A Behavioral-Analysis, Systems Approach in a University-Based, Food Co-Operative

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A BEHAVIORAL-ANALYSIS, SYSTEMS APPROACH IN A UNIVERSITY-BASED, FOOD CO-OPERATIVE

by

Harry M. Kent

A Thesis Submitted to the Faculty of The Graduate College in partial fulfillment of the Degree of Master of Arts

Western Michigan University Kalamazoo, Michigan August 1974

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Harry Mason Kent
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Large social settings are areas of particular interest to those who would further the survival of their culture through intentional design. The experimental analysis of behavior has steadily advanced into complex social situations since the publication of The Token Economy (Ayllon and Azrin, 1968). More recently, controlled studies have been carried out in a home environment for pre-delinquent boys (Fixen et al., 1972). Characteristically, however, the results of these studies have been limited in their generalizability because the experimental setting has been too unlike the setting in which replication is desired.

Control of potential independent variables has been a hallmark of applied behavior analysis. Procedures to facilitate generalization to post-treatment settings have included elaborate fading, and even programming the natural environment (Kazdin, 1972), but the treatment itself has occurred under conditions in which the effects of isolated variables may be rigorously observed, often during experimental reversals.

Rigorously controlled conditions cannot be achieved for the modification of all behaviors of importance to society. The purpose of the present study is to demonstrate an approach to cultural design which is results oriented, as well as concerned with the demonstration of high probability functional relations between independent and dependent variables. This type of approach is probably necessary if cultural design is to advance beyond its present pre-revolutionary stage.

Systems analyses of various types have been in increased use

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in government and corporate operations since World War II (Black, 1966), but the universal principles which contributed to their effectiveness went without integration with the principles of behavioral contingency management until recently.

Systems analysis (Malott, 1972) provides for an initial stage in which the existing system is analyzed in behavioral terms in order to decide what behaviors and what consequences need modification. It then calls for a statement of behavioral objectives for the modification or replacement of specific parts of the existing system. The design of the system takes place next and involves the theoretical applications of the principles of behavior. Implementation involves observing and conseqating specified behaviors. Evaluation and recycling are based upon the early emphasis upon observable and measurable behaviors, which is perhaps the most important, if not the only, common attribute of all systems approaches.

The system selected for analysis was the People's Food Cooperative of Kalamazoo (the co-op), situated at two locations near Western Michigan University and Kalamazoo College in Kalamazoo, Michigan. The co-op, a member-owned grocery and bakery, included approximately 550 members in mid-June of 1973. Most of the households consisted of students or ex-students of Western Michigan University or Kalamazoo College. In terms of numbers of members, and in terms of gross volume and volume of purchase at the warehouse of the Michigan Federation of Food Co-operatives, the Kalamazoo co-op was the second largest of thirty co-ops in the area including Michigan, northern Ohio, and northern Indiana. This and other similar
systems are not readily amenable to experimental control, as will become evident in the ensuing systems analysis.

A systems approach does not by any means exclude a functional analysis. Evaluation should include methods for assessing the relative contributions of different factors of each suspected independent variable. A reasonable way to evaluate a social system such as the one selected is to use a "time-series" quasi-experimental design (Campbell and Stanley, 1968) with more conventional multiple baseline and reversal designs added if their use is opportune.

"Treatment packages" (Azrin, 1973) of independent variables may also be used when time is a factor, when costs can be so reduced, and when the probability of a successful intervention is so increased. This technique need not detract significantly from experimental method when the effects of each component may be measured on different dependent variables, or when the relative effects of each component on the dependent variable of interest have been satisfactorily demonstrated elsewhere.
SYSTEMS ANALYSIS IN THE CO-OP

In May of 1973 the co-op was in a state of disarray, which, according to a history of the co-op written in that year, was characteristic of its previous four years of existence (Sarvardi, 1973). For purposes of clarity, the systems analysis conducted for each major problem area will be presented separately. The complete schedule of independent and dependent variables is presented in Figure 1.

Core Worker Performance

The co-op had moved into a large building in the fall of 1972, and had very soon thereafter acquired a second building which was used as a bakery and as an additional retail outlet. This increase in the size of the co-op led to an increased workload which in the spring of 1973 was beginning to severely tax the energies of the small group of core workers which did all of the ordering, pricing, trucking, and other essential jobs at the co-op.

Phase 1. Behavioral analysis

Jobs for core workers were not specified in written form. The high rate of turnover of core workers (present core workers had not worked longer than five months) had not lead to the development of a training program to facilitate transfer of critical jobs. It was commonplace for goods not to be ordered, produced, delivered, or priced. The core group of workers openly expressed dissatisfaction
Figure 1. Schedule of independent and dependent variables. Each major independent variable or "package" of independent variables introduced during the ten month study is presented along with the date of introduction. Dependent variables of interest during the design phase are presented above as they correlate with each independent variable.
Schedule of Dependent Variables

June  July  Aug  Sept  Oct  Nov  Dec  Jan  Feb  Mar

Schedule of Independent Variables

June  July  Aug  Sept  Oct  Nov  Dec  Jan  Feb  Mar

1973  1974

Weeks
with the amount of work not done by the other workers and with the inordinate amount of work which fell upon them as a consequence.

Core workers were "volunteers," with the exception of a baker who received $.10 per loaf baked. The reinforcers for existing behaviors were difficult to identify and must be left largely to speculation. It can be reasonably assumed that, in the absence of pay, functional consequences for work were largely social in nature.

**Phase 2. Statement of the behavioral objective**

If goods were not ordered, produced, delivered, and priced, the co-op would not survive. It was stated that jobs in the areas of ordering, pricing, bookkeeping, baking, trucking, and maintenance of equipment were to be performed at at least a minimum level necessary for financial solvence of the co-op.

**Phase 3. Design of the system**

Behavioral contracts were designed to improve core worker performance (see Appendix A). The contracts provided extrinsic monetary reinforcers contingent upon the completion of clearly defined and observable tasks. These contracts included self-report forms which were to be completed each week by meeting time, when they were to be presented for assessment and consequation.

The pay for contract jobs was designed somewhat along the lines of the labor credit system first elaborated in Skinner's (1948) *Walden Two* and later put into effect at Twin Oaks in Virginia (Kincaid, 1973). Points which were later converted to dollars were determined, taking
into consideration the time necessary to do the job and the desirability of the job to the person concerned. Fifty cents per hour was the basic pay arrived at by considering what the co-op could afford and what might be the minimum necessary to maintain performance. In the labor credit system at Twin Oaks, credits and desirability interact on a forced choice ordinal scale, whereas at the co-op credits were merely doubled if a job was deemed undesirable for reasons such as difficulty, wearisomeness, or for any other consideration approved by the majority of those present at any of the weekly meetings of the co-op. Taking inventory, for example, earned one point or one dollar per hour because of its acknowledged undesirability. A third factor entered the calculation in the co-op labor system; overhead contributed to a job was included in the job credits. If, in completing a job, a person had to drive a vehicle, then ten cents per mile was added to the pay. An additional feature of the contracts was the payment of credits in food for as much of the week's earnings as could be agreed upon with the worker. This feature may induce larger volume purchases at the co-op on the part of core workers. If the added purchases do not compete with cash purchases, the co-op saves an amount equal to the mark-up (20%) on each additional sale.

Contract items could be delegated, subcontracted, or transferred to other persons' contracts. Minimum wage laws do not apply to contract workers, who are "self-employed." Withholding taxes are not deducted by the co-op for the same reason.
Phase 4. Implementation

Contracts were prepared for ordering and pricing, trucking, baking, bookkeeping, maintenance, and the production of various saleable items. The contracts were approved by all of the members present at two successive meetings of the co-op.

Phase 5. Evaluation

No baseline was taken with core worker performance. In the case of core worker contracts this was not considered possible, as taking the time necessary to measure a baseline may have allowed core workers' behavior to be punished or extinguished beyond easy recovery. Problems in independently observing core worker job performance would also have been significant. Many of the jobs were such that rate measures would not have been revealing over a short time span, and more immediate data such as verbal reports were often used to vary the points to be earned for particular jobs.

One contract was an exception to this, however. A design was used in which differential point values were used to consequate attendance at work by a group of people belonging to the Divine Light Mission who were baking bread at the co-op's bakery. They would pay two cents less per loaf baked for their group if they worked one afternoon at the bakery to keep it open to the general public, and four cents per loaf less than the prearranged discount price if they worked a second afternoon. Attendance was observed for over a month.
The differential points were then dropped and attendance was again monitored.

The introduction of behavioral contracts was correlated with financial solvency, increased monthly gross income (mean increase from $4955.00 per month for two months prior to contracts to $6425.00 per month for two months after contracts, an increase of 26%), and increased vocalized happiness on the part of core workers. Inventory records were not considered to be accurate enough to verify the accumulation of goods during this time. It can be reasonably concluded, however, that increased production of baked goods, more consistent ordering of other goods, and faster, more accurate pricing, created surplus capital which went immediately towards the purchase of more items, which then sold, leading to the increase in gross income. This increase is attributable less to "chance" factors in time because of the fact that the introduction of the contracts corresponded with the termination of the spring session and a considerable out-migration of students.

Attendance at work by the group of people who were baking bread on contract was perfect while the differential contingencies were in effect. When the differential point values were dropped, allowing the group to receive the maximum discount whether or not they attended work, only one of the twelve possible afternoons was missed during a six-week observation period. It could have been that the effort involved in keeping the store open to the general public while baking was not great.
Phase 6. Recycling

Contracts were created, re-written, and adjusted as jobs were identified, as people offered their services, and as verbal reports came in concerning the contracts. An example in point is the contract for ordering and pricing. Three different people held this contract in its many varying forms from June, 1973 to February, 1974. Two people held different parts of it at the same time. One particular job, that of bulk ordering for individual customers, was created, then doubled in value, and then allowed to run concurrently with another job, that of "general co-op work," which accrues hourly rather than by an output criterion.

Dues Payments

When the behavioral contracts were introduced, there was no assurance that increased income would result, in the short run. The income in the spring of 1973 had barely been able to cover the basic overhead expenses of the co-op, such as rent and utilities for the two buildings. In the past, each "household" had been asked to pay $.75 per month "dues" to help pay the rent.

Phase 1. Behavioral analysis

A median of 230 dues were paid monthly for the first five months of 1973. There was a sign posted in the co-op requesting $.75 per month dues, and there was an additional reminder about dues taped
to a small green index card box on the check-out counter. Occasionally the person at the check-out counter would ask a customer if dues had been paid, but according to experienced workers' testimony and to casual observation, this was done very infrequently. Consequences for paying dues were not specified, and were difficult to identify. One event which followed the payment of dues was that the customer was often asked to record the payment on an index card. A "thank-you" from the cashier also frequently followed dues payments.

Phase 2. Statement of the behavioral objective

The behavior specified in this case was increased payment of dues by members of the co-op. As little was known of the variables of which this behavior was a function, no more specific objective was stated.

Phase 3. Design the system

A 4% discount was specified as a consequence for those members who paid dues each month. "Member" here was defined as any member of a household which had paid dues at least once in the current calendar year. It was felt that the capital made available through the payment of $.75 per month per household would contribute to more goods being made available for sale at the lower mark-up the co-op offered. The $.75 could be "earned back" by the household by purchasing goods ($18.75) at the 4% discount, but the original capital insured that the goods would be on the shelves to buy. The discount may also serve as a source of extrinsic reinforcement for purchasing for an individual
customer, and may contribute to "increasing the commitment" of customers to the co-op by, for example, increasing the probability that by being a member a person might also come to meetings, be a worker, and expose himself to whatever other potential reinforcers the co-op has to offer.

Phase 4. Implementation

The change in dues policy passed with no opposition at a co-op meeting. A small sign explaining the policy was posted near the check-out counter. The procedure for collecting dues remained virtually the same. If a customer paid dues, he was asked to record the payment in a ledger book rather than on an index card. The 4% discount was effected quite simply by not adding the 4% sales tax to the bill. As taxes were computed from gross income, this was not illegal. Had the discount been taken after taxes had been added, the customer in only a very few cases would have benefitted more than by the method described.

Phase 5. Evaluation

As can be seen in Figure 2, the 4% discount was followed by an immediate median increase of 50% in dues payments (230 per month for five months to 345 per month for seven months). Dues book (or index card) measurement had the weakness that a member may pay several months' dues during one month and thus the dues are not recorded necessarily during the month that they are paid. It was estimated that few people paid ahead, and even fewer paid back dues, however.
Figure 2. Number of dues payments per month. Each payment was $.75. The horizontal dashed lines represent the median for each period.
A cumulative record of dues was kept which verified the relative increase in dues payments and also revealed a pattern after the 4% discount of numerous payments in the first week of the month followed by successively decreasing payments until just before the first week of the next month. This scallop pattern was not characteristic of the previous four months' dues payments. The cumulative record was subject to the criticism that all dues were not recorded on cards provided daily for this purpose. In the first full month of the 4% discount, for example, 223 dues were recorded on the cumulative record, and 327 in the dues book. The baseline cumulative record was taken by counting the money in a "dues bucket" and dividing by $.75, a procedure which also suffered from lack of consistency.

The observed increase in dues payments occurred at a very unlikely time, i.e., the beginning of the summer session, when number of customers has typically reached a nadir.

Phase 6. Recycling

The 4% discount was judged by the members to have met the objective specified. No recycling occurred. A cost-analysis based on crude estimates of the average monthly purchase of a household member of the co-op has brought the financial success of the discount into question. It appeared that more money would be made with the same amount of customers at the same volume of purchase if the discount were removed and the difference in dues paid as a result of the discount sacrificed. This analysis does not take into account any difference in the number of customers or in the volume of individual
purchase that the discount may have induced, however. As no baseline exists for these variables, the effect of the discount on income remains in question. Recycling through the stages of systems analysis may benefit the co-op, even if a withdrawal of the discount is specified.

Manager and Worker Attendance

In the spring of 1973, the co-op was often not open for a full eight hours per day. A sign in the door proclaimed that the co-op would be open from eleven to seven Monday through Saturday each week, excluding holidays. The reason for this inconsistency was that there were not enough workers to keep the store open.

Phase 1. Behavioral analysis

Managers (two per day with four-hour shifts, 11:00 a.m. to 3:00 p.m. and 3:00 p.m. to 7:00 p.m.) and workers (no maximum hours specified; requested minimum two hours per week per member) were in attendance at the co-op in widely divergent numbers and at inconsistent intervals. There were signs posted asking people to work, and there was a calendar with nails sticking out for people to affix their names if they intended to work.

All workers and managers were "volunteers." As with core workers, functional consequences were likely social in nature. Potluck dinners every other weekly meeting date and an occasional co-op sponsored square dance were attended by several of the workers and managers, supporting this assumption. Alternate weekly meetings were not so
well attended (mean attendance for June-July, 1973 was 9.5 as compared to 13 during the same period for potlucks), nor were weekly meetings for worker education (mean attendance of less than one), but these were additional social occasions. The store, if not the bakery, was a gathering place for students to some extent, and was a place where notices of public events and personal communications were posted.

Other possible consequences which may have been functional in maintaining existing behaviors included conditioned negative reinforcers having to do with "avoiding failure," or with avoiding the loss of the types of food that the co-op and no other store in town carried. Avoidance of association with aversive activities may also have been functional, as some workers said that they worked at the co-op to show disapproval with the existing economic system in the United States. Avoidance of participation in aversive activities seemed less functional, as work in the co-op did not supplant these activities for most of the workers.

Phase 2. Statement of the behavioral objective

It was desired that the number of workers per shift increase. Tentatively, the combined number of managers plus workers who were to be present each two hours was set at four, although it was also stated that more than four would not be discouraged until problems arose with too many workers, if such could be imagined. An eight-hour day at the co-op which met this objective would then contain two four-hour managers (one each shift), and twelve two-hour workers (three each two-hour period), for a total of twenty-four worker hours.
and eight manager hours.

Phase 3. Design of the system

Work forms were made which included places to record the number of workers who signed for work and the hours for which they had signed, the hours the manager was present, and the hours the store was open during each shift. Managers were to complete the forms. As the baseline for manager and worker attendance accumulated in this way, several interventions were made.

A public display was made of the names of managers and of their hours of participation in the co-op. Names of those workers who pre-signed for work and showed up, and the names of those workers who merely showed up were also displayed on a large blackboard in the middle of one wall of the co-op. Most of the shopping in the co-op is done facing that wall.

Later (refer to Figure 1), an extrinsic reinforcer, $.50 per hour in food credit, was made contingent upon signing up for at least two hours of work 24 hours ahead of time, and upon being present for at least those two specific hours. Other steps were taken at that time to encourage people to work at the co-op, and to encourage those who did work to continue doing so on a regular basis. A set of proposed by-laws was designed (see Appendix B). It was hoped that the by-laws would set the occasion for differential reinforcement for those who did the work of the co-op. Differential voting power was allocated to those who participated in the co-op according to whether they were a member, worker, manager, or core worker on contract. Provisions were
also made to select three core workers as "head managers," or "coordinators," with additional block voting power. Another change was made which provided for the removal of the dues requirement for one month for workers who completed four two-hour shifts in a month. These three sets of contingencies and consequences formed a "treatment package" of independent variables.

Phase 4. Implementation

Implementation included an aspect not often encountered in the history of the experimental analysis of behavior, namely the implementation of experimental contingencies in a social system that has a special history of opposition to methods which are deemed to be contrary to freedom, dignity, and democracy. Several of the members of the co-op reacted to the food credit and free dues provisions by saying that passing such measures would, in essence, deprive the worker the right of working on his own free will, and deny him the dignity of having done it for nothing. The weighted votes were described as contrary to the democratic tradition of "one man one vote."

Because knowledge of the basic principles of behaviorism is probably essential to the design and implementation of a culture which will survive and whose people will be happy, the challenge of the present project became not to dissociate proposals from their theoretical base, but to make the whole system come across as positively as possible. An attempt was made to explain the design of the behavioral system to everyone involved. The rules of contingency management (Malott, 1972) apply; start at the existing level of the behavior,
proceed in small steps, and consistently apply consequences as immediately as possible upon the emission of appropriate behaviors. Words were used which were more a part of existing repertoires than psychological jargon would have been. Potentially aversive words such as "control," "manipulation," and "intervention" were not used. Implementation of the total system began with a contingency which had a high probability of a conspicuous change in the universally desired direction (the 4% discount for dues paying members).

To implement a system which is based upon the ideas that behavior is modified by its consequences, and that people should be affected by the consequences, however remote, of their own behavior, it is important to insure that those who are designing contingencies are subject to those same contingencies or to some equally effective form of counter-control. Some contingencies were designed by a four-hour manager in the co-op (the present author), and other members of the co-op contributed substantially to aspects of that design.

The "treatment package" was implemented by a close majority vote at a meeting attended by 32 people, the most people to have attended a meeting of the co-op (19 present at a potluck is the next highest attendance figure, from June, 1973 to February, 1974). The purpose of the meeting had been pre-announced, and copies of the proposals had been made available.

Phase 5. Evaluation

The percentage of work forms completed by managers for the four weeks prior to group feedback was 80% of the total possible if
a form had been completed for each four hour shift. For the eleven weeks of group feedback this completion frequency was 72%. For four weeks following the "treatment package," 69% of the possible number of work forms was completed by managers. No single shift was systematically excluded from the sample. Each manager filled out at least one form for each four weeks of the sample.

Independent checks were made for manager and worker attendance. Two persons other than the manager would record which managers were present and when, and at which hours the store was open. No attempt was made to systematically randomize the observations, as the two observers were each in the co-op at varying times at least once per day for average durations of over thirty minutes each visit. Worker attendance was monitored by a sign-up procedure introduced one month prior to the use of the "treatment package." The previous sign-up board with nails on it made it difficult to tell if a worker whom a manager had recorded as being signed was indeed signed because the worker may have moved his piece of paper to another date during the shift in which he worked. A continuous calendar sign-up sheet was substituted and used to verify reliability of attendance. A further check was made when food credits were introduced whereby workers who were paid food credit would record hours signed, hours worked, and pay received. The two persons who recorded which managers were present also kept an informal record of which workers were present. The "informal" record did not include a procedure for discovering the names of all workers who may have been present at a given time.

The observers were instructed to note, to the best of their knowledge,
which workers were present, but not to spend an inordinate amount of
time asking names. This procedure was designed to save the observers'
time and to allow them to be as unobtrusive as possible.

As there would be reasonable doubt concerning the "informal"
check on worker attendance, a more systematic record of workers who
were in attendance was conducted for two weeks following the intro­
duction of the continuous sign-up calendar. Observers would make
every attempt to find out the names of workers who were present on
each shift. If an observer could not be present during a shift, a
phone call to the manager for that shift would be made to ask the
names of workers who were present. These additional precautions pro­
vided evidence which was consistent with the more informal observations.
There was a small number of instances in which a worker was recorded
by the manager as being present, and was not present. There was also
a small number of cases in which the worker was recorded as signed,
and was present, but was not recorded as present.

The same procedure for discarding data was followed with all
recording procedures. If one of the observers attested that a worker
was in fact present during the hours for which he had signed, or if
a worker was shown to be present on the food credit record, these
single instances were corrected and included in the data. If there
was any reasonable question as to whether a worker was actually present
or not present at the time recorded by the manager, the manager's re­
port was taken as correct. If an observer attested that more than
one worker on a given shift was present but not reported as such by
the manager, but could not verify all of the attendance data for that

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shift, all of the attendance data for that form were discarded from the summary data. This discarding of the attendance part of work form happened about once in every twenty forms (about once every three weeks).

1. Group feedback. Group feedback had a noticeable effect on manager hours of attendance as shown in Figure 3. For eleven weeks after group feedback median manager hours of attendance was 7.0, as opposed to 6.2 for the previous four weeks. More weeks of higher attendance by managers after group feedback was offset by a few weeks of very poor attendance during the same time period.

Hours of attendance by workers, in Figure 4, was not improved by group feedback. For eleven weeks after group feedback median worker hours of attendance decreased from 9.2 to 7.8.

2. The "treatment package." The "treatment package" of $.50 per hour in food credit, opportunity for more votes, and removed dues requirement appeared to slightly depress manager hours of attendance. The median dropped from 7.0 prior to the "treatment" to 6.45 for four weeks following the "treatment."

The "treatment package" produced an appreciable increase in worker hours of attendance. Median worker hours of attendance per day increased from 7.8 prior to "treatment" to 9.8 for four weeks following "treatment."

A rising baseline which preceded the introduction of the "treatment package" is probably explainable in terms of the cumulative effects of several interventions not included in the intentional design which were made by co-op members with the expressed intention of trying
Figure 3. Number of manager hours of attendance per day per week.

The horizontal dashed lines represent the median for each period.
Figure 4. Number of worker hours of attendance per day per week.

The three triangular points in the group feedback period represent data which may have been influenced by social events preceding the introduction of $.50 per hour in food credit. The horizontal dashed lines represent the median for each period. The gray area represents those periods in which an appreciable change in the dependent variable was achieved.
everything to get more workers short of paying them. Four weeks prior to the "treatment" a worker recruiting stand was erected in a classroom building at Western Michigan University. A well publicized square dance was held the next week. The following week signs were posted announcing the intention to vote at the next meeting on the question of pay for workers. At that meeting the entire "treatment package" was approved and it was assumed that this information was widely disseminated.

Phase 6. Recycling

Mean managers plus workers per hour that the co-op was open rose from 1.8 for eleven weeks prior to "treatment" to 2.1 for four weeks after treatment. This figure was still a long way from the 4.0 desired.

Recycling to the design stage took place, and a public notice of the $.50 per hour food credit for work was added. This discriminative stimulus change produced an immediate, somewhat irregular, but extremely powerful change in median worker hours per day. The median increased from 9.8 to 16.4 for eight weeks.

Manager hours of attendance per day increased from a median of 6.45 to 7.41 for corresponding periods. Managers plus workers per hour that the co-op was open increased from a mean of 2.1 to 3.0, with a high of 3.7 for the same time periods. The hours which the co-op stayed open increased from a median of 7.68 prior to the discriminative stimulus change to 8.0 for eight weeks following the change. For ten weeks prior to the termination of the study, the co-op was open eight hours per day, six days per week.
Data appear to indicate that it was the $.50 per hour food credit which was the critical component of the "treatment package." The fact that differential votes were available had been posted immediately. Attendance at meetings after the vote on the bylaws decreased to its baseline level and stabilized. Also little advantage was taken by workers of the dues removal component, as only three workers reached criterion (i.e. four completed two-hour shifts) in the first month. There were few discriminative stimuli for this component, however, and its effect remains in question.

Manager and Worker Reliability of Attendance

Another problem having to do with attendance of managers and workers which contributed to the inconsistency with which the co-op stayed open was the fact that people who were assigned at meetings to be managers and people who signed up as workers often were not present during the times assigned or signed.

Phase 1. Behavioral analysis

Manager shifts were clearly defined at meetings when managers were recruited as being four hours each, 11:00 a.m. to 3:00 p.m. and 3:00 p.m. to 7:00 p.m. for six days of the week Monday through Saturday. Worker shifts were clearly marked as being two hours each on the sign-up board.

Consequences for high reliability of attendance for managers and workers were similar to those for hours of attendance. Managers very likely were subject to more aversive social consequences for not
attending when they had committed themselves to attending than were workers, however. The managers had the keys to the co-op, and if they did not show up for work, the store very often did not get opened. This fact would be brought to the attention of the manager at the next meeting, or possibly during the week by a worker who was unable to attend because of being locked out. Workers rarely received feedback concerning non-attendance because they were less conspicuous and because very few workers attended meetings.

Phase 2. Statement of the behavioral objective

It was stated that managers who were assigned a shift at a meeting should come 100% of the time assigned, or should recruit somebody who had previously been a manager or worker to come at that time and to accept responsibility for the shift. It was stated that workers who signed for work shifts should come 100% of the time at the time signed. Workers who called in 24 hours ahead if they intended not to attend were not to be considered as being signed.

Phase 3. Design the system

The specifics of the design for improved reliability of attendance are included in the design for manager and worker hours of attendance. During group feedback those managers who were assigned a particular shift but who were not present for that shift were named publicly. Workers who were signed but who did not attend were not named. During the "treatment package" period, it was clearly stated on the food credit recording form that only those workers who attended the exact
hours for which they had signed were to be paid.

Phase 4. Implementation

Implementation of the contingencies designed to improve reliability of attendance of managers is discussed in the context of manager and worker hours of attendance.

Phase 5. Evaluation

Independent observations of reliability of attendance are described in the evaluation phase for contingencies implemented to increase manager and worker hours of attendance. If a worker was present at any time during the time for which he was signed, he was counted as present for purposes of this measure.

1. Group feedback. As can be seen in Figure 5, group feedback had an appreciable effect on median manager reliability of attendance. For eleven weeks after group feedback median manager reliability of attendance was 91%, as opposed to 83% for the previous four weeks.

The pattern of change for reliability of attendance was similar to the pattern of change for manager hours of attendance. More weeks of higher reliability of attendance by managers after group feedback was offset by a few weeks of very poor reliability of attendance during the same time period.

The pattern of change for reliability of attendance of workers was similar to the pattern of change for worker hours of attendance. Reliability of attendance of workers was not improved by group feedback. For eleven weeks after group feedback median worker reliability of
Figure 5. Percentage reliability of manager attendance. The number of managers who were signed for work and attended work as a percentage of the total number of managers who were signed. The horizontal dashed lines represent the medians for each period. The gray area represents those periods in which an appreciable change in the dependent variable was achieved.
attendance decreased from 73% to 63%. This can be seen in Figure 6.

The baseline for reliability of worker attendance was rising during the four week period prior to group feedback, but the baseline in general was highly variable. The number of worker hours signed during this baseline was also highly variable. As the number of hours signed declined during the four weeks prior to the introduction of group feedback, the reliability of attendance by workers increased. In the last week prior to group feedback, for example, in which reliability of workers attendance was 77%, there were only 20.5 hours signed, as opposed to a mean of 33 hours signed for the previous three weeks.

2. The "treatment package." The "treatment package" of $.50 per hour in food credit, opportunity for more votes, and removed dues requirement, appeared to have a downward effect on manager reliability of attendance. The median dropped from 91% prior to the "treatment" to 77.5% for four weeks following the "treatment." This pattern of change was similar to manager hours of attendance.

The "treatment package" had an immediate and dramatic effect on reliability of attendance of workers. Median worker reliability of attendance increased from 63% prior to "treatment" to 93.5% for four weeks following "treatment." This increase occurred despite large increases in hours signed. The increase also survived the Christmas holidays, a period in which the number of workers declined. Hours signed per worker and hours of attendance per worker increased dramatically to keep total worker hours well above baseline.
Figure 6. Percentage reliability of worker attendance. The number of workers who signed up for work and attended work as a percentage of the total number of workers who signed. The horizontal dashed lines represent the medians for each period. The gray area represents those periods in which an appreciable change in the dependent variable was achieved.
Phase 6. Recycling

As measures for worker reliability of attendance had been changed significantly in the desired direction, and showed no signs of reversing in direction, no recycling took place specifically for this variable. The addition of the public notice for the $.50 per hour in food credit, however, produced the first appreciable increase in manager reliability of attendance. The median increased from 77.5% for four weeks to 100% for the final fourteen weeks. It appears that the increased social reinforcement provided by the influx of workers was necessary in addition to the food credit pay to improve manager reliability of attendance.

Increases in hours of attendance and reliability of attendance occurred for workers and managers who were present before the food credit contingency as well as for those who started work after the contingency. Of 226 workers and managers who attended during the period from May, 1973 to January, 1974, 40 worked before and after the food credit was introduced. These persons attended 15% more frequently after the food credit began, and their reliability of attendance increased from 85% to 96%. These data suggest that the most dramatic effects of the "treatment" were on persons other than those who were attending reliably in the first place.

Comparisons of time signed and time actually present for managers and workers showed considerable discrepancies, indicating that there was some tardiness and some early departures. These measures lack
reliability, but point to a need to recycle through the stages of systems analysis with punctuality and endurance as dependent variables.

Job Performance

Survival of the co-op depends upon the completion of the day to day jobs which the people on contracts do not possibly have the time to do.

Phase 1. Behavioral analysis

In the spring of 1973, there was abundant evidence that what few jobs were specified in any clear manner were not consistently done by the managers and workers and that there were many important jobs not specified which were done rarely if at all. There was a manual which contained instructions for the four hour managers, but it was largely obsolete and few managers knew of its existence.

Identifiable consequences for the completion of necessary jobs in the co-op were mostly of the same social nature as were consequences for attendance. Avoiding social ostracism may have been negatively reinforcing. In addition, avoiding certain smells and hazards to health may have been negatively reinforcing.

Phase 2. Statement of the behavioral objective

The behavioral objective was that each four hour shift would complete at least 90% of the jobs applicable to that shift. It was also stated that, in reporting which jobs were completed for each shift, the manager should make no more than five errors.
Phase 3. **Design the system**

Jobs were first to be specified clearly in writing. A work form was designed which allowed the manager to decide which jobs applied to each particular shift. The top part of the form was concerned with manager and worker attendance, and with the hours that the store was open.

Phase 4. **Implementation**

The work form was introduced following discussion at a weekly meeting of the co-op. During the first week of use of the form, managers were individually contacted and the form was explained to them in detail. All questions the managers had relating to the form were answered at that time.

Phase 5. **Evaluation**

Observations were made of job performance as reported by managers. During the period of the first work form, those jobs checked as either complete or incomplete by managers were observed by a second person several times a week. The observer would look at the manager's form while assessing whether or not the jobs reported done were actually done.

In the opinion of the core workers, the introduction of the first work form brought about an increase in the number of jobs done in the co-op. Over the eight week duration of the first work form, a median
of 67% of the jobs that the manager checked as applying to the shift were reported done. A very small number of disagreements between the manager and the observer occurred in this phase (less than one per form observed, two to five observations per week).

Phase 6. Recycling

Recycling through the phases of systems analysis appeared to be required at this point.

Phase 3. Design the system

A second work form was designed which listed the same jobs as the first form with few modifications, and added several that had previously not been listed. Specific jobs were assigned to each shift, with those which did not apply (because they were assigned to another shift, because they had been done by a previous shift and did not need doing, or because they were physically impossible to do because a tool or supply was missing), to be marked as complete. Separate front sheets for the three page form for morning and afternoon shifts allowed for a minimal number of irrelevant jobs. The manager was designated as the person responsible for the completion of all of the jobs on the form, although columns were provided for the manager to assign individual jobs or job areas to workers. The part of the form dealing with manager and worker attendance, and with the hours that the store was open, stayed the same as on the first form.
Phase 4. Implementation

The second form was introduced in the same manner as was the first form.

Phase 5. Evaluation

Observations of job performance continued as in the period of the first work form. For the duration of the first five week period in which the second work form alone was in effect, the absolute number of jobs completed increased from a mean of about 15 to a mean of about 23. An individual item analysis of jobs completed indicated that most of the increase in absolute jobs completed was accounted for by the completion of jobs added on form two which were not included on the first form. There were some large discrepancies between percent completion of individual jobs on the two forms, but percentage decreases almost equalled percentage increases from the first form to the second (of ten jobs with a completion of the second form 10% or more different from the completion on the first form, four were decreases and six were increases. The increases were of slightly higher magnitude).

The median job performance as reported by managers for the last three weeks in which observations were made was 70%, as seen in Figure 7. The median job performance as reported by observers was 63%. The range of difference in reporting between managers and observers on observed shifts was 1% to 18%. Manager reporting on observed shifts was
Figure 7. The number of jobs reported done by managers as a percentage of the total number of jobs which applied and which were observed independently. The last three weeks of each observation period are presented. The horizontal dashed lines represent the median manager report for each period. The horizontal solid lines represent the median most "lenient" observer report for each period. The gray area represents the period in which an appreciable change in the dependent variable of interest was observed.
generally representative of the total sample of completed forms. The range of difference being 6% to 11%.

Data were taken for every week in each condition. The original computation of the data included jobs which did not apply to every shift and jobs for which reliability was not assessed (i.e. self-report jobs). It was decided that this method of computation was unsatisfactory as it may have obscured important differences in performance of those jobs which were applicable and which could be observed. Because of the difficulty of recomputing all of the data, only the data for the last three weeks of each condition were recomputed. These data are more reliable and the effects of each independent variable are just as ascertainable as with the original data. Where an effect was observed in the early phase of a particular condition, this effect is described without reference to a figure, using recomputed data.

Phase 6. Recycling

As job performance appeared not to have improved on a percentage basis even though more absolute job completion may have occurred as a result of the introduction of the second work form, recycling took place.

Phase 3. Design the system

The second work form continued to be used. Public display of the combined performance of all shifts completing forms was designed as a consequence along with the public display of managers' and workers' names. This feedback included percent of jobs completed,
percent of jobs not reported, and percent of jobs reported incorrectly.

Phase 4. Implementation

Group feedback was introduced as described under manager and worker hours of attendance.

Phase 5. Evaluation

After four weeks of the same observation technique as was used for the first work form, independent observations were instituted. Two persons would alternately act as second observers of job performance using blank work forms to record their observations. A third person would perform a reliability check on most of these observations, also using a blank form and not looking at the manager form or the second observer form.

After four weeks of independent observation, some changes were made in the observations procedure. An item reliability evaluation was conducted, and those jobs with low inter-observer agreement (below 75%) were evaluated by the three observers. Discussion of jobs was limited to that which was believed to be consistent with the overriding consideration of external generalizability. Questions and answers were limited to those which simply served the purpose of confirming that the secondary observers understood what was written. The wording was not changed on the work forms. For three jobs, however, it was decided that the response cost for the observers was much too high to properly assess their completion status. These jobs had to do with checking the approximately forty containers in
the co-op to see if the supply was below the R-0 (reorder or run-out) mark, and then to refill the container, mark the run-out list, or clean the containers as applicable. For the observers to check each of these containers, and then to correlate each of them with the available supplies and with marks on the run-out list, would sometimes require fifteen minutes. An observer check, not including these jobs, took approximately twenty minutes. A sample of sixteen containers was marked in such a way that the observers could tell which ones to check, but so that no manager would suspect the purpose of the markings. Independent observations were then continued as before.

Group feedback superimposed on the second work form increased the percentage of jobs reported by managers as done in the first week (from 62% the previous week to 77%). This effect was temporary, and variable. Reports also show that jobs not reported diminished almost to zero in the week immediately after feedback started, and jobs reported incorrectly increased. These data are consistent with the conclusion that group feedback increased reporting of completed jobs, but did not increase real job completion. Variability of the baselines of these two measures and of their various components point to the desirability of replication.

Median job performance for the last three weeks of group feedback was 66%. It was the policy to compare the manager report with the report of the observer which had the greater percentage of jobs reported done. Even so, jobs reported done by observers were consistently below those reported done by managers, with a median of 46%. Representativeness of observed shifts revealed differences of 13% to 31%
between observed and total reported shifts.

Independent observation of job performance was introduced after four weeks of group feedback. After four weeks mean reliability between observers was 75% (range 63% to 84%) for seven observations. An item reliability evaluation was conducted which revealed eleven jobs which had low (below 75%) inter-observer agreement. It was felt that the descriptions of the jobs were adequate. The reliability training which followed, along with the procedural change for checking bins, led to an immediate increase in reliability (mean 85%, range 79% to 94% for fifteen observations). This level of reliability sustained for the duration of the study (mean 85.9% for 41 checks, range 71% to 100%). At least one reliability check was conducted for each week excepting the weeks of December 24 and 31, and March 4. Independent observation techniques did not appear to affect manager reporting or the direction of observer reports in relation to manager reports.

Phase 6. Recycling

As job performance did not appear to be improving, the group feedback was discontinued 16 weeks after its introduction, five weeks after the introduction of the "treatment package." Median job performance of all shifts as reported by managers was 71% for the last three weeks of the "treatment package." It may reasonably be concluded that job performance remained little improved through all of the interventions following food credit for attendance (median observers' report was 67%). Job performance had remained at a reported
level of about 70% since the introduction of the first work form.

Phase 3. Design the system

After eight weeks of no group feedback, during which time the hours and reliability of attendance of managers and workers had increased and stabilized, a series of contingencies designed to improve job performance was introduced.

Job training under the heading of "worker re-education" took place in the first week. A thirteen page job description booklet was given to each manager. The first three pages described in detail each of the jobs listed on the second work form. Where applicable, references to fuller explanations of jobs were provided. References included descriptions of the location of on-site job descriptions in the co-op. References also included page numbers for relevant parts of the old managers' manual, which made up the remainder of the job description booklet. Managers were asked to read the entire booklet, and to be ready for a brief "questionnaire" about the details of the jobs when they returned to work the following week. The "questionnaire" consisted of fifteen multiple choice questions and was given to each manager the following week. Any questions missed were remediated at that time. In the third week, managers began receiving individual feedback as to their shift's job performance. Each shift was allocated a manila folder in which the work form to be completed that day was located. Signs were posted directing the managers to these folders. Attached to the blank work form was the work form completed by the manager who had that shift in the previous week. Only four
kinds of written feedback were given: "no crosscheck done," "crosscheck done," "90%+ jobs reported done," "five or less errors." This feedback was given as applicable. Jobs reported incorrectly were circled. New managers were given the job description booklet and the "questionnaire" prior to their first shift.

Phase 4. Implementation

Problems of implementation arose due to the knowledge on the part of potential subjects of the proposed experimental contingencies. This aspect of implementation is perhaps endemic to non-institutional social settings.

The "Hawthorne effect," or social reinforcement associated with "being experimented on," is often feared by experimenters in social settings, because it may bias results in the desired direction. An opposite effect of social reinforcement presents a more difficult problem for an engineering approach in the co-op. The possibility exists that a proposed contingency may be explained to the evident satisfaction of the members and yet may have the deferred effect of causing the members to state that they have been unduly manipulated. This could have undesirable side effects for existing contingencies and for future design. As the study progressed, there were more comments to the effect that the workers and managers did not like to be "experimented on." It is not clear that job performance would have been higher if the managers were not aware that a study was being undertaken. Occasional work forms were turned in with comments about how unnecessary the work forms were considered to be by the
manager. One manager refused to take the "questionnaire" concerning the job description booklet. One manager would refer to herself as an "uncontrolled variable." But the booklets were read and the work forms were generally completed.

Phase 5. Evaluation

The introduction of individual feedback to managers on job performance and on reporting performance produced an increase in the percentage of jobs reported done (to median 89% for the last three weeks from 71% for the last three weeks of the previous condition). Percent job performance as reported by observers did not substantially increase under individual feedback conditions (median 71% as compared with 63% under form two alone, 46% under group feedback, 66% under the "treatment package," and 69% under the public notice conditions). Work forms observed had a range of difference of 1% to 20%. All possible shifts were represented in each of three of the five conditions. One shift, a different one for each condition, was not represented in the other two conditions in the re-count (form one condition, and $.50 per hour food credit condition).

There is no reason to question the implication of the observers' reports that little real improvement occurred in job performance under individual feedback conditions. Observers' reports of percent job performance were below those of the managers, but may have been biased in a downward direction. Some jobs were completed by managers before the end of a shift, and were reported as done. These job may have not been done when the observer came in at the end
of a shift due to conditions of change on a busy day in the co-op. Shelves that had been dusted may have gotten dusty again, the supplies in containers may have gone below R-0 again, and so on. There is good reason to suspect that this bias was considerable during individual feedback as the volume of business was higher than in previous conditions (refer to gross income figures in Figure 8, which by this time had increased to over $8,500 per month, an increase of nearly $2,000 from the month prior to the introduction of individual feedback).

There is little doubt, though, that the behavioral objective of 90% job completion with five or fewer errors of reporting had yet to be achieved. There is also a question as to whether those work forms which had not been completed were those with particularly poor performance. No systematic observations were made in these instances.
Figure 8. Gross sales per month in thousands of dollars. The horizontal dashed lines represent the medians for each period.
GENERAL DISCUSSION

Something can be said for gradual introduction of contingencies in an economic system both from the standpoint of building support for the system and of meeting the cost of each contingency before going on to the next. But most of the changes introduced in the co-op over the nine months of the study could have been introduced all at once and so would have had a greater positive effect on the co-op. The reason why contingencies were introduced one at a time or in small "treatment packages" was to work toward a larger behavioral objective. By allowing the effects of each independent variable to be observed on each of the many dependent variables, the guesswork in replication is decreased and the probability of successful implementation in other similar settings is increased. This is the goal of a science.

The time-series design, lacking controls for coincidental factors in time, has much in common with experiments in the physical sciences. Campbell and Stanley (1968) pose the analogy of a metal bar placed in acid, and then withdrawn. The bar is weighed before and after being placed in the acid bath. This procedure demonstrated with high validity that the bar weighed less as a result of the treatment. Those metal bars which remained on the shelf showed no weight loss. Co-ops have considerable similarities in function and in size. For one co-op using a behavioral systems approach to have expanded in gross income from $4,500 to almost $9,000 in nine months,
while others increased at the approximately 20% rate of inflation, says something about a feedback-extrinsic-reinforcement approach as an acid bath if not as something composed of several more specific factors.

In many ways, however, this "time-series" design is similar to an engineering project in which experimental rigor takes a backseat to achieving behavioral objectives. No experimental reversals were used, for example, in which a "successful" contingency is withdrawn to see if the indeces revert to baseline or pre-improvement levels of performance. This is not to say that a reversal would not have been used if the outcome of a contingency was in doubt to a significant number of the participants in the system. In this case a reversal would have been a form of recycling after evaluation, and also good experimental design.

A pure engineering project, on the other hand, would probably not have bothered with independent variables with a predicted low probability of success, such as the effect of group feedback on worker turnout and on job performance. Feedback must be backed by reinforcement in the long run to be effective in a relatively high response cost situation. The purpose of this manipulation was to help to prevent the continuation of countless failures of co-op ventures due to overemphasis on volunteerism, "consciousness level," and other unobservable incentives. If to be "informed" was incentive enough for people to improve deficient performance, then group feedback would have produced more workers, more consistent turnout, and better job performance. There is no evidence that conspicuous and prolonged
group feedback improved anything other than reporting of jobs done, and this only temporarily.

As in the beginning of the experimental analysis of behavior, it is helpful to document that behavior is lawful and governed by extrinsic reinforcement even in the simplest cases. Then, more complex relationships may be documented. The principles of behavior generated as a result of controlled experiments with rats in "Skinner boxes" were later used with much success with residents in a mental hospital (Ayllon and Azrin, 1968). It was perhaps the dissimilarity of the settings which was a major factor in delaying for thirty years the generalizability of the results of the early experiments (Skinner, 1938) to their later use with human beings. Generalization of the present results will hopefully be much closer to building more "Skinner boxes" than was generalization of earlier results in controlled settings, however, as the settings in which replication is desired are similar in the essential environmental components of which behavior is a function.

This systems approach has revealed some high probability functional relations among several behaviors of importance to society and several environmental events, and has done so without sacrificing the success of the social setting. Hopefully, in other large social settings more complex relationships among extrinsic reinforcers and feedback and specified behaviors will be developed and evaluated in the future.
APPENDIX A

Contract #3  8/24/73  Marie

Jobs: Ordering and Pricing, etc.  1 pt. = 2 hours work adjusted for miles and difficulty
1 pt. = $1.00

1a. Assess needs and deliver goods to bakery.  Points X #Jobs = $
   1.0  X (3) = $

1b. Assess needs and buy goods at Hybels for both stores.
    .5  X = $

2.  Price goods when delivered.
    .5  X = $

3a. Bakery work.
    .5  X hrs. = $

3b. Bake cookies @ $1.00/batch of 100
    1.0  X = $

3c. Make granola @ $1.00/half-batch (12 lbs.)
    1.0  X = $

3d. Make pastries @ $1.00/
    1.0  X = $

4.  Call ahead at least 2 days and pick up honey at Plainwell. Also pick up cheese if possible.
    .10  X mi. = $
    .5  X hrs. = $

5.  Take cardboard to salvage. Keep payment.

6.  Go on Detroit trip once or twice a month @ $5.00 + ($5.00 for over 200 mi; other trips just .10 X mi. =

7a. General co-op work
    .5  X hrs. = $

7b. Hold education meeting Monday eve.
    1.0  X = $

8.  Conduct weekly inventory. Record column D on form as needed. Assessment: completed forms (summary) at meeting.
    1.0  X hrs = $

9.  Count dues paid for current month, count new members, draw line after last new member. Do on last day of the month.
    .5  X = $

10. Wash aprons each week.
    1.0  X = $

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11a. Balance own credit and cash account by meeting day.

b. Complete weekly self-report by meeting.
   Assessment: form at meeting. .5 X =

c. Attend meeting.
   Assessment: Marie at meeting. .5 X =

Assessments not specified are self-report for now.
SELF-REPORT FORM #3
8/24/73
Marie, please complete this form by meeting day each week.
Credit and cash will be contingent upon assessment.

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<th>WED</th>
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Enter total of assessment on credit and cash account, the first $12.00 on the credit account.
APPENDIX B

BYLAWS FOR THE PEOPLE'S FOOD CO-OP OF KALAMAZOO

I. Definition: The People's Food Co-op of Kalamazoo consists of properties listed in the articles of incorporation, and is owned by the members as specified in those articles and in the bylaws.

II. Purpose: The purpose of the co-op is to provide the greatest benefit possible to the most people possible.

Specific objectives believed to be consistent with the general purpose are:

A. To provide only such products and services as are beneficial to long term health.

B. To provide products and services at the lowest possible price while allowing for profit only for specific purposes known to all members and believed to be consistent with the general goal.

C. To provide all workers with pay, products, and services consistent with the general purpose, and consistent with the above objectives.

D. To provide all workers, consumers, and others affected by the actions of the co-op all possible means of counter-action consistent with the purpose as stated above.

E. To provide in written form complete as possible explicit definitions of the above objectives, and to make these definitions available to anyone who wants them. These
definitions will be included in the bylaws appendix and will be so included according to the procedures outlined in Section III B 2.

III. Structure

A. Membership: A member shall be any member of a household which has paid dues at least once in a given year. A household shall be defined as any people who share at least half of their food bill.

B. Administration: The control of the co-op policies and procedures will be by public vote according to the following guidelines:

1. All decisions will be made based on a majority of eligible votes cast.

2. Eligibility and distribution of votes will be based upon the following principles:

   a. To be eligible to vote, a person must be a member and be present when the vote is cast, unless specifically excepted in the bylaws.

   b. Members who are not workers shall have one vote.

   c. Members who have worked three signed shifts of at least two hours each within the last four weeks, or who have worked same for at least four months within the last year, shall have two votes.

   d. Members who have worked three signed "manager" shifts within the last four weeks, or who have worked same for at least four months within the last year, shall
have four votes.

e. Members who work more than four hours, or for more than four points, under contract with the co-op with their name specifically on the contract, shall have six votes while the contract is current.

f. Three members eligible for six votes each shall be designated as "head managers," and shall have jointly a number of votes equal to 25% of all votes excluding their own, or thirty votes, whichever is greater, cast on a given ballot. Two "head managers" in agreement is necessary to cast these votes. These votes may not be split, and proxies must be obtained for each ballot for which a second concurring vote is lacking. In case of a tie vote for the total votes on a given ballot, the "head manager" vote will decide.

Elections of "head managers" will be held in January of each year, unless a special election is called for by vote.

C. Changing the bylaws: The bylaws will be changed according to the procedure in section III B.

IV. Appendix
REFERENCES


