Technical Report 821

Modeling the Effects of Army Advertising

Roy D. Howell, James B. Wilcox, and Robert E. Wilkes
Texas Tech University

November 1988

United States Army Research Institute for the Behavioral and Social Sciences

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction of the Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Technical Director

JON W. BLADES
COL, IN
Commanding

Research accomplished under contract
for the Department of the Army

College of Business Administration
Texas Tech University

Technical review by

Timothy W. Elig
Leonard White

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS --
2a. SECURITY CLASSIFICATION AUTHORITY --	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE --	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) --	5. MONITORING ORGANIZATION REPORT NUMBER(S) ARI Technical Report 821
6a. NAME OF PERFORMING ORGANIZATION Dr. James B. Wilcox 6b. OFFICE SYMBOL (If applicable) --	7a. NAME OF MONITORING ORGANIZATION U.S. Army Research Institute for the Behavioral and Social Sciences
6c. ADDRESS (City, State, and ZIP Code) College of Business Administration Texas Tech University, Box 4320 Lubbock, TX 79409	7b. ADDRESS (City, State, and ZIP Code) 5001 Eisenhower Avenue Alexandria, VA 22333-5600
8a. NAME OF FUNDING/SPONSORING ORGANIZATION -- 8b. OFFICE SYMBOL (If applicable) --	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER DAAL03-86-D-0001, DO No 0591, TCN 87-454
8c. ADDRESS (City, State, and ZIP Code) --	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. 62772 / PROJECT NO. A791 / TASK NO. 2.2.2 / WORK UNIT ACCESSION NO. C.5

11. TITLE (Include Security Classification)

Modeling the Effects of Army Advertising

12. PERSONAL AUTHOR(S)

Howell, Roy D., Wilcox, James B., and Wilkes, Robert E.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM 86/10 TO 87/09	1988, November	104

16. SUPPLEMENTARY NOTATION This task (DO No 0591, TCN 87-454) was performed under a scientific services agreement between the U.S. Army Research Office and Battelle Laboratories, Research Triangle Park, NC 27109. ARI's Technical monitors were Curtis Gilroy and Timothy Elig.

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Advertising,
05	09	--	Modeling,
05	08	--	Recruitment, (Enlistment)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This research was performed to develop and empirically examine a set of prototype behavioral models designed to measure the effects of Army advertising on the decision to enlist in the Army. Data were taken from the Army Communications Objectives Measurement System (ACOMS) project. Psychometric properties of each of the model's components were assessed and parameters of the overall models were estimated using covariance structural modeling. The potential benefits of this approach were examined and recommendations were made for development of future models. Keywords:

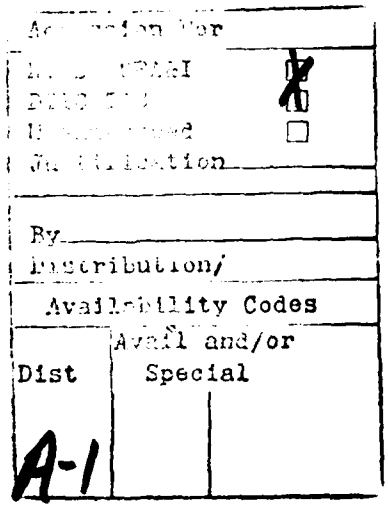
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Timothy W. Elig	22b. TELEPHONE (Include Area Code) (202) 274-5610 / 22c. OFFICE SYMBOL PERI-RG

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

Technical Report 821

Modeling the Effects of Army Advertising

Roy D. Howell, James B. Wilcox, and Robert E. Wilkes
Texas Tech University



Manpower and Personnel Policy Research Group
Curtis L. Gilroy, Chief

Manpower and Personnel Research Laboratory
Newell K. Eaton, Director

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel
Department of the Army

November 1988

Army Project Number
2Q262722A791

Manpower, Personnel, and Training

FOREWORD

The U.S. Army uses advertisements to influence the knowledge, attitudes, and behavioral intentions of youth in order to effectively recruit manpower. Both the message content and the delivery of the message are designed to recruit soldiers who are most likely to provide effective national defense. The U.S. Army wants to understand the specific impacts of Army advertising on intention to enlist and enlistment behavior. From a managerial perspective, this knowledge will allow more effective design, execution, and presentation of messages to attract the desired number and profile of recruits. This research represents a step in this process by examining the potential of an interdisciplinary analytic framework to provide the desired insights.

This work is an essential part of the mission of the Army Research Institute's Manpower and Personnel Policy Research Group (MPPRG) to conduct research to improve the Army's capability to effectively and efficiently recruit its personnel. This work is based on the Army Communications Objectives Measurement System (ACOMS), which was undertaken at the direction of the Deputy Chief of Staff for Personnel (references: Message 2614317 NOV 84, subject: 'Operation Image-Watchdog,' and Memorandum for Record, ODCSPER, DAPE-ZXA, 3 Feb 86, subject: Army Communications Objectives Survey (ACOMS)). Results reported here were briefed to the Commander of the U.S. Army Recruiting Command on 12 April 1988.

EDGAR M. JOHNSON
Technical Director

ACKNOWLEDGMENTS

We gratefully acknowledge the efforts of researchers in the Manpower and Personnel Policy Research Group of the Army Research Institute. In particular, thanks go to Tim Elig and Roy Nord.

ROY D. HOWELL
JAMES B. WILCOX
ROBERT E. WILKES

MODELING THE EFFECTS OF ARMY ADVERTISING

EXECUTIVE SUMMARY

Requirement:

To construct a prototype behavioral model designed to measure the effects of Army advertising on the Army enlistment decision.

Procedure:

Data on cognitive, affective, and behavioral variables related to advertising and the enlistment decision were taken from the Army Communications Objectives Measurement System (ACOMS) project. Covariance structure analysis was employed to simultaneously estimate measurement and structural models.

Findings:

- The prototype model fit the youth data, chi-square = 84.4 with 113 degrees of freedom.
- The youth model was capable of explaining enlistment related behavior, R^2 = .23.
- The youth model was capable of explaining enlistment related intentions, R^2 = .38.
- Youth's beliefs about the Army were multidimensional.
- Advertising had a significant impact on youth's beliefs about the Army.
- Parents had a significant impact on youth's enlistment decisions.
- Peers and others had a significant influence on youth's perceptions of the Army.
- The parent model fit the data, chi-square = 200, degrees of freedom = 97.
- The parent model explained actions toward youth enlistment behavior, R^2 = .11.

Utilization of Findings:

The U.S. Army wants to understand the specific impacts of Army advertising on intention to enlist and enlistment behavior. From a managerial perspective, this knowledge will allow more effective design, execution, and presentation of messages to attract the desired number and profile of recruits. This research represents a step in this process by examining the potential of an interdisciplinary analytic framework to provide the desired insights.

CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

MODELING THE EFFECTS OF ARMY ADVERTISING

OVERVIEW OF THE PROJECT

Introduction

This report presents the results of an effort to construct an analytic framework for a behavioral model designed to measure the effects of Army advertising on the Army enlistment decision. Previous empirical attempts to capture this effect have been relatively unsuccessful due primarily to the specification of inappropriate economic models (Zirk et al., 1987). Characteristically, analysts have attempted to measure advertising effects within a multiple regression framework where enlistment contracts were the dependent variable and a host of explanatory variables appear on the right-hand side of the equation. Typically, the advertising variable has been measured in dollar terms. It has frequently been the case that the results of these models have been insignificant and/or counter-intuitive.

The specific tasks to be performed were:

a. Develop an interdisciplinary analytical framework and an empirical behavioral model to measure the effectiveness of Army advertising on the decision to enlist. The model will be considered a prototype.

b. Obtain the necessary data to test the model at the prototype stage.

c. Perform the empirical analyses with these data to test the performance of the model.

It is important to note that the primary objective of this effort was not to build a new conceptual model of advertising effects, but rather to build a prototype model within an interdisciplinary analytic framework. The question addressed is how can we better analyze data from existing models of advertising effects in order to learn more from them.

The General Approach

To perform these tasks requires three major components -- the analytic framework, the model to which this framework is applied, and a database appropriate for the empirical examination. Each of these as well as the result of joining the model and the database will be considered in turn.

The Analytic Framework

The analytic framework chosen, covariance structure analysis (Joreskog, 1978), is one which should overcome the limitations noted in previous work. It simultaneously estimates parameters for a structural model and a measurement model, and provides an estimate of the degree to which the hypothesized structure is capable of reproducing the original data. With the appropriate data it is also capable of testing causal hypotheses. This approach is described in detail in the second chapter.

The Conceptual Model

A great deal of work has been performed on behalf of the Army to develop a model of advertising effects on the enlistment decision (Kralj et al., 1987; McTeigue et al., 1987; Zirk et al., 1987). Numerous alternative models of choice were considered from both a theoretical and a data gathering perspective. The model which evolved from these deliberations forms the basis for the Army Communications Objectives Measurement System (ACOMS) project (Gaertner and Elig, 1988), and will be referred to as the ACOMS model.

The core constructs and relationships of the ACOMS model are presented in Figure 1-1 (Gaertner and Elig, 1988). It considers the influence of advertising on both youth and their parents as well as recognizing the potential influence of significant others. In addition it implies that many of the effects of advertising will be indirect (ie. through other variables) rather than suggesting that advertising directly influences behavior.

The general form of the model makes use of the Lavidge and Steiner (1961) Hierarchy-of-Effects framework (and is similar to many other communications models as well). In this context, advertising moves an individual through various stages enroute to a decision. For present purposes these stages include awareness of the Army as a career alternative, knowledge about the offerings of the Army, liking or affect for the Army, preference for the Army as an alternative, conviction of the preference, and enlistment. These stages are generally grouped into three broader categories descriptive of the process: cognitive, attitude formation, and behavioral.

The ACOMS model conceptualizes attitudes according to a model frequently referred to as the 'extended Fishbein' model (Fishbein and Ajzen, 1975). In this model, career choice

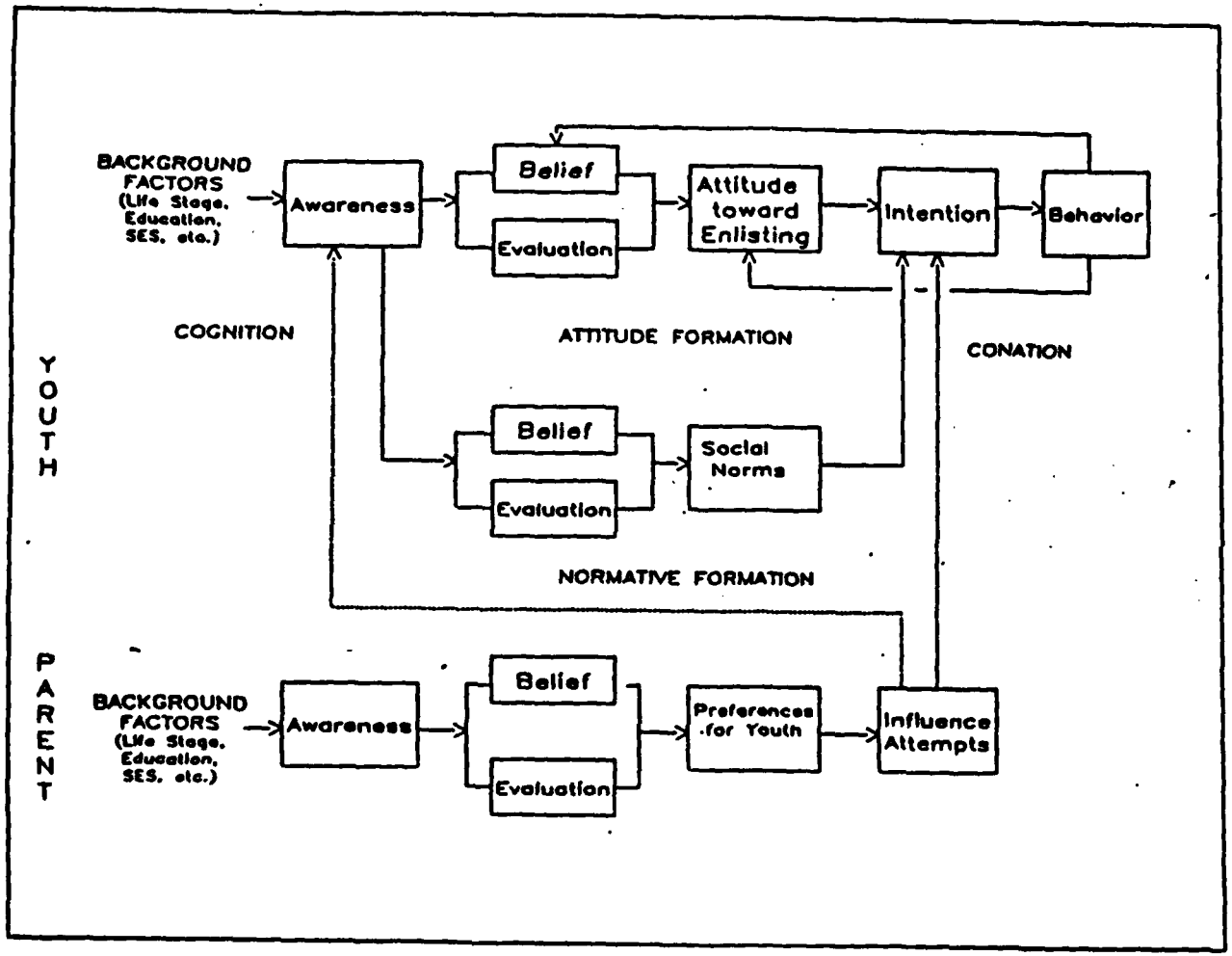


Figure 1-1. Expanded Fishbein and Azjen hierarchy of effects model from Gaertner and Elig (1988).

alternatives are conceptualized as being composed of a number distinct attributes (e.g. pay, potential for future employment). Attitudes concerning career choice are the product of the importance of each attribute times the amount of that attribute felt to be possessed by the alternative. In addition, attitude toward the act of enlisting (or going to college), is included as an influencer of intentions.

Two characteristics of this model deserve particular attention. First, the model reflects the affective, cognitive and behavioral stages for an individual. Thus, individual level data are required to examine the model. Attempts to evaluate the relationships implied by the model with aggregate data would likely be unsuccessful and potentially misleading. Second, the model represents a process which takes place over time. Cross-sectional data cannot capture this process. When taken together, these two characteristics suggest the need for periodic reinterview of appropriate respondents. These are the only type of data which can correctly assess the relationships portrayed in the model.

The Database

As suggested above, the ACOMS model was a part of an extensive and multi-objective data gathering effort, intended to address many issues relating to Army advertising. The portion of the data which was utilized here was derived from 30-minute telephone interviews with a complex sample of youth 16-20 years of age. Data were gathered quarterly with an intended sample size of about 1,300 per quarter. Parents of a subset of youth were also interviewed.

The survey instrument contained in excess of 700 questions (although not all were to be answered by each youth), a portion of which were intended to measure the constructs in the ACOMS model. Data for the first four quarters of youth interviews and the first three quarters of parent interviews were available for the present project.

The Empirical Model

The actual models to be analyzed appear in Figures 1-2 and 1-3, representing models for youth and parents, respectively. These models are the result of joining the conceptual model from ACOMS (Figure 1-1), and the data available to test them from the ACOMS project. Although the ACOMS model and the empirical models look somewhat different, they contain essentially the same constructs. For example, Future, Develop and Experience in the Youth model are elements of the beliefs segment listed in the ACOMS model. Likewise, Recall in the Youth model corresponds to awareness in Figure 1-1. The arrows represent hypothesized relationships and the

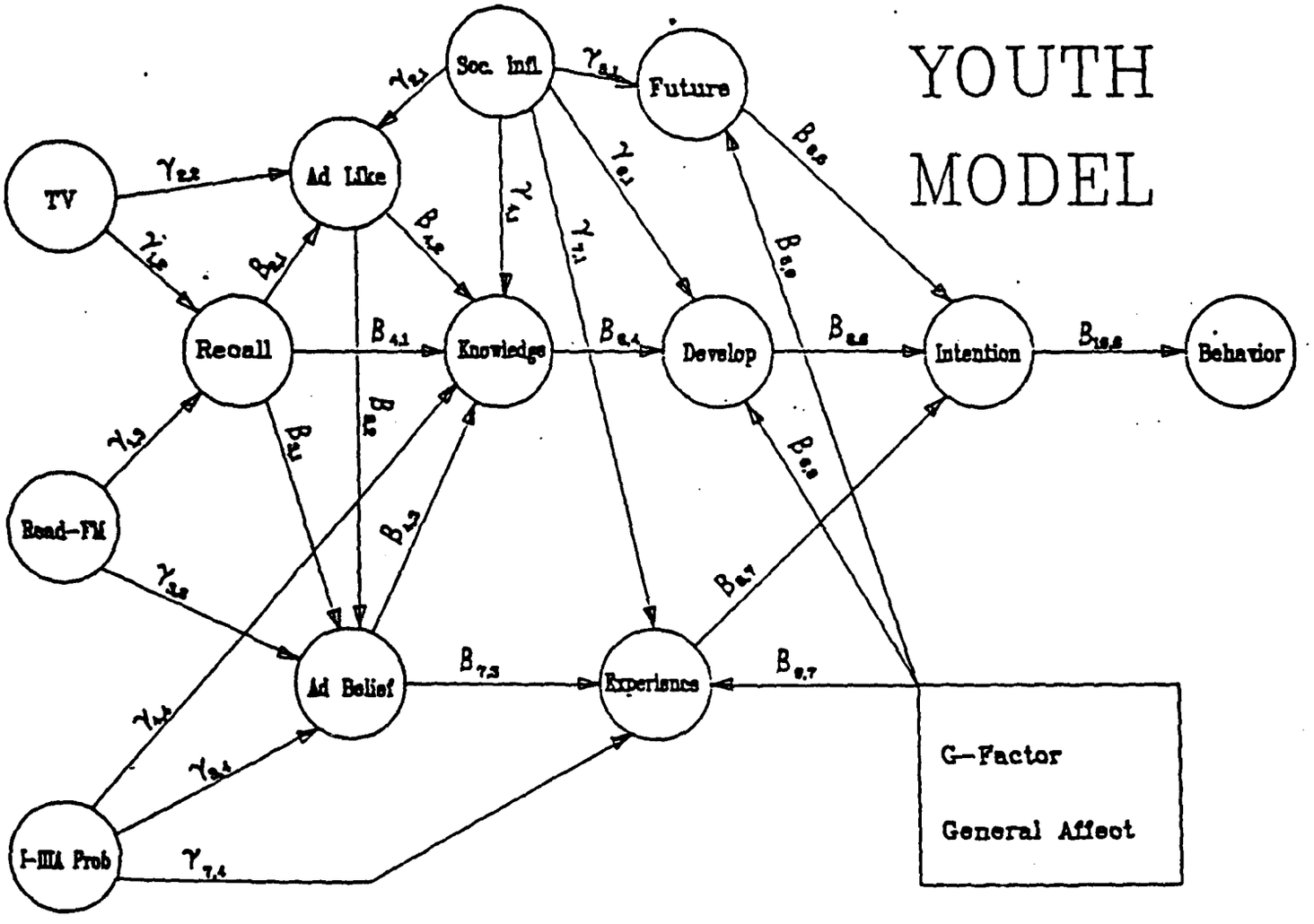


Figure 1-2. Advertising effects model for youth.

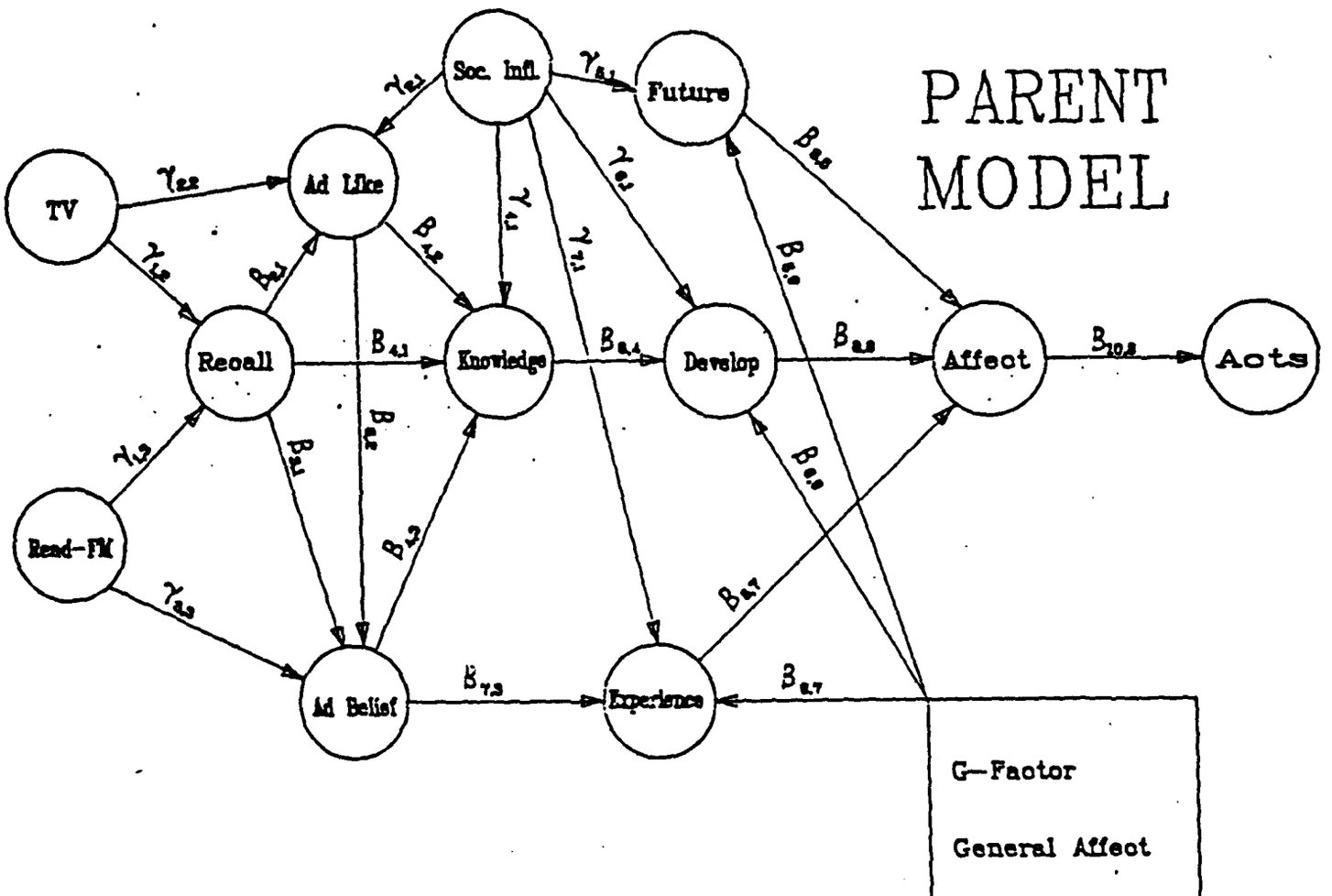


Figure 1-3. Advertising effects model for parents.

greek symbols represent the parameters to be estimated. The components of the empirical models are largely defined by data availability.

The empirical models are not necessarily what we would recommend as the best models of advertising effectiveness. Rather, they reflect the best models we could develop for which data were available. We will, in the final chapter, make some recommendations regarding certain aspects of structure and measurement that we feel would improve the model. Since, however, model form and data are so interrelated and since some of the changes we suggest are the result of empirical analysis, we felt it best to present the empirical results before addressing more conceptual issues.

Organization of This Report

The second chapter describes covariance structure modeling and suggests why it was selected as the analysis approach. The third chapter addresses the actual constructs in the model and examines their measurement properties. The results of fitting the models are presented in the fourth chapter. In the final chapter we discuss the modeling and the data-gathering processes and make recommendations concerning both.

Some Caveats

Before reporting the results of this effort, a few words of caution are in order. Many resources were utilized in the execution of this project, including the findings of a number of prior projects conducted on behalf of the Army. It is important to keep in mind that each project had objectives and goals which were quite different from those pursued in this effort. At various points in this report, these other projects will be evaluated in terms of their potential contribution to this effort. Thus, the criteria used for evaluation are different than those which should be employed to assess the original contribution.

This is particularly true in the case of the project providing the primary source of data for testing the model. Recall that ACOMS was a multipurpose project dealing with advertising effectiveness, advertising strategy efficiency, management of the advertising program and planning and development of new marketing strategies and segmentation. It is clearly impossible for a project with this breadth of objectives to also satisfy the needs of a project which was not part of the original design.

Nonetheless, the form and content of ACOMS had a significant impact on the empirical evaluation of the model proposed. As described in the third chapter we would have measured certain things differently, or indeed, measured different things entirely. This is not a criticism of ACOMS but rather a recognition of different objectives for different projects. It should highlight, however, the fact that the model and the results reported are prototypical. The empirical model was shaped to fit the data rather than vice versa. Care should be taken in generalizing specific empirical results.

ANALYTIC STRATEGY

The basic analytic tool employed in this research is the analysis of covariance structures, otherwise known as latent variable structural equations (LVSE) modeling or "causal modeling." This methodology is implemented through the LISREL VI software developed by Joreskog and Sorbom (1986). This methodology has several advantages over other methods for estimating models of the type developed here. The LISREL modeling approach will be described before we present the rationale for the use of LVSE modeling in this study.

In LVSE modeling, a structural equations model is used to specify the phenomena under study in terms of hypothesized cause and effect variables (constructs) and their indicators (observables). As noted by Joreskog and Sorbom (1986, p.I.1):

> Because each equation in the model represents a causal link rather than a mere empirical association, the structural parameters do not, in general, coincide with coefficients of regressions among observed variables. The structural parameters represent relatively unmixed, invariant and autonomous features of the mechanism that generates the observable variables. The use of structural equation models requires statistical tools which are based upon, but go well beyond, conventional regression analysis and analysis of variance.

The LISREL Model

Assuming that all variables are measured as deviations from their respective means, the basic system of (linear) structural equations is

$$\eta = \beta\eta + \Gamma\xi + \zeta$$

Where

- η = a random vector of latent endogenous (dependent) constructs;
- ξ = a random vector of latent exogenous (independent) constructs;
- β = an (m x m) matrix of coefficients specifying relationships among endogenous constructs;
- Γ = an (m x n) matrix of coefficients specifying the relationships between the exogenous and the endogenous constructs; and
- ζ = a random vector of disturbance terms (residuals).

It is assumed that ζ is uncorrelated with ξ and that $(I-\beta)$ is non-singular.

The vectors η and ξ above are not observed. Rather the observables are vectors y and x, and these are related to the latent constructs through the measurement equations:

$$y = \Lambda_y + \epsilon$$

and

$$x = \Lambda_x + \delta$$

where

ϵ = a vector of errors of measurement in y;
δ = a vector of errors of measurement in x;
Λ_y = the (p x m) matrix of regression coefficients of y on η .
Λ_x = the (q x n) matrix of regression coefficients of x on ξ .

Further, one can define four other matrices in LISREL:

θ_δ = the (n x n) variance-covariance matrix of δ.
θ_ϵ = the (m x m) variance-covariance matrix of ϵ.
Ψ = the covariance matrix of ζ .
Φ = the covariance matrix of ξ .

Thus there are eight parameter matrices to be specified in the LISREL model: Λ_x, Λ_y, β, Γ, Ψ, Φ, θ_δ, and θ_ϵ.

The elements in each of these matrices can be <u>fixed</u> to a prespecified value, <u>free</u> to be estimated in the model, or <u>constrained</u> to equal one or more other parameters.

<u>Estimation</u>

While a variety of fitting functions are available in LISREL, the most desirable properties are available through Maximum Likelihood estimation. The basic objective of each estimation method is to minimize some discrepancy function between the observed variance-covariance matrix (S) and the variance-covariance matrix (Σ) reproduced as a function of the eight parameter matrices listed above.

The fitting function minimized under maximum likelihood estimation is

$$F = \log|\Sigma| + tr(S\Sigma^{-1}) - \log|S| - (p+q).$$

When the observables are approximately multivariate normally

distributed, the value of the fitting function F multiplied by the sample size follows a chi-square distribution with degrees of freedom equal to the number of unique variances and covariances among the observables minus the number of parameters estimated in the model.

While a detailed discussion of estimation methods, identification conditions, and alternative model specifications is beyond the scope of this chapter, several points which are important to the development and estimation of the specific model of advertising effects in this study need to be explicated:

1. Since the chi-square value is equal to n, the sample size, times the value of the fitting function at its minimum, it is easily seen that its value is a direct function of the sample size, and that with large samples, the chi-square value will be large even when the discrepancy function F is small. In the chi-square test of model fit, the hypothesized model is the null-hypothesis, with large values of chi-square leading to the rejection of the model, which is a reversal of the normal role of the null-hypothesis. The result is that with large sample sizes, no reasonably parsimonious model will "fit" the data.

2. The chi-square statistic, and the standard error estimates for the individual parameters are based on the multivariate normal distribution assumption, and the use of the variance-covariance matrix as the basis for analysis (as opposed to the correlation matrix). For the ACOMS data, due to its method of collection, and the use of rotating modules such that correlations for different pairs of variables in the input correlation matrix are based on (sometimes widely) differing sample sizes, the multivariate normal assumption is clearly violated. Thus, while the parameter estimates themselves are maximum likelihood estimators, the chi-square value and standard error estimates must be interpreted as suggestive indices rather that strict statistical estimates (Bearden, Sharma, and Teel, 1982).

3. The measurement model relating the unobservable (latent) constructs to the observables is a restricted case of common factor analysis known as a congeneric measurement model (Joreskog, 1971). As such, the observables are conceptualized as being a function of the unobservables, and the latent constructs are defined by the intercorrelations of their respective observables. Thus, behavioral indices, checklist tasks, and other measurements in which the (perhaps weighted) sum of the items is the appropriate conceptualization of the construct cannot be used directly in the measurement model underlying LISREL. Further, in order to estimate the measurement model for a construct, at least three indicants

are necessary for the measurement of that construct to be internally identified. While in the context of a larger model a two-item construct can often be estimated, in no case can the measurement parameters of a construct with a single indicant be estimated by the model. In such cases, one must estimate the amount of measurement error in the construct outside the model estimation process itself, or assume a reasonable amount of measurement error, and fix the measurement error term for the construct to reflect the estimate or assumption (Howell, 1987).

4. All of the parameters, structural and measurement, are estimated simultaneously to reproduce the observed variance-covariance matrix as closely as possible. Thus, the coefficients of any given equation are partial coefficients, given the other constructs in the equation and the measurement properties thereof. Further, each equation is estimated simultaneously with all other equations using all of the available variances and covariances of the observables. In this sense, LISREL is a full-information model. The result is that the model parameter estimates may bear little resemblance to any given bivariate correlation between two observables, and the coefficients of any equation may differ substantially from the coefficients one would obtain if equation-by-equation estimation were employed, even if the measurement model were to be fixed. This is simultaneously a strength and a weakness of the approach. The full-information nature of the estimation may allow one to find relationships in the context of the complete model which would not be detectable in single equation estimation. On the other hand, this also means that specification error in any equation is not limited to that equation alone, but may impact on the estimation of the entire model, making a correct specification of each equation more critical than would be the case if limited information estimates were used.

5. While there are separate equations for measurement and structural parameters in the LISREL specification, all parameters, both measurement and structural, are estimated as a single long vector during the minimization process. Thus, the distinction between measurement and structural parameters is entirely pedagogical; the estimation itself does not make such a distinction. This is clearly evident when one considers the alternative LVSE specification suggested by Bentler and Weeks (1980) and implemented by Bentler (1985). This is important in the context of the second-order factor analysis model employed in the context of the structural model of Advertising Effects, wherein measurement parameters for the second-order factor are specified as β elements, which are normally structural estimates.

Rationale for Use

The LISREL approach to the estimation of Latent Variable Structural Equations models offers several advantages which suggest that it may be the methodology-of-choice for the analysis of models with the characteristics and objectives of the model developed in this report.

In particular, under this methodology, the coefficients estimated reflect relationships among theoretic constructs as opposed to observables or linear combinations thereof. As a result, the estimated coefficients are not attenuated by random measurement error which is invariably present in survey data. Further, the methodology allows an explicit test of the correspondence rules relating observables to theoretic constructs of interest (Bagozzi, 1984).

Also, this approach allows an overall assessment of the "fit" of the entire model, since the entire model is estimated simultaneously. This fit, based on the ability of the model parameters to reproduce the relationships among the observed data, is assessed by the χ^2 statistic, the ratio of the chi-square statistic to its degrees of freedom, the goodness-of-fit index, and the root-mean-square residual of the variance-covariance matrix. Additionally, the explanatory power of each equation can be assessed through traditional R^2 statistics for each endogenous construct. While there are strengths and weaknesses associated with each index of fit, taken as a group they can provide a reasonable assessment of the "goodness" of the overall model which is unavailable in equation by equation methods.

It should finally be emphasized that this methodology can test causal hypotheses, not establish causation. In fact models with different causal directions can exhibit equally good fit to the data. The causal in causal modeling refers to the hypotheses tested, not to the findings themselves. In the absence of experimental control, no cross-sectional methodology can unequivocally determine causal direction.

MEASUREMENT ISSUES AND OPERATIONALIZATION OF THE CONSTRUCTS

Introduction

As noted in the previous chapter, measurement and structural relationships are normally estimated simultaneously in covariance modelling. Given, however, that the present effort deals with data which were not collected with this approach in mind, it was necessary to consider the measurement of the various constructs outside the model itself. Thus, in the sections that follow, each construct is considered separately in terms of its conceptual domain, the questions used to operationalize it, and the particular measurement approach employed. Within each construct, measurement results for both the Parent Model and the Youth Model are presented when the same construct appears in each. Before considering the constructs, however, there are several other topics which must be considered, including the subsets of the databases used, the issue of weighting and how missing data was handled.

Data

The data were taken from the Army Communications Objectives Measurement System (ACOMS) project, conducted by Westat, Inc. on behalf of the Army. The data were collected by means of a 30-minute interview of a nationwide sample of youth (Youth Sample) and parents of a subset of these youth (Parent Sample). The data were gathered and summarized quarterly, starting in October, 1986 (Nieva, Rhoads, & Elig, 1988; Westat, 1988a, 1988b). The data available for this project included four quarters for youth and three for parents.

Only a subset of the data available was utilized in the present effort. The original intent of this research was to simultaneously estimate individual-level models for youth and their parents, requiring a one-to-one linkage of parents and youth. This linkage was subsequently discarded when the fourth quarter of data for youth became available, but was not accompanied by corresponding parental data. Rather than ignore a significant portion of data for the youth, the decision was made to uncouple the models for estimation purposes.

Nonetheless, it seemed appropriate to maintain comparability of the data in both samples. Thus, only those youth who could have been linked to a parental interview (were the data available) were candidates for the youth sample. Parental interviews in ACOMS were sought if a youth contacted was in the Primary Enlistment Market and from 16 to 20 years

of age. Further restrictions were imposed. Since the main concern for enlistment involves males and since it is likely that a separate model would have been necessary for females, only males were considered. Finally, the majority of analysis to date has been conducted on a subset of the Primary Males Sample (PMS), the Primary Male Analytic Sample (PMAS). In order to analyze similar data and to match the content of the Youth Attitude Tracking Study (Research Triangle Institute, 1987), this restriction was imposed as well. Thus, the youth sample which formed the basis for this research consisted of 16-20 year-olds who were in the Primary Male Analytic Sample and were interviewed in any of the four quarters of data gathering. The parental sample, based upon three quarters of data, was composed of parents who provided information on youth meeting the above requirements.

The youth data utilized in this report are from telephone interviews conducted for ACOMS between 13 October 1986 and 30 September 1987. The youth sample for this report consists of 2,534 16- to 24-year-old males, living in the contiguous 48 states, who have no prior military service nor contractual commitment to serve, who are not institutionalized, who have not completed 2 years of college nor a college-level ROTC course, who have received a diploma from a regular high school or who are in a diploma-granting regular high school or who are treated as such by the Army due to college attendance. Not that the sample excludes GED and ABE certifications as well as high school dropouts unless the individual completed one year of college or was attending college full time when interviewed. These sampling specifications were set to match the prime market for Army enlistments.

The parental data utilized in this report are from telephone interviews conducted for ACOMS between 13 October 1986 and 30 July 1987. The parental sample for this report consists of 2,534 parent of young men who meet the qualification requirements discussed in the previous paragraph.

Weighting

The ACOMS data were gathered by means of a complex sample design in that some groups (females) were purposefully undersampled, while others (Hispanic males) were oversampled. Moreover, the total set of information sought in the study was so extensive that it was impossible to obtain it all from each respondent. Therefore, related questions were treated as modules, and random assignment of modules to respondents was used to reduce the length of any given interview. Summary results based upon these data therefore need to be adjusted to account for these departures from simple random sampling.

The adjustments are in the form of weights applied to both the individual respondent and to the modules of questions. In all, ACOMS data requires 14 different weights to bring the sample in line with the population. If pairs of variables are considered, it is frequently the case that pairs of weights are also required. There are potentially 91 different weighting combinations for bivariate analysis. The use of weights in multivariate analysis of the sort required by covariance modeling can quickly become unwieldy.

Fortunately, the objective of the research presented here was not to make marginal distributions of variables look like their population distributions. It was the relationship among these variables which was of importance. Thus, weights required to adjust for rotating modules were ignored. Since these modules were randomly assigned to respondents, no bias should arise because of different rates of asking the questions. Weights intended to account for varying incidence of individuals in the sample were important in order to correctly reflect the relationships examined. Therefore, in all of the analysis that follows, case weights (Fullwght for youth and Parnwght for parents) were used.

Missing Data

The ACOMS data contain (as do all surveys) missing data attributable to a variety of causes. This is not usually a problem in bivariate analysis but can become quite significant in multivariate analysis. The problem is that most multivariate techniques employ 'list-wise' deletion. That is, if any variable in the set has a missing value for a respondent, all answers for the respondent are deleted (i.e., the entire case is dropped). Given the rotating module design of the ACOMS survey and the number of variables considered in the models reported here, list-wise deletion would result in a sample size of zero.

There are many alternative ways to overcome this problem (see, for example, BMDP routines 8D and AM), including substituting or imputing values for the missing data (Dixon, 1981). While there are pros and cons of each of these methods, discussion of these issues is beyond the scope of this report. Pair-wise deletion was selected to deal with missing data in the current study. In pair-wise deletion, a case is dropped if it does not contain responses for each of two variables under consideration, but the case is included for other pairs of variables. Since the covariance models could be estimated from correlation matrices rather than from raw data, this seemed the most reasonable solution. Thus, each cell in the correlation matrix was estimated separately

utilizing all of the data available for that pair of variables. The result is a correlation matrix in which each cell may be based on a different sample size (and may not be invertable). Nonetheless, it seemed an acceptable compromise between having no data and having to substitute values for, in some cases, more than half the sample.

Media Habits

Parents

Domain of the construct. The media habits construct was designed to capture parental exposure to media used to convey messages about the Army.

Questions employed. The questions, taken from the Media Habits Module of the ACOMS questionnaire, were open-ended and requested the respondent to provide an estimate of the number of hours he or she spent each week listening/reading/watching each of six media:

1. regular TV
2. cable TV
3. AM radio
4. FM radio
5. newspapers
6. magazines.

Although the Media Habits section of the ACOMS questionnaire also contained many questions which addressed the specifics of media exposure -- section of newspaper read, type of TV program watched, type of magazine read -- this level of detail was felt to be unnecessary for a prototype model.

Approach. Responses to open-ended questions tend to be less well-behaved than their pre-coded counterparts. For this reason, distributional properties of the media habit responses were examined first. Table 3-1 contains the quartile values for the hours of exposure to the six media for parents.

With the possible exception of newspaper hours, the distributions are all highly skewed. The figures for FM radio, for example, indicate that three-quarters of the parents listen to the radio 20 hours or less per week, while the remaining quarter vary from 20 hours to 140. The presence of such extreme values can dramatically impact the results of analysis. These outliers, by virtue of their extremity, tend to have more influence than should be allowed a single observation, particularly on means and correlations.

Table 3-1
Quartiles of Parent Media Habits

Medium	Min	25%	50%	75%	Max
Regular TV	0	6	12	20	100
Cable TV	0	0	2	7	60
Newspaper	0	2	4	7	21
Magazine	0	2	3	5	40
Radio - AM	0	0	1	6	126
Radio - FM	0	3	7	20	140

Table 3-2
Coding For Parent Media Hours

Medium	Coded Categories				
	0	1	2	3	4
Regular TV	0	1-6	7-12	13-20	21+
Cable TV	0	-	1-2	3-7	8+
Newspaper	0	1-2	3-4	5-7	8+
Magazines	0	1-2	3	4-5	6+
Radio - AM	0	-	1	2-6	7+
Radio - FM	0	1-3	4-7	8-20	21+

For this reason, the actual hours of media exposure were replaced by the number of the interquartile range into which they fell. Thus, for example, a parent who watched 10 hours of regular TV each week would be coded as a 2 since 10 hours is greater than the first quartile score of 6 hours but less thanthe second quartile score of 12. This coding scheme for each of the media is presented in Table 3-2. Notice that the highest value for a single medium is now four. While this transformation discards some of the information in the original coding, it sustantially lessens the impact of the outliers an outcome which was deemed important given the nature of these data.

The recoded variables representing the six media were then analyzed by means of principal components to identify a more parsimonious structure. The results are presented in Table 3-3. Two components were extracted (via the eigenvalue > 1 criterion) and rotated (Varimax). The first component captures the television and reading habits of the parents while the second relates to radio listenership. It is interesting to note that while both AM and FM radio load heavily on the second component, the loadings are of opposite sign. This suggests that while radio listening may be distinct from other media, it is an either/or proposition. That is, parents who listen to radio, do so to either AM or FM, but not both. Nonetheless, the high absolute magnitudes of the loadings suggest that radio listenership is a separate phenomenon from the other media.

Thus, two constructs were formed to represent the media exposure of parents. As noted at the bottom of Table 3-3, the first is operationalized by summing the exposure to television (regular and cable) and reading material (newspapers and magazines), and is referred to as READTV. The second construct is operationalized as simply exposure to FM radio. For all variables included in these constructs, the quartile values were substituted for the actual hours of exposure.

Table 3-4 presents the frequency distribution for the two constructs READTV and FM. The distributions seem adequate to capture the desired information.

Youth

Similar procedures were utilized to develop media habit constructs for youth. The quartile values are presented in Table 3-5 and reflect distributions which are at least as skewed as those of parents. For the same reasons given above, the interquartile range into which these values fell (Table 3-6) were substituted for the actual hours of exposure. These values were then factor analyzed and the results presented in Table 3-7.

Table 3-3
Rotated Factor Pattern
Structure of Parent Media Habits

	Factor1	Factor2
TVREG	0.50866	0.18822
TVCAB	0.34298	-0.00965
PAPER	0.73304	-0.17561
MAG	0.73468	-0.01207
AM	0.14754	-0.79423
FM	0.14177	0.83183

Variance Explained by Each Factor
1.495325 1.389236

Note: The measurement model based on this factor analysis involves two equations:

TVREAD = (paper hours
+ magazine hours
+ TV hours)

FM = FM radio hours

where quartiles are used in place of actual hours.

Table 3-4
Frequency Distribution for Parent Media Habits

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
		TVREAD		
.	5508767	.	.	.
3	26975	2.2	26975	2.2
4	79009	6.5	105985	8.7
5	76061	6.3	182046	15.0
6	142895	11.8	324941	26.8
7	138912	11.4	463853	38.2
8	180363	14.9	644216	53.1
9	112380	9.3	756596	62.4
10	128305	10.6	884901	72.9
11	142369	11.7	1027271	84.7
12	90673	7.5	1117944	92.1
13	47740	3.9	1165684	96.1
14	29400	2.4	1195085	98.5
15	14662	1.2	1209746	99.7
16	3602	0.3	1213348	100.0
		FM		
.	4391287	.	.	.
0	288932	12.4	288932	12.4
1	404558	17.4	693491	29.8
2	474217	20.3	1167708	50.1
3	769542	33.0	1937249	83.1
4	393579	16.9	2330829	100.0

Table 3-5
Quartiles of Youth Media Habits

Medium	Min	25%	50%	75%	Max
Regular TV	0	6	10	20	151
Cable TV	0	0	3	10	105
Newspaper	0	2	3	5	72
Magazine	0	2	3	5	70
Radio - AM	0	0	0	0	100
Radio - FM	0	8	15	30	168

Table 3-6
Coding For Youth Media Hours

	Coded Categories				
Medium	0	1	2	3	4
Regular TV	0	1-6	7-10	11-20	21+
Cable TV	0	-	1-3	4-10	11+
Newspaper	0	1-2	3	4-5	6+
Magazines	0	1-2	3	4-5	6+
Radio - AM	0	-	-	-	1+
Radio - FM	0	1-8	9-15	16-30	31+

Table 3-7
Rotated Factor Pattern
Structure of Youth Media Habits

	Factor1	Factor2	Factor3
PAPER	0.75176	0.02419	0.15504
MAG	0.78510	0.05090	-0.02484
FM	0.55687	0.24897	-0.50355
TVREG	0.15217	0.71211	-0.11815
TVCAB	-0.02944	0.79176	0.10373
AM	0.13464	0.05691	0.89596

Variance Explained by Each Factor

1.533784	1.202388	1.105674

Note: The measurement model based on this factor analysis involves two equations:

READFM = (paper hours + magazine hours
+ FM radio hours)

TV = (regular TV hours
+ cable TV hours)

where quartiles are used in place of actual hours.

Table 3-8
Frequency Distribution for Youth Media Habit Constructs

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
		READFM		
.	5205850	.	.	.
2	18148.6	0.9	18148.6	0.9
3	159847	8.3	177995	9.3
4	182329	9.5	360324	18.8
5	205038	10.7	565362	29.5
6	255115	13.3	820477	42.8
7	243308	12.7	1063786	55.5
8	242957	12.7	1306743	68.2
9	233364	12.2	1540107	80.3
10	133923	7.0	1674031	87.3
11	165098	8.6	1839129	95.9
12	78260.3	4.1	1917389	100.0
		TV		
.	4497259	.	.	.
0	12473.2	0.5	12473.2	0.5
1	245347	9.3	257820	9.8
2	194270	7.4	452090	17.2
3	442277	16.8	894367	34.1
4	505477	19.2	1399845	53.3
5	358728	13.7	1758573	67.0
6	422465	16.1	2181037	83.1
7	240449	9.2	2421486	92.2
8	204494	7.8	2625980	100.0

The media which load together clearly differ between youth and parents. The first factor consists of reading (both newspapers and magazines) and FM radio listenership. The second factor clearly reflects television viewing habits. The third factor is primarily defined by AM radio listenership (with the FM complement as well). This third factor appears to be more artifactual than real. Referring back to Table 3-5, note that even the third quartile for AM radio is zero. That is, less than 25% of the sample of youth listen to the radio (AM) at all. Thus, even substituting quartile range for actual hours doesn't remove the skewness. For this reason and the fact that at least part of the AM hours are captured by the first factor, AM radio listenership was not included.

Two media constructs were created for youth. The first is defined by the sum of the quartile values of newspaper hours, magazine hours and FM radio hours (READFM). The second construct is defined by the sum of quartile hours for regular and cable television (TV). The frequency distribution for both of these constructs is presented in Table 3-8.

Advertising Impact

Parents

Domain of the construct. The effects of advertising can be operationalized in a variety of ways. However, to have these impacts, advertisements must accomplish several objectives. First, to be effective, ads must be remembered. Second, more effective ads are those that are liked. Finally, ads need to be believeable in order to get the intended message across. Thus, within the domain of advertising effects there are three constructs: recall of the ad, liking of the ad, and believeability of the ad.

Questions. The questions, taken from the Attitude Toward Army Ads Module and the Knowledge Recall Module of the ACOMS questionnaire, covered these topics for the Army as well as for other branches of the service. Two questions were utilized to assess recall of Army advertising:

1. "Now, thinking about radio, newspapers, magazines and any other sources of advertising, for what military service or services do you recall seeing or hearing advertising?" [unaided recall]

2. (if 'don't know' to question 1, "Do you recall seeing or hearing any advertising for the Army?" [aided recall]

How much the respondent liked Army advertisements was measured by the question, "Overall, how much do you like the Army ads you have seen or heard over the past year?" Responses were obtained on a 5-point scale anchored by do not like (1) to like very much (5). Likewise, believeability was addressed by the question, "How much do you believe what the ads say?" Responses to this question were also obtained on a 5-point scale anchored by do not believe (1) to strongly believe (5).

Approach. The first two questions were joined to form a single measure of ad recall. A respondent who had no recall of ads was assigned a value of zero. One who could recall Army advertising only in the aided condition was assigned a value of one. Finally, those who recalled advertising without aid were coded as a four, the higher number reflecting the much greater impact of advertising. The frequency distribution of the recall construct is presented in Table 3-9. It does suggest a highly skewed shape with almost three-quarters of the parents in the unaided category. Although other questions were considered as possible additions to this construct (including slogan recognition), none were capable of spreading out this upper category. It is possible that a closer examination of the data in PARNVERB (verbatim impressions of ads) may suggest a way to enrich this construct. The difficulty in using this data is that the units into which verbalizations are coded may increase because of multiple mentions or because of single, but lengthy responses.

Liking and believeability were operationalized by direct use of the two questions described above. The frequency distributions for these questions are presented in Tables 3-10 and 3-11, respectively. Both distributions are reasonably well-behaved with a slight skew toward the upper end of each scale.

Youth

Identical constructs were developed for the youth as for the parents, and similar procedures yielded very similar results. The frequency distribution for recall of Army advertising (Table 3-12) appears even more skewed that that of the parents, with over 85% of the youth exhibiting unaided recall. Attempts to spread out this category were also unsuccessful. How much youth like Army advertising (Table 3-13) and how much they believe the ads (Table 3-14) are also very similar to the responses provided by parents.

Table 3-9
How Much Parents Like Ads

Like Ads	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DK	88391	.	.	.
Inapplicable	770198	.	.	.
Do Not Like	350888	6.0	350888	6.0
Scale Point 2	413151	7.0	764039	13.0
Scale Point 3	2239367	38.2	3003406	51.2
Scale Point 4	1383747	23.6	4387153	74.8
Like Very Much	1476373	25.2	5863526	100.0

Table 3-10
How Much Parents Believe Ads

Believe Ads	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DK	41803	.	.	.
Inapplicable	770198	.	.	.
Do Not Believe	606430	10.3	606430	10.3
Scale Point 2	848334	14.4	1454764	24.6
Scale Point 3	1823127	30.8	3277892	55.5
Scale Point 4	1307531	22.1	4585422	77.6
Believe Very Much	1324692	22.4	5910115	100.0

Table 3-11
How Much Parents Recall Ads

Recall		Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	(0)	770198	11.5	770198	11.5
Aided	(1)	959091	14.3	1729289	25.7
Unaided	(4)	4992827	74.3	6722116	100.0

Table 3-12
How Much Youth Like Ads

Like Ads	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DK	9555	.	.	.
Inapplicable	354037	.	.	.
Refused	1667	.	.	.
Do Not Like	600763	8.9	600763	8.9
Scale Point 2	706846	10.5	1307609	19.3
Scale Point 3	2651573	39.2	3959182	58.6
Scale Point 4	1679801	24.9	5638984	83.4
Like Very Much	1118995	16.6	6757979	100.0

Table 3-13
How Much Youth Believe Ads

Believe Ads	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DK	4061	.	.	.
INAPPLICABLE	354037	.	.	.
REFUSED	1667	.	.	.
Do Not Believe	532819	7.9	532819	7.9
Scale Point 2	884031	13.1	1416851	20.9
Scale Point 3	2016392	29.8	3433243	50.8
Scale Point 4	1961023	29.0	5394266	79.8
Believe Very Much	1369208	20.2	6763474	100.0

Table 3-14
How Much Youth Recall Ads

Recall	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None (0)	354037	5.0	354037	5.0
Aided (1)	709427	10.0	1063465	14.9
Unaided (4)	6059774	85.1	7123239	100.0

Parents

Domain of the construct. The knowledge construct was designed to capture information regarding what specific facts parents knew about the various offerings of the army.

Questions. The questions, taken from the Knowledge-Awareness Module of the ACOMS questionnaire, were in the form of a test which for most topics provided multiple-choice responses. The answers to these questions were subsequently coded as right (code = 1) or wrong (code = 0).

Although many topics were covered in this section of the questionnaire, consideration was limited to those questions which related to the active Army, and were the subject of Army advertising. Thus, for example, questions assessing knowledge about the Marines or Army Reserve were deleted as was a question regarding the sponsor of the Scholar-Athlete Award since this information was conveyed via high school posters rather than Army advertising.

The six questions which remained dealt with:

1. PXKAEARN: Amount of Army education benefits
2. PXKAGIAR: Minimum Army Enlistment period
3. PXKADEP: Availability of Army GI Bill
4. PXKAEDBN: Army offering educational support
5. PXKAYRS: Delayed Entry Program, and
6. PXKASAME: Same benefits being available from all services.

Approach. The mean values for each of these variables are presented in Table 3-15 for the parent sample. Since the variables were coded as a zero or a one depending upon correctness, the mean reflects the proportion of parents who responded with the correct answer. It is interesting to note that parents seem well aware that the Army offers funds for college and the availability of delayed entry. Considerably fewer know the amount of these benefits (27%) or the minimum enlistment period (40%). Finally, less than five percent were aware that similar educational benefits were available from all of the services.

Table 3-15
Parent Knowledge About The Army - Means

Variable	N	Mean
PXKAEARN	842	0.89631150
PXKAGIAR	842	0.79220466
PXKADEP	842	0.81462073
PXKAEDBN	842	0.27168834
PXKAYRS	842	0.39840208
PXKASAME	842	0.04738262

Table 3-16
Parent Knowledge About The Army - Correlations

	PXKAEARN	PXKAGIAR	PXKADEP	PXKAEDBN	PXKAYRS	PXKASAME
PXKAEARN	1.00000	0.17586	0.15376	0.17994	0.03509	0.02191
PXKAGIAR	0.17586	1.00000	0.17621	0.20342	0.12641	0.01680
PXKADEP	0.15376	0.17621	1.00000	0.16192	0.14679	0.00264
PXKAEDBN	0.17994	0.20342	0.16192	1.00000	0.00900	0.08164
PXKAYRS	0.03509	0.12641	0.14679	0.00900	1.00000	-0.04582
PXKASAME	0.02191	0.01680	0.00264	0.08164	-0.04582	1.00000

The correlations among these knowledge questions are presented in Table 3-16. As would be expected, the relationships among these questions are modest at best. That is, knowledge of one aspect of the total Army offering does not imply knowledge (or lack thereof) of the others. The weakest relationships are those of the question asking about similar benefits from all services to the other questions. This too was expected since virtually no one was aware of the correct answer. The maximum absolute value of the correlation between two variables is bounded by the marginal distribution of each variable. Two variables skewed in opposite directions have a maximum positive correlation which can be considerably less than one. Two variables skewed in the same direction have a maximum negative correlation which can be considerably higher (i.e., less negative) than -1.

The knowledge construct was operationalized by adding the zero/one coding of these six questions together to form a single measure. The construct can take on values from zero to six, with higher values reflecting greater knowledge about the Army's offerings. It is worth noting that these variables were not factor analyzed since they are conceptually distinct elements of knowledge, a fact borne out by the correlations.

The frequency distribution of knowledge scores is presented in Table 3-17 for the parent sample.

Youth

Similar procedures were utilized to develop a knowledge scale for the youth portion of the sample. The same questions, coded in the same fashion, form this construct as well. The means of the variables presented in Table 3-18 suggest that the pattern of knowledge for youth is much like that of their parents, although the means are slightly higher for the youth. The correlations among these variables (Table 3-19) for youth are much like those for the parents. Finally, the frequency distribution of the knowledge construct is presented in Table 3-20 and shows a similarity between parents and youth as well.

Table 3-17
Frequency Distribution of Parental Knowledge Construct

KNOW	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.	3370029	.	.	.
0	35264	1.1	35264	1.1
1	278472	8.3	313737	9.4
2	489527	14.6	803263	24.0
3	1052057	31.4	1855321	55.3
4	1123757	33.5	2979078	88.9
5	351014	10.5	3330092	99.3
6	21994	0.7	3352086	100.0

Table 3-18
Youth Knowledge About Army - Means

VARIABLE	N	MEAN
YXKAEARN	2250	0.95527469
YXKAGIAR	2250	0.87547978
YXKADEP	2250	0.84005687
YXKAEDBN	2250	0.27982382
YXKAYRS	2250	0.37958652
YXKASAME	2250	0.15893428

Table 3-19
Youth Knowledge About The Army - Correlations

	YXKAEARN	YXKAGIAR	YXKADEP	YXKAEDBN	YXKAYRS	YXKASAME
YXKAEARN	1.00000	0.13603	0.10297	0.13488	0.05211	0.09406
YXKAGIAR	0.13603	1.00000	0.15346	0.11104	0.08306	0.10986
YXKADEP	0.10297	0.15346	1.00000	0.12012	0.09909	0.03485
YXKAEDBN	0.13488	0.11104	0.12012	1.00000	0.12703	0.09825
YXKAYRS	0.05211	0.08306	0.09909	0.12703	1.00000	0.07744
YXKASAME	0.09406	0.10986	0.03485	0.09825	0.07744	1.00000

Table 3-20
Frequency Distribution of Youth Knowledge Construct

Know	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.	3524342	.	.	.
0	24034	0.7	24034	0.7
1	107292	3.0	131326	3.6
2	474815	13.2	606141	16.8
3	1231908	34.2	1838049	51.1
4	1120992	31.1	2959041	82.2
5	518637	14.4	3477678	96.6
6	121219	3.4	3598897	100.0

Constructs Unique to Parental Sample

Parental Feeling Toward Military

Domain of the construct. To the extent that parents are involved in planning the future of the youth involved, it is important to consider explicitly the parent's feeling toward military service. This construct is intended to capture that feeling.

Question. The question, taken from the Parental Influence Module of the ACOMS questionnaire, asks For most young men, do you think service in the military is . . .

definitely a good idea 4
probably a good idea 3
probably not a good idea 2
definitely not a good idea?. . . . 1

Approach. This question was used as a direct measure of the parent's feeling about military service. The frequency distribution is presented in Table 3-21.

Parental Actions Toward Youth

Domain of the construct. The ultimate aim of most advertising programs is to enhance the likelihood of response on the part of the target audience. In the case of Army advertising and its influence on parents, the hoped for result is encouragement by parents for youth to consider Army enlistment. This construct is intended to capture the influence of such encouragement.

Questions. The questions, taken from the Parental Influence Module of the ACOMS questionnaire covered a variety of topics including frequency and nature of parental interaction with youth regarding future plans, parental perceptions of the various alternatives, specific actions taken, and perceived influence on the youths' ultimate decision. For present purposes, four questions were selected. They dealt with:

1. parent's influence on enlistment
2. parent talked to youth about enlisting
3. parent pointed out service advertisements
4. parent suggested youth talked to recruiter

Table 3-21
Parental Feelings Toward Army

PAFCT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.	336343	.	.	.
1	249053	3.9	249053	3.9
2	799789	12.5	1048842	16.4
3	3663436	57.4	4712278	73.8
4	1673495	26.2	6385773	100.0

Note: PAFCT = (5 - PIMENMIL), and PIMENMIL = Should young men serve in Army ?

Table 3-22
Parental Actions Toward Youth

PACT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.	166861	.	.	.
0	2824512	43.1	2824512	43.1
1	849080	13.0	3673592	56.0
2	1071966	16.4	4745557	72.4
3	407557	6.2	5153115	78.6
4	741607	11.3	5894722	89.9
6	413768	6.3	6308490	96.2
8	122760	1.9	6431249	98.1
9	54609	0.8	6485859	98.9
12	69396	1.1	6555254	100.0

Note: PACT = [(5 - PINFMIL) * (PITLKMIL + PIPOIADS + PISUGREC)], and PINFMIL: Self-report influence on enlistment
PITLKMIL: Talked to Y about enlisting
PIPOIADS: Pointed out service ads
PISUGREC: Suggest Y talk to recruiter
all are coded as 0 = no, 1 = yes.

The first question was a self-report measure of influence of parent on youth. It utilized a five point scale ranging from a great deal of influence (1) to no influence at all (5). The last three questions dealt with specific behaviors related to encouraging enlistment and are coded yes (1), no (2).

Approach. The first question was reverse coded so that higher numbers represented more influence. This is normally accomplished by subtracting the response from a value equal to a number one greater than the number of points on the scale thereby flipping the scale end for end. In this case however, the response of no influence at all was taken literally. Thus, the response to the item was subtracted from five (rather than six) resulting in a zero to four scale, where zero reflected no influence.

The last three questions were recoded to a standard 0 (no), 1 (yes), format. These three questions were then summed to form the total number of encouraging actions in which the parent engaged. This sum was then multiplied by the response to the first question to weight it by the self-reported influence. Thus, this operationalization of the construct should correspond to effective parental influence.

The frequency distribution for the construct is presented in Table 3-22. It appears as a relatively skewed distribution with 43% of the parents having no effective influence. For the remaining 53% which do claim influence, however, the distribution seems to exhibit a reasonable spread.

Constructs Unique to Youth Sample

Social Influence on Youth

Domain of the construct. By the time a youth reaches the stage of a decision regarding his future, he has developed a number of reference groups which may influence behavior. It is important to consider therefore, the feelings of others (as perceived by the youth). This construct is intended to capture how the youth perceives a number of others would feel if he were to enlist in the Army.

Questions. The questions, taken from the Social Influence Module of the ACOMS questionnaire, ask how the youth thinks others would feel about his joining the Army. The responses are coded on a five point scale from a very bad idea (1) to a very good idea (5). Youths are asked about:

1. Father
2. Mother
3. Army friend
4. Friend with Army experience
5. Friend with military experience
6. Friend with no military experience
7. School counselor
8. Teachers
9. Co-workers
10. Fellow students
11. Employer

Approach. An additional code of six was used for any of the potential influencers who were deceased, not applicable, etc. Values of six were therefore considered as missing data in the analysis. To avoid the possibility that this would introduce significant reduction in sample size, the correlation matrix was estimated using pair-wise deletion as described above. This correlation matrix of 11 variables was then submitted to a principal components analysis to identify underlying dimensions. The results are presented in Table 3-23. Two factors were extracted (via the eigenvalue > 1 criterion) and rotated (varimax).

The first factor, characterized by uniformly high loadings, seems to reflect the influence of all but friends who have some experience with the Army or the military in general. Although even these two variables load positively on the first factor, they define the second factor. It is likely however, that the incidence of friends in the military is relatively low. To assess the factor intercorrelation, the factors were also obliquely rotated (Promax). The relatively high correlation of r = .44 (Table 3-23, bottom) suggests the appropriateness of a single factor. Therefore, the social influence was operationalized as the sum of responses to these 11 questions.

Several additional points deserve mention with regard to this construct. First, recall that the parent model and the youth model were not simultaneously estimated in this research for the reasons reported above. If both were estimated as a part of the same model (via the parent-linked sample), it would be advisable to delete both mother and father from this measure. Their influence on the youth would more appropriately be captured by the parental actions construct. Under these conditions, failure to remove them from this measure would likely cause estimation difficulties due to lack of discriminant validity.

Table 3-23
Rotated Factor Pattern of
Social Influence on Youth

	Factor1	Factor2
Father	0.61222	0.32100
Mother	0.62403	0.23975
Army Friend	0.18602	0.88997
Friend Mil Exp	0.19824	0.88294
Friend No Exp	0.60892	0.00548
Counselor	0.68481	0.26170
Teachers	0.72888	0.23683
Co-workers	0.76046	0.17041
Students	0.71185	0.15326
Employer	0.74268	0.13651
Variance Explained by Each Factor		
	3.845729	1.927913

Note: Correlation of Fact1 and Fact2 = .44

Second, given the nature of the questions asked in this module, it is possible that the responses actually reflect the youth's feelings rather than those of the others asked about. That is, it is possible to imagine these questions more as projective than substantive. To examine this possibility, the 11 questions listed above were factor analyzed with the beliefs of the youth about the Army. To the extent that the responses were simply projections of the youth's own beliefs, a single factor should have emerged. It did not. Although there was some shared variance, three distinct factors emerged corresponding to the structure of beliefs of youth and feelings of others. Thus, it appears that the social influence construct does reflect how others feel about Army enlistment for the youth in question.

Youth's Intentions with Regard to Army

Domain of the construct. Although many factors may influence the ultimate path a youth selects, an important determinate of this choice is intention to at least further investigate a particular course. This construct is intended to capture the youth's intentions with regard to the Army.

Question. The question, taken from the Intentions and Propensity Module of the ACOMS questionnaire, asks "How likely is it that you will do something about joining the Army (such as, see an Army Recruiter, call a toll-free number, answer an Army ad, or visit an Army base)? Would you say . . .

definitely 1
probably 2
probably not 3
definitely not . . . 4

Approach. The question, used as a single item measure of intentions, was reverse coded so that higher values reflected greater likelihood of taking action to learn more about the Army. The frequency distribution of this construct is presented in Table 3-24.

Behaviors of Youth With Respect to the Army

Domain of the construct. The ultimate aim of Army advertising is, of course, enlistment on the part of the prime prospect. Thus, a key variable in any investigation of effectiveness is desired behaviors of youth motivated by the advertising. This construct is intended to capture those behaviors which indicate that a youth is considering a positive enlistment decision.

Table 3-24
Intentions - Prob Youth Will Do Something About The Army

YPROBADO	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DK	45207.4	.	.	.
REFUSED	744.288	.	.	.
DEFINITELY	680112	9.6	680112	9.6
PROBABLY	1501250	21.2	2181362	30.8
PROBABLY NOT	2774266	39.2	4955628	70.0
DEFINITELY NOT	2121660	30.0	7077287	100.0

Questions. The questions, taken from the Behaviors Module of the ACOMS questionnaire, addressed many behaviors associated with the information gathering process relating to career choice. Questions concerned activities related to going to college, getting a full-time civilian job, and joining the Army. For present purposes, consideration was limited to behaviors associated with gathering information about the Army as an alternative. The behaviors include:

1. YBAEVEREC: Talking to a military recruiter,
2. YBATALK: Talking to anyone about joining the Army,
3. YBAGIFT: Responding to an Army ad by sending for gift, or
4. YBAVISIT: Visiting an Army recruiting station.

Other actions related to consideration of the military were also addressed by the ACOMS questionnaire, but were not necessarily related to voluntary actions on the part of the youth. For example, youth were asked if they had ever taken the ASVAB test. However, some high schools administer this test to all students and it therefore is not necessarily related to advertising. Questions of this type were not considered.

Approach. The questions above were coded 0,1 reflecting that the youth did not/did engage in the behavior, respectively. Since these behaviors were conceptualized as independent actions, a principal components analysis did not seem appropriate. Rather the items seemed more consistent with a Scalogram approach developed by Guttman (1941,1944) and extended by others (Proctor 1970). In a Guttman scale, the items are ordered such that an individual responding positively to an item (i.e., engaging in the behavior), would be expected to answer positively to all items below it in the order. The ability of the items to be ordered in such a manner indicates the degree to which the items form a scale.

The results of Guttman analysis are presented in Table 3-25. Although a variety of measures are available to assess the fit of the scale, it is obvious that there were considerably fewer errors in classifying individuals than correct assignments. In addition, the coefficient of reproducability seems adequate for present purposes. Thus, the behavior construct was operationalized as the sum of the 0,1 codes for the four questions listed above.

One additional point about this measure deserves mention. The questions which addressed these actions varied in terms of the period during which the behaviors could have taken place. Thus for example, the time frame for talking to a recruiter was ever, while talking to anyone about the Army was

Table 3-25
Guttman Analysis of Youth Behaviors With Respect to Army

GUTTMAN SCALE SCORE	YBAGIFT No(0) Yes(1)	YBAVISIT No(0) Yes(1)	YBATALK No(0) Yes(1)	YBAEVREC No(0) Yes(1)	TOTAL
4	0* 40	0* 40	0* 40	0* 40	40
3	186 76*	67* 195	8* 254	1* 261	262
2	720 87*	735 72*	116* 691	43* 764	807
1	1673 48*	1706 15*	1371 350*	413* 1308	1721
0	1593 0*	1593 0*	1593 0*	1593 0*	1593
PERCENT	94 6	92 8	69 31	46 54	

* RESPONSES IN ERROR

COEFFICIENT OF REPRODUCIBILITY	0.9267
MINIMUM MARGINAL REPRODUCIBILITY	0.7763
PERCENT IMPROVEMENT	0.1505
COEFFICIENT OF SCALABILITY	0.6726

restricted to the last six months. Even when time frames for questions were comparable the possible impact of telescoping (Loftus 1986) should be considered. Given that only four quarters of data were available from the ACOMS project, these differences bring into question where in the model the behavior construct belongs. This issue is of less concern, however, in a prototype model than for one intended to provide the basis for substantive conclusions.

Background Factors

Virtually all efforts at modeling human behavior take into account the fact that individuals are different and that they cannot be expected to behave identically. These differences are usually accounted for by what are termed 'background factors' that include a host of variables which are specific to the individual. Frequently these variables are used to group or segment individuals.

In the case of reactions to, and effects of, Army advertising, many of the important background factors are strongly related the likelihood that an individual will score in the top categories on the Armed Forces Qualification Text (AFQT), the military's entry test for trainability. Test Score Category I-IIIA is comprised of individuals who score at or above the 50th percentile on the AFQT. The ACOMS database contains a measure (Orvis & Gahart, 1987) of the probability that an individual would score in TSC I-IIIA. Since this is a direct measure of the characteristic of interest and since it is an index which is developed from many of the background factors which would have been included, it seemed more efficient to directly use the index itself. Thus, the measure, HIWGT, labeled as I-IIIA Prob in the model was incorporated as a predictor. Its presence in the model can account for the background factors and its relationship to the other constructs will suggest the effect of advertising on more desirable recruits.

Perceptions of Army Attributes

A critical component of any model of advertising effectiveness is the measurement of the perceptions or beliefs of the target audience about the object being advertised. The development and management of perceptions and beliefs is advertising's primary role, and it is through perceptions or beliefs that advertising can be expected to exert its primary influence. Thus, the correct modeling of this component of the model is critical to the research effort.

The attributes chosen for inclusion in the ACOMS data are all positive attributes and are all the focus of current or

recent Army advertising (see Table 3-26). No "negative" attributes are included, and no attributes which have not been at least indirectly incorporated in recent campaign themes are present. As a result, while the attributes are quite appropriate as reflections of the result of Army advertising, they may not be the attributes one would choose if the primary goal of the research effort were the modeling of choice, per se.

An examination of Table 3-27, which contains descriptive statistics for the fourteen Army attributes measured in the ACOMS data, suggests that Army advertising has been very effective in communicating these beliefs and perceptions to youth. The vast majority of youth agree or strongly agree with each of the statements. While this is a strongly favorable result for Army advertising, it presents some difficulties in a modeling effort such as this. If virtually all youth believe that the Army possesses each of these attributes, yet only a few take action with regard to enlistment, it is unlikely that the predictive power of beliefs about Army attributes will be high. In a purely statistical sense, the skewed distributions reported in Table 3-27 present further difficulties. With all of the available attributes skewed in the same direction, it is clear that correlations among the attributes, which serve as the basis for constructing a measurement model, will be generally high and positive, and that distinguishing among the attributes or subsets of attributes will be difficult.

This is just the result obtained from a common factor analysis of the Army attributes. The first principal component (or the first factor when common factor analysis is conducted) overwhelms the remaining components. While by some criteria, and on some subsets of the data, one can rationalize the rotation of a second component or factor, the dominance of the first renders the amount of variance in the original items accounted for by the remaining factors small and difficult to interpret.

This result is quite similar to that obtained in the Westat analysis of the first three quarterly ACOMS data sets (Wilson, Davis, & Greenlees, 1988), wherein the report concludes that there is a single unidimensional "perceptions" construct. However, the usefulness of a single component representing all available Army attributes is limited, in that few actionable recommendations can be made on the basis of a single global perceptions or beliefs measure, and the richness of a multiattribute characterization of the elements in the choice set is lost.

Table 3-26
Variable Definitions For Youth Beliefs About The Army

Variable	Definition
WIDE	Wide variety of opportunities to find a job you like
STEP	Advantage over going right from high school to college
CIVCAR	Great value in civilian career development
HITECH	Chance to work with latest hi-tech equipment
TRAIN	Many opportunities for training in useful skill areas
HIQUAL	Many chances to work with highly-trained people
SELCON	Opportunity to develop self-confidence
POTEN	Opportunity to develop your potential
MENTAL	Mentally challenging experience
MATURE	Opportunity to become more mature and responsible
CASHED	Excellent opportunity to obtain money for college
PHYS	Physically challenging environment
PROUD	Experience you can be proud of
LEADER	opportunity to develop leadership skills

Table 3-27
Perceptions of Army Attributes--Youth

Belief	Mean
WIDE	3.57
PHYS	4.19
PROUD	3.85
STEP	3.26
LEADER	3.90
HITECH	4.09
CIVCAR	3.47
SELCON	3.90
POTEN	3.83
MENTAL	3.75
MATURE	4.02
TRAIN	3.93
HIQUAL	3.94
CASHED	4.05

Modeling the G-Factor

As noted above, the generally high agreement of respondents with each of the statements regarding attributes of the Army suggests that recent Army advertising has been quite successful. On the other hand, not all respondents agree with every statement, and the item intercorrelations are higher than the constraints on the correlation coefficient imposed by the marginal distributions indicate they must be. In effect, we find that individuals who agree with any of the statements tend to agree with all of them, while those who do not agree with any of the statements tend to not agree with all of them. Respondents seem to be failing to make distinctions among the attributes, and seem to be taking them all "as a group" and agreeing or disagreeing on the basis of some overall perception. It is this overall perception which is contributing, along with the success of Army advertising, to the strong first component.

Such a phenomenon is not uncommon when respondents are asked to assess the attributes of an object. First termed "halo" by Thorndike (1920), it is the result of the respondent's perception of the presence of each attribute being based on that respondent's general liking or disliking, in a holistic sense, of the object. If a respondent has a positive global predisposition toward an object, he or she rates the object as possessing all of the positive attributes, to a greater or lesser degree, while if the respondent is generally negatively predisposed, the object is rated as not possessing positive attributes, again to a greater or lesser degree. If the attributes are the "controllable" variables of interest, one objective of the modeling effort must be to isolate the correlation among attributes due to generalized affective overtones, or halo, in order to proceed with the modeling of structure among the attributes which is attributable to variations in responses not accounted for by the global predisposition (Beckwith and Lehman, 1975; Cooper, 1981).

Given the long recognition of the problem and the wide use of ratings of objects on attributes as the core-component of many modeling efforts, several methods have been suggested for dealing with "halo-obscured" data. Among the methods which have been suggested are:

1. Defining the first factor as generalized affect, and rotating the remaining interpretable factor (Myers, 1965). This suggestion is consistent with the interpretation of the first unrotated factor as a "general size factor related to average differences among subjects."(Cattell, 1966)

2. Identifying those attributes which correlate highest with the first principal component or factors, and regressing each of the remaining attribute ratings on these strongly affective attributes. The residual scores from these multiple regressions are then used for further analysis. This approach essentially operates on the partial correlation matrix, with global affect having been partialed out (Holbrook and Huber, 1979).

3. Defining each respondent's position on the scale across attributes as an indication of generalized affective response, and subtracting it. In this approach, the data matrix is "double centered" by first standardizing the data by column (traditional standardization), followed by a row centered standardization, which subtracts each respondent's mean attribute rating from each individual attribute rating. Data are thus (standardized) differences of each individual around his or her own mean (Dillon et al., 1984). The data as transformed can then be analyzed without the interference of the first factor relating to average differences, since each subject's average is the same (zero).

While a detailed discussion of the strengths and weaknesses of each of the above approaches is beyond the scope of this report, procedures generally consistent with each of the above were conducted on the ACOMS data to determine if there was in fact any interpretable structure in the ratings of the fourteen Army attributes beyond the first global factor. All three approaches yielded similar, although not identical interpretations. The first approach, that of simply rotating the second through p^{th} principal factors, is reported in Table 3-28. It is chosen, despite the limitation noted by Holbrook (1984) that "it generally produces components with low and difficult to interpret loadings," on the basis of its general simplicity and the relative ease of communicating its results. Since these results are in general agreement with the other methods and, as will be discussed, are subjected to a relatively rigorous confirmatory analysis, some confidence is gained in the legitimacy of the resulting structure.

Findings--Youth Model

A principal axes common factor analysis was conducted on the fourteen attributes on which the Army was rated. The strong first factor found in previous analyses of the ACOMS data remains evident, with an eigenvalue of 6.28, and explaining over 40% of the common variance (with prior communalities estimated using squared multiple correlation coefficients obtained from regressing each attribute on the remaining thirteen). The next three factors, are associated

Table 3-28
Rotated Factor Pattern of Youth Beliefs (1st Factor Not Rotated)

	Future	Experience	Develop
WIDE	0.20379	0.07272	-0.08743
STEP	0.27458	-0.02127	-0.03805
CIVCAR	0.21784	-0.04646	0.04081
HITECH	-0.06540	0.17887	-0.06735
TRAIN	0.03134	0.22950	-0.01463
HIQUAL	-0.07879	0.23111	-0.04902
SELCON	-0.08148	-0.17012	0.14268
POTEN	0.02133	-0.07663	0.16847
MENTAL	0.00651	0.00844	0.11265
MATURE	-0.09304	-0.08387	0.10360
CASHED	-0.00152	-0.00780	-0.21372
PHYS	-0.24910	-0.07805	-0.13369
PROUD	-0.07068	-0.14086	-0.03902
LEADER	-0.06289	-0.08468	-0.01823
Variance Explained by Each Factor			
	0.26264	0.22105	0.15547

with eigenvalues lower than the average initial communality estimate. Nonetheless, they have eigenvalues that are substantially greater than the remaining factors and which decline rapidly from factor to factor. The remaining eigenvalues are at a consistently low level. The first factor was thus dropped, and factors two-through-four were rotated subject to the Varimax criterion.

An interpretation of the largest positive loadings in each of the rotated factors suggests an interpretable and intuitively appealing structure. The first rotated factor (the second factor overall) loads strongly on wide variety of jobs, stepping stone to college, and civilian career development. These attributes seem to be clearly associated with future opportunities available after service in the Army, and we have thus labeled this factor Future. The second rotated factor reflects attributes of the Army experience itself, loading on items reflecting the use of "high-tech equipment", the "opportunity to work with highly skilled co-workers", and "training in useful skills." While these items all deal with skills and training, they are the only three of the fourteen items which do not have a future or developmental connotation, and we have labeled this factor the Experience factor. The third rotated factor is the least ambiguous of the three, and we have labeled it Development to reflect its association with items relating to personal development, such as develop self-confidence, develop your potential, opportunity to become mature and responsible, and mentally challenging.

Confirmatory Analysis

The loadings shown in Table 3-28 are uniformly small, and the factors exhibit larger negative loadings than one usually observes in a common factor analysis. This is expected, based on the amount of variance accounted for by the first factor and the tendency of this approach, as noted above, to yield solutions of this type. As also noted above, other methods yield highly similar results. In order to more rigorously assess this solution, however, a maximum likelihood confirmatory analysis was employed to assess the overall fit of the three facet solution with a general factor as compared with a one-factor solution.

The confirmatory factor analysis was conducted using the LISREL VI software for the analysis of covariance structures (Joreskog & Sorbom, 1986). This methodology allows the assessment of the fit of data to a hypothesized structure. As opposed to exploratory factor analysis, which allows only the specification of the number of factors to be rotated, confirmatory factor analysis allows a specification of fixed

and free loadings in the factor loading matrix, with the fixed elements fixed at any value, including zero. Thus, cross loadings of an observable on more than one factor can be restricted, with a resultant "congeneric" measurement model (Joreskog, 1971). Further, one can specify second-order factors which account for covariance among first order factors, which themselves are directly related to the observable variables in the model.

As noted in the second chapter, several measures of goodness-of-fit are available, all based on some function of the difference between the observed sample covariance or correlation matrix and the covariance or correlation matrix reproduced as a function of the estimated parameters in the model. As such, alternative models can be compared. While in this case the hypothesized structure was derived from an exploratory analysis of the same data, thus rendering true statistical probability statements invalid, competing structures can be compared and evaluated on the several goodness-of-fit criteria.

Second-Order Factor

The hypothesized structure, as suggested by the orthogonal rotation of the second through the fourth principal components derived from exploratory analysis, is depicted in Figure 3-1. Based on the strong first principal component, as discussed previously, we suspect a strong general factor representing generalized affect toward the Army, with the first order factors representing those Army attributes which tend to correlate more strongly among themselves than the already high interattribute correlation attributable to generalized affective response.

Higher-order factor structures are a common occurrence with attribute rating-type data (Gerbing and Anderson, 1984). Such higher-order factors may arise from a variety of circumstances, including the "halo" or generalized affective overtones discussed previously. Whether one chooses to model the G-Factor or the orthogonal facets depends on the purpose of the research. For the purposes of theory building and development, often it is the higher-order factor which is of interest. In the case of modeling perceptual response to Army advertising, the facets represent the actionable level accessible through intervention strategies and message content adaptation. The model in Figure 3-1 suggests three first-order factors whose intercorrelation is accounted for by a single second-order factor.

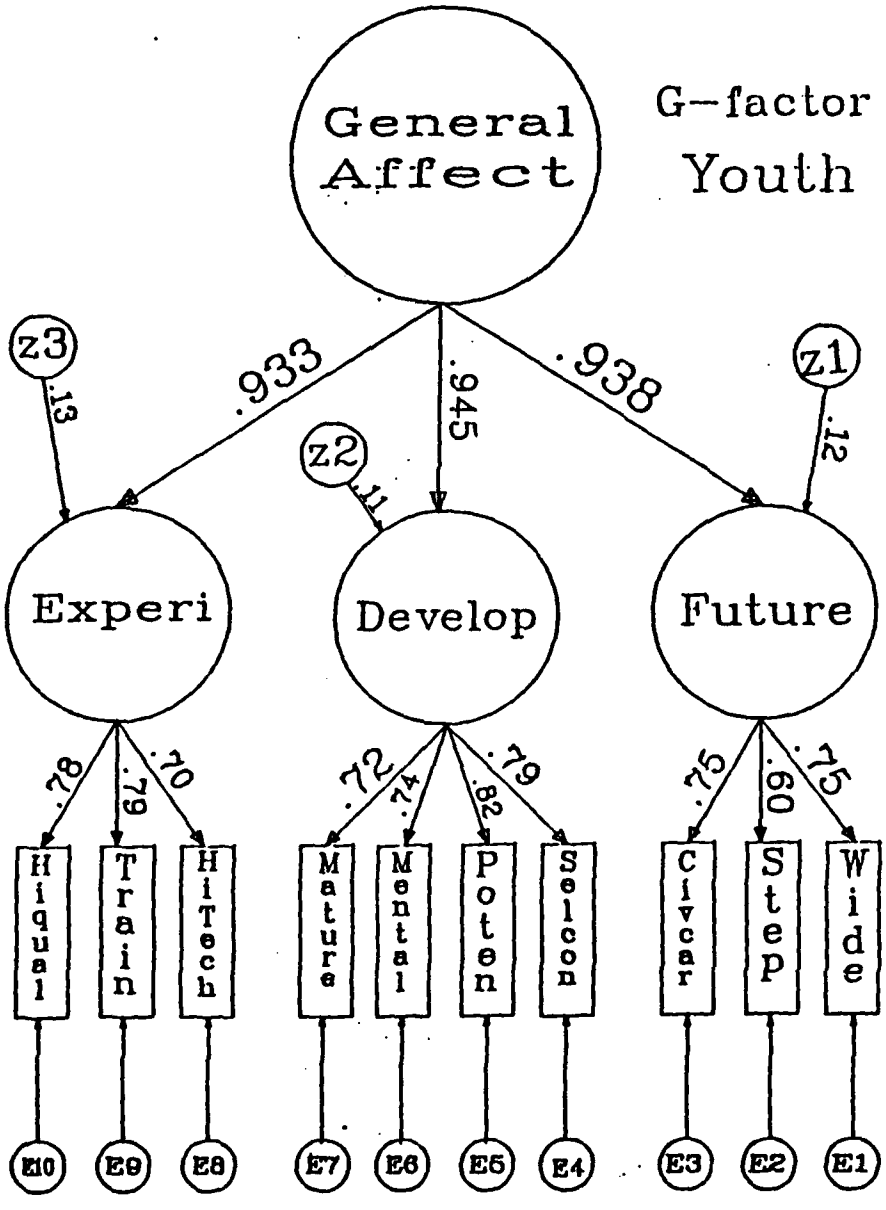
Procedure

The weighted correlation matrix was used as input, and "pairwise" deletion was employed in the case of missing data, such that the correlations which formed the basis for analysis were based on differing sample sizes. With a matrix of this type, there is no guarantee that it is positive definite; this was not a problem in this analysis. Such a matrix does violate the assumptions of the LISREL maximum likelihood procedure, in that the chi-square statistic and standard errors are computed on the basis of the estimated variance-covariance matrix of a sample variance-covariance matrix, not a correlation matrix. The chi-square statistic reported may thus not follow a chi-square distribution, and should be used only as an index of fit, and not a statistical test for the rejection of the null hypothesis with a specified level of Type I error.

The model was identified by fixing the factor loading of one of the indicants of each of the constructs (including the second order construct) to 1.0. This provides a metric for the otherwise undefined scale of the unobservable, while leaving the associated measurement error variance free to be estimated. This allows for the estimation of the measurement error associated with each indicant. The loadings of the observables on the three first-order factors are indicated as elements in LAMBDA, while the second-order measurement loadings are given by the matrix GAMMA. Measurement error in the first-order observables is contained in the THETA-EPSILON matrix in this model, while the PSI matrix contains the unique and specific error variance associated with the three first-order factors as indicants of the second-order factor. It should be noted that the second-order measurement model in this case is "just-identified", in the sense that three inter-construct correlations are used to estimate three factor loadings. Thus, this model is functionally equivalent to the estimation of three interfactor-correlations in a first order model.

Results

As can be noted in Figure 3-1, the model provides a good fit to the observed data. As suggested in the second chapter, the chi-square statistic is a direct function of sample size and, due to the use of the correlation matrix as input, may not be distributed as a chi-square random variable. It remains a useful index of the fit of the model, however. For the Youth data, with an arbitrary sample size of 500, the chi-square value is 43 with 32 degrees of freedom, suggesting an adequate model. This is corroborated by the Goodness-of-Fit index produced by the LISREL software, which is .97, with a



CHI-SQUARE = 43 d.f. = 32 GFI = .97

RMSR=.02

Figure 3-1. General-factor model for youth.

maximum value of 1.0. Further, the root-mean-square residual (the square root of the average squared difference between the observed correlation matrix and the correlation matrix reproduced as a function of the estimated parameters) is .02, which is highly acceptable.

Finding that a given model seems to fit the data does not mean that other models may not also fit. In particular, given the previous findings suggesting a unidimensional structure of beliefs (Wilson et al., 1988), and the strength of the general factor in both the confirmatory and exploratory models, we fit a single-factor model to the data, again using LISREL VI. The one factor model is equivalent to fixing the interfactor correlations to 1.0 (or the GAMMA estimates in Figure 3-1) while constraining all latent constructs to a variance of 1.0. The result is a gain of three degrees of freedom, but the fit of the model is reduced substantially. With thirty-five degrees of freedom, the chi-square value for the unidimensional model is 112, or alternatively, the gain of three degrees of freedom "cost" 69 chi-square points. The GFI decreased to .95, and the RMSR increased from .2 for the second-order three facet model to .04 for the unidimensional model.

Of course, it is not possible to assess the pragmatic usefulness of this solution vis-a-vis a one-factor solution entirely on the basis of interitem correlations or factors derived therefrom. If the three factors are predicted equally by prior constructs in the model, and relate equally to key constructs hypothesized to be outcomes of beliefs, then a one-factor solution would be preferred on the basis of parsimony. This will be assessed in the context of model estimation, discussed in the fourth chapter.

Findings--Parent Model

Procedures followed for the modeling of parental beliefs about Army attributes were identical to those described above for the youth data. The first common factor was again attributed to a combination of success in communicating Army attributes and to generalized affective response, or halo. All three methods for dealing with the halo effect were examined, as were the rotation of from two to four factors beyond the first factor. Table 3-29 presents the results of Varimax rotating factors two through four of a common factor analysis. The resulting factors seem to be interpretable in a manner quite similar to the youth data. The largest positive loadings on the Development factor are from the same items as the youth data; i.e., "Self Control", "Potential", "Mental Challenge", and "Maturity". The Experience factor is somewhat different in terms of items, but seems similar in terms of

Table 3-29
Rotated Factor Pattern of Parent Beliefs (1st Factor Not Rotated)

	Develop	Experien	Future
SELCON	0.24665	0.01441	-0.03785
POTEN	0.17802	-0.12992	-0.03926
MENTAL	0.11167	-0.03131	0.01148
MATURE	0.17572	0.15383	-0.02043
PHYS	0.01929	0.28144	-0.03438
PROUD	0.02570	0.10570	0.10745
HITECH	-0.12787	0.03476	-0.17714
WIDE	-0.17302	-0.09448	0.04831
STEP	0.00509	-0.14018	0.22693
CASHED	-0.08209	0.10979	0.17578
LEADER	0.00546	-0.01017	-0.05568
CIVCAR	-0.01714	-0.15544	-0.03499
TRAIN	-0.19106	-0.04930	-0.07979
HIQUAL	-0.18870	-0.04261	-0.02050
Variance Explained by Each Factor			
	0.26239	0.20246	0.14347

interpretation. "A Physical Challenge" and "An Experience to be Proud of" have relatively high positive loadings, while "Use Hi-tech Equipment" was included to attain as much consistency as possible with the youth model. The "Mature" item from the Development factor alsoloads on this factor. The Future factor is also similar to that found in the youth model, with the exception that "Money for College" is perceived by parents as future-related, rather than "Civilian Career Development".

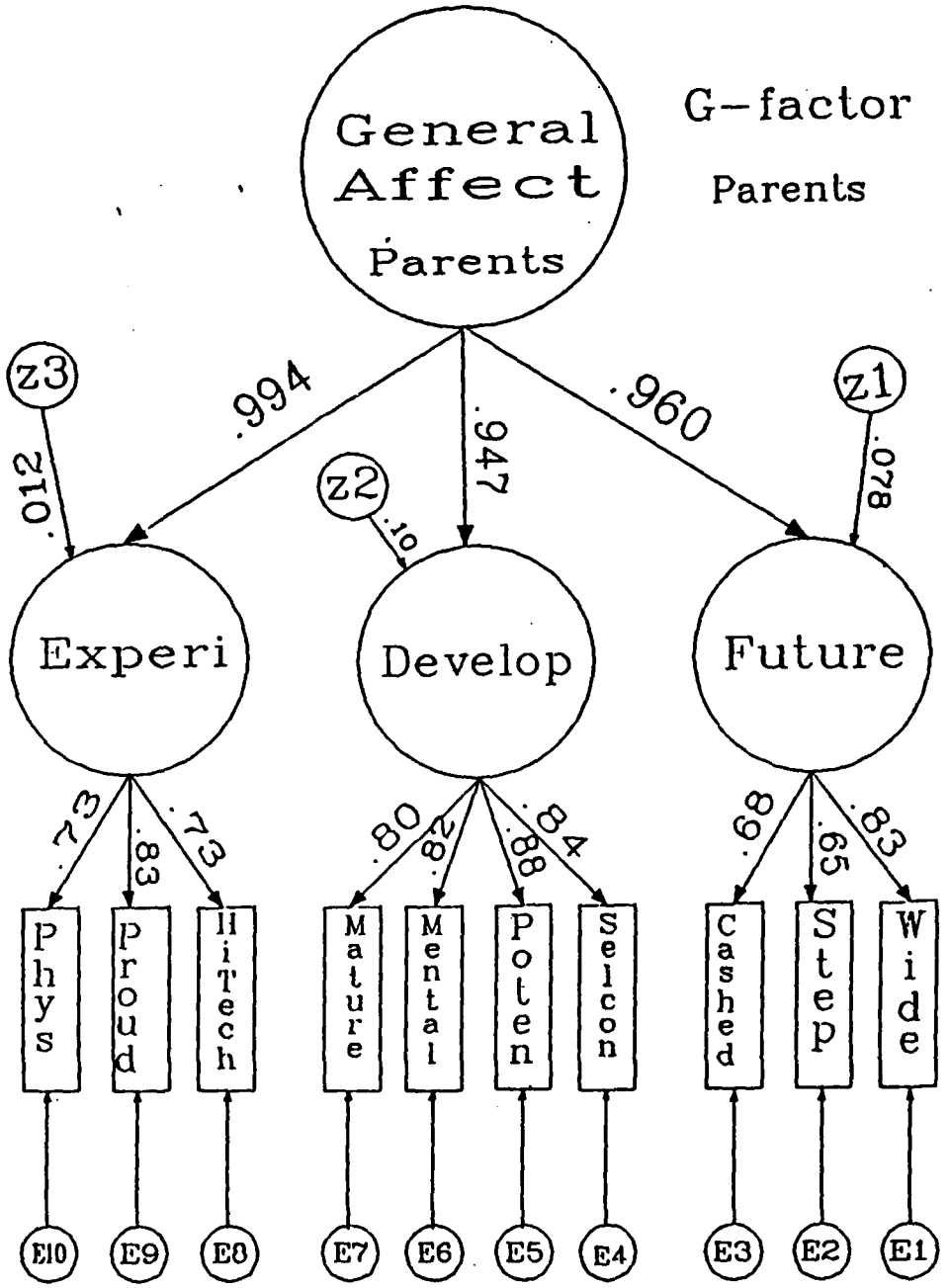
As with the youth data, and perhaps more so, the choice of items as representative of constructs and the labeling of constructs are quite problematic. Thus, a confirmatory analysis was conducted to assess the ability of a congeneric measurement model with a second-order general factor to reproduce the observed data. The results of this analysis (again using LISREL VI software) are presented in Figure 3-2. While the chi-square value for the parent data is 86.5 with 32 degrees of freedom, suggesting a less well fitting structure than for the youth data, the GFI and RMSR both suggest that the fit is adequate.

As with the youth data, the "G-factor with three facets" model fits substantially better that a single-factor, unidimensional conceptualization, which results in a chi-square of 133 with 35 d.f. (chi-square difference = 47 with 3 d.f.), a slightly lower GFI and a higher RMSR.

Discussion

The three factor solution seems adequate for both the youth and parent data. The factors, which we suggest represent personal development, the Army experience itself, and future opportunities resulting from service in the Army have a strong intuitive appeal, and correspond broadly to basic themes present in Army advertising. Further, these dimensions correspond quite well to the dimensions of career choice suggested by Jepsen and Dilley (1971) in their general review of vocational decision making models.

Our confirmatory analysis also suggests the adequacy of three factors with the presence of a strong G-factor, while a similar analysis conducted on a one-factor or unidimensional model of beliefs about Army attributes suggests that such a model is empirically inadequate.



Chi-square = 86.5 RMSR = .024

D.F. = 32 AGFI = .939

Figure 3-2. General-factor model for parents.

RESULTS

Based on the measurement work described in the previous chapter, and the theoretical considerations discussed previously, the model presented in Figure 4-1 was estimated using the LISREL VI software discussed in the second chapter. This model has four exogenous constructs: Social Influence (Soc. Infl.), Hours per week of Television Viewing (TV), the joint construct of hours per week reading and listening to FM radio (Read-FM), and the probability that a youth is I-IIIA. Recruiting-related behavior (Behavior) is the ultimate dependent variable in the model.

Since behavior is a retrospective question covering the last 6-months, however, an equally compelling model would have behavior as an exogenous construct, preceding the attitude formation process. This is not to say that we perceive career choice in general and Army enlistment in particular, as a low involvement decision wherein behavior is often prior to cognition and thus attitude formation; this is simply due to the lack of longitudinal data and the necessity of cross-sectional behavior measures being retrospective. If indeed a youth has contacted a recruiter, called a toll-free number, or any of the other enlistment-related behaviors, he or she may be sensitized to the Army media message, may more closely monitor Army advertising, and may exhibit more knowledge about Army offers, etc. For these reasons, a second model was estimated with self-report behavior included as an exogenous construct.

It is also of interest to determine the value of the three-facet conceptualization of beliefs about Army attributes. To the extent that general affect toward the Army is indeed an important construct, in-and-of itself, and to be consistent with the Wilson et al. (1988) conceptualization of a unidimensional belief structure, the second-order construct is modeled as an endogenous construct, itself leading to intentions and behavior. This model is consistent with the model in Figure 4-1, except that structural paths flowing to and from the three facets of beliefs in figure one are focused on and emanate from the second order factor.

The Parent Model is then estimated, with three exogenous constructs and parental actions toward youth enlistment as the ultimate exogenous construct. Given adequate data, it would be of interest to estimate both the best available youth model and the parent model simultaneously for a linked sample in order to determine the ultimate influence of parental actions on youth intentions and behavior. The Parent Model is depicted in Figure 4-2.

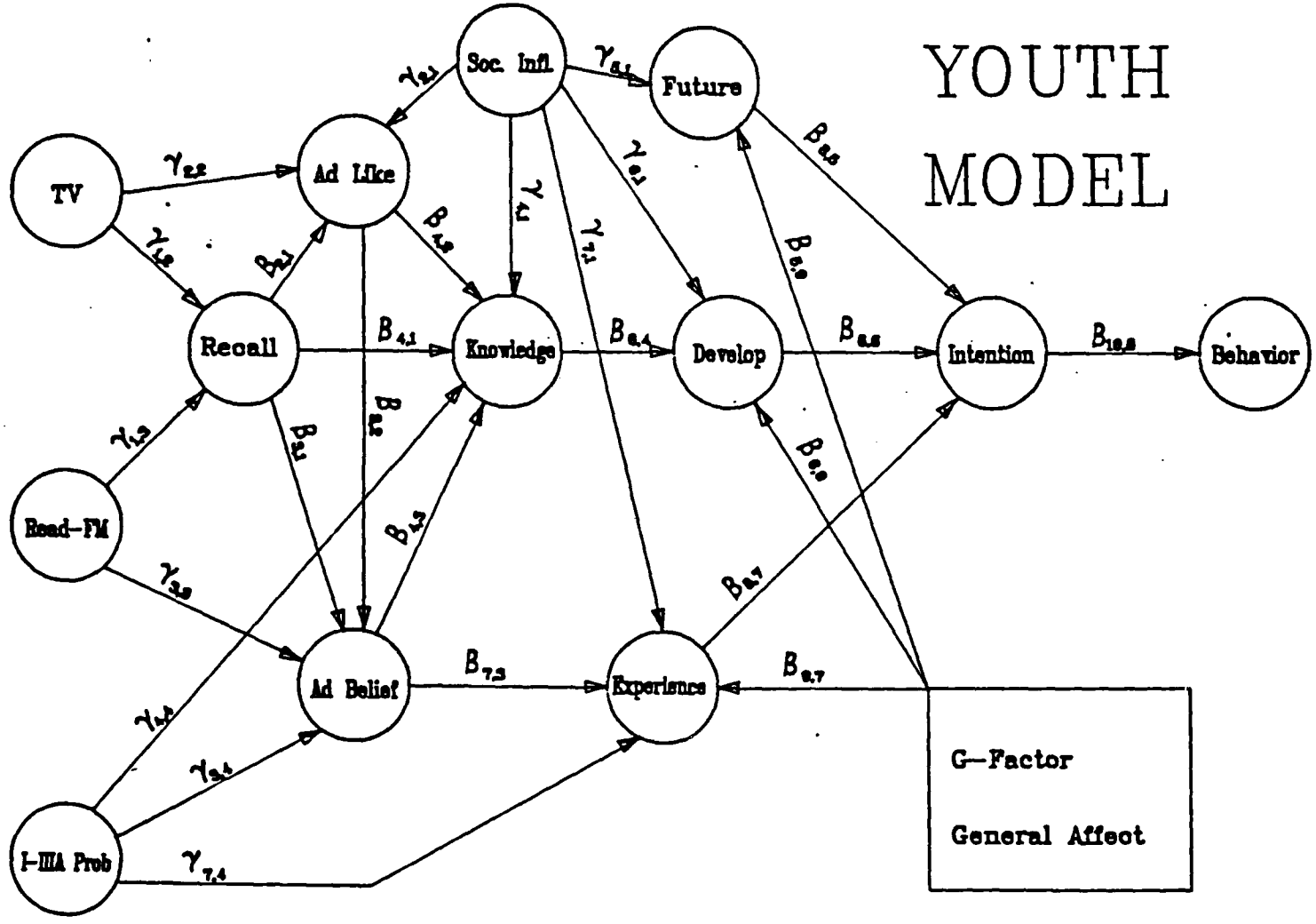


Figure 4-1. Advertising effects model for youth.

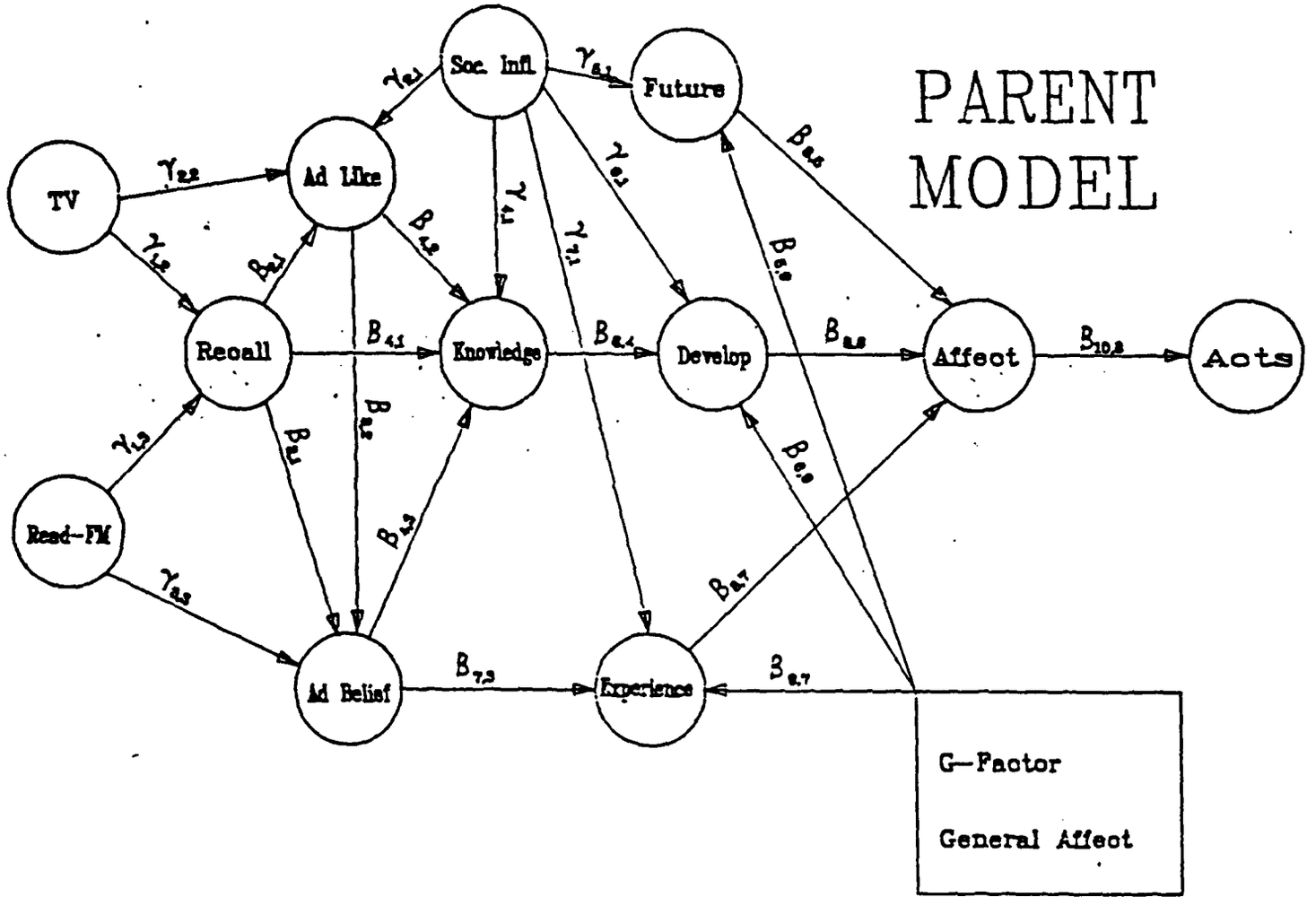


Figure 4-2. Advertising effects model for parents.

Behavior-Last Youth Model

Measurement

None of the exogenous constructs in Figure 4-1, the Youth Behavior-Last Model, are based on the true-score model or the common factor model from which the congeneric model commonly employed in LISREL is derived as a more restrictive version. That is, hours of media exposure is not defined by the intercorrelation, but rather by the sum of its indicants; and social influence is assessing the impact of several mutually distinct significant others in the youth's decision process, not the common component thereof, and is properly conceptualized as an index rather than a factor. Since it imperative that measurement error in exogenous constructs be accounted for to avoid downwardly biased parameter estimates, and since the measurement error in LISREL is defined as non-common (unique and specific) variance, it is necessary to account for measurement error outside the estimation process of the model itself. As noted by Fornell (1983), "... the more common case is that it is not possible to identify the measurement residual [of a single item measure]. Nevertheless, this does not imply that one has to assume perfect measurement and a zero residual (p. 446)." Fornell goes on to note, after discussing large scale findings by Andrews, "... it is probably safe to say that an assumption of at least a 10 percent measurement residual for almost any behavioral or attitudinal measure is more realistic than the traditional assumption of a zero residual (Fornell, 1983; p.446)."

Based on the above, those constructs for which multiple indicators are not available or which do not conform to the assumptions or conceptualization of the restricted common factor model are modeled with an assumed measurement error of 10%. This is an extremely conservative estimate, since the reliability of a composite, as many of these estimates are, is the average of the reliabilities of the (equal variance) scales which form the composite. In any event, since greater measurement error leads to larger parameter estimates in LISREL, it is preferable from the perspective of avoiding type I error to employ conservative estimates, while necessary for the power of the test to employ at least some moderate degree of measurement error.

The measurement parameters estimates for those items/constructs amenable to the measurement model employed in LISREL are presented in Table 4-1 for both the "Behavior Last" and the "Behavior First" construals of the Youth model, since for both models these parameter estimates are the same to at least two decimal places. As can be noted, the second-order factor solution, when estimated in the context of a structural

Table 4-1
Measurement Estimates - Youth Model

Observable/ 1st-order Factor	Construct			
	Future	Develop	Experience	Gen. Affect
Wide	.76			
Step	.62			
CivCar	.74			
SelCon		.79		
Poten		.82		
Mental		.74		
Mature		.72		
Train			.79	
HiTech			.70	
HiQual			.78	
Future				.62
Develop				.70
Experience				.73

model, appears to be quite good. The loadings of the ten observables on the three first-order factors are uniformly high. The loadings of the first-order factors on the second-order factor are also quite reasonable, and are substantially lower than the loadings obtained when the measurement model is estimated without consideration for the structural estimates. This indicates that a large portion of the correlation among the three facets is due to common predictors, and that the shared variance among them, when viewed as a partial correlation after accounting for all shared variance due to prior common exogenous constructs in the model, is high but substantially lower than the zero-order correlations. In particular, one can compare the loadings in the range of .9 or greater in Figure 4-1 with the loadings in the .7 range in the bottom portion of Table 4-1. A model postulating 1.0 loadings of the first-order factor on the second cannot be accepted, accentuating the discriminant validity of the three-facet solution. As will be noted subsequently, the three facets neither have identical paths from predictor constructs nor do they relate equally to subsequent constructs of interest.

Structure

The coefficients shown in Table 4-2 and subsequent tables in this chapter are those which are at least 1.5 times their respective standard error estimates, based on a sample size of n = 1000. Since the weighted correlation matrix computed based on pairwise deletion of missing data was employed, the correct sample size is highly problematic, and standard error estimates are probably understated for a given sample size due to violations of the multivariate normal covariance matrix assumption of LISREL. However, since most of the correlations were based on a sample size of well over 4000, the choice of n = 1000 with a 1.5 standard error cutoff seems to be both reasonable and conservative for a prototype model such as this, wherein one wishes to avoid both Type I and Type II error in the specification of future research. The chi-square value is based on n=500, since it is a direct function of sample size. That is, for samples of over 500, no model will fit the data since even minor departures from perfect reproduction of the input matrix are not likely to be due to sampling error, and the role of the null hypothesis is reversed. Since 500 is a large but clearly acceptable sample size for this type of analysis, corresponding to the n available for any two low-incidence rotating module items, it appears to be a reasonable choice. Again it should be reiterated that strict hypothesis testing should be absolutely avoided in this prototype model, and that while we have a high level of confidence in the parameter estimates themselves, the inferential statistics are not to be trusted.

Table 4-2
LISREL Estimates of Exogenous Effects
in the Behavior-Last Youth Model

Effect On	Effect of			
	Soc Infl	TV	Read-FM	I-IIIA
Recall		.10		.09
AdLike	.35			-.07
AdBelief	.15	.08		
Knowledge	.12	-.07	.06	.27
Future	.25		-.05	-.25
Develop	.21		-.05	-.14
Experience	.19	.07	-.05	-.13
Intention	.26			-.22
Behavior	.16			

Note: Chi-Square = 84.36 d.f. = 113
GFI = .98 RMSR = .018 R^2= .82

The most striking aspect of Table 4-2 showing the standardized structural estimates from the exogenous constructs to the endogenous constructs in the Behavior Last Youth Model is the impact of Social Influence. Clearly, those youth who feel that significant others would approve of their decision to enlist in the Army have more positive responses to all of the endogenous constructs. Again, causal interpretations must be avoided, but the relationship is obviously strong and consistent, all the way from liking and believing Army ads to intentions and enlistment-related behaviors.

Also of interest is the relationship between I-IIIA probability and the endogenous constructs. With the exception of Recall and Knowledge, the impact is uniformly negative: the more desirable the youth, the less positive are reaction to Army ads, beliefs, and intentions. Note in particular the positive relationship between I-IIIA probability and Knowledge of Army Offers. When preliminary model specifications were examined prior to the availability of the I-IIIA composite, a negative (and counterintuitive) relationship was found between Knowledge and both Intention and Behavior. This finding helps explain the earlier negative relationship. It is likely that I-IIIA youth are more cognitively oriented (and are better at test-taking and the associated processes), and thus, given exposure, are likely to do well, cetaris paribus, on the knowledge questions. Simultaneously, such youth, given perhaps a wider perspective and more alternative prospects, are less positive toward the Army, as can be noted in Table 4-2 and 4-3. Thus, when one fails to control for I-IIIA probability, or the "Quality" construct it represents, one finds a <u>spurious</u> relationship between Knowledge and positive outcomes. Knowing more about Army offers is not related to negative intentions or beliefs, but the background or individual factors contributing to a high score on I-IIIA probability, unfortunately, are.

The media exposure relationships are also of interest. Those who report a larger number of hours per week spent watching TV are more likely to recall Army ads, are more likely to believe Army ads, and report higher levels of perceptions of Army attributes in the Experience construct. At the same time, such youth demonstrate a lower Knowledge of Army offerings. The youth who report more hours per week spent reading and/or listening to FM radio (included as a single construct due to the similarity in pattern of the two activities across respondents) exhibit a different set of relationships. They score higher than their low-hour counterparts in Knowledge of Army offerings, and score lower on all three facets of Perceptions of Army attributes.

Table 4-3
LISREL Estimates of Endogenous Effects
in the Behavior-Last Youth Model

Effect On	Effect of							
	Recall	Adlike	AdBelief	Knowl	Future	Devel	Experi	Int
AdLike								
AdBelief		.38						
Knowledge	.14	.14						
Future	.06	.21	.35					
Develop	.10	.25	.28	.05				
Experience	.09	.18	.31					
Intention		.19		.06	.22	.18	-.29	
Behavior			-.08	.11				.38

Note: Chi-Square = 84.36 d.f. = 113
GFI = .98 RMSR = .018 R^2= .82

There are many competing explanations for these findings. It seems likely that the interpretation of the positive TV--Recall relationship is straightforward, in that more TV exposure yields more exposure to Army ads, and a higher recall score. The positive relationship of TV with Believing Army ads can be similarly interpreted. The reversal of sign between the TV and Read-FM constructs in their relationships with Knowledge of Army offers and perceptions of Experience attributes, however, deserves a closer examination. It does not seem that direct interpretations such as "spending more time watching TV per week leads to less knowledge of Army offers," or "Spending more time reading/listening to FM radio leads to lower perceptions of Army Attributes" are appropriate, in that such interpretations imply a causal mechanism which cannot be investigated outside the context of experimental manipulation of media exposure. A more appropriate interpretation would be "Those who report spending larger amounts of time watching TV also score lower on their Knowledge of Army offers," or "Those who report spending more hours per week reading/listening to FM Radio report lower beliefs/perceptions of Army attributes." That is, there may be basic differences between TV watchers and readers/FM listeners which account for both media exposure patterns and differing knowledge or perceptions scores.

As in the discussion of the I-IIIA probability measure and its moderating impact on the knowledge--intention relationship, it may well be that other predictor variables which tap basic individual life-style and personal differences could account for both the media exposure patterns and the outcome measures. In the absence of experimental manipulation or, at a minimum, process level reinterview data, causal inference should be avoided.

Endogenous Constructs

The effects of each endogenous construct on subsequent endogenous constructs in the model are given in Table 4-3. It can be noted that Recall is positively related to Knowledge and the three facets of perception: Future, Development, and Experience, but is not related to either Intention or Behavior. Liking of Army ads is positively related to Belief of Army advertising, the three facets of perception, Knowledge, and Intention to take action, while Belief of Army ads shows a strong positive relationship with the three facets of perception. AdBelief shows a weak but negative relationship with Behavior, however. One interpretation concerns the retrospective nature of the behavior measure itself: it may be that those who have engaged in enlistment related behaviors such as talking with Army recruiters or gathering other information are less inclined to find Army advertising believable.

Knowledge of Army offers is positively related to the "Development" construct, as well as to Intention and Behavior. Perceptions of both the "Future" and "Personal Development" aspects of Army attributes are positively related to Intentions, but not to Behavior. The "Experience Itself" aspect of Army attributes, including items relating to receiving training, working with hi-tech equipment, and working with highly trained co-workers, shows a remarkably strong negative relationship with intentions. That is, those youth who most strongly believe that enlistment in the Army would likely provide these opportunities are less likely than their less strongly believing counterparts to intend to take enlistment-related action. This is a finding which deserves further investigation, but for which we have no adequate rationale beyond the straightforward interpretation.

Finally, the strongest relationship in the model occurs between intention and behavior. This is consistent with the theory and with previous findings of Nord et al. (1986). Overall, the model fits the observed data quite well. The chi-square value is less than its associated degrees of freedom, indicating a reasonably good fit although, as noted repeatedly, it is not to be taken as a true statistical test of the probability of obtaining the sample data from a population in which the null hypothesis (the specified model) is true. The goodness-of-fit index is .98, approaching its theoretical maximum of 1.0, and perhaps most importantly, the root mean square residual is less than .02. While covariance reproduction is an important criterion, variance explained is of high pragmatic interest. For each of the endogenous constructs (except Recall), the explained variance, as shown in Table 4-4, is reasonably high given the survey research context and the nature of the constructs themselves. Recall is not well-explained by the exogenous constructs, but this is not totally unexpected. The rest of the constructs have at least 12 percent of their variance explained within the model.

The R^2 reported for the facets of Perceptions of Army attributes has been adjusted to reflect only the model-based contribution to explanation; that is, the variance explained by the G-factor, given by the squared loading as reported in Table 4-1, has been subtracted from the total variance explained as reported by the LISREL software to provide a more realistic estimate. The 38% explained variation in Intentions compares quite favorably with the studies reported by Fishbein and Ajzen (1975). It thus seems that the model as specified performs quite well. The fit is good, the variance explained is adequate, and the relationships are generally in the hypothesized direction and of the expected magnitude. While there are some unexpected findings, these may represent either shortcomings in the specification of the model or

Table 4-4
Variance Explained in Endogenous Constructs of Youth Model with Behavior Last

Construct	R^2
Recall	.02
AdLike	.14
AdBelief	.22
Knowledge	.12
Develop	.39
Experience	.35
Future	.53
Intention	.38
Behavior	.23

opportunities for further analysis as model development moves beyond the prototype stage.

Behavior-First Youth Model

Since the model development effort in this project is designed to construct a prototype, the investigation cannot be halted when a model which seems to adequately fit the data is found. In fact there may be many alternative models which fit the data. In this case, the most compelling alternative model is one which models behavior as an exogenous variable, assuming that the 6-month retrospective nature of the behavior measurement encompasses mostly or entirely "past" behavior, as opposed to contemporaneous behavior, however defined. The measurement parameter estimates are virtually identical to the measurement parameters reported in Table 4-1 and are not repeated. This is encouraging in that it suggests that interpretational confounding of measurement with structural parameters is not a serious problem with these models.

Structure

The effects of Behavior, along with the four previously investigated exogenous constructs, on the remaining endogenous constructs in the reformulated model are presented in Table 4-5. Enlistment-related behavior is positively related to Recall, Liking of Army ads, Knowledge of Army offers, and Intention. It is of interest to note that the path from Behavior to Belief of Army ads is not substantial in this model, as compared with the small negative path from Ad Belief to Behavior found in the previous model specification. The relationships of the other four exogenous constructs seem to be somewhat invariant to the placement of Behavior in the model, as are, in general, the relationships among the endogenous constructs (Table 4-6). The effects of Knowledge on Intention become less substantial when past behavior is accounted for, as does the path from "Develop" to Intention. The negative relationship between "Experience" and Intention remains.

The overall fit of the "Behavior First" model is almost identical to the fit of the "Behavior Last" model. Chi-square decreases modestly with an associated increase in degrees of freedom, while the remaining fit criteria are essentially unchanged (Table 4-7). It thus seems that it is not possible to choose between the two models on purely empirical grounds. Therefore, it seems imperative that individual-level reinterview data be obtained such that behavior subsequent to intentions and the other predictors in the model can be measured, and behavior can unambiguously take its proper position as the ultimate endogenous construct in the model.

Table 4-5
LISREL Estimates of Exogenous Effects
in the Youth Model with Behavior First

	Effect of				
Effect On	Behavior	Soc.Inlf.	TV	Read-FM	I-IIIA
Recall	.10		.10		.10
AdLike	.10	.32			-.06
AdBelief		.16	.07		
Knowledge	.12	.09	-.06		.28
Future		.24	.04	-.05	-.25
Develop		.20	.03	-.05	-.13
Experience		.19	.06	-.05	-.12
Intention	.27	.19			-.21

Note: Chi-Square = 80.23 d.f. = 111
GFI = .98 RMSR = .017 R^2= .84

Table 4-6
LISREL Estimates of Endogenous Effects
in the Youth Model With Behavior First

Effect	Effect of						
On	Recall	Adlike	AdBelief	Knowl	Future	Devel	Experi
Recall							
AdLike							
AdBelief		.38					
Knowledge	.13	.12					
Future	.06	.21	.35				
Develop	.09	.24	.28				
Experience	.09	.18	.31				
Intention		.16			.23		-.26

Note: Chi-Square = 80.23 d.f. = 111
GFI = .98 RMSR = .017 R^2= .84

Table 4-7
Variance Explained in
Endogenous Constructs
Youth Model Behavior First

Construct	R^2
Recall	.03
AdLike	.15
AdBelief	.23
Knowledge	.14
Develop	.40
Experience	.35
Future	.53
Intention	.44

Table 4-8
Measurement Estimates of Youth Model with G-factor Modeled

Observable/	Construct			
1st order factor	Future	Develop	Experience	Gen. Affect
Wide	.75			
Step	.61			
CivCar	.75			
SelCon		.79		
Poten		.82		
Mental		.74		
Mature		.72		
Train			.79	
HiTech			.70	
HiQual			.78	
Future				.96
Develop				.93
Experience				.92

G-Factor Model

Since by far the most tenuous part of the two models discussed thus far is the "three-facet with a second order factor" structure of perceptions, and since research on this data to date had conceptualized these items as unidimensional, the model in Figure 4-1, the behavior last model, was reestimated with the G-factor itself serving as an endogenous construct to be predicted and to in turn predict behavior. The results of the measurement estimation are presented in Table 4-8. When the G-factor is modeled in a structural context, the measurement parameters relating the first-order constructs to the individual items are quite similar to those obtained from both the preceding facet models and the confirmatory factor analysis conducted in a strictly measurement context. The second order loadings of the three facets on the G-factor now far more closely resemble the confirmatory factor loadings than they do the corresponding loadings obtained from the first-order factor oriented model.

The parameter estimates associated with the exogenous constructs again are changed very little by this model respecification. The General Affect second-order construct is positively related to Social Influence and TV, and negatively related to Read-FM and I-IIIA probability. With regard to the other endogenous constructs, the G-factor is positively related to Recall, AdLike, AdBelief, and Knowledge. As a predictor of Intention, however the small positive coefficient (.08) in Table 4-9 suggests that the facet model may be preferred. That is, this low coefficient comes about as a result of the Future and Develop facets having strong positive relationships with Intentions, while the Experience facet has a strong negative effect. The net result is a weak positive coefficient for the second-order factor. This is reflected in the fit of the model also, which is marginally worse than the facet model, given its increase in degrees of freedom. The difference in chi-squares for the two models is approximately 32, with 20 degrees of freedom, and the RMSR is 33% larger. The variance explained in the endogenous constructs changes very little in this model (Table 4-10) from the previous formulation, however (see Table 4-4).

Parent Model

The model for the parent sample is depicted in Figure 4-2. The parent model is quite similar to the youth model in Figure 4-1, with the exceptions noted in the third chapter. Specifically, the structure of the media exposure constructs for the parent sample suggests that TV hours and Reading hours can be combined as a single construct, while FM radio exposure

Table 4-9
LISREL Estimates of Youth Model With G-factor Modeled and Behavior Last

Effect On	Effect of									
	SocInfl	TV	Read-FM	I-IIIA	Recall	AdLik	AdBelf	Know	G-Fac	Int
Recall		.10		.09						
AdLike	.35			-.07						
AdBelief	.15	.08				.38				
Knowledge	.12	-.07	.06	.27	.14	.14				
Gen. Affect	.23	.05	-.05	-.18	.09	.23	.33	.05		
Intention	.28			-.25		.21		.06	.08	
Behavior	.15						-.09	.12		.38

Note: Chi-Square = 116.39 d.f. = 133 R^2 = .485 RMSR = .024

Table 4-10
Variance Explained in
Endogenous Constructs
Youth Model Behavior-Last
G-Factor Modeled

Construct	R^2
Recall	.02
AdLike	.14
AdBelief	.22
Knowledge	.12
General Affect	.47
Intention	.36
Behavior	.23

Table 4-11
Measurement Estimates for Parent Model

Observable/ 1st-order Factor	Construct			
	Future	Develop	Experience	Gen. Affect
Wide	.83			
Step	.66			
CashEd	.69			
SelCon		.84		
Poten		.88		
Mental		.82		
Mature		.80		
Physical			.74	
HiTech			.73	
Proud			.83	
Future				.71
Develop				.71
Experience				.77

hours per week is the second exogenous construct. The three facets of generalized affective response underlying perceptions of Army attributes are similar in nature and content, but with some different observable indicants. Finally the ultimate dependent constructs are the parent's affect toward the Army as a career choice and the parents self reported activities directed toward the youth's enlistment.

The measurement model for the facets of perceptions of Army attributes is presented in Table 4-11. These parameter were estimated in the context of the overall structural model, and compare favorably with the results of the youth model. Once again we note the lower magnitude of the loadings relating the first order facets to the second order generalized construct when the measurement model is embedded in the structural model. Overall, the measurement model seems to fit and exhibit both convergent validity (large positive first order loadings) and discriminant validity (second order loadings not equal to 1.0).

Structure

Interestingly, both media exposure constructs are negatively related to recall of Army ads (Table 4-12). As with the youth model, however, it seems that this is likely to reflect background individual difference effects not included in the model rather than causal relationships. It is highly unlikely that decreasing media exposure would in fact bring about an increase in recall. TV-Read is, however, positively related to the perceptions of Army attributes facets. Recall is positively related to Knowledge, the Develop and Future facets of perceptions, and directly to parental action. Liking of Army ads is positively related to AdBelief, Knowledge of Army offers, and all three facets of perceptions, while Belief of Army ads is related to the Develop and Experience facets of perceptions.

Consistent with the youth findings relative to intentions, two of the three facets of perceptions relate positively to parental affect, while the Experience first-order factor shows a negative relationship. It should be noted, however, that although all three coefficients are large in absolute magnitude, they also exhibit large standard errors. Nevertheless, the consistency of the negative relationship between the Experience facet and subsequent endogenous constructs for both the youth and the parent models suggests that attributes relating to what is done while in the Army are, at a minimum, secondary to personal development and preparation for the future related attributes. There is, as expected, a strong positive relationship between parental affect toward the Army and parental action with respect to the youth's enlistment related activities.

The overall fit of the parent model is substantially worse than the fit of the youth model in any of its forms. The chi-square value is over twice the degrees of freedom available for an assumed minimum sample size of 500. The goodness of fit index is still rather high, however, and the RMSR, while higher than for the youth model, is still highly acceptable. We would conclude that the parent model provides a fit of the data consistent with the fit obtained in most reported applications of the covariance structure modeling methodology, and suffers only by comparison to the extremely good fit obtained with the youth model. The explained variance in many of the endogenous constructs is good (Table 4-13), with only the ultimate endogenous construct, parental action, exhibiting lower than expected variance explained. This is not surprising since there are many reasons why a parent who has a positive feeling toward the army may or may not choose, at a particular point in time, to discuss enlistment with his or her child.

Table 4-12
LISREL Estimates of Parent Model

Effect On	Effect of									
	TV-Read	FM	Recall	AdLik	AdBelf	Know	Devel	Exper	Fut	Affect
Recall	-.14	-.10								
AdLike				.64						
AdBelief			.30	.23						
Knowledge	.26		.10	.24	.40					
Develop	.14		.10	.31	.37					
Experience	.13			.20						
Future							.41	-.75	.72	
Affect			.12							.22
Action										

Note: Chi-Square = 200 RMSR = .026 R^2 = .76 d.f. = 97 GFI = .96

Table 4-13
Variance Explained in
Endogenous Constructs
Parent Model

Construct	R^2
Recall	.03
AdLike	.01
AdBelief	.42
Knowledge	.12
Develop	.41
Experience	.32
Future	.47
Affect	.31
Action	.11

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

In this chapter, we briefly summarize the results of the modeling effort, and conclusions relative to the objectives of the project. We also make recommendations for further study and model development.

Summary

Findings with respect to the overall model and each of the endogenous (dependent) constructs in the model are summarized below. First, the overall prototype model developed, based on both theoretic considerations and the limitations and possibilities inherent in the ACOMS data base, is discussed. This discussion is followed by a review of the findings with respect to each endogenous construct, in terms of its structure, predictors, and explained variance.

Overall Youth Model

The basic model developed and estimated consists of twelve constructs, eight of which are endogenous. Due to the inapplicability of the congeneric measurement model employed in LISREL to many of the constructs, the ability of the covariance structure modeling approach to incorporate measurement error was utilized by assigning a conservative measurement error estimate to the single-indicant constructs. In the case of the facets of Beliefs about Army Attributes, a second-order measurement model was directly estimated.

The overall fit of the basic model is quite good. The chi-square statistic, interpreted as an index of fit rather than a formal test for the rejection of the null hypothesis, is small relative to its degrees of freedom; the overall variance explained in the model is high (.82) and the goodness of fit index is very good (.98); and the square root of the average squared residual correlation is quite small (.018).

Specific findings. Findings with respect to the endogenous constructs in the Youth Model are as follows:

Behavior, the self-reported enlistment-related activities of youth, are predicted in the model by Social Influence, Knowledge of Army Offers, and Intentions to "do something" about enlistment. Behavior is negatively related to Ad Belief. Twenty-three percent of the variance in behaviors is accounted for by the model.

Intention to engage in enlistment-related activities is predicted by Knowledge, Liking of Army Ads, and Social Influence. It is also positively related to the "Development" and "Future" facets of Beliefs. There is a negative relationship between Intention and Probability of scoring in TSC I-IIIA, as there is with the "Experience Itself" facet of Beliefs. R^2 for Intention is .38.

Beliefs about the Army are found to be composed of a single general or second-order factor with three facets or first-order factors relating to the opportunities in the Army for Personal Development, Future benefits from Army service, and beliefs about the Army Experience itself. When the second-order general factor is modeled, it is predicted by Social Influence, TV hours, Reading-FM Radio hours (negative), I-IIIA probability (negative), Recall, Liking, and Believing Army Ads, and Knowledge of Army Offers. Forty-seven percent of its variance is explained.

When the three first-order factors or facets are modeled, all three are positively related to Social Influence and negatively related to Read-FM and I-IIIA probability. All three are also positively related to Recall, Liking and Believing Army Ads, and the Personal development factor is related to Knowledge of Army Offers. Variance explained for the Future, Development, and Experience facets is .53, .39, and .35, respectively.

Knowledge of Army Offers is positively related to Recall and Liking Army Ads, Social Influence, and I-IIIA probability, while negatively related to TV hours. R^2 is .12.

Belief of Army Ads is strikingly related to Liking of Army Ads, Social Influence, and TV-Hours, while Liking Army Ads is positively related to Social Influence and negatively related to I-IIIA probability. Finally, Recall of Army Ads is related to hours spent viewing TV.

Alternative Youth Model. As previously discussed, the retrospective nature of the "Behavior" construct renders its proper placement in the model problematic. In order to account for the alternative interpretation, a model similar to the basic model was estimated with reported enlistment-related behaviors as an exogenous construct rather than an endogenous construct. The fit of this Behavior-First model is virtually identical to that of the basic (Behavior-Last) model, providing no substantive grounds for distinguishing between the two models on their ability to reproduce the observed correlation matrix. As a result, one must interpret the findings of each model with the alternative interpretation in mind.

Parent Model

A separate model was developed for the Parent data available in ACOMS. The parent model and the youth models were estimated separately in order to use all of the available youth data. The Parent model contains nine endogenous constructs and two exogenous constructs, with measurement properties similar to those in the Youth model. The Parent model also fits the data quite well, with a chi-square of approximately twice its degrees of freedom, an overall variance explained of .76, and a goodness of fit index of .96.

Specific findings. The overall pattern of relationships in the Parent model is surprisingly similar to the findings of the Youth model. The ultimate endogenous construct, the intent of the parent to take Action with respect to youth enlistment, is positively related to recall of Army ads and to the overall positive predisposition (Affect) of the parent toward the Army, with an R^2 of .11.

Parental Affect has an explained variance of .31, and, consistent with the findings of the youth model, is negatively related to the "Experience Itself" facet of Beliefs while positively related to the "Development" and "Future" aspects.

Conclusions

Overall, the prototype models developed, subject to the limitations of the data and the recommendations for further work presented subsequently, seem to be successful in modeling the complex and often indirect effects of Army Advertising as it affects beliefs, intentions, and behavior. It is perhaps important at this point to pay particular attention to the relationship between this prototype modeling effort and the objective of "modeling the effects of Army advertising". In particular, the model assumes a particular role for Advertising which should be formally stated.

The Role of Advertising

Advertising is a tool which can be used to accomplish one or more objectives of the sponsor. At the broadest level, advertising objectives are described as those of 1) providing information (inform), 2) persuading the potential buyer of the relative superiority of the sponsor's product (persuade), and 3) to keep the name of the sponsor in front of the potential buyer (remind). A specific ad, however, would pursue a more specific objective. An ad might seek to increase awareness of the product or service by a specified amount, for example. Or, the objective might be to change the beliefs in the amount of a particular attribute possessed by the product.

These objectives are not developed in isolation. They are a link in a means-end-chain in which the "end" refers to overall organizational goals and objectives. Thus, the development of objectives is a hierarchical process. Based upon the organizational goals, marketing, for example, must develop its own set of objectives which when accomplished, will contribute to achieving the broader objective. Likewise, advertising derives its objectives from marketing which when accomplished will lead to the achievement of marketing objectives. As a result, objectives for advertising are seldom stated in the same units as those of marketing (nor are marketing's objectives in units of the organization). Thus, marketing may seek objectives of increasing brand loyalty or maintaining market share, but virtually never of return on investment. Likewise, advertising objectives are almost never stated in terms of sales.

This does not mean that marketing efforts do not contribute to ROI nor that advertising is unrelated to sales. It does suggest that these effects are likely to be indirect in nature. In the context of Army advertising, this suggests that ads are unlikely to directly cause enlistment. (This may be the reason that the regression techniques reviewed in the first have been unsuccessful). It is intuitively implausible that a youth would listen to an ad or ads for the Army and immediately enlist. Clearly, such a decision would involve many other factors.

The point of this brief tutorial is that while advertising has a role to play in the Army enlistment process, its effects are necessarily embedded in a broader hierarchy. The prototype models developed here must be viewed in this context; while they were designed to assess the impact of advertising, the means-end-chain linkages must be examined and advertising effects considered within this framework.

Considering the above, Army advertising appears to have been reasonably successful. The respondents tend to recall, like and believe Army ads, and this in turn results in consistently favorable beliefs about the Army, at least with respect to those beliefs included in the ACOMS data. These beliefs, then, are generally positively related to intentions to take some action with respect to enlistment. This chain of events is consistent with the role of advertising discussed above, and suggests that Army advertising does indeed have an impact on those areas where it can be expected to play a role.

While the models estimated include retrospective behavior as a construct, which is positively related to both Beliefs about Army attributes and Intentions, it should be emphasized that these are enlistment-related behaviors, not accessions. If actual accession, the ultimate goal of the recruiting

process, were taken as the dependent variable, the direct impact of Advertising and its closely related outcomes might not, and indeed probably would not, emerge as strong predictors, given the myriad of other factors which could result in a favorably predisposed (perhaps due to Advertising) youth not enlisting or being accepted, and alternatively the potential of a non-favorably predisposed youth at the time of interview eventually enlisting in the Army. The point is, there is a large unexplainable (unmeasured) component in accessions, from the modeling viewpoint. If accessions are used as an ultimate criterion without the inclusion of other conditions under which actual behavior could deviate from predispositions and intentions, biased and misleading conclusions with respect to the role of advertising in the overall enlistment process could result.

Recommendations

In conclusion, it is perhaps appropriate to address some of the issues which should be considered as plans are made for future research which may be conducted on the effects of Army advertising and the enlistment decision, whether based directly on the prototype models developed here or on other models for other immediate purposes. These issues will be discussed as they relate to measurement considerations, model structure, and data gathering.

Measurement Issues

Recall. Over 80% of the respondents in the ACOMS data recall (unaided) one or more Army Ads. This is a testimony to the effectiveness of the Army advertising program, but presents difficulties in the modeling process. Since almost everyone recalls Army ads, it is impossible for this variable to discriminate among those who have favorable and unfavorable beliefs, intentions, etc. Future research efforts should attempt to gather sufficient data, perhaps in the form of specific recall of content over a number of ads, to gain a distribution of respondents on this variable rather than having such a high proportion in the single category.

Knowledge of Army life. One of the more intriguing findings in this prototype model is the negative relationship between the "Experience Itself" facet of Beliefs and Intentions for the Youth sample and between the same facet and Affect for the Parent sample. The "Experience" facet is not particularly strong, and its labeling must be viewed as both subjective and tentative. However, this consistent finding would seem to warrant further study, through the use of belief statements which reflect beliefs about what Army life is, and Knowledge assessment relative to daily life of an Army

recruit. It may be that the Army has "sold" American youth and their parents on the value of the Army as a means toward personal development and as a road to future opportunities, but has not adequately addressed what the experience in the Army actually entails, apart perhaps from the sometimes negative images of basic training emanating from popular media.

Beliefs. If one is to have a well-specified model, avoiding the potential for omitted variable bias, the beliefs about Army attributes which may be negative, or which at the least are not the subject of current or recent Army advertising, should be included. While these beliefs may have nothing directly to do with the success of the Army in meeting its communications objectives, their presence is necessary if one is to obtain unbiased estimates of the more relevant parameters in the model, as well as having the potential to provide additional insight into the enlistment decision. With respect to widely held beliefs such as those included in the ACOMS data, an effort should be made, either through question wording or response category labeling, to obtain a distribution of responses with greater variance than the distribution obtained in this data, which is skewed strongly to the left and truncated to the right.

Behavior. Given the sequential nature of the impact of advertising, and the "over time" nature of behavior, it is impossible to measure behavior in the same instrument at the same time as the other components in the model while maintaining an unambiguous causal directionality. This argues strongly for reinterview data, with behavior (and other factors which could have influenced that behavior) assessed after the other components in the model.

Structural Issues

With respect to model structure, it seems that choice should be the focus of this model and that relative assessment of alternatives should be a component. Thus, rather than relate attitude score to behavioral intentions as in the Fishbein case, we recommend a 'share of attitude' approach such as the multinomial logit model (McFadden, 1986). In this model, the probability that an individual will select i^{th} alternative is given by:

$$P_c(i) = EXP(V_i)/ \Sigma EXP(V_j).$$

where V_i is the utility for the i^{th} alternative and is usually considered a linear function of the belief statements. Intentions then, would be predicted by these probabilities.

Such an approach would explicitly account for the "choice-among-alternatives" nature of the enlistment decision, and should provide additional insight as well as better predictive capability. Of course, other factors affecting the choice would need to be included, and the extensive use of rotating modules for data collection would be ruled out. Such a model could be estimated in a covariance structure context, however.

Data Gathering

First and foremost, as noted previously, a model such as the prototype developed here is impossible to estimate on strictly cross-sectional data. Two or more reinterviews of the same respondent over the course of the decision "window" leading to enlistment or an alternative choice are imperative if the model is to be viewed as other than a suggestive prototype.

While it is fully recognized that the ACOMS data were collected to serve a variety of purposes, it may well be that a data collection effort more singularly focused on modeling the effects of Army advertising may prove fruitful. In particular, such a data collection effort could:

1. Be designed with the congeneric measurement model employed in covariance structure modeling in mind;

2. Be carried out on a smaller sample, with the national representativeness of the sample not an overriding issue;

3. Discard the use of rotating modules and interpenetrating modules, due to the lower volume of data necessary, and thus maintain the possibility of meeting the assumptions underlying the use of covariance structure models while allowing for a "choice" formulation of the model.

4. Drop the Parent sample from the data collection effort, as the ACOMS data seem to have demonstrated that a similar model holds for youth and parents and the importance of parents in now well established.

5. Incorporate two or more reinterviews to truly assess the linkages between advertising, beliefs, intentions, and behavior in a time-series context.

REFERENCES

Bagozzi, R. P. (1984). A prospectus for theory construction in marketing. Journal of Marketing, 48 (Winter), 11-29.

Bearden, W., Sharma S., & Teel, J. (1982). Sample size effects on chi-square and other statistics used in evaluating causal models. Journal of Marketing Research, 14 (November), 425-430.

Beckwith, N. E. & Lehman, D. (1975). The importance of halo effects in multi-attribute attitude models. Journal of Marketing Research, 12 (August), 265-275.

Bentler, P. M. & Weeks, D. G. (1980). Linear structural equations with latent variables. Psychometrika, 45, 289 -308.

Bentler, P. M. (1985). Theory and implementation of EQS: A structural equations program. Los Angeles: BMDP Statistical Software.

Cattell, R. B. (1966). The scree test for the number of factors. Multivariate Behavioral Research, 1 (April), 245 -276.

Cooper, W. H. (1981). Ubiquitous halo. Psychological Bulletin, 90 (2), 218-244.

Dillon, W. R., Mulani, N. & Frederick, D. (1984). Removing perceptual distortion in product space analysis. Journal of Marketing Research, 21 (May), 184-193.

Dixon, W. J. (Ed.). (1981). Biomedical computer programs. Berkeley: University of California Press, Ltd.

Fishbein, M. & Azjen, I. (1975). Beliefs, attitude, intention, and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley.

Fornell, C. (1983). Issues in the application of covariance structure analysis: a comment. Journal of Consumer Research, 9 (March), 443-448.

Gaertner, G. H. & Elig, T. W. (Eds.). (1988). The Army Communications Objectives Measurement System (ACOMS): Survey analysis plan (ARI Technical Report 786). Alexandria VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A196 588)

Gerbing, D. W. & Anderson, J. C. (1984). On the meaning of within-factor correlated measurement errors. Journal of Consumer Research, 11 (June), 572-580.

Guttman, L. (1941). The quantification of a class of attributes: A theory and method of scale construction. In P. Horst et al. (Eds.). The prediction of personal adjustment. New York: Social Science Research Council.

Guttman, L. (1944). A basis for scaling qualitative data. American Sociological Review, 9, 139-150.

Holbrook, M. B. (1984). Using a structural model of halo effect to assess perceptual distortion due to affective overtones. Journal of Consumer Research, 10 (September), 247-252.

Holbrook, M. B. & Huber, J. (1979). Separating perceptual dimensions from affective overtones: An application to consumer aesthetics. Journal ofConsumer Research, 5 (March), 272-283.

Howell, R. D. (1987). Covariance structure modeling in marketing: A comment on "Intercorrelations among sources of power in a channel of distribution." Journal of Marketing Research, 19 (February), 119-126.

Jepsen, D. A. & Dilley, J. S. (1971). Vocational decision making models: A review and comparative analysis. Review of Educational Research, 44 (3), 331-349.

Joreskog, K. G. (1971). Statistical analysis of sets of congeneric tests. Psychometrika, 36 (June), 109-133.

Joreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. Psychometrika, 43 (December), 443 -447.

Joreskog, K. G. & Sorbom, D. (1986). LISREL VI. Mooresville, IN: Scientific Software, Inc.

Kralj, M. M., Adelman, L., Wilson, M., McTeigue, R.J., & Zirk, D.A. (1987). Modeling the individual enlistment decision, Phase I final report (ARI Research Note 87-61). Alexandria VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A189 481)

Lavidge, R. J. & Steiner, G. A. (1961). A model for predictive measurements of advertising effectiveness. Journal of Marketing, 25 (October), 59-62.

Loftus, E. (1986). Survey remembering. Proceedings of the Second Annual Research Conference. Washington, D.C.: Bureau of the Census, 193-207.

McFadden, D. (1986). The choice theory approach to market research. Marketing Science, 5 (Fall), 275-297.

McTeigue, R. J., Kralj, M. M., Zirk, D. A., Adelman, L. & Wilson, M. (1987). Predecision processes involved in the enlistment decision (ARI Research Note 87-62). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A189 597)

Myers, J. H. (1965). Removing halo from job evaluation Factor structure. Journal of Applied Psychology, 49, 217-221.

Nieva, V. F., Rhoads, M. D. & Elig, T. W. (Eds.). (1988). The Army Communications Objectives Measurement System (ACOMS): Survey methods (ARI Technical Report 787). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A199 441)

Nord, R. D., Schmitz, E. J. & Weiland, T. A. (1986). Propensity and the enlistment decision (ARI Technical Report 723). Alexandria VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A178 444)

Orvis, B. R. & Gahart, M. T. (1987). Development of quality-based analysis capability for national youth surveys (RAND Working Draft WD-3280-FMP, Contract No. MDA903-85-C-0030). Washington, DC: Office, Assistant Secretary of Defense (Force Management and Personnel).

Proctor, C. H. (1970). A probabilistic formulation and statistical analysis of Guttman scaling. Psychometrika, 35, 73-78.

Research Triangle Institute. (1987). Youth Attitude Tracking Study II: Supplementary tabulations of data collected in the Fall, 1986 (Contract No. MDA903-86-C-0066). Arlington, VA: Defense Manpower Data Center.

Thorndike, E. L. (1920). A Consistent Error in psychological ratings. Journal of Applied Psychology, 4, 25-29.

Westat, Inc. (1988a). The Army Communications Objectives Measurement System (ACOMS): Parental user's manual (ARI Research Product 88-07). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A199 663)

Westat, Inc. (1988b). The Army Communications Objectives Measurement System (ACOMS): User's manual (ARI Research Product 88-08). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A199 840)

Wilson, M. J., Davis, J. B., & Greenless, J. B. (1988). Brand differentiation among Army components and military services. In V. F. Nieva, G. H. Gaertner, T. W. Elig, & M. E. Benedict (Eds.). The Army Communications Objectives Measurement System (ACOMS): Annual report, school year 86/87 (ARI Technical Report 784). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A196 607)

Zirk, D. A., McTeigue, R. J., Wilson, M., Adelman, L., & Pliske, R. (1987). Alternative approaches to modeling the individual enlistment decision: A literature review (ARI Technical Report 738). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A184 498)