Organizational change

Working Paper Series

ISSN 0318-3483

α, β AND γ CHANGE IN MODELING-BASED OGRANIZATION DEVELOPMENT

By

Jerry I. Porras
Stanford University

[and] Jitendra V. Singh.
University of Toronto

(WORKING PAPER WP-83-02)

FACULTY OF MANAGEMENT STUDIES
UNIVERSITY OF TORONTO

[Toronto, 1983]

α, β AND γ CHANGE IN MODELING-BASED ORGANIZATION DEVELOPMENT

By

Jerry I. Porras
Stanford University

and Jitendra V. Singh
University of Toronto

(WORKING PAPER WP-83-02)

α, β and γ Change in Modeling-Based Organization Development

Jerry I. Porras*

Jitendra V. Singh**

*Associate Professor o Organizational Behavior, Graduate School of Business, Stanford University

**Assistant Professor of Organizational Behavior, Faculty of Management Studies, University of Toronto

The research reported here is part of a larger project conducted by a team consisting of Bob Bies, Kenneth Hargis, David Maxfield, Kerry Patterson and Nancy Roberts. The authors are indebted to Kerry Patterson, Hugh Arnold and Martin Evans for their thoughtful comments on earlier drafts of this paper, to MOHR Development for the change program, and to Brad Anderson for its implementation.

α, β and γ Change in Modeling-Based Organization Development

The variety of techniques for planned organizational change continues to develop and grow. Within the last five years the field has witnessed a substantial increase in the use of behavioral modeling as an approach to improving problem solving in the work setting (Zenger and Hargis, 1982). Yet, as with much of existing change technology, the introduction of this new approach has not been accompanied by a concomitant number of empirical investigations into the dynamics and impact of modeling-based interventions. As a change strategy growing in importance, this approach merits rigorous investigation. Yet, research in planned organizational change is burdened by a variety of problems (Roberts and Porras, 1982).

One key problem plaguing researchers of organizational development processes rests in the interpretation of the data gathered to assess change. Since most approaches to the evaluation of change use subjective ratings, any evaluation procedure needs to be examined for its ability to identify the specific types of change (Golembiewski, et al, 1976) that might have occurred. Since its identification by Golembiewski and his colleagues, the measurement of α, β and γ change has drawn much interest from methodologists (Armenakis and Zmud, 1978, 1979; Armenakis and Bedian, 1982; Bedian, et al 1980; Golembiewski & Billingsley, 1980; Lindell & Drexler, 1979; Terborg, et al. 1980, 1982) but little from researchers actually applying the proposed measurement techniques to change projects (some exceptions are Randolph & Edwards, 1978; Armenakis, 1979).

The purpose of this paper is (1) to examine the effects of a modeling-based intervention on self reported change; and (2) to apply one of the proposed measurement techniques for α, β and γ change (Terborg et al. 1980) to determine the types of change that occurred as a consequence of the intervention; and (3) to elaborate the Terborg et al. methodology on two counts -- one, by suggesting

the order in which to test for the exisence of different types of change, since the occurrence of one kind of change may have interpretational implications for the other kinds of change, and two, by suggesting the use of correlation coefficients (rather than correlation differences as suggested by Terborg et al.) to test for gamma change. In the discussion below we will first describe the intervention technique used in this study along with some of its theoretical bases. A description of the techniques used for measuring the impact of the intervention will follow. This procedure will also outline the order in which the tests should be carried out, and suggest some modifications to the Terborg et al. methodology to test for gamma change. Finally, the results obtained and their implications will be discussed.

MODELING BASED INTERVENTION

The change program examined here employed techniques similar to those developed by Goldstein and Sorcher (1974)[1] and investigated by Latham and Saari (1979). Its main focus was the improvement of interpersonal problem-solving skills of first line supervisors. The process of intervention utilized behavior modeling as the key change mechanism (Bandura, 1977). The content emphasized communication skills and participative management. Both will be discussed more fully.

Process: Ten video taped behavioral models, the core of the intervention process, were implemented through weekly workshops, each covering one behavioral skill module. The workshop design centered around a short video tape presentation portraying an actual supervisor from the target organization dealing with one of ten problem situations most commonly faced by all plant supervisors in the company. The ten situations, selected from a longer list developed through a needs assessment of the organization, required the effective

use of five interpersonal problem-solving skills. Each video tape demonstrated these five skills and their correct application on the job.

Participant rehearsal of observed skills followed the video tape showing. Only successful rehearsals were taped and played back to participants so that they could observe themselves correctly applying the skills in a "real-life" situation. Contracts in which participants committed themselves to using the skills in back home environments were made. A review of the outcomes of these contracts occurred at the beginning of the following session and problems with use of the skills on the job identified. When necessary, further rehearsals to practice weak skills occurred.

Workshop leaders were usually upper level managers in the organization who themselves had undergone intensive development in the behavioral skills, as well as in the process of leading the workshops. They had participated in a complete set of workshops and had undergone several weeks of training in the process of workshop leadership. In addition, they were thoroughly coached and audited by an outside consulting group during early phases of the workshop presentations. The use of line managers was critical for the continued organizational support of the processes initiated in the work shops.

Content: Five basic behavioral skills, along with a problem-solving approach heavily dependent on the use of these skills, provided the central content of each module in the change program. The problem-solving was a rather straight-forward one consisting of three phases-problem identification, problem-solving, and implementation. The five behavioral skills developed by participant supervisors are defined as follows:

1. Behavior Description - The ability to describe the behavior of self or other in specific, concrete terms and to avoid generalizations or inferences drawn from observed behaviors.

2.	Justification	- The ability to clearly explain the impact of an observed behavior on the individual, the observer, or the organization.
3.	Active Listening	- The ability to accurately reflect both the content and the feelings of another's communcation.
4.	Participative Problem Solving	- The ability to involve another, meaningfully and appropriately, in the process of solving a work related problem.
5.	Positive Reinforcement	- The ability to complement another in a sincere and authentic manner.

Overall, the intervention attempted to first develop each supervisors' abilities to use the five behavioral skills and then provide a series of experiences which would help them to apply the skills on the job and in the sequence prescribed. Originally the contexts for using the skills and the problem-solving sequence were limited to the ones portrayed in the video tapes. Later, however, the supervisors were expected to generalize their knowledge to other similar problem situations. The program was further designed to help accomplish this by focusing the last module on the process of generalizing to new situations. In this way supervisors were aided in developing a general approach to all job related interpersonal problem-solving situations.

The following sections describe the methodological approach used to determine the effects of this modeling-based intervention. Since the method was grounded in the Golembiewski, et al. change typology, the typpology is discussed first, followed by a description of the methodology used to assess the three major types of changes - alpha, beta, and gamma change.

The Change Typology

Golembiewski, Billingsley and Yeager (1976) proposed that three different types of change, alpha, beta, and gamma, can result from an individual's participation in a planned organizational change process.

> Alpha change invloves a variation in the level of some existential state, given a constantly calibrated measuring instrument related to a constant conceptual domain. Beta change involves a variation in the level of some existential state, complicated by the fact that some intervals of the measurement continuum associated with a constant conceptual domain have been recalibrated. Gamma change involves a redefinition or reconceptualization of some domain, a major change in the perspective or frame of reference within which phenomena are perceived and classified, in what is taken to be relevant in some slice of reality (pp. 134-135).

A few brief examples of each of these three types might help to clarify their meanings. Gamma change could describe a situation in which a change intervention focused on altering the management style used in the organization. Whereas before the intervention managers may have conceptualized the process of management as one steeped in the authority relationship, afterwards they may see the process in a completely new and different light. Now they might see it as a subtle influence process in which power differentials are virtually non-existent and in which assumptions about the abilities and commitment of employees are quite different. This would constitute gamma change in the individual.

Beta change is a bit simpler. As in the management style example described above, a change in perceptions could occur not in the definitions of reality but in the standards used to assess the phenomenon. That is, judgements used to label the level of the existence of a certain syle of management could change when one gets a better idea of the size of the entire continuum of that style. So, a person might feel that participation is used to a medium degree when he/she is unaware of exactly what participation is all about. After the awareness sets in, then the assessment of the exact same phenomenon might well switch to low or high. This would be Beta change.

Alpha change is the type normally assumed for change situations - one that involves no reconceptualization or (shift) in standard. Changes in responses would reflect accurately the changes in reality, i.e. changes in assessed degree of participation would reflect changes in actual participation.

In their original discussion, Golembiewski and his colleagues proposed a factor analytic method for assessing gamma change, made no concrete suggestions for measuring beta change, and suggested that evluating alpha change was straightforward given that no beta change had occurred.

Subsequent to the original Golembiewski, et al. article, other researchers proposed alternative approaches to the problem of assessing both beta and gamma change. Zmud and Armenakis (1979) suggested that after employing the Golembiewski, et al. factor analytic method to rule out gamma change, alpha and beta change could be differentiated by comparing actual and ideal criterion levels for Pre and Post ratings. An examination of Pre and Post ideal scores would indicate whether or not beta change had occurred. A shift in these ideal scores would indicate that a recalibration of scales had occurred and thus beta change. No shift would indicate that only alpha change had occurred (if, in fact, there had been a gain in actual post scores as compared to actual Pre scores).

Lindell and Drexler (1979) attacked the Golembiewski, et al. position by arguing, albeit without any empirical evidence, that if psychometrically sound instruments were used, the beta change concept would no longer be relevant. But this is not true since the problem is not in the psychoretric properties of the instrument, but rather in the conceptualization of the variables measured by the instrument in the minds of the respondents. In fact, the fundamental perspective presented by Golembiewski and his colleagues is that there is no such thing as a true "psychometrically sound instrument" because of the phenomena described by the beta change concept.

Lindell and Drexler (1980) made a more convincing point when they noted that alpha change could result in changes in factor structures when in fact no gamma change had occurred, thus obscuring the reliability of gamma change detected using factor analytic methods. However, other than emphasizing the use of psychometrically sound instruments, they proposed few concrete solutions to the dilemmas identified.

More recently, Terborg, Howard, and Maxwell (1980) reviewed both the Zmud and Armenakis (1979) and Lindell and Drexler (1979) arguments, as well as the original Golembiewski, et al. proposals, and concluded that all the suggested methods of measuring beta and gamma change suffered from several important flaws.[2] They, in turn, proposed an alternative method rooted in the work of Howard and his colleagues (Howard and Dailey, 1979; Howard, Ralph, Gulanick, Maxwell, Nance and Gerber, 1979; Howard, Schmeck and Bray, In Press; Howard, Dailey and Gulanick, In Press; and Howard, Millham, Slater, and O'Donnell, 1977) which more convincingly dealt with the problems existing in previous methods.

The Terborg, et al. approach is based on a retrospective measure obtained at the same time that the Post measure is taken. The retrospective measure asks the respondent to look back to the time of previous measurement and respond to each question based on the situation as it was then. Comparison of the retrospective or "Then" measure with the Pre and Post measures yield more plausible indications of alpha, beta, and gamma change.

Armenakis and Bedian (1982) raise several criticisms of the retrospective design and cite several studies questioning its validity. The principal criticism is based on the premise that individuals cannot accurately recall perceptions originating as recently as 30 minutes prior to being questioned about them. However, the evidence they cite primarily focuses on perceptions of phenomena external to the respondent or on factors external to the individual's

behavior. Neither study is anchored in recollection of the personal, internally focused experience of the subject. As such, they appear to describe situations different from the ones encountered when asking people about their own behavior or feelings at a previous time as is being done here. We argue that these phenomena are more likely to be accurately recalled by respondents.

Measuring Change: The Terborg et al. Methodology and some elaborations

Measurement of alpha, beta, and gamma change as proposed by Terborg, Howard and Maxwell (1980) can be accomplished at both the individual and group level. In this research, only the group level approach was used. This was done primarily because the research objective was to evaluate the impact of the intervention on the supervisory group rather than individual supervisors.

In the Terborg et al. approach, the data gathered immediately before the intervention are collected in the usual fashion. After the intervention, the data are obtained in two different forms. The first is the normal post-intervention form asking the respondent to answer questions based on perceptions of the situation as it exists at that point in time. The second is a retrospective form in which the respondent is asked to look back in time and respond to how things were prior to the beginning of the intervention. Measures taken before the intervention are called the PRE data, measures after the intervention are called the POST data, and the retrospective measures are called the THEN data.

Compared with the methodology for assessing different types of change suggested by Terborg et al., two modifications are suggested here. First, the order in which one should proceed to test for α, β and γ change is specified. This was not explicitly addressed by Terborg et al. It is suggested that gamma change be tested for first. If gamma change has occurred, the interpretations of alpha and beta change are problematic. But if gamma change has not occurred, the next step

is to test for beta change. The test for alpha change is the last step in the sequence. Second, the use of correlation coefficients to compare profile shapes while testing for gamma change usually detects such differences, but may be misleading in some circumstances. It is suggested that comparing correlations is a simpler and more appropriate way to compare profile shapes.

Order for measuring α, β and γ change

The three kinds of change may be measured in the following order:

1. For every subject, data from the 19 scale items making up the questionnaire are used as the raw data, i.e. the response of the individual supervisor on each scale item for the Pre, Post, and Then measures are the basic data points.

2. For every subject in both the experimental and control groups, dispersions in behavior scores are obtained by calculating standard deviations using all the 19 scale items as data points. These overall standard deviations are calculated separately for the Pre, Post and Then measures.

3. Using the raw data for each supervisor from 1 above as data points, a t-statistic is calculated for each supervisor for the following comparisons (a dependent t-test is used since the different ratings are not independent of each other, the supervisor being the same):

   a. Pre vs. Then (yields $t_{Pre,\ Then}$)

   b. Post vs. Pre (yields $t_{Post,\ Pre}$)
   c. Post vs. Then (yields $t_{Post,\ Then}$)

4. Using the raw data from 1 above, correlations are calculated for every supervisor for each of the three comparisons in 3 above ($r_{Pre,\ Then}$, $r_{Post,\ Pre}$ and $r_{Post,\ Then}$).

5. Tests for gamma change are performed in two ways:

a. Shape differences in profiles.

1. Using the correlations computed in 4 above the following differences are calculated for each supervisor:

(a) RDIFA = $r_{\text{Post, Then}} - r_{\text{Pre, Post}}$
(b) RDIFB = $r_{\text{Post, Then}} - r_{\text{Pre, Then}}$
(c) RDIFC = $r_{\text{Pre, Post}} - r_{\text{Pre, Then}}$

2. Experimental differences are compared with control differences by using either a Mann-Whitney U test or a Kruskal Wallis one-way ANOVA. For gamma change to have occurred, the following relationships must obtain.

(a) RDIFA for Experimental group ≠ RDIFA for Control group
(b) RDIFB for Experimental group ≠ RDIFB for Control group
(c) RDIFC for Experimental group = RDIFC for Control group

b. Dispersion differences in profiles

1. Using the standard deviations computed in 2 above the following differences are calculated for each supervisor:

(a) SDDIFA = $SD_{\text{Then}} - SD_{\text{Pre}}$
(b) SDDIFB = $SD_{\text{Post}} - SD_{\text{Pre}}$
(c) SDDIFC = $SD_{\text{Post}} - SD_{\text{Then}}$

2. Experimental differences are compared with control differences using either a Mann-Whitney U test or a Kruskal-Wallis one-way ANOVA. For gamma change to have occurred, the following relationship must obtain:

(a) SDDIFA for Experimental group ≠ SDDIFA for Control group
(b) SDDIFB for Experimental group ≠ SDDIFB for Control group
(c) SDDIFC for Experimental group = SDDIFC for Control group

c. The strongest evidence for the occurence of gamma change is when predicted significant differences between experimental and control profiles are found for <u>both shape and dispersion</u>. All three predicted relationships must hold for each test. If predicted significant differences between experimental and control group profiles are found either for shape or dispersion, there is weaker evidence for the occurence of gamma change.

d. If gamma change has occured, interpretations of test results for beta and alpha change are somewhat problematic, and should be done with caution. If gamma change does not occur, there are no such interpretation problems. The next step is to check for beta change.

6. Using the t-statistic calculated for each subject, a test can be carried out for beta change using a Mann-Whitney U test to demonstrate the following relationship:

$t_{Pre,\ Then}$ for Experimental group $> t_{Pre,\ Then}$ for Control group

7. Two tests for alpha change are available. If no beta change is found either test is appropriate. But if beta change does occur, only the second test is appropriate.

a. $t_{Post,\ Pre}$ for Experimental group $> t_{Post,\ Pre}$ for Control group

b. $t_{Post,\ Then}$ for Experimental group $> t_{Post,\ Then}$ for Control group

Gamma change: Some modifications

Till this point, the only addition that has been suggested to the Terborg et al. methodology has been the order in which tests for the different kinds of change may be carried out. This section clarifies the use of correlation differences to study the occurrence of gamma change.

Terborg et al. suggest that "...two profiles are similar in shape if the correlations between the two profiles are positive and statistically significantly different from zero" (p. 115). Given this definition, it should be possible to test if gamm change has occurred by comparing the $r_{Pre,\ Post}$ $r_{Pre,\ Then}$ and $r_{Post,\ Then}$ correlations between the experimental and control groups directly. This is instead of the complex tests of correlations differences suggested by Terborg et al. If gamma change has occurred, $r_{Pre,\ Post}$ and $r_{Pre,\ Then}$ would be significantly different across the experimental and control groups, but $r_{Post,\ Then}$ would not be significantly different.

In addition to being relatively simpler than the correlation difference tests suggested by Terborg et al., the method suggested above avoids a potential possiblity of mistakenly detecting gamma change when it is not present. An example will clarify this point. As mentioned in the previous paragraph, for gamma change to have occurred, the $r_{Pre,\ Post}$ and $r_{Pre,\ Then}$ correlations should be nearly zero and $r_{Post,\ Then}$ should be positive for the experimental group, but all three should be positive for the control group. However, the test of correlation differences suggested by Terborg et al. may not distinguish between this situation and another in which $r_{Pre,\ Post}$ and $r_{Pre,\ Then}$ are positive but $r_{Post,\ Then}$ is zero in the experimental group, and all three are positive for the control group.

According to the simpler test for gamma change using correlations, gamma change occurs if:

$r_{Pre,\ Post}$ for Experimental group $<$ $r_{Pre,\ Post}$ for Control Group,

$r_{Pre,\ Then}$ for Experimental group $<$ $r_{Pre,\ Then}$ for Control Group,

and $r_{Post,\ Then}$ for Experimental group $=$ $r_{Post,\ Then}$ for Control Group.

Method

Thirty eight supervisors from four small to medium-sized manufacturing plants participated in the modeling program described earlier and formed the experimenta group in this study. Twenty one other supervisors from three different plants were used as controls. In both the experimental and control plants, all the first level supervisors in each plant participated in the study. Experimental plants were not randomly selected for inclusion in the sutdy. They were assigned based on the scheduling needs of the organization. Control plants however, were selected to match, as closely as possible, the experimental plants on key variables such as size, technology, geographical location, performance, and general organizational climate.

Questionnaires specifically developed for this study were administered to all the participants two-times -- first, one week before the intervention began, and second, one week after it ended (twelve weeks later). Among other things, the questionnaires focused on the five specific behavioral skills targeted by the change program. Each skill was described by a sub-scale consisting of two to five items, giving a total of 19 scale items for the five behavioral skills.

The Post questionnaires contained two response scales for each item, one which asked for a response based on how the supervisor perceived himself at that point in time (the Post response), and a second which asked how the supervisor perceived he was the week before the intervention began (the Then response).

The analytical method used here to assess alpha, beta and gamma change, though based upon Terborg, et al. (1980), contained two important modifications -- one in the order in which to perform the analysis and the other in using correlatins to test for γ change. Terborg and his colleagues did not explicitly address the issue of the order in which alpha, beta and gamma change should be investigated. This is an important omission since the finding of one type of change may affect the interpretation of another type of change. Also, the test for gamma change using correlation differences may make for misleading inferences under some conditions and is quite complex. A simpler test based upon correlations is suggested. In our analysis, the Terborg et al. approach is expanded to account for both these modifications.

The analytical sequence used here involved testing for gamma change first. If it had occurred , the investigation of beta and alpha change would be problematic. If it did not occur, then testing for both beta and alpha change would be more meaningful. If the test for beta change showed that it did not occur, then either of the two methods proposed by Terborg et al. for assessing alpha change would be suitable and both would yield similar results. On the other

hand, if beta change did occur, then only one of the two methods of detecting alpha change would be appropriate (i.e. comparing Post and Then data). Testing for alpha change is the last step in the analytical sequence.

These procedures were used to assess the impact of the modeling-based intervention. The results obtained are discussed in the next section.

Results

The summarized results of the impact of the modeling based intervention are shown in Table 1. Since each of the three profile characteristics--shape, dispersion and level--is tested separately using different indices as data, columns indicating the characteristic tested and index used are shown as they relate to the type of change being considered and the dependent variables being compared across groups. A Mann-Whitney U-Test corrected for ties was used to assess the significance of each comparison (the Kruskal-Wallis one-way ANOVA gives identical results.)

Table 2 summarizes the results from the testing of gamma change using correlations rather than correlation differences. A Mann-Whitney U-Test was again used to test if mean ranks were the same in the experimental and control groups.

Gamma Change

A comparison of the shapes of profiles for the experimental and control groups using correlation differences revealed support for the existence of gamma change. The correlation differences RDIFA and RDIFB were unequal in the experimental and control groups (P-levels <0.001 and 0.008 respectively, see Table 1), and the correlation difference RDIFC was not significantly different for the two groups. But this pattern of results was not found for the differences in profile dispersions. While profile shape differences indicated the occurrence of gamma change, profile dispersion differences indicated no gamma change. Terborg, et al.

(1980) noted that "the strongest demonstration of gamma change can be defined as group differences in both profile shapes and profile dispersions." (p. 118) (emphasis added). This outcome did not obtain here. A rigorous interpretation of these findings would, therefore, indicate that gamma change did not occur as a result of the modeling-based intervention.

An examination of Table 2 further clarifies this issue. Although the test of correlation differences to compare pofile shapes indicated that gamma change had occurred, the test of correlation coefficients did not support the occurrence of gamma change. This was quite consistent with the pattern of dispersion differences between control and experimental groups.

Beta Change

Beta change is indicated if the levels of the Pre and Then profiles are significantly different. This result would reflect a shift in the standards used to judge behavior. Before the intervention, supervisors used a particular standard to evaluate their own behavior (Pre measure). After the intervention, the supervisors looked back and once again judged how they were behaving prior to the beginning of the change activity (Then measure). If beta change had occurred, the standards with which supervisors judged their own behaviors should have been affected by the intervention and consequently the level of the Pre profile should have been different from that of the Then profile.

The data show that beta change did occur, since the levels of the Pre and Then profiles were significantly different ($P < 0.003$, see Table 1). Supervisors recalibrated their conceptual domains as they related to the behavioral skills targeted by the intervention and assessed their behavior with a different "yardstick" after the intervention.

This pattern of results -- weak support for gamma change and significant support for beta change -- sheds new light on the impact of an intervention such as the one described here. The intervention did not have the appropriate types of impact to cause reconceptualization of the perceived realities but did have the effect of altering the standards applied to judging the targeted behaviors.

Alpha Change

Since beta change occurred, it is appropriate to assess alpha change only by comparing the levels Post and Then profiles. Terborg, et al. recommend using this comparison in all cases regardless of the presence or absence of beta change, but if beta change is indicated, this is the only appropriate comparison to use.

The data show that alpha change occurred ($P < 0.000$, see Table 1). The Post-Then profile comparison yielded mean ranks that were substantially higher in the experimental group as compared to the control group. It appears therefore, that the modeling-intervention was sufficiently strong so as to result in significant alpha change.

DISCUSSION

An analysis of the three different types of change provided insights into the change process richer than those derivable from the usual Pre and Post intervention comparisons of behavior scores. Investigation of gamma, beta and alpha change led to a more complete understanding of the effects of the modeling-based O.D. intervention.

Gamma Change

Testing for gamma change may be done by comparing profile shapes and dispersions. Profile shape comparisons using the correlation differences as

suggested by Terborg et al. indicated that gamma change may have occurred as a result of the intervention. But when only correlations were compared, the modification sugested here in order to improve detection of gamma change, the conclusion of gamma change was not supported.

Differences in profile shapes imply that skills perceived as having been high relative to others prior to the intervention, were perceived as lower after the intervention, and skills perceived as low earler were later perceived as relatively high. A comparison of profile shapes using correlations did not indicate that gamma change had taken place. Thus, the intervention did not produce significant alterations in how the supervisors constructed the reality of their behaviors.

Similarly, the dispersions of the various profiles did not follow the predicted patterns for gamma change. Given similar profile shapes and levels, dispersion differences occur when those skills perceived as high at one point in time are perceived as even higher at another point, or when those perceived as low at the earlier point in time, are later seen as even lower. In order for gamma change to have occurred, the differences in standard deviations of the Then and Pre profiles (SDDIFA) and the Post and Pre profiles (SDDIFB) would have had to have been unequal for the ex-perimental and control groups but the difference for the Post and Then profiles (SDDIFC) would have had to be equal for the experimental and control groups. The observed results were that the first two differences in profile dispersions were not significant (at $p < .05$), but the third was significant ($p < 0.001$, see Table 1). This was the opposite of what was expected. Thus, the test of profile differences on dispersions did not lend support to the existence of gamma change.

As was discussed before, the position taken here, consistent with Terborg et al. (1980), is that the strongest evidence for gamma change would be predicted changes in both the shapes and dispersions of the profiles. Since neither the

shapes nor the dispersions changed in ways that indicated gamma change, we concluded that no gamma change had occurred due to the modeling-based intervention. This was, however, not surprising. Given the highly focused nature and limited scope of the intervention, the level of profound change needed for gamma change would have been unlikely as a result of the intervention.

Beta Change

Beta change could be expected to be one consequence of a modeling-based intervention. Prior to this intervention, most of the supervisors perceived themselves as relatively skilled in the interpersonal processes necessary to carry out their jobs. The behaviors targeted for change by the intervention were sufficiently common that supervisors regularly enacted them to one degree or another and probably believed that they were performing them relatively well. The interventions therefore, could well have affected the supervisors' perceptions of how well each of the behaviors were performed, and as a consequence, caused a shift in the anchor points of the measuring scales. The results show that, overall, there is a difference in the levels of the Pre and Then profiles.

It appears that this group of supervisors significantly shifted the points with which they anchored their perceptions of the behavioral items. Frequency distributions of the Pre and Then scores show that the Then responses tended to be a bit lower than the Pre responses with the shift indicated by those data being statistically significant. Therefore, an alteration in the anchor points of the scales occurred and was large enough to be greater than one which could have occurred by chance.

This finding with the previous one, the absence of gamma change, gives a clearer insight into the dynamics of a modeling-based change process. It

appears that an intervention such as this, one tightly connected to specific behavior, is less likely to lead to conceptual shifts than one in which the change targets are attitudes, values or more global perceptions of behavior. Most organizational change interventions are of this latter type and as a consequence can be expected to result in more gamma change than a modeling-based one. In addition, a modeling-based intervention can be expected to cause less disorientation for the organizational participants since it isn't turning their views of the world upside down. Consequently, one might expect that less resistance to changing behaviors would occur in a modeling-based intervention due to the natural resistance to change people feel when they become more disoriented and "out of control."

On the other hand, it appears that the intervention did result in a shift of standards used for judging the extent to which a behavior occurs. Certainly, the intervention made participants more aware of the behaviors in question as well as more knowledgeable of the levels of competence which were possible in the use of the behaviors. Both these processes could have contributed to a shift in the standards applied by the organizational members.

Alpha Change

Alpha change, the final and most straightforward form of change, was also found to have occurred. When assessed using Post and Then profiles, the differences in levels of the two profiles is quite large. An analysis of the Post/Then data shows substantial changes in most of the 19 items as well as in the overall profiles. Thus, the modeling based intervention not only changed supervisors' standards for judging their own behaviors, but also the behaviors themselves. Indeed, the change of these behaviors was the objective of the intervention.

Another interesting finding, which underscores the importance of using this methodology, is that the use of Post and Then profiles to evaluate alpha change if beta change has occurred improves the Z-score from 3.3131 (if Pre and Post profiles are used) to 5.2782 (see Table 1). In the present case, the level of signficance does not change, but it is possible to think of situations where the Pre-Post comparison may not indicate alpha change, but the Post-Then comparison may do so, if beta change has also occurred.

CONCLUSIONS

The research reported here highlighted three important aspects of assessment of planned change. First, a modeling-based change strategy (Bandura, 1977) is a highly effective means for developing critical interpersonal problem solving skills of first line supervisors. Second, it is important to analyze the three different types of changes that occur when attempting to assess change to improve effective behavior in organizations using the alpha, beta and gamma change distinction (Golembiewski, et al., 1976). The Terborg et al. methodology is quite useful in evaluating these changes. Third, the Terborg et al. methodology is elaborated in two areas - the order in which to test for the existence of different types of change, and the use of correlations rather than correlation differences to compare profile shapes when testing for gamma change. The first elaboration suggests first testing for gamma change, and then for beta and alpha change, since the occurrence of gamma change makes it difficult to interpret the other two. The second suggests using correlations to compare profile shapes. While the use of correlation differences to compare profile shapes will usually detect such differences, it can be misleading in certain situations. Using correlations differences is simpler and more appropriate.

TABLE 1: ALL EXPERIMENTALS VS. ALL CONTROLS

TYPE OF CHANGE	PROFILE CHARACTERISTIC	INDEX	DEPENDENT VARIABLE	PREDICTION	MEAN RANK		MANN WHITNEY U - WILCOXON RANK SUM W TEST			
					EXPERMENTAL	CONTROL	U	W	z	P≤
GAMMA	SHAPE	CORRELATION COEFFICIENT	RDIFA	E ≠ C	24.55	39.86	192.0	837.0	-3.2771	0.001
			RDIFB	E ≠ C	25.61	37.95	232.0	797.0	-2.6438	0.008
			RDIFC	E = C	30.68	28.76	373.0	604.0	-0.4168	0.675
	DISPERSION	STANDARD DEVIATIONS	SDDIFA	E ≠ C	31.74	26.86	333.0	564.0	-0.0449	0.296
			SDDIFB	E ≠ C	27.04	35.36	286.5	742.5	-1.7811	0.075
			SDDIFC	E = C	24.62	39.74	194.5	834.5	-3.3023	0.001
BETA	LEVEL	t-STATISTIC	*PRE, THEN	E > C	33.89	21.15	213.0	423.0	-2.7323	0.003*
ALPHA	LEVEL	t-STATISTIC	*POST,THEN	E > C	37.03	12.95	56.0	246.0	-5.2782	0.000*
ALPHA	LEVEL	t-STATISTIC	*PRE, POST	E > C	39.63	24.17	177.5	792.5	-3.3131	0.000*

$N_E = 38$ $N_C = 21$ *one-tail test

TABLE 2: ALL EXPERIMENTALS VS. ALL CONTROLS

TYPE OF CHANGE	PROFILE CHARACTER-ISTIC	INDEX	DEPENDENT VARIABLE	PREDICTION	MEAN RANK		MANN-WHITNEY U - WILCOXON RANK SUM W TEST			
					EXPTL.	CONTROL	U	W	Z	P≤
GAMMA	SHAPE	CORRELATION COEFFICIENT	$r_{Pre,\ Post}$	E < C	27.12	32.76	289.5	622.5	-1.2104	0.113*
			$r_{Pre,\ Then}$	E < C	25.95	35.11	245.0	667.0	-1.9637	0.025*
			$r_{Post,\ Then}$	E = C	20.00	46.44	19.0	836.0	-5.7804	0.000

*one-tail test

FOOTNOTES

[1]The intervention used here was originally develped by a private consulting firm and then modified by Brad Anderson, Organization Development specialist for the organization.

[2]It is beyond the scope of this paper to deal with the flaws noted by Terborg, et. al. The interested reader is referred to the original document for complete detail on their arguments.

BIBLIOGRAPHY

1. Armenakis, A.A. & Bedian, A.G. On the measurement and control of Beta change: Reply to Terborg, Maxwell and Howard. Academy of Management Review, 1982, 7, 296-299.

2. Armenakis, A.A. & Zmud, R.W. Interpreting the measurement of change in organizational research. Personnel Psychology, 1979, 32, 709-723.

3. Bandura, A. Social Learning Theory, Englewood Cliffs, N.J.: Prentice-Hall, 1977.

4. Bedian A.G., Armenakis, A.A., & Gibson, R.W. The measurement and control of Beta change. Academy of Management Review, 1980, 5, 561-566.

5. Burnaska, R.F. The effects of behavior modeling training upon managers' behaviors and employees' perceptions. Personnel Psychology, 1976, 29, 329-335.

6. Byham, W.C., Adams, D., & Kiggins, A. Transfer of modeling training to the job. Personnel Psychology, 1976, 29, 345-349.

7. Goldstein, A.P. & Sorcher, M. Changing Supervisor Behavior, New York: Pergamon, 1974.

8. Golembiewski, R.T., Billingsley, K., & Yeager, S. Measuring change and persistence in human affairs: Types of change generated by OD designs. Journal of Applied Behavioral Science, 1976, 12, 133-157.

9. Golembiewski, R.J. & Billingsley, K. Measuring change in OD panel designs: A response to critics. Academy of Management Review, 1980, 5, 97-104.

10. Howard, G.S. & Dailey, P.R. Response-Shift bias. A source of contamination of self-report measures. Journal of Applied Psychology, 1979, 64, 144-150.

11. Howard, G.S., Ralph, K.M. Gulanick, N.A. Maxwell, S.E., Nance, D.W., & Gerber, S.R. Internal invalidity in pretest-posttest self-report evaluations and a re-evaluating of retrospective pretests. Applied Psychological Measurement, 1979, 3, 1-23.

12. Howard, G.S., Schmeck, R.R., & Bray, J.H. Internal invalidity in studies employing self-report instruments: A suggested remedy. Journal of Education Measurement, In press.

13. Howard, G.S., Dailey, P.R., & Gulanick, N.A. The feasiblity of informed pretests in attenuating response-shift bias. Applied Psychological Measurement, In press.

14. Howard, G.S., Millham, J., Slaten S. & O'Donnell, L. Response-style bias: A problem in measuring pre/post change with self-reports. Unpublished paper, Department of Psychology, University of Houston, 1979.

15. Kraut, A.J. Behavior modeling symposium: Developing managerial skills via modeling techniques: Some positive research findings -- a symposium, Personnel Psychology, 1976, 29, 325-328.

16. Latham, G.P. & Saari, L.M. Application of social-learning theory to training supervisors through behavioral modeling. Journal of Applied Psychology, 1979, 64, 239-246.

17 Lindell, M.K. & Drexler, J.S., Jr. Issues in using survey methods for measuring organizational change. Academy of Management Review, 1979, 4, 13-19.

18. _____ Equivocality of factor incongruence as an indicator of type of change in OD interventions. Acadmey of Management Review, 1980, 5, 105-108.

19. Lundberg, C. The current state of OD theory. Paper presented to the Academy of Management, 1978.

20. Moses, J.L. & Ritchie, R.J. Supervisory relationships training: A behavioral evaluation of a behavior modeling program. Personnel Psychology, 1976, 29, 337-343.

21. Porras, J.I. The comparative impact of different Organization Development techniques and intervention intensities. Journal of Applied Behavioral Science, 1979, 15, 156-178.

22. Porras, J.I. & Berg, P.O. The impact of Organization Development. Acadmy of Management Review, 1978, 3, 249-266.

23. Porras, J.I., Patterson K.J., Mazfield, P.G. Bies, R.J., Roberts, N. & Hargis, K. Modeling-based Organizational Development: A longitudinal assessment. Journal of Applied Behavioral Science, 1982.

24. Randolph, W.A. & Edwards, R.G. Assessment of alpha, beta, and gamma changes in a university-setting OD intervention. Academy of Management Proceedings, 1978, 313-317.

25. Smith, P.E. Management modeling training to improve morale and customer satisfaction, Personnel Psychology, 1976, 29, 351-359.

26. Terborg, J.A. Howard, G.S. & Maxwell, S.E. Evaluating planned organizational change: A method for assessing alpha, beta, and gamma change. Academy of Management Review, 1980, 5, 109-121.

27. Terborg, J.R., Maxwell, S.E. & Howard, G.S. On the measurement and control of Beta change: Problems with the Bedian, Armenakis, and Gibson technique. Academy of Management Review, 1982, 7, 292-295.

28. Zmud, R.W. & Armenakis, A.A. Understanding the measurement of change. Academy of Management Review, 1978, 3, 661-669.