COMPENSATION FOR SHIFT WORK: A MODEL AND SOME RESULTS

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In the early sixties the results were published of the first large scale research project concerning shift work in the Netherlands (Banning, Bonjer, Bast, De Jong, & Van der Werff, 1961). The subject of shift work was studied from a medical, psychological, sociological, technical, and economic point of view.

Several years ago the results of a second encompassing research study became available. Problems regarding shift work were analysed from three different perspectives. The first one was macro-economic in nature (Iwema & Hoffman, 1974). The second one carried a micro-economic orientation (De Jong & Bonhof, 1974). The third perspective stemmed from an industrial and organizational psychology approach (Hoolwerf, Thierry, & Drenth, 1974).

Reports in the English language on some of the main findings of the psychological research study have been published elsewhere (a.o.: Thierry, Hoolwerf & Drenth, 1975; Thierry, 1975; Drenth, Hoolwerf, & Thierry, 1975; Thierry & Hoolwerf, 1976).

The current research study - a part of a field experimental project - is primarily designed in accordance with the main recommendations of our 1974 publication. Although its basic outline was available in 1975, the Dutch Ministry of Social Affairs - which had co-sponsored the earlier studies and stimulated the present one - was not allowed to spend the funds it had assigned to this experiment. Since the background against which these developments occurred provides for an illustrative understanding of the past and the current "climate" in the Netherlands concerning research on social matters of shift work, a very brief account of the events around the research proposal will be given.

The employers federations and the central unions in the Netherlands vary widely in the values, ideas, and preferences they have regarding shift work, and thus in their strategic policy on this subject. The unions have stressed for a couple of years the necessity of introducing a 5th shift in the event that shift work is applied on a full continuous basis. This would cause a decrease in the average amount of working hours per week from 40 hours to 33.6 hours. In earlier years, representatives of the unions primarily stressed the probability that a considerably shorter working week would cause the living and working situation in shifts to be less unhealthy. More recently, another issue acquired equal or even more importance: the 5th shift will further the creation of more jobs and thus have positive employment effects. Unfortunately, hardly any 5 shift-work-scheme (with the qualifications as mentioned) is currently applied, and as a result empirical evidence to support or to oppose any argument is lacking.

The employers federations, on the other hand, are strongly opposed to the 5th shift, unless the shift workers would be willing to accept a rather considerable decrease in their pay. They fear that the application of the 5th

shift on a large scale would eventually cause a considerable decrease in working hours for many other categories of workers as well, including not only workers in less progressive shift work schemes, but also workers and employees in permanent daywork. They held the view that both the employment rate and the economy at large might be thus greatly impaired.

Although our design does not deal in particular with the 5th shift - as will be shown in a later section - it would allow in principal to experiment with it. So a part of our research proposal was favored both by the unions and by the employers federations, but unhappily, each of them favored quite different parts. Summarizing now a long series of events: it ended with a complete dead-lock. The unions reject any study that may restrict even temporarily their freedon at the bargaining table with respect to the 5th shift; the employers federations opposed any study which results might be conducive to its introduction.

It is our luck however that the European Foundation is able to fund a part of our project on the basis of its four years rolling program on shift work. The present study started in the beginning of 1979.

The major part of this contribution deals with the model that serves as the core part of our research (Section 2). After a brief overview of the way in which interventions are being designed (Section 3) that constitute the framework of the experiment, some empirical results will be presented (Section 4). At this stage - the design of compensatory functions - just started, the evidence is more "illustrative" than "conclusive". The 5th and last section relates this study to the larger project in the years ahead.

The Compensation Model: Counter-weight versus Counter-value

Simple Counter-weight

In the Netherlands (and in most other European countries) shift work is exclusively or mainly applied on the basis of a rotating scheme. Practicing shift work implies that all employees concerned get a specific bonus, the amount of which is larger the more the shift work scheme in question is considered as "progressive" (in other words: the more the scheme implies working at "unsocial" hours). Generally, it is assumed that the shift work bonus compensates for the disadvantageous aspects of working in shifts. The bonus is supposed to balance for the inconvenient effects of shift work. This very assumption prevails in the usual bargaining situation: discomfort, negative characteristics, and so forth, that are related to shift work, are in a sense translated in terms of money ("labor costs" versus "income"). Such a process of translation not only manifests a recognized, and often welcomed, strategy to summarize a complex, multi-dimensional problem, but in doing so, it also tends at once to reduce the problem to matters of money (the size of the shift work bonus). As such, it may even conceal the very problem at hand, the more so since successful negotiations (as to the bonus amount), tend to sustain the status quo.

Now an interesting question involves the theoretical meaning that has been given to the concept of compensation, according to the line of thinking just mentioned. It seems that a rather simple, though intuitively-attractive

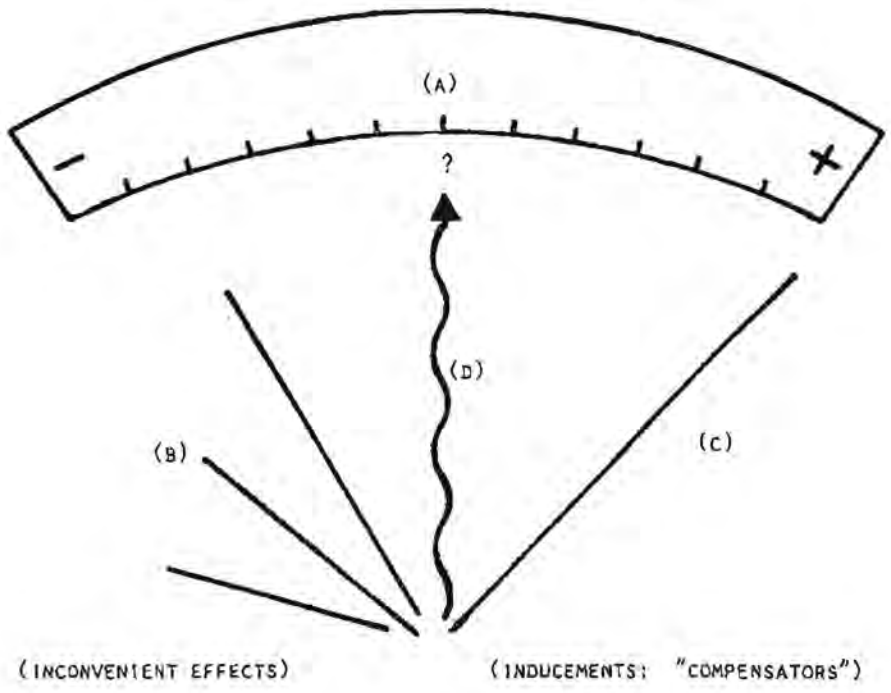

FIGURE 1. THE ASSUMED COMPENSATORY FUNCTION OF MONEY.

model is used as to the compensatory meaning and function(s) of money. The next figure illustrates this (see Figure 1).

Figure 1 reflects a weighting scale. The scale itself (A) indicates the "criterion behavior" one would like to predict or explain. As such, the decision of a person to start working in shifts or to quit shift work might be taken, or the motivational force to perform shift work, and so forth. Let's assume that (A) reflects the extent to which an employee is satisfied with working in shifts. At the left hand side the inconvenient effects (B) of shift work are outlined; the longer the length of a line, the more that effect is experienced and/or perceived as inconvenient by an employee. Let's suppose that several effects of the disrupting impact of the shift work rhythm - for example, a broken night - stands for (B).

The inducements of shift work - those positive rewards that are thought to compensate for (B) - are mentioned at the right hand side (C) of Figure 1. Again, the longer the length of the line (or lines), the more the outcome(s) which it reflects, is experienced and/or perseived as rewarding. In this case, the shift work bonus is the content of (C). The scale-indicator (D) reflects the end result of the weighting process in question, in terms of balance. The more the inconveniences outweigh the inducements, the more negative the resulting balance, and so forth.

Now the model underlying Figure 1 may be summarized as follows: "shift work is not an unfavorable living and working situation at all, since the shift work bonus compensates for inconveniences" (Hoolwerf et al., 1974). Several doubts may arise as to the validity of this statement. Firstly, the size of the bonus - which generally increases gradually over time in many countries - must be redefined time and again. Among several potentially determining variables would be at the one hand "objective" changes in inconveniences of shift work. At the other, changes in the perceptions and/or evaluations of disadvantages of shift work - for instance as an effect of changing societal values regarding work at unsocial hours - may affect the process of bargaining as to the bonus. Also, changes in status dimensions (and so forth) in the local area that reflect themselves in attitudes and opinions about shift work, may have an impact.

From a psychological point of view one wonders - as the second point - what the concept of compensation stands for. In other words, which inconvenient effects are compensated for by the shift work bonus? Is there any change in the variation of spare time periods (not to mention other aspects that are frequently experienced as negative)? Empirical data relevant to these questions, tend to show opposing evidence. The model underlying Figure 1 shows that apart from experiencing negative effects, the bonus is offered to provide for satisfactory rewards in other domains, that seem to be unrelated to the ones in which the negative effects occur. The potentially compensatory function of the bonus does not apply to specific sub-balances, in which a particular inconvenience - such as a broken night - must be "balanced" by a specific inducement. Rather, its significance might be better understood in terms of a global balance that pertains to the way in which a job as a whole is evaluated by an employee; on the one hand a variety of heterogeneous disadvantages are to be found, on the other a series of heterogeneous advantages are available. Now supplying more money usually causes an increase

in the "package" of advantages, although its meaning is dependent upon both the actual income position of the employee and his pattern of motivation (e.g., Lawler, 1971; Thierry, 1980). So the shift work bonus may "weigh against" (compensate for) a certain amount of dissatisfaction with the shift work situation in general. But its capacity to solve (that is: to eliminate or to reduce) effectively the specific negative effects of shift work, ought to be considered as small or negligable (some supportive empirical evidence for this statement is mentioned in: Thierry & Hoolwerf, 1976). Therefore this type of "global" compensator will be called: a counter-weight.

Extended Counter-weight

Gradually, the importance is stressed of other potentially compensatory variables in addition to this "simple" counter-weight. On the one hand the potential value is emphasized of a shorter average working week (for instance as an effect of introducing the 5-shift work scheme), more holidays (which results in less working hours per year), earlier retirement, and so forth. On the other, "humanizing" the working place of shift workers is advocated: leadership styles ought to be more considerate to the needs and wants of the workers; communication patterns should enhance the availability and the quality of information; workers' control and autonomy have to be increased; jobs ought to be enlarged or enriched, and so forth. This type of approach is illustrated in Figure 2.

Agian, a weighting scale is shown. Examples of inconvenient effects are: perceived health impairment; a broken night; varying spells of spare time. In addition to the bonus, inducements are provided like: more holidays; more control of workers over departmental decisions; a more considerate leadership style.

The model underlying Figure 2 is in a sense an extended version of the Figure 1-model: "since shift work causes inconveniences for the workers, the working place ought to be humanized, e.g. the amount of working hours has to be reduced".

This second approach may be considered as a more fruitful on than the "mere provision of a bonus" approach. On the one hand, humanizing the working place gradually becomes recognized as one of the major requirements for current work organizations. On the other, reducing the total amount of working hours - disregarding now its particular scheme - may be rewarding from the workers' point of view.

But still the psychologist wonders how the concept of compensation is suppose to work. Does each inducement of this nature - like job autonomy - reduce or even eliminate a specific inconvenient aspect of shift work (such as a broken night)? Or do these inducements add to the rewarding "convenient" side of the global balance that relates to the way in which the shift worker evaluates his working and living situation as a whole?

Empirical evidence in this area is very scarce. Both logically and theoretically one would expect that the capacity of this type of inducement to reduce or to eliminate specific disadvantageous aspects of shift work, is still rather weak. Then how would a compensator like job autonomy be conceived

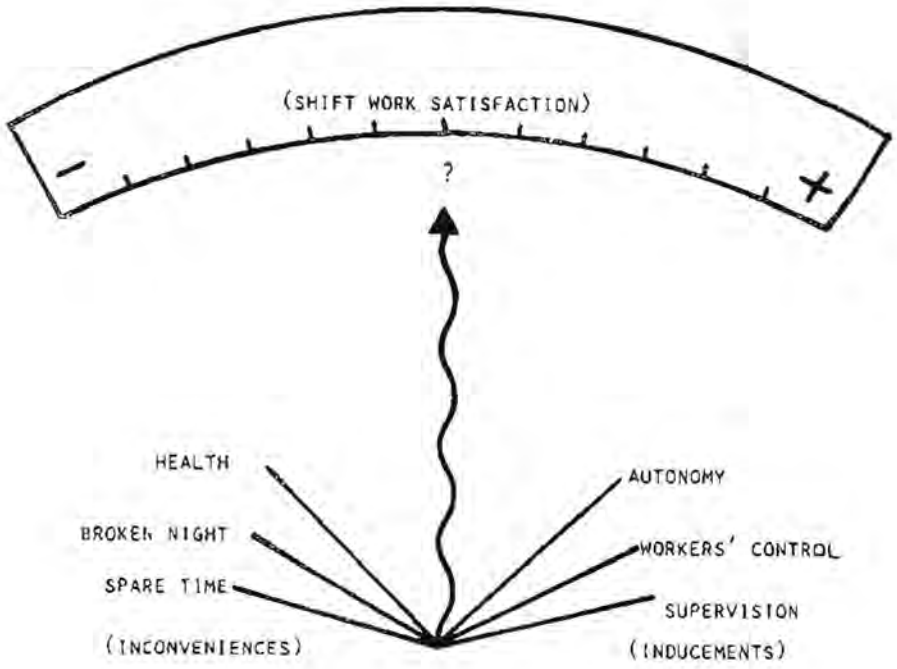

FIGURE 2. THE EXTENDED-BALANCE MODEL.

to operate in reducing, for example, one's perceived (or real) health impairment? Some slight evidence was found, however, in favor of the potentially inconvenience-reducing capacity of workers' control on departmental decisions. For instance, the more workers' control, the less varying spells of spare time are perceived as inconvenient (Thierry & Hoolwerf, 1976). Another, not yet published, analysis suggested that feeelings of isolation ("apartheid") within the organization may be reduced by the combined effect of increasing workers' control and a more dynamic leadership style of the direct supervisor.

Generally, however, we tend to consider the potential value of this second approach as mainly (or exclusively) contributing to the positive side of the global job balance, that is: the evaluation of the shift work situation as a whole. Therefore, it is called an "extended counter-weight" model. Its capacity to reduce specific inconveniences seems to be restricted to just a few cases. (It should be added though, that there has scarcely been any research study on the effects of reducing the amount of working hours. Thus the potentially compensatory effects of this type of inducements are still open to test.)

Consequently, this second model does not, or hardly, operate on the level of specific sub-balances. As was the case with the first model, the lack of "real" balance in these respects may cause a never-ending increase in the level and nature of wants and desired outcomes, precisely as each individual is striving - under normal conditions - to achieve balance. A variety of theories about work motivation stresses that a major determinant of an individual's behavior is provided by the need for balance, such as between his contributions and the rewards he gets. As these theories will not be treated here, the attention is called to just two categories of approaches: social-comparison theories, and the theory on self-esteem.

Counter-value

The concept of compensation as outlined in the two preceding models has been characterized as counter-weighting, that is, as operating on the global, general level on which costs and benefits relative to a job and its conditions as a whole, are weighted against one another. Providing for more beneficial weights may lead to more satisfaction, inducing the worker to reconcile, to adjust himself to his situation. But the costs in question - the inconveniences - remain unchanged. Another approach to compensation may operate more effectively, according to which the actual inconveniences are being reduced or eliminated. It focuses upon specific sub-balances, and not upon the global balance. To reflect its potential capacity to reduce or to eliminate a negative effect, it is called the counter-value model.

This model provides for the basis upon which our current research project is designed. In order to acquire counter-value properties, each intervention (that is, a purposefully-introduced change) should fulfill two requirements:

1. Its operation ought to produce positive effects (also called: rewards, inducements; conveniences) that tap on, i.e. belong to, the same category, the same denominator as the perceived and/or experienced unfavorable aspects of shift work in question. For example, if shift workers complain about psycho-somatic symptoms, then a counter-value type of

intervention should produce a decrease in (or elimination of) those very symptoms.

2. Its effects should be also rewarding in relation to the motives and situational outcomes the workers in question view as important. For example, an intervention that reduces (or eliminates) loss of autonomy for a worker, is ineffective to the extent that the worker does not value autonomy.

It is clear that the construction and experimental try-out of each intervention require extensive analyses and careful attention. It appears worthwhile to differentiate among three types of counter-value interventions, that obviously operate on different levels of analysis. As such, there exists a certain "hierarchical order", Type I being more encompassing than Type II, while Type II may cover more ground than Type III. These are:

Type I: Reducing or eliminating the causes of inconveniences.

A rather extreme, and unlikely, example would be to refrain completely from the application of shift work. A more realistic example might probably be a change-over towards a less progressive shift or work scheme, the reduction of night work, and so forth. Other interventions of this type relate to various changes in the rotating scheme, the length of each shift, and so forth. To illustrate the last point, current change-over times in many organizations (in the Netherlands as well as in other countries) provide a good case: when somebody would try to find those change-over times that would most harmfully affect the social, psychological, and biological rhythms of the average worker, his findings may, ironically, not diverge too much from 0600, 1400 and 2200 hours. As indicated earlier, in the Netherlands (and in many other European countries) shift work is primarily or exclusively applied on a rotating basis.

The current state of knowledge as to this area does not allow for any statement on the general effectiveness of any intervention of Type I (as well as Type II and III), although Knauth's, Rohmert's and Rutenfranz' proposal(1976) regarding schemes in which each night shift is followed by at least 24 hours of rest, provides for a case in point. Rather, the potential value of the most promising interventions has to be assessed first experimentally and under a variety of conditions. Its experimental applicability depends upon: (1) the actual inconveniences as experienced by the shift workers in question; (2) the opportunities within the organization for its provision and (3) the degree in which workers and managers expect its use to be instrumental to their situation. In other words, a comprehensive body of "locally-collected" data and experiences regarding a variety of interventions has to be created. This is the main reason why the present study has been designed as a case study.

Assuming that some Type I interventions can be introduced in an organization and do provide for counter-value compensation, we further suppose that several inconveniences have not been tapped on, and still exist. This is the moment to analyse the applicability of the second type of intervention.

Type II: Reducing or eliminating the consequences of inconveniences.

Since the causes of many uncomfortable aspects of shiftwork are not pre-

sently amenable to change, one might try to compensate for the effects of inconveniences. A few examples may illustrate this approach: firstly, suppose that a shift worker aspires to get advanced education and additional training. Usually, the courses which he has to take fit into the time schedule of the permanent day worker. Compensating for this negative effect may include organizing the courses in question according to the shift worker's time table (it is obvious that this example is realistic to the extent in which various shift workers - perhaps from different organizations - would apply for these courses). Secondly, assume that the shift work scheme does not permit a group of workers to watch a favorite TV program. Compensating along the Type II approach may imply taping the program, rebroadcasting it at a time of the day that suits the shift worker's schedule.

Again, it is assumed that some Type II interventions are to be "constructed" and subsequently introduced in an organization. Still several inconveniences could not be touched upon, neither by Type I nor Type II interventions. It is now time to turn the attention to a third type.

Type III: Compensating for the psychological meaning of inconveniences.

This type of intervention is illustrated in Figure 3. The first example in Figure 3 relates to status; suppose that one (or more) of the still existing inconveniences as experienced and/or perceived by a shift worker, reflects for him a loss in status. That is, regardless of both the causes and the consequences of this inconvenience, it is interpreted, evaluated by him in terms of having less status (for instance in comparison with others in his social community). Now an intervention that provides for counter-value compensation, should result in a gain in status for him. As was mentioned in relation to Type I intervention, it is not possible to indicate beforehand which specific interventions will produce a status gain for a particular shift worker in a particular organization. In some organizations the opportunity to attend educational courses (being transferred and/or promoted afterwards to a job in day work) may be a fruitful avenue, and so forth. The second example refers to a loss in perceived autonomy; a similar line of reasoning applies here. Again, one cannot identify beforehand which interventions will produce more (perceived) autonomy. Enrichment of the job, sharing in the decision-making power of a group or committee, and so forth, may provide for successful changes.

Earlier in this section it was stressed that any intervention should meet two requirements in order to acquire counter-value properties. So regardless of its type, each intervention should operate along the same denominator as the inconvenience it tries to compensate. The second point - the degree to which motives concerned are considered as important - is separately mentioned in Figure 3; the box on "valance of motives".

To conclude, the model of counter-value compensation seems to present a different approach for trying to improve the living and working situation in shift work. As indicated, its potential usefulness has to be tested experimentally in a variety of ways. Elsewhere (Thierry & Hoolwerf, 1976) some tentative evidence regarding Type III compensation was presented. It suggested that complaints about earnings in general might be offset by providing for more spare time. An unpublished finding related experienced sleep deficit to whether or not a shift worker has children; this last point of course should

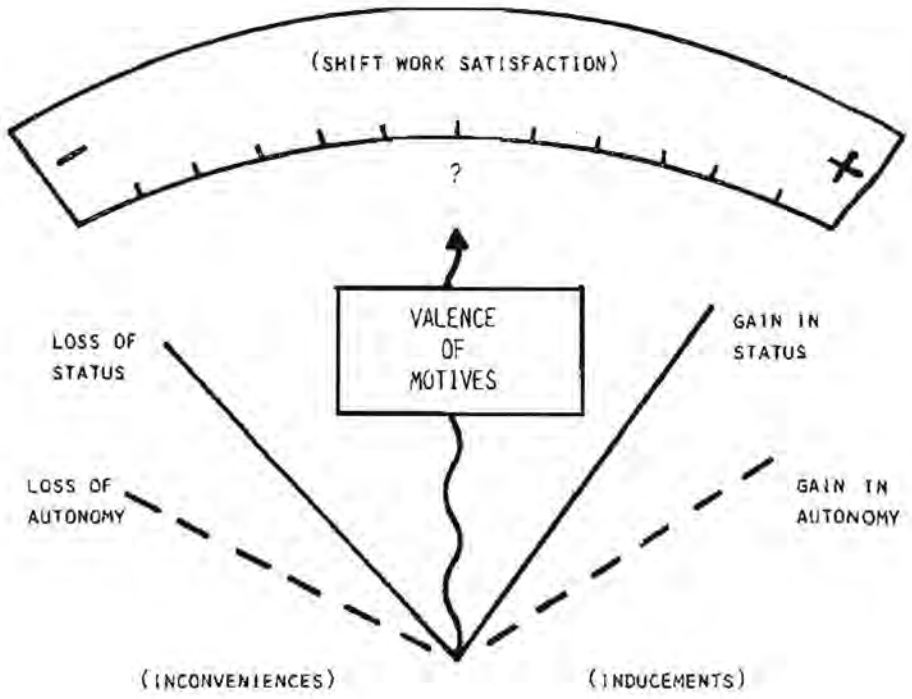

FIGURE 3. COUNTER-VALUEING PSYCHOLOGICAL MEANINGS.

not be considered as a "compensatory intervention", but may only be viewed as a potential selection device.

Current insights into this subject as well as current opportunities for change and experimentation cause me to emphasize that, at least in the near future (if ever), counter-weight compensations cannot be completely dispensed with. In other words, in order to reach an optimally designed shift work situation - although opinions and values on what is an optimum may diverge considerably among the parties concerned - perhaps major contributions may be made along the route of counter-value compensation, although "additional" compensations like a shift work bonus, reduction in working time, "humanitarian" rewards, and so forth, would appear to be needed.

Designing Interventions: A Short Overview

In order to design interventions that may provide for counter-value compensations, three different approaches are followed. The first one focusses upon major "objective" and "subjective" data as reported in various empirical research studies, for instance with regard to Circadian Rhythms. The second approach consists of an analysis, with respect to a variety of characteristics, of the working and living conditions that apply to the shift workers in the work organization concerned. Relevant sources are: records, documents, interviews with key-informants (managers and others) and the like. The third approach is tuned to the experiences, perceptions, preferences, and so forth, as reported by the shift workers (and in a variety of cases also by their spouse).

It is obvious that the data from these different sources are not necessarily in accordance with one another. it is not unlikely, for instance, that a particular intervention with respect to the rotation of shifts may produce positive effects from a psychological point of view, while those very effects may be considered as disadvantageous from a social or cultural perspective. This subject relates to the well-known issue of "objective" versus "subjective" criteria for designing a different shift work system. Among those that favor objective criteria, Knauth, Rohmert, and Rutenfranz (1976) state that "... as most workers voted for the shift system they were just working on (....), recommendations for optimal shift systems can rarely be obtained from questioning shift workers". On the other hand, Mott (1976) among others pleads as follows: "... we should encourage more worker participation in the design of their shift patterns. But we ought to make them aware of what the consequences are likely to be of their choices".

Our stand, put very briefly, is that this subject ought not to be viewed as an either / or matter. The three approaches mentioned at the beginning of this section reflect our position that both objective and subjective criteria have to be taken into account. Therefore, we consider it an essential condition to get a high degree of involvement of the shift workers concerned - in this study; around 100 workers from a paper mill facility - in experimenting with changes. In order to prevent "degrees of freedom" for installing an experiment being considerably restricted by the well-known phenomenon of resistance to change on the side of shift workers, sessions have been organized to provide for information and to offer opportunities for discussion. During these meetings, several major findings of previous research studies were presented, explained and discussed.

On the basis of the preceding analyses, a list of potential interventions is currently being designed that may produce counter-value compensations. These interventions probably pertain to the three types of counter-value compensations, mentioned in the preceding section.

In order to clarify how the potential usefulness of each intervention may be assessed, how certain interventions may be skipped and others invented, the design of the questionnaire is outlined in Figure 4.

Starting at the left hand side of Figure 4, Box 1 represents a series of biographical and demographical characteristics of the individual shift worker. Box 2 reflects a personality variable; the degree of Ambitiousness (Type A). The extent to which a worker is motivated in his work provides for Box 3. Boxes 4-6 refer to the way in which each shift worker describes the physical working conditions - like noise, temperature, and so on, his task activities (such as manual labor, process control, and the like), as well as how he perceives shift work arrangements. Box 7 contains a variety of satisfaction measures. With respect to each variable in Box 8 the worker is asked to indicate whether the aspect in question causes inconvenient effects for him. Then the worker is requested to assume that this very aspect indeed provides him with inconveniences (Box 9); he now has to assess whether each of 38 different interventions (or more, in the case he lists these) would lead to a change in effects (positively or negatively), no change at all, or would not apply. Since Box 8 contains 10 different variables, each worker has to evaluate 10 times the instrumentality of all potential interventions.

The "order" of the boxes (indicated by arrows) in Figure 4 is a tentative one. Empirical results may cause some revision.

To summarize, compensatory functions may be designed on the basis of three different perspectives:

1. Experiences with Type-I-interventions elsewhere (mainly as discussed in the literature). We also may profit from another on-going research study on some Type-I-interventions within our department.
2. The extent to which shift workers expect that Box 9 variables may be instrumental towards reducing or removing inconveniences as experienced or perceived.
3. Statistical analyses of the questionnaire data in order to locate various denominators, each of which encompasses both an inconvenient aspect and an inducement of a common nature.

Subsequently these results will be discussed extensively with the shift workers (and with management), the outcome of which provides for the core components of the interventions that constitute the major framework of the experiment.

Some Empirical Evidence

Orientational Phase

As mentioned earlier, this study currently bears upon around 100 shift workers in a paper mill facility that belongs to a large organization within

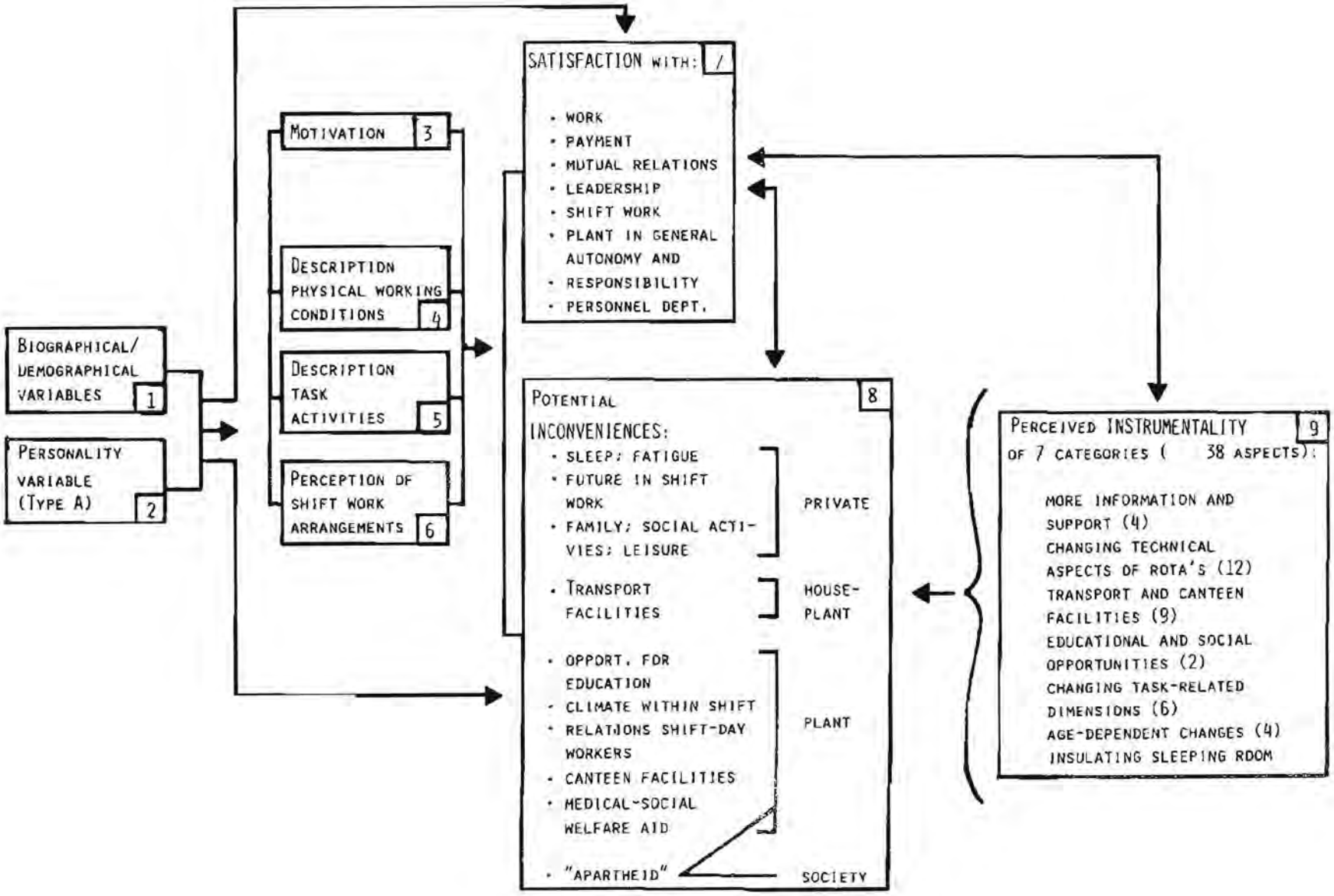

FIGURE 4. DESIGN OF THE QUESTIONNAIRE

the same branch. Firstly, the research team engaged itself in an intensive process of orientation within the plant in question, i.e. to learn whether a series of conditions concerning the shift workers, lower and higher management, and top management of the parent organization could be met. Likewise, these groups specified some criteria regarding the research team and the possible experiment. Eventually, both "parties" favored to start the experimental study. Top management indicated however that the next requirements had to be met:

- The introduction of a 5th shift is not permitted (see Section 1).
- A permanent raise in labor costs is unacceptable.
- Any change to be introduced should not be at variance with the conditions specified in the Collective Labor Agreement.

The research team on its side specified two requirements:

- Each shift crew will get one additional member (in order to allow for more flexible working arrangements).
- Around $150.000,—will be available for workers' home-work travel expenses (in the case different rotating schemes will be introduced).

All requirements were accepted by the "parties" concerned.

Inconveniences and Interventions

Concerning the potential inconveniences (as described in Figure 4, Box 8) questionnaire data show that aspects like transport facilities, climate within shift, and apartheid hardly cause any problems for the far majority of the workers. On the other hand both "subjective health" and "family, social activities and leisure" appear to provide for a lot of discomfort and complaints. Compared to national norms regarding subjective health, our respondents indicated nearly twice as many problems.

The method to select potential interventions on the basis of questionnaire data will now be illustrated with respect to one aspect in particular: subjective health. As this is a composite score (being very consistent, $\alpha = .87$), attention will be focussed upon one of its dimensions: "fatigue" $\alpha = .72$). It is on this dimension which respondents assessed the instrumentality of various interventions (Figure 4, Box 9).

Firstly, the pattern of correlations with other inconveniences (as well as with facets-satisfaction and the description of the work situation) is analyzed. These results will support or weaken the choice of interventions made on the basis of the fatigue-dimension. It turns out, among other things, that one's "future in shift work" and "family life" correlates significantly - but not very high - with fatigue ($.30 > r < .43$).

Secondly, the potential impact of major biographical and demographical variables is inspected. Results reveal that only plant tenure correlates with fatigue ($r = .24$; $p < .01$); the more tenure, the more complaints about fatigue. All other variables - like age, tenure in shift work, travel time, education, and so forth - do not affect fatigue scores.

Thirdly, cross-tabulations are made concerning the assessed relevance of each potential intervention. In Table 1 just some of these results are shown.

Table 1

Cross Tabulations (in Percentages) of Workers' Fatigue Complaints and Perceived Efficacy of Various Intervention Strategies

Fatigue Complaints	Permanent shifts *				Less than 3 consecutive nights **				More time off for education *			
	1	2	3	4	1	2	3	4	1	2	3	4
. a few	23	23	46	7	30	19	44	7	62	15	-	23
. moderate	37	27	13	23	31	41	3	24	63	17	-	20
. many	53	16	16	16	58	21	11	11	42	11	21	26

Meaning of Scores: 1, improvement; 2, no change; 3, deterioration; 4, not relevant. * $p < .05$, ** $p < .01$.

The first column in Table 1 shows that 53% of the workers with many fatigue complaints expect that the introduction of permanent shifts would improve their condition; on the other had 46% of those with just a few complaints indicate that permanent shifts would aggravate their situation. The second column reveals a comparable pattern; the more complaints, the more a scheme with less than 3 consecutive night shifts is expected to cause an improvement. The pattern in column 3 is different; more time off for education is welcomed by those with a few or a moderate amount of complaints, but assessed as considerably less beneficial by workers with many complaints. With concern to a variety of other potential interventions it appears that a large amount of workers expect these to cause an improvement regardless of their complaints. There is an overall tendency, however, that experiencing more complaints coincides with the expectation that an intervention will be more beneficial.

Fourthly, the score on each relevant intervention is considered in relation to major biographical and demographical variables. This will be illustrated with respect to one potential intervention; "a scheme with less than 3 consecutive night shifts". Table 2 refers to just some biographical variables.

Earlier in this section it was mentioned that none of the biographical variables of Table 2 affected the extent to which shift workers have fatigue complaints. The results of Table 1 showed, among other things, that a scheme with less than 3 consecutive nights is favorably assessed by those with many complaints. Although the data in Table 2 do not differ significantly per variable (taking all cells into account), they suggest for example, that this intervention is expected to cause improvement more by married workers, but not so much by workers with 10 years or less tenure in shift work. This method of splitting up data allows us to select one or more interventions that may apply to just one specified category of workers, and not to all workers alike. As such, this design may contribute to a less uniform, rather pluriform way of organizing shift work. It is obvious that not each intervention lends itself to be applied to a segment of the work force.

Table 2

Cross Tabulations (in Percentages) at the Perceived Efficacy of a Scheme with Less than 3 Consecutive Night Shifts as a Function of Biographical/Demographical Variables

		Less than 3 consecutive nights			
		1	2	3	4
Job Type:	Main machine	40	23	31	6
	Process preparation	39	31	8	22
Tenure in Shift Work:	0-5 years	57	7	22	14
	6-10 years	46	21	21	12
	> 10 years	19	44	19	18
Marital State:	Married	44	24	21	11
	Unmarried	8	50	17	25
Travel Time:	< 15'	27	18	37	18
	15-30'	43	41	13	3
	> 30'	38	12	12	38

Meaning of Scores: 1, improvement; 2, no change; 3, deterioration; 4, not relevant.

Based upon the 4 preceding "steps of analysis", several potential relevant interventions are being selected for each of the separate inconveniences. The following criteria have been set to determine whether or not an intervention will be chosen. Each intervention should:
- relate in a meaningful way to the inconvenience in question;
- not be assessed as detrimental by more than 20% of the workers (total sample);
- not be rated in terms of "no change" and "not relevant" by 50% of more of the workers (total sample).

When combining the seperate selections of interventions, also the expected detrimental effect "in other areas" should be taken into account. Since several interventions had to be presented in other general terms during this phase of the research - such as; a shorter rotating scheme - discussions with the shift workers on details per interventions ought to clarify whether they stick to their assessments. Moreover, results of other studies concerning comparable changes may also affect decision-making.

Data currently available suggest the relevance of at least 8 different categories of intervention:
- Age limits on shift work (including earlier retirement).
- Additional days off.
- Medical tests and social welfare support.
- Shorter cycle of rotation (including other change-over times, unequal

watches, and so forth).
- General advisory function within Personnel Department ("ombudsman").
- Introduction of job consultation.
- Leadership training (stressing a considerate style).
- Canteen facilities.

In terms of the section entitled Counter-value, these changes primarily bear upon Type I and Type II interventions. Future reports will deal with the actual effectiveness of the chosen ones as well as with potential Type III interventions.

Concluding Comments

Both prior to the start of the experiment (which is expected to last 1 1/2 years) and at later points in time, some physiological data will be assembled. Although the comparative effectiveness of our approach is being tested - and will be evaluated extensively - it is obvious that the counter-value strategy is not exclusively linked to shift work. As such, applying it in domains other than shift work, would be highly needed. But let me indicate, as a final point, some of the shortcomings of our present study.

The design of this case study belongs to the quasi-experimental category (O_1 XO_2), for which the pitfalls are very well known. Even a control group is lacking (although control groups are being used as to specific issues, such as absenteeism and turnover); but serious ethical considerations prevent us from doing so.

The question thus prevails in which respects our results might be generalizable. As our focus is on the specifics of the local situation in a plant, generalizing according to actors is not sought for. Rather, we try to learn the validity of this model per se, which implies generalization as to behaviors and contexts (Runkel & McGrath, 1972).

Looking ahead we intend to enlarge the scope in two ways:

1. Applying the model of counter-value compensation in one or two other plants, in which other potential interventions - like the 5th shift - are open to test.
2. Applying another model - that is, survey feedback - under most comparable conditions in two or three plants. Then the design would look like:

$(O_1\ X_a\ O_2)$
$(\qquad\qquad)$
$(O_1\ X_b\ O_2)$

This strategy will allow us to overcome at least the main soft points at present.

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PROCEEDINGS

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Public Health Service
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