1856**	-6.1041**	-0.5534	-11.9463**	-10.3119**	-1.9030**
2	-5.2627**	-3.5459**	-0.5073	-7.6150**	-6.4615**	-2.1109**
3	----	----	----	----	----	----

† Refer to Table 5

** Significant at the 1% level

Table 18

Bleed -- No Bleed Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	----	----	----	----	----	----
2	1.1661*	0.4975	0.9522**	2.3106**	1.9864**	1.2123**

† Refer to Table 6

* Significant at the 5% level

** Significant at the 1% level

Table 19

Left or Right Page Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	-7.1476**	-6.6993**	-2.5641	-4.1458	-4.9886*	-0.3173
2	-3.1159**	-2.7924**	-0.2965	-3.5151**	-3.0433**	-0.1665
3	----	----	----	----	----	----

† Refer to Table 7

* Significant at the 5% level

** Significant at the 1% level

Table 20

Position in Magazine Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	----	----	----	----	----	----
2	-1.4177*	-1.2969	-0.5980	-0.7769	-0.2797	-0.0306
3	-2.6807**	-2.3602**	-0.2671	-2.2854**	-1.6745*	0.0661
4	-2.9507**	-2.2841**	-0.5530	-2.7811**	-2.1355**	-0.4622
5	11.5497**	9.0402**	0.9295	12.6888**	11.5751**	1.3010
6	3.7147	3.2280	1.5280	0.5015	-0.1561	1.0368
7	30.5751**	29.7921**	3.7246*	21.6501**	21.6207**	-1.3748

† Refer to Table 8

* Significant at the 5% level

** Significant at the 1% level

Table 21

Layout Coefficients

State†	Men Readers			Women Readers		
	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	-2.1009	-1.1604	-0.9792	-3.9270	-4.1479*	-1.1800
2	-5.5272**	-4.0761*	-0.6212	-6.9972**	-5.1666*	-1.7612
3	-5.7626**	-4.8930**	-0.7962	-6.1268**	-4.6741**	0.4415
4	----	----	----	----	----	----
5	-4.5887**	-4.1552**	0.2086	-2.8756	-1.9287	2.7534**
6	-4.5480**	-4.1097**	-1.4616**	-1.6980	-0.6418	0.3764
7	-2.4658	-2.7533	-1.8139	-5.6807*	-4.7685*	-1.3387
8	-8.3204**	-8.4159**	-2.6524	-1.4361	-0.8015	-0.6603
9	3.7575	4.3385	-4.3058*	-9.2201*	-8.7606**	-4.7040*
10	-7.6353*	-5.0363	-4.7727**	-7.3384	-4.9051	-1.2240
11	-0.6046	-0.9141	-0.8969	-2.1214	-1.9517	-1.4742
12	-2.8576	-2.4345	-0.7553	-3.3222	-2.6729	-1.9749*
13	-2.0430**	-2.0848**	-2.3419**	-0.4754	-0.1307	-1.4686**
14	-3.0070**	-3.1840**	-1.5806**	-0.0063	0.5124	-0.3627
15	-0.7949	0.7746	-1.3216	-2.7569	-1.2586	-0.7010
16	-7.5820**	-7.0439**	-0.8631	-8.3938**	-7.3309**	-1.9160
17	-3.1132	-2.0694	-0.6427	-11.4373**	-10.7137**	-2.1212
18	-3.5014	-4.0371	-2.6726	-0.9048	0.6199	-0.9712
19	-10.5719**	-7.7140**	0.1231	-11.5402**	-7.8976**	-0.7260

† Refer to Table 9

* Significant at the 5% level

** Significant at the 1% level

Table 22

Number of Words Coefficients

	Men Readers			Women Readers		
State†	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	1.9764*	1.7760*	3.9123**	4.3260**	4.8185**	5.3000**
2	----	----	----	----	----	----

† Refer to Table 10

* Significant at the 5% level

** Significant at the 1% level

Table 23

Brand Prominence Coefficients

	Men Readers			Women Readers		
State†	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	-0.9560	-1.3820	2.0120	0.7828	0.7944	1.4216
2	-----	----	----	----	----	----
3	-0.0637	0.8281	-0.9069**	-0.2548	0.5085	-0.8026*
4	-0.4582	1.0392	-0.8194	-1.1429	0.2711	-0.2905
5	-0.0156	1.6474	-1.0828*	0.1647	1.8548	-0 4859

† Refer to Table 11

* Significant at the 5% level

** Significant at the 1% level

Table 24

Headline Prominence Coefficients

	Men Readers			Women Readers		
State†	Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
1	-0.1317	-0.8529	3.4003**	1.4736	0.0716	4.5826**
2	0.6950	0.6491	0.1897	1.1429	1.0075	0.6797
3	1.1217	1.3221*	-0.2419	0.1730	0.0027	-0.0664
4	----	----	----	----	----	----
5	-0.6936	-0.4270	0.3745	-1.3232	-1.0931	0.0383

† Refer to Table 12

* Significant at the 5% level

** Significant at the 1% level

Table 25

Regression Equation Constant Terms

Men Readers			Women Readers		
Noted	Seen-Associated	Read Most	Noted	Seen-Associated	Read Most
42.0259	35.5477	9.6826	57.9110	51.8479	12.7425

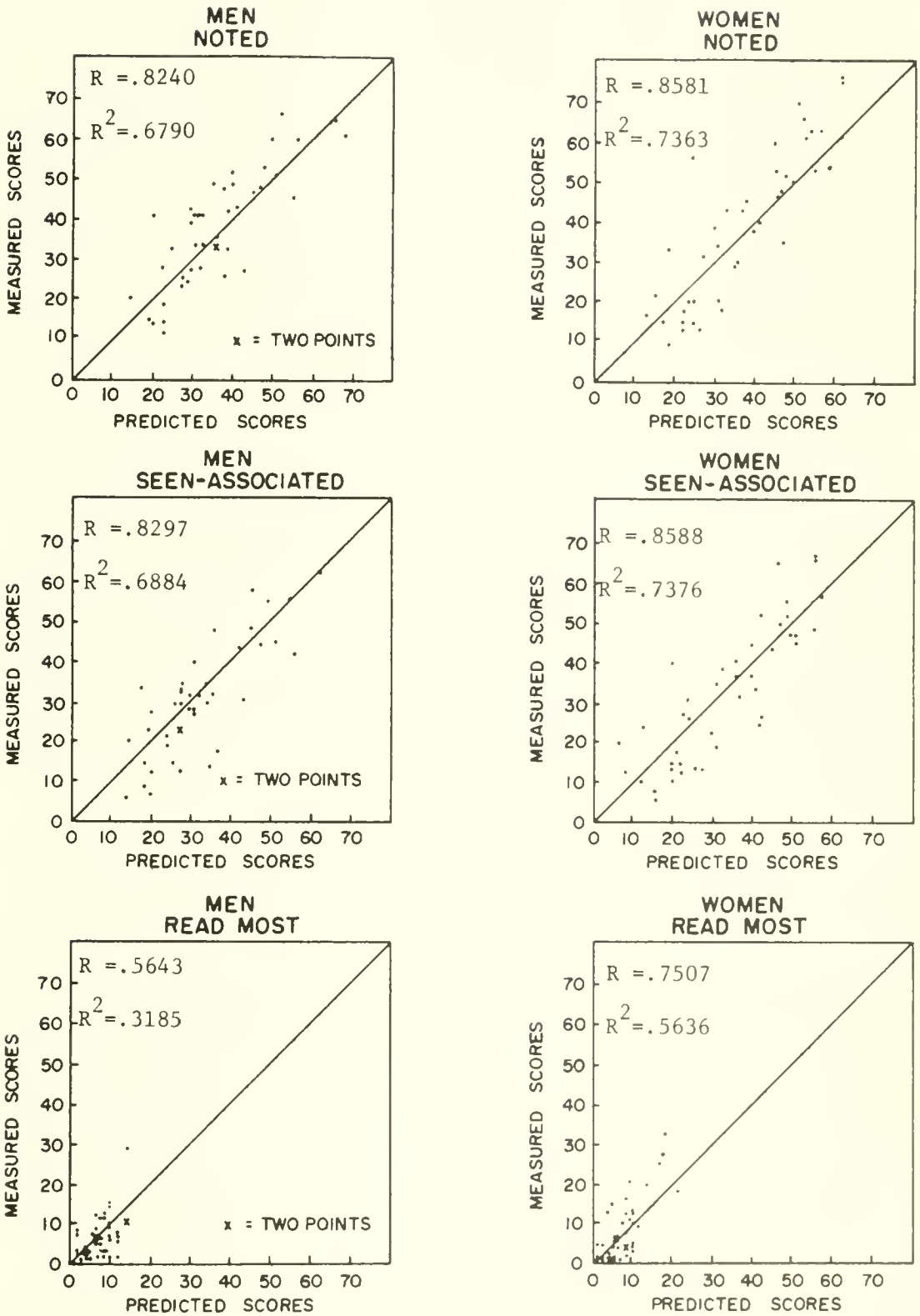

Figure 1. Validation of readership models.

III. ADVERTISEMENT FORMAT SELECTION

Selection Considerations

Given that the attention-getting power of an ad is measured by its readership scores and that the readership of an ad can be explained to a fair degree solely on the basis of its format, the process of selecting an optimal format should simply be that of picking format elements (size, number of colors, etc.) so as to maximize expected readership scores. The problem is not quite so simple, however. In general, the selection of an advertisement format requires two types of marketing considerations: (1) objectives for the advertisement, and (2) restrictions on the advertisement. A few possible restrictions will be pointed out. By the time the advertiser is ready to design an advertisement, he must certainly have a product. Hence, every advertisement will have at least one restriction -- it will be for a product in a fixed product class. Depending upon the product and the purpose of the advertisement, it might be desirable to present a photograph rather than an illustration, or vice versa. Similarly, the photo or illustration might be better in full color than in black and white. To illustrate, if one of the objectives of an advertisement is to emphasize the brand logo, the advertisement might require a full-color illustration. If the advertisement is intended to demonstrate a product in use, its layout might be restricted to several illustrative photographs or illustrations. In addition, due to the demonstrative nature of the advertisement, the number of words of text might need to be

relatively large. Other considerations might influence any of the nine advertiser-controlled format variables listed in Table 1. Format restrictions may also result from a budget limitation. For example, a maximum allowable insertion cost of $40,000 would permit a full-page black and white ad in Life. However, it would permit neither bleed nor color.

The Readership Objective Function

Subject to any such restrictions, it would be possible to maximize, in turn, the six Starch scores for an advertisement by selecting an appropriate combination of variable states. (All of the advertiser-controlled variables in the readership models are discrete.) However, it is possible that six different formats would be needed to maximize the six readership scores, and it is very likely that more than one would be necessary.

In addition, although advertisement format F_1 may be predicted to have higher readership scores than those of format F_2, F_1 might well cost more than F_2 to insert -- the added cost of F_1 going to pay for those factors (e.g., greater number of colors, larger size, etc.) which cause its scores to be greater than those of F_2. Thus, readers-per-dollar will often be of concern to the advertiser. These considerations lead to the concept of a readership objective function, which can have either of the following forms:

$$\text{(I)} \quad V = \sum_{i=1}^{6} (W_i R_i) \qquad \text{(II)} \quad V = \sum_{i=1}^{6} (W_i R_i)/C,$$

where W_i is a weight (or importance) assigned to the ith Starch score, R_i, and C is the cost of inserting the advertisement. The W_i are arbitrarily normalized to one. The second form is used when readers-per-dollar is to be maximized. As an example, suppose an advertiser finds himself with a food product, the promotion for which he feels (or his research has shown) should be aimed at women and men in the ratio of, say, 7 to 3. Also, for the particular advertisement in question, he wants as many women as possible to read the text of the ad, which contains several recipes presenting new ways to prepare the product. As far as men readers are concerned, the advertiser will be satisfied with producing brand-name remembrance. In a mathematical programming sense, then, the readership objective function for the advertisement would be $0.3R_2 + 0.7R_6$, where R_2 is the "seen-associated" score for men readers, and R_6 is the "read most" score for women readers. If the advertiser wished to maximize readers-per-dollar, the objective function would become $(0.3R_2 + 0.7R_6)/C$.

IV. THE ADFORS SYSTEM

This approach to the selection of magazine advertisement formats has been implemented by means of an interactive computer program given the name ADFORS (ADvertisement FORmat Selection), operating under the MIT Compatible Time Sharing System. ADFORS is the third format selection system based on the ideas presented here.[8,9] The system is command oriented: the user gives ADFORS an instruction representing some task in the format selection process, and the system carries it out.

ADFORS Users' Guide

A user enters ADFORS by issuing the CTSS command "resume adfors". ADFORS responds by typing "READY". The system now expects to receive an ADFORS command. After executing a command, ADFORS again types "READY". An ADFORS command consists of one, two, or three elements: a command name or abbreviation followed, possibly, by one or two arguments or abbreviations. (If required arguments are omitted, ADFORS will ask for them.) Each element in the command is separated from the next by one or more spaces, but spaces may not occur within the elements themselves. Command names and arguments are composed of from one to three words, concatenated by periods. Command abbreviations, which are defined for all but four commands, are one or two characters long. Argument abbreviations are single characters.

There are currently seventeen ADFORS commands, falling into seven command classes: option setting, procedural, identification,

problem condition setting, problem condition displaying, format selection, and format displaying. There are two options in ADFORS. The default settings of both are "off". The first option, turned on with the "brief" command, reduces the amount of console printing done by the system, omitting from displays all but the most necessary information. It should probably not be used until after one is sufficiently familiar with the system as a whole, since it also suppresses the printing of certain instructions. This option is turned off with a subsequent issue of the "brief" command. The second option is the use of a timer. When the timer is on, each "READY" message will be followed by the time in seconds charged to the user for its execution. This time includes both processing and overhead. The timer is turned off with a subsequent issue of the "timer" command.

The Appendix presents detailed information on all commands. However, a brief comment about each of the remaining six classes of commands is in order. The procedural group contains three commands The first, "remark", permits the user to type a comment of arbitrary length. "Save.status" creates an updated core image file so that the system can be abandoned and resumed later with the problem and machine conditions unchanged. "Quit" returns the user to CTSS command level. The identification commands are used to identify the product or advertiser, publication (for future expansion -- currently, the only publication for which ADFORS has data is Life magazine), and advertising agency The problem condition setting commands are the means by which the user enters

modifies, and resets the objective function, format restrictions, and the budget limitation. The problem condition displaying command is used to print the conditions which have been set by the previous command class. Once a set of conditions have been specified, the "select. format" command is issued to select a set of optimal formats. The optimal formats so selected (up to the first five) may be displayed in detail or (up to fifty), in less detail, on- or off-line.

The process of selecting an optimal format is that of solving a search problem. When no advertiser-controlled format variables are constrained (albeit a rather unlikely situation), the optimal format lies in a space containing nearly 600,000 points. ADFORS solves the problem heuristically, by an adaptation of a procedure described elsewhere.[10] Although there is no guarantee that the solutions found are actually optimal, a comparison of the first five solutions to the "Puff Filter Cigarettes" problem (to be discussed below) by ADFORS and the previous format selection system (which actually enumerated all solutions) indicates that they are identical. ADFORS finds fifty solutions, but since the previous system found only five, there is no basis for comparison beyond this point. The relative speeds of format selection by ADFORS and the previous system range from about 1, in the case where all format variables are constrained, to about 130 in the worst case.

An Illustration of ADFORS in Use

In order to illustrate the use of ADFORS in selecting a magazine

advertisement format, consider the hypothetical case of the Universal Tobacco Company, which is about to introduce a new brand: Puff Filter Cigarettes. In order to introduce Puff nationally (no promotion has appeared as yet) it has been decided to place an advertisement in Life. The format of this ad will be prepared with the assistance of ADFORS.

Many years of research in the cigarette market have led Universal to believe that their efforts in reaching men and women should be divided in the ratio of 55 to 45. The main function of the Life advertisement would be to introduce the name "Puff." The special characteristics of Puff's "best filter yet" are to be secondary in this ad. It has been decided, therefore, to split the 55 percent for men into weightings of 40 and 15 for the Starch "seen-associated" and "read-most" scores, respectively, in the readership objective function. For women, the weightings were set at 35 and 10 for the same scores. It is intended to examine those formats produced with both forms of the readership objective function. Universal has no control over three of the twelve readership model variables: Puff Filter Cigarettes are in the "Tobacco and Related Products" product class; there has been no promotion; and about fifty advertisements are expected for the Life issue in question. For the remaining nine variables, in order to give ADFORS as much freedom as possible in maximizing the readership objective function, only those restrictions which were decided to be absolutely necessary would be imposed: The advertisement would contain two full-color photographs -- one large and one small -- the larger one showing

a pleasant scene of a young couple enjoying their first Puffs,and the smaller showing the construction of the filter. The Brand Prominence would be set at its maximum level.

The ADFORS conversation used to aid in selecting the format of the Puff ad is shown in Figure 2. (The Appendix may be referred to for detailed information on each command.) An outline of the conversation is as follows. After an introductory remark, the system is reset and the timer started. The product, ad agency and publication are identified. The six restrictions described above are then entered. This is followed by the objective function in its second form ("readers per dollar"). The problem conditions are displayed to make sure that everything is as intended. ADFORS is then asked to "select.format". The optimal format is displayed with the "display.format" command, and the best five are then tabulated. The arguments "on-line" and "5" indicate that the table is to be printed on-line and that it should contain five formats. The table request is issued again with the arguments "off-line" and "all". The table that appeared the next morning in the file folder for the ADFORS CTSS problem number is shown in Figure 3. The objective function is changed to its first form ("readers") and the optimal format selected and displayed. The budget is then set to $50,000 and the process repeated. An on-line table of twenty formats is requested, but after seeing three, the user has decided that no more need be printed. His pushing the interrupt button once caused CTSS to print "INT.1" after which ADFORS returned to its command level.

Finally, the problem status is saved, and control returned to CTSS.

It is significant to note that while the Puff Filter Cigarettes ad to be placed in Life, if one of the three formats selected by ADFORS were to be used, would cost between $31,660 and $79,350, the total cost of the computation required for Figure 2 (based on summing the times displayed by the "READY x.xxx" messages and multiplying by the current CTSS charge of 5.55¢/second) was only $2.19. Moreover, if it were decided that efficiency (readers-per-dollar) rather than total readers was desired, the user of ADFORS would have led to a saving of more than $40,000.

CONCLUDING REMARK

In the paper describing the first format selection system, it was claimed, in response to the question, "Is the approach suggested in this paper a useful method for selecting a magazine advertisement format...?" that, yes, it is practical if the advertiser is willing to accept readership as a measure of attention-getting power. ADFORS, it is hoped, will allow this technique to find its way into the daily life of the advertiser in the not-too-distant future. Expansion of the data base to include media in addition to Life is planned and improvements and refinements in the interactive system are expected to continue.

```
resume adfors
W 2051.6

READY
remark     This is a demonstration of ADFORS, the ADvertisement
           FORmat Selection System.


READY
reset all

READY
timer

READY  1.067
product        Puff Filter Cigarettes

READY   .500
agency         Fenstermacher and Snivelgrood

READY   .550
publication    Life

READY   .950
restrictions

ENTER ONE (VAR. CODE, VALUE) PAIR PER LINE

pc 11
dlr 1
ads 50
col 3
```

FIGURE 2.

ADFORS Conversation

```
lyt 13
brp 5


READY  2.183
objective.function

ENTER ONE (WEIGHT, SCORE CODE) PAIR PER LINE

40 msa
15 mrm
35 wsa
10 wrm
/cost


READY  1.167
print

READERSHIP OBJECTIVE FUNCTION

(0.   M NTD +  .40 M S-A +  .15 M RM + 0.   W NTD +  .35 W S-A +  .10 W RM)/COST


FORMAT RESTRICTIONS

PRODUCT CLASS                    TOBACCO + RELATED PRODS
PAST ADVERTISING EXPENDITURE                UP TO $449K
NUMBER OF ADS IN ISSUE                              50
NUMBER OF COLORS                              FULL COLOR
LAYOUT                           1 LG PHOTO + 1 SM PHOTO
BRAND PROMINENCE                              VERY HIGH
```

FIGURE 2.

(Cont.)

```
BUDGET IS UNLIMITED

PUBLICATION IS LIFE

READY   .867
select.format

READY  3.233
display.format 1


                              FORMAT NO. 1

      PRODUCT CLASS                          TOBACCO + RELATED PRODS
      PAST ADVERTISING EXPENDITURE                     UP TO $449K
      NUMBER OF ADS IN ISSUE                                   50
      SIZE                                  ONE-HALF PAGE (VERT)*
      NUMBER OF COLORS                                FULL COLOR
      BLEED - NO BLEED                                  NO BLEED*
      LEFT OR RIGHT PAGE                                    RIGHT*
      POSITION IN MAGAZINE                          FIRST QUARTER*
      LAYOUT                          1 LG PHOTO + 1 SM PHOTO
      NUMBER OF WORDS                             FEWER THAN 50*
      BRAND PROMINENCE                                 VERY HIGH
      HEADLINE PROMINENCE                                   LOW*


 * SELECTED BY ADFORS

                          MN MS MR WN WS WR   OBJ. FNC.     COST
PREDICTED READERSHIP SCORES 34 32  5 29 27  5     .000735  $ 31660

READY  1.483
```

FIGURE 2.

(Cont.)

table on-line 5

TABLE 1

NO.	OBJ. FNC. VALUE	COST	PREDICTED READERSHIP SCORES MN	MS	MR	WN	WS	WR	FORMAT ELEMENTS PC	DLR	ADS	* SIZ	COL	* BLD	* L-R	* POS	LYT	* WDS	BRP	* HLP
1	.000735	31660	34	32	5	29	27	5	11	1	50	3	3	1	3	1	13	1	5	2
2	.000733	31660	34	30	8	30	26	9	11	1	50	3	3	1	3	1	13	1	5	1
3	.000728	31660	35	33	5	28	26	4	11	1	50	3	3	1	3	1	13	1	5	3
4	.000724	32335	35	32	6	30	27	5	11	1	50	4	3	1	3	1	13	1	5	2
5	.000723	32335	34	30	9	30	26	8	11	1	50	4	3	1	3	1	13	1	5	1

* SELECTED BY ADFORS

READY 1.567
table off-line all

TABLE 2 WILL BE PRINTED OFF-LINE

READY 13.033
objective.function

ENTER ONE (WEIGHT, SCORE CODE) PAIR PER LINE

xcost

READY 1.000

FIGURE 2.

(Cont.)

```
select.format

READY  2.983
brief

READY   .850
display.format 1
```

FORMAT NO. 1

SIZE	ONE PAGE
BLEED - NO BLEED	BLEED
LEFT OR RIGHT PAGE	DOES NOT APPLY
POSITION IN MAGAZINE	OUTSIDE BACK COVER
NUMBER OF WORDS	FEWER THAN 50
HEADLINE PROMINENCE	LOW

	MN	MS	MR	WN	WS	WR	OBJ. FNC.	COST
PREDICTED READERSHIP SCORES	66	61	9	59	54	7	45.301834	$ 79350

```
READY   .750
budget $50,000

READY   .883
print

READERSHIP OBJECTIVE FUNCTION

 0.   M NTD +  .40 M S-A +  .15 M RM + 0.   W NTD +  .35 W S-A +  .10 W RM

FORMAT RESTRICTIONS
```

FORMAT ELEMENT -	PC	DLR	ADS	COL	LYT	BRP
VALUE -	11	1	50	3	13	5

FIGURE 2.

(Cont.)

```
BUDGET IS  $50,000

PUBLICATION IS LIFE

READY   .517
select.format

READY  2.967
display.format 2

                          FORMAT NO. 1

      SIZE                                ONE-HALF PAGE (HORIZ)
      BLEED - NO BLEED                                   BLEED
      LEFT OR RIGHT PAGE                                 RIGHT
      POSITION IN MAGAZINE                      FIRST QUARTER
      NUMBER OF WORDS                           FEWER THAN 50
      HEADLINE PROMINENCE                                 LOW

                          MN MS MR WN WS WR   OBJ. FNC.     COST
PREDICTED READERSHIP SCORES  36 32  7 32 29  6   24.583294  $ 37185

                          FORMAT NO. 2

      HEADLINE PROMINENCE                            VERY LOW

                          MN MS MR WN WS WR   OBJ. FNC.     COST
PREDICTED READERSHIP SCORES  35 31 10 32 28 10   24.526809  $ 37185

READY  1.367
```

FIGURE 2.

(Cont.)

```
table on-line 20

                                        TABLE     3

 NO.    OBJ. FNC.    COST    MN MS MR WN WS WR    SIZ BLD L-R POS WDS HLP

  1     24.583294    37185   36 32  7 32 29  6     4   2   3   1   1   2
  2     24.526809    37185   35 31 10 32 28 10     4   2   3   1   1   1
  3     24.423110    36409   36 32  6 32 29  6     3   2   3   1   1   2
  4     24.366624    36409   35 31  9 32 28 10  3-INT. 1

READY  1.467
save.status

READY
quit
```


FIGURE 2.

(Cont.)

TABLE 2

CREATED ON 08/02 AT 2102.8

NO.	OBJ. FNC. VALUE	COST	PREDICTED READERSHIP SCORES MN	MS	MR	WN	WS	WR	FORMAT ELEMENTS PC	DLR	ADS	* SIZ	COL	* BLD	* L-R	* POS	LYT	* WDS	BRP	* HLP
1	.000735	31660	34	32	5	29	27	5	11	1	50	3	3	1	3	1	13	1	5	2
2	.000733	31660	34	30	8	30	26	9	11	1	50	3	3	1	3	1	13	1	5	1
3	.000728	31660	35	33	5	28	26	4	11	1	50	3	3	1	3	1	13	1	5	3
4	.000724	32335	35	32	6	30	27	5	11	1	50	4	3	1	3	1	13	1	5	2
5	.000723	32335	34	30	9	30	26	8	11	1	50	4	3	1	3	1	13	1	5	1
6	.000718	32335	35	33	6	29	26	4	11	1	50	4	3	1	3	1	13	1	5	3
7	.000712	31660	34	31	5	28	26	4	11	1	50	3	3	1	3	1	13	1	5	4
8	.000712	31660	33	31	5	29	26	5	11	1	50	3	3	1	3	2	13	1	5	2
9	.000711	31660	32	29	8	29	25	9	11	1	50	3	3	1	3	2	13	1	5	1
10	.000705	31660	33	31	4	28	25	4	11	1	50	3	3	1	3	2	13	1	5	3
11	.000703	32335	34	31	6	29	26	4	11	1	50	4	3	1	3	1	13	1	5	4
12	.000703	32335	33	31	5	29	26	5	11	1	50	4	3	1	3	2	13	1	5	2
13	.000701	32335	33	29	9	29	25	8	11	1	50	4	3	1	3	2	13	1	5	1
14	.000697	31660	33	31	5	27	24	4	11	1	50	3	3	1	3	1	13	1	5	5
15	.000696	32335	34	31	5	28	25	4	11	1	50	4	3	1	3	2	13	1	5	3
16	.000690	31660	32	30	4	28	25	4	11	1	50	3	3	1	3	2	13	1	5	4
17	.000687	32335	33	31	6	27	25	4	11	1	50	4	3	1	3	1	13	1	5	5
18	.000685	31660	32	29	5	27	25	5	11	1	50	3	3	1	3	3	13	1	5	2
19	.000684	31660	31	28	8	28	24	9	11	1	50	3	3	1	3	3	13	1	5	1
20	.000681	32335	33	30	5	28	25	4	11	1	50	4	3	1	3	2	13	1	5	4

FIGURE 3.

Listing Produced by ADFORS Command "table off-line all"

21	.000678	31660	32	30	5	26	24	4	11	1	50	3	3	1	3	3	13	1	5	3
22	.000674	31660	32	29	5	26	24	4	11	1	50	3	3	1	3	2	13	1	5	5
23	.000665	32335	32	29	6	26	24	4	11	1	50	4	3	1	3	2	13	1	5	5
24	.000663	31660	31	29	5	26	24	4	11	1	50	3	3	1	3	3	13	1	5	4
25	.000647	31660	30	28	5	25	23	4	11	1	50	3	3	1	3	3	13	1	5	5
26	.000624	31660	33	30	1	25	22	0	11	1	50	3	3	1	3	1	13	2	5	2
27	.000622	31660	32	29	5	25	21	3	11	1	50	3	3	1	3	1	13	2	5	1
28	.000617	31660	33	31	1	24	21	0	11	1	50	3	3	1	3	1	13	2	5	3
29	.000616	32335	33	30	2	25	22	0	11	1	50	4	3	1	3	1	13	2	5	2
30	.000614	32335	32	29	5	26	21	3	11	1	50	4	3	1	3	1	13	2	5	1
31	.000609	32335	33	31	2	24	21	0	11	1	50	4	3	1	3	1	13	2	5	3
32	.000601	31660	32	29	1	24	21	0	11	1	50	3	3	1	3	1	13	2	5	4
33	.000601	31660	31	29	1	24	21	0	11	1	50	3	3	1	3	2	13	2	5	2
34	.000600	31660	30	27	4	25	20	3	11	1	50	3	3	1	3	2	13	2	5	1
35	.000594	31660	32	29	0	23	20	0	11	1	50	3	3	1	3	2	13	2	5	3
36	.000594	32335	32	29	2	24	21	0	11	1	50	4	3	1	3	1	13	2	5	4
37	.000594	32335	31	29	2	25	22	0	11	1	50	4	3	1	3	2	13	2	5	2
38	.000592	32335	31	27	5	25	21	3	11	1	50	4	3	1	3	2	13	2	5	1
39	.000587	32335	32	29	1	24	21	0	11	1	50	4	3	1	3	2	13	2	5	3
40	.000586	31660	31	29	1	23	20	0	11	1	50	3	3	1	3	1	13	2	5	5
41	.000579	31660	30	28	1	23	20	0	11	1	50	3	3	1	3	2	13	2	5	4
42	.000579	32335	31	29	2	23	20	0	11	1	50	4	3	1	3	1	13	2	5	5
43	.000574	31660	30	28	1	23	20	0	11	1	50	3	3	1	3	3	13	2	5	2
44	.000573	31660	29	26	4	23	19	3	11	1	50	3	3	1	3	3	13	2	5	1
45	.000572	32335	31	28	1	23	21	0	11	1	50	4	3	1	3	2	13	2	5	4
46	.000567	31660	30	28	1	22	19	0	11	1	50	3	3	1	3	3	13	2	5	3
47	.000563	31660	30	28	1	22	19	0	11	1	50	3	3	1	3	2	13	2	5	5
48	.000557	32335	30	28	2	22	19	0	11	1	50	4	3	1	3	2	13	2	5	5
49	.000552	31660	29	27	1	22	19	0	11	1	50	3	3	1	3	3	13	2	5	4
50	.000536	31660	28	27	1	20	18	0	11	1	50	3	3	1	3	3	13	2	5	5

* SELECTED BY ADFORS

FIGURE 3.

(Cont.)

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APPENDIX

The ADvertisement FORmat Selection System:

Detailed Command Information

Appendix Directory

Command Name	Abbreviation	Command Class
advertiser	--	3
agency	--	3
brief	br	1
budget	b	4
display.format	df	7
objective.function	o	4
print	pr	5
product	--	3
publication	p	3
quit	q	2
remark	--	2
reset	rt	4
restrictions	r	4
save.status	ss	2
select.format	sf	6
table	t	7
timer	tr	1

1. Option Setting Commands

Command Name: brief

Abbreviation: br

Arguments: (optional) - "on" "off"

Description: Controls brief option, minimizing information displayed by various commands. Also suppresses instructions printed by objective.function and restrictions commands. Subsequent issues of the command turn the option on and off.

Command Name: timer

Abbreviation: tr

Arguments: (optional) - "on" "off"

Description: Controls timer option. When this option is on, the "READY" message will be followed by a number of the form x.xxx. This is the total CPU time (both processing and overhead) in seconds, charged to the user for the command just executed. Note: following the save. status command, the charged time is not printed. Subsequent issue of the command turns the option on and off.

2. Procedural Commands

Command Name: remark

Abbreviation: none

Arguments: text (see Description)

Description: Permits typing of textual information of arbitrary length. End of remark is signified by a blank line (extra carriage return).

Command Name: save.status

Abbreviation: ss

Arguments: none

Description: Saves current core image (and all problem conditions) by creating file "adfors saved". The next time the user is at CTSS command level and types "resume adfors", ADFORS will be in the state it was in at the time of the last save.status command. This command may be issued any number of times during an ADFORS session, a new saved file being created each time. Note: when CTSS is behaving badly, the save.status command may be used to prevent loss of information due to system collapse.

Command Name: quit

Abbreviation: q

Arguments: none

Description: Returns control to CTSS.

3. Identification Commands

Command Name: product

Abbreviation: none

Arguments: product name (may contain spaces)

Description: Means by which user identifies product to ADFORS. Note: the select.format command requires that the product or advertiser have previously been identified.

Command Name: advertiser

Abbreviation: none

Arguments: advertiser name (may contain spaces)

Description: Means by which user identifies advertiser to ADFORS. Note: the select.format command requires that the product or advertiser have previously been specified.

Command Name: agency

Abbreviation: none

Arguments: advertising agency name (may contain spaces)

Description: Permits user to identify advertising agency preparing advertisement. Note: use of this command is optional.

Command Name: publication

Abbreviation: p

Arguments: $\leq$ 6 character publication identifier

Description: Means by which user identifies publication to ADFORS. Note: the select.format command requires that the publication previously have been identified.

4. Problem Condition Setting Commands

Command Name: objective.function

Abbreviation: o

Arguments: requested by command (see Description)

Description: Except when the brief option is on, command prints "ENTER ONE (WEIGHT, SCORE CODE) PAIR PER LINE". Weights must be integers less than or equal to 999999. Score codes are:

mn ≡ men, noted
msa ≡ men, seen-associated
mrm ≡ men, read most
wn ≡ women, noted
wsa ≡ women, seen-associated
wrm ≡ women, read most

Two score codes that are not preceeded by weights are "/cost" (divide by cost) and "xcost" (do not divide by cost). The user of xcost is only necessary when changing an objective function which has previously been divided by cost. Any or all codes may be used in any order. The end of input is signified by a blank line. After seeing the blank line, the system normalizes the weights to 1.0 for use in the selection procedure. However, changes to an objective function should be in terms of numbers comparable to those originally used (i.e., same order of magnitude). An example of what the user might type is

```
2wsa
1mn
/cost
       (blank line)
```

To remove the cost denominator, the user would (after issuing the objective.function command) simply type

```
xcost
       (blank line)
```

Command Name: restrictions

Abbreviation: r

Arguments: requested by command (see Description)

Description: Except when the brief option is on, command prints "ENTER ONE(VAR. CODE, VALUE) PAIR PER LINE". Variable codes are

```
pc  ≡ product class
dlr ≡ past advertising expenditure
ads ≡ number of ads in issue
siz ≡ size of ad
col ≡ number of colors
bld ≡ bleed - no bleed
l-r ≡ left or right page
pos ≡ position in magazine
lyt ≡ layout
wds ≡ number of words
brp ≡ brand prominence
hlp ≡ headline prominence
```

The select.format command requires that the first three of these have previously been defined. Variable values may be found in Tables 2 - 12. The special value, zero, is reserved for the removal of format restrictions. The end of input is signified by a blank line. An example of what the user might type is

```
lyt 9
col 0
bld 2
hlp 0
      (blank line)
```

Command Name: budget

Abbreviation: b

Arguments: maximum allowable insertion cost (see Description)

Description: The user types "budget $xx,xxx", where the dollar sign and comma are optional, and the number of digits is four or five.

Command name: reset

Abbreviation: rt

Arguments:

"objective.function"	or "o"
"restrictions"	or "r"
"budget"	or "b"
"all"	or "a"

Description:

argument	operation
"objective.function"	Resets objective function weights to zero (both unnormalized and normalized).
"restrictions"	Resets all format restrictions to zero, i.e., unconstrained.
"budget"	Resets maximum allowable insertion cost to "unlimited".
"all"	Used to completely reset the problem. Resets objective function, restrictions, and budget as described above. Other resulting conditions are product and advertiser--unknown, publication--unknown, brief and timer options-- off.

5. Problem Condition Displaying Command

Command Name: print

Abbreviation: pr

Arguments:

"objective.function"	or "o"
"restrictions"	or "r"
"budget"	or "b"
"publication"	or "p"
"all"	or "a" or blank (i.e., argument omitted)

argument	operation
"objective.function"	Prints current normalized objective function
"restrictions"	Prints current values (or state names) of all restricted format variables.
"budget"	Prints current maximum allowable insertion cost.
"publication"	Prints current publication identification.
"all"	Prints all of above information.

6. Format Selection Command

Command Name: select.format

Abbreviation: sf

Arguments: none

Description: Given the existing set of problem conditions, the system attempts to find the fifty best formats (i.e., fifty sets of values for unconstrained variables), storing them internally.