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Dynamic models of social influence  
in small group research

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# **Dynamic models of social influence in small group research.**

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## **SUMMARY**

The main intentions of this paper are to discuss the similarities and dissimilarities between different **dynamic** models of social influence in small groups and the development of a dynamic version of the group situation theory.

As theoretical approaches were chosen : a) the social transition scheme model (STS) developed by Kerr(1981, 1982), b) the social interaction sequence model (SIS) proposed by Stasser & Davis (1981), and c) the dynamic theory of social impact (DTSI) published by Nowak, Szamrej and Latane'(1990).

These theories were compared with group situation theory developed by Witte (1987,1990) and now modified as a dynamic version. This group situation theory tried to explain the different meanings of a group decision for their members after the group discussion and not only the change of the opinions to reach a consensus. However, this qualitative change of the group situation in its normative components has to be modelled in the future.

## Dynamic models of social influence in small group research.

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During the last years mathematical models of social influence in small groups have become more and more dynamic in describing the process of opinion or decision change.

Two derivations of the well-known social decision schemes (Davis, 1973) have been most influential in the last years : the social transition schemes developed by Kerr (1981, 1982) and the social interaction sequence model proposed by Stasser and Davis (1981). Recently, Nowak, Szamrej and Latane' (1990) also proposed a dynamic version of the social impact theory.

Thus, these three models are the basis of our discussion in order to find similarities and dissimilarities between the approaches. Additionally, as a consequence of this discussion we will formulate a dynamic version of the group situation theory developed by Witte (1987, 1990).

### Social Transition Scheme Model

The social transition scheme (STS) model is an extension of the social decision scheme approach. The STS model does not only focus on a group's final decision , but also on the successive changes in a group member's position during the process of decision making in the group. There are two submodels of this general approach : 1) The STS shift model in which a change in a member's preference is taken as an event but all failures of

change are ignored , and 2) the STS rate model in which a group's state is reassessed at regular time intervals. Since time is a physical measure with which social processes can be described in a very rough sense the rate model approach will be ignored . Furthermore, the shift model is the natural extension of the original social decision schemes as its dynamic version therefore we will concentrate on this approach.

It is not very easy to formalize this approach as the usual formalization through a Markov chain cannot be applied . There is a violation of its fundamental assumption concerning path-independence. This violation seems to be small in amount - one would decrease the proportion of incorrect predictions of groups' next shift by only 8.2% by taking into account the groups' immediate prior shift history instead of ignoring it. However, a criterion evaluating a theory besides the amount of correct predictions is also the psychological explanation of the process . Under this perspective the violation comprises some qualitative interaction processes which should be taken more seriously , because the aim is not only a description of the process on quantitative grounds ,but also an explanation on psychological grounds.Both kinds of models - the descriptive and the explanative - are supplementary, because a quantitative description is a necessary condition of an explanation and an explanation should not violate the quantitative descriptive level if it is to be seen as valid.

Additionally, there are two typical effects in the data analyzed by Kerr(1981) : the asymmetry effect , which means that advocates of acquittal are more likely to win converts than are

advocates of conviction ; and the **majority effect** which assumes that group members are more likely to join a majority than to defect from one.

The easiest way to describe the shift model is the following : There is a specific distribution of group members' votes for conviction or acquittal at a certain point of deliberation  $c(t)$ . There is a probability  $p'$  to transform this configuration into one with one more member for conviction  $c'(t+1)$  and a probability  $p''$  to transform this configuration into one with one more member for acquittal  $c''(t+1)$  .

If an unanimous group decision has been reached there will be no change further , unanimity is an absorbing state.

Unfortunately, the  $p'$ -values are not constant but dependant on the specific configuration (majority effect), the specific decision (asymmetry effect) , and the way of the specific configuration (path dependence) :

$$p' = f[c(t), c'(t+1)] \quad . \quad (1)$$

What has to be explained is the probability  $p'$  of an average individual to change his/her opinion in one direction under a given distribution in the small group, with a specific social valuation of a decision problem, and finally a specific path of change in the past.

The final formulation of the theoretical problem to be solved could be a point of convergence in order to find an integration of different approaches. So let us move on to the next model .

### Social Interaction Sequence Model

The social interaction sequence (SIS) model also represents the group's decision-making process in terms of the sequential choice behavior of group members. Now , however, choice behavior includes changes of opinion or preference and revisions of certainty which are not understood as a change in the group , but as an internal individual change without an observable , external change of preference or opinion. The basic assumption of this model is that group members who are certain will not change their mind. Therefore the probability of change from one configuration to one of the two adjacent configurations depends upon the certainty of an average individual's position and the information received during group discussion :

$$p' = g\{f[c(t), c'(t+1)], h(\text{cer})\} \quad . \quad \{2\}$$

The specification of the general functions are the following :

$$h(\text{cer}) = \alpha(t, t+1) \text{ a random change of the uncertain people}$$

and

{3}

$$f[c(t), c'(t+1)] = [n(t)/n]^c$$

Finally, we get the following result :

$$p' = \alpha(t, t+1) * [n(t)/n]^c \quad (4)$$

$n(t)$  : number of group members with a specific opinion during  $t$

$n$  : group size

$\alpha(t, t+1)$  : a change constant of the uncertain people, which combines characteristics of the task with characteristics of the people

$p'$ : probability of change of the next individual.

This means that the  $g$ -function is a simple multiplication, and due to the majority effect the exponent  $c$  often equals 2 .

For more complex formulas it is sometimes easier to construct a linear relationship between the independent and the dependent variables in order to render different formulas comparable. The linear expression of this formula is the following :

$$\log p' = \log \alpha(t, t+1) + c * [\log n(t) - \log n] \quad (5)$$

Generally, the SIS shift model is an extension of the STS shift model combined with a precision of the  $f$ -function as a special power function.

## Dynamic Theory of Social Impact

In the two models described above the dependent variable is the probability of change of an average individual under specific group conditions in a binary choice task. The independent variables are the distribution of votes and the individual certainty of each position.

The dynamic theory of social impact (DTSI) is an extension of the original theory of social impact in a way that two kinds of impact on an individual are compared : the opposers and supporters. The assumption is that an individual will change his or her mind if the impact of opposers is greater than the impact of supporters.

Generally, impact (IP) depends upon strength(S), immediacy(IM), and number(n) for both the supporters and the opposers.

The following formulas were used for opposers and supporters :

$$IP(o) = n^{1/2}(o) * [\Sigma \{S(i)/IM^2(i)\} / n(o)] \quad (6)$$

$$IP(s) = n^{1/2}(s) * [\Sigma \{S(j)/IM^2(j)\} / n(s)] \quad (7)$$

An individual will change his or her opinion (C) if

$$IP(o)/IP(s) > 1$$

the impact of the opposers is greater than the impact of the supporters including the individual.

If the sum in parantheses is a constant K for a fixed configuration of the group members we get the following result:



$$IP(o) = K(o)/n^{\frac{1}{2}}(o) \quad \{8\}$$

$$IP(s) = K(s)/n^{\frac{1}{2}}(s) \quad \{9\}$$

$$C = [n(s)/n(o)] * [K(o)/K(s)] \quad \text{with } C > 0. \quad \{10\}$$

The linear expression of the change measure is :

$$\log C = \frac{1}{2}[\log n(s) - \log n(o)] + \log K(o) - \log K(s). \quad \{11\}$$

It is a bit surprising and contrary to the verbal expression of the social impact theory that a change positively depends upon the number of supporters -  $n(s)$  - and not upon the number of opposers -  $n(o)$  . In the original article (Latane', 1981) social impact increases with the number of opposing people directly. Thus the formulas above should be modified :

$$IP^{\circ}(o) = n^{\frac{1}{2}}(o) * K(o) \quad \{12\}$$

$$IP^{\circ}(s) = n^{\frac{1}{2}}(s) * K(s) \quad \{13\}$$

Now we get a change formula which is in line with the assumptions of social impact theory :

$$\log C^{\circ} = \frac{1}{2}[\log n(o) - \log n(s)] + [\log K(o) - \log K(s)]. \quad \{14\}$$

(The contradiction above between the verbal expression and the formalization of DTSI comes into play because  $n$  has been introduced in two different ways, as a theoretical variable and as a normalizing factor. The normalization itself is in contradiction to the verbal expression of the theory, because impact is a combined effect of all opposers and not of the average opposer or supporter.)

Thus the individual change of opinion or preference depends upon the majority of the opposers, their immediacy and strength. Both aspects are independent and thus can compensate each other, which means, that a minority with high immediacy and strength is able to change an individual or a majority without power.

### Similarities and Dissimilarities between models

The shift version of the SIS model is a direct extension of the STS model . Thus we only need to discuss the DTSI model and the SIS model more in depth.

First, in the SIS model the dependent measure is a probability while in the DTSI model it is a change measure  $C$  without the restrictions of probabilities. But if logarithmic transformations are used we have a reaction scale without some anomalies combined with probabilities and their distributions , e.g. correlations with other variables etc.

Secondly, the independent variables in both models - except faction size - are comparable. The parameters of certainty, and immediacy and strength should be related to each other - the higher immediacy and strength of the opposers the less the certainty of the subject. Thus certainty of a subject is in itself a parameter which could be explained by strength and immediacy of the opposing group members, at least to some extent if personal characteristics are ignored , as it is usual in all these models .

However, only uncertain people change their mind, which means that there is a threshold separating certain from uncertain

subjects. It may be better to discriminate between three states of certainty : certain - medium certain - uncertain, because the change from certain to uncertain might be less abrupt than described by a step-function without an intermediate state of medium certainty. Being medium certain means to look for more information without decision , being certain means no change, and being uncertain means to conform to the majority or sometimes to the minority. This effect of the certainty is additive to the influence of the number of group members supporting or opposing the individual position, in a logarithmic model.

Thirdly, the influence of the group members is different. In the SIS model the ratio of the opposing members and the complete group is the independent variable (see formula {3} where  $n(t)$  are the members of the opposing group to induce change), while in the DTSI model it is the ratio of sizes of both subgroups (see formula {14}) :

$n(o)/n$  for the SIS model and  $n(o)/n(s)$  for the DTSI model, which could be expressed as  $n(s) = n - n(o)$  so that the following ratios, only depending on  $n(o)$ , have to be compared:  $n(o)/n$  and  $n(o)/n-n(o)$  , but , of course, with different exponents .

If we take a maximum size of a small group of 12 members there are the following differences between both approaches :

n(o)	1	2	3	4	5	6	7	8	9	10	11
n(o)/n	.08	.17	.25	.33	.42	.50	.58	.66	.75	.83	.92
n(o)/n-n(o)	.09	.20	.33	.50	.71	1.0	1.4	2.0	3.0	5.0	11.0
[n(o)/n] <sup>2</sup>	.01	.03	.06	.11	.18	.25	.34	.44	.56	.69	.85
[n(o)/n-n(o)] <sup>1/2</sup>	.30	.45	.57	.71	.84	1.0	1.2	1.4	1.7	2.2	3.3

Now there is the question whether it is possible to discriminate the two models under the assumption that they will predict another amount of change independent of a linear transformation. The correlation between the last two rows is  $r = .97$ .

Thus both approaches are nearly identical under a linear transformation within the range of the size of small groups. It seems almost impossible to test one model against the other empirically.

Both show the observed majority and asymmetry effect, as the difference between the weights increases if the distribution deviates from the equal distribution in the direction of a majority compared with a minority influence.

Also with regard to the content all three models are similar, perhaps with one exception: the certainty change is a dependent variable on the side of the individual to be influenced, while immediacy and strength are independent variables on the side of the opposing group members. But, of course, these kinds of variables are related as is discussed in Stasser and Davis (1981).

If these three models have to be evaluated concerning their prediction of empirical results they seem to be very flexible and might be corroborated equally well by empirical results. But the SIS and the DTSI model try to incorporate the psychological

processes more deeply compared to the more simple STS model by using parameters describing the fundamental psychological processes. The critical point is to make these processes more explicit by introducing the main psychological functioning moderating the quantitative approaches through the psychological processes themselves. Furthermore, parameters and models should not be fitted but rather introduced theoretically.

In some respect group situation theory tries to fulfill these demands, but, of course, it is far from reaching this aim. Perhaps it is one step in the right direction. However, group situation theory is static and has to be modified in order to become a dynamic theory of group influences. This modification will be discussed now.

#### A Dynamic Version of Group Situation Theory

The main characteristic of group situation theory (GST) is the explicit differentiation of normative and informational components. The normative dimensions have the function of antecedent conditions and the process of the information integration of the group discussion is a consequence which means that the weights of the informational elements are modified by the normative conditions of the group situation (Witte, 1987, 1990). The result is a hierarchical order of the different components: starting with the normative conditions, leading to a specific information integration process of the individual group member, finally resulting in an individual reaction.

In a metaphorical sense GST assumes that **subjects are socially determined information processors** : The social condition (normative dimensions) determines how to use the information given in a group situation. Therefore subjects start to get an impression of the social circumstances and after a clear impression they know how to use the information to make a decision , to give a judgment , or to solve a problem.

The strategy to get an impression of the circumstances itself is simple and optimizing that means subjects implicitly follow a rule which is hierarchically ordered and stop if they have reached the first absorbing state with a clear enough impression. Under this condition they implicitly know how to use their information to reach a decision. The information integration itself is assumed being simple linear and hierarchically ordered .

The standard normative conditions in an experimental group discussion are the following :

1. no awareness of theory explaining behavior in group situations (AT = 0)
2. medium (neutral) group atmosphere (GA = 2)
3. medium distribution of individual choices (DIC = 2)
4. medium verifiability of choice (VC = 2)
5. no commitment to a constituency ( CC = 1).

Given this standard situation the individual reaction can be predicted by the following information integration formula :

$$Y = SV + 1/2(GS-SV) + 1/3[AR-(SV + 1/2(GS-SV))] \quad \{15\}$$

Y : individual reaction

SV : social value as a general orientation what to do;

GS : group standard as the weighted average of the individual reactions, where the weights depend upon the power or strength of the group members, usually being the arithmetic mean with equal weights;

AR : argumentation during group discussion measured on the reaction scale , sometimes the single arguments have to be weighted by their convincingness to find an expression of the whole discussion .

Often during the discussion no new arguments are mentioned so that the third term of the sum equals zero . And under the usual conditions of ad-hoc groups the group standard (GS) is simply the arithmetic mean of the individual reactions. Finally, the social value is the general preferred reaction in a reference group depending upon the problem given.

What is GST's explanation of the three effects usually found in the data : the **asymmetry** effect, the **majority** effect, and the **path dependence** ? The **asymmetry** effect depends upon the SV which influences the individual decision as a general orientation what to do. Because of a socially valued direction it is simpler to influence people in this direction than in the other one.

The **majority** effect is simply the influence of the GS which usually is the arithmetic mean of the individual choices.

The problem of the **path dependence** has to do with the different information integration processes under different normative conditions. Since the standard group situation is the most frequent in experimental settings the description of this setting seems to be sufficient. However, there is no validity of the models based on Markov chains (e.g. STS, SIS) under other

conditions because of the path dependence and the amount of the error rate also depends on the frequency of the standard conditions . Thus the error rate might increase if other studies were used.

Now, in order to find a dynamic version it is necessary to transform the hierarchical order of normative and informational components into a feedback loop. The information transmitted in the group discussion and the distribution of the individual reactions should be able to modify the status of the normative components. The impressions of the social circumstances could be modified by the interaction in the group leading to a reevaluation of the normative conditions. This assumption was already made for the reconstruction of the data from the Asch-study, which assumed that the informationally consistent majority of the confederates is able to change the verifiability of choice from a high level to a medium level, a normative component (Witte, 1987). This , of course, is comparable to the change in certainty proposed in the SIS model and the impact through number in the DTSI model. Such a reevaluation depends on the prior information exchange so that the change of the impression about the normative components has to be explained in a dynamical model which is able to integrate these changes after information exchange.

If such a feedback loop is introduced the normative status depends on the informational components because the communication in the group has two aspects : content (information of the task) and social-emotional relationship . In general, this feedback loop must lead to a transition due to the



non-stationarity and path-dependence found in the data given by Kerr(1981). ( In connection with the evaluation of the STS model Kerr (1981,p. 693) argues that the deviation from a Markov chain model of 8.2% could be neglected. Still a deviation from random of the same amount is more than a medium effect, if a theory is corroborated by a significance test ( see Cohen,1977). Thus the logic behind these interpretations seems to be somewhat inconsistent.)

At best, we go through the normative components and discuss their dependence on the process of informational exchange.

If one member of the small group has theoretical knowledge about the functioning of small groups and is able to transmit this knowledge (informational component) to the other members, then the normative status has changed and the information integration is modified ( $AT = 1$ ). This information exchange , however, is not on finding the reaction or making the decision it is on normative aspects how to organize the group discussion.

Now the group as a whole will be able to to concentrate on the arguments of its members and to reduce irrational conformity processes.

The group atmosphere may also depend on the informational exchange during discussion. A highly aggressive discussion might lead to a bad atmosphere ( $GA = 1$ ) resulting in the group falling apart. On the other hand , a discussion producing an increasing similarity between the viewpoints of the problem improves the group atmosphere to a highly positive regard of each other ( $GA = 3$ ) ,which is the most probable route. The consequence is a conformity effect concentrating on a compromise of the

individual decisions before discussion, perhaps, modified by the social value as the general orientation at the beginning of the group discussion.

The distribution of individual choices could increase through the discussion from a tolerable medium size ( $DIC = 2$ ) to an intolerable size ( $DIC = 3$ ), which means that the group falls apart or the jury hangs. On the other hand, if a compromise agreed upon by all group members has been found, there is no deviation anymore ( $DIC = 1$ ) and the discussion ends, which is the most probable way.

The given problem can be verified more or less easily on objective or social grounds. This verifiability of choice can be changed by the decision of other group members, like a consistent majority against an objectively verified stimulus in the case of the Asch-studies. Usually, the comparison between an experimental line and a standard line is very easy. Still, the decisions of the other group members had confused the naive subject so that it was no longer certain about the right reaction. This is a change from high verifiability ( $VC = 3$ ) to medium verifiability ( $VC = 2$ ). The same change might also be possible from medium to low verifiability ( $VC = 1$ ), if the arguments in the discussion seem to prove different alternatives. A consistent minority might also change the verifiability, perhaps to a lesser amount. However, the usual change of this normative dimension will be an increase in confidence (Snieszak & Henry, 1989). Thus the group ends with the normative status of high verifiability ( $VC=3$ ).

The commitment to a constituency has often been eliminated in

experimental research because of the ad-hoc-ness of the groups so that there is usually no commitment ( $CC = 1$ ). On the contrary, there are some studies where group members have to negotiate as representatives of other groups. This implies a deep obligation to a given position ( $CC = 3$ ). This obligation can be reduced if the new group develops some form of solidarity, which results in a reduction of the commitment to a medium degree ( $CC = 2$ ).

Obviously, the information exchange and changes of the individual reaction can produce changes in the normative components, but without being aware of the kind and contents of the discussion it is impossible to predict the change. Each change of the normative components, however, leads to a change in the information integration which determines the change in the individual's reaction. Thus, the law predicting the individual reaction is modified. Assuming this, there is no single dynamic model - comparable to a Markov chain - which could predict the process of individual reaction changes, as the process is non-stationary or path-dependent.

The general idea is that the discussion is, in general, a kind of social support, which increases the emotional bonds and as a whole the group atmosphere. This positive group atmosphere changes the status of the group situation where with its increasing also the conformity reaction as a compromise between the individual positions becomes more probable, perhaps modified by the social value during the beginning of the discussion. At the end of such a discussion the whole status of the normative dimensions has changed from indifference to

absorbing states : GA=3, DIC=1, VC=3 and now a high commitment to the discussion group and its reaction or solution. The last kind of change might be dependent on the commitment to other groups before the discussion and the role being played in the discussion group. In general, there is not only a change in opinion but also a change in the normative dimensions which is a change in the meaning of the reaction and its importance after the discussion. To explain this kind of change on the level of the social meaning of an reaction is one strength of a dynamic group situation theory compared with the other models.

One might argue fundamentally, that a more complex approach as the group situation theory must lead to a better prediction of the results, as there are more parameters and different equations. This argumentation is incorrect if one does not fit the model and the parameters but instead uses an equation with fixed parameters on theoretical grounds. In this case a prediction of a complex model could be worse than a prediction of a simple model.

The fundamental difference between STS, SIS, DTSI and GST is the dependent variable . In the first three models the dependent variable is a reaction and its probability is related to a preceding configuration of reactions in the group . These three models could be named reaction shift models as they describe the reaction process by modelling the progress from one reaction pattern to the next.

The GST model , on the contrary, is a normative-informational shift approach . It predicts the reaction differently under different normative conditions and the discussion in the group

can change the normative status at the beginning of the discussion. Sometimes the discussion process only stops if unanimity is reached or the group falls apart (jury hangs).

Such a group decision can be reached, in principle, because :

- a) the interaction between the group members leads to a great positive regard ( $GA = 3$ ) and this affective basis determines the compromise between the individual reactions (emotional route);
- b) the information exchange under a medium group atmosphere shows identical individual reactions ( $DIC = 1$ ), which is a cognitive way of supporting each others view (supportive route);
- c) there is an intensive discussion which does not change group atmosphere and which shows a medium range of the individual choices so that at the end the individual choice is a real consensus (cognitive route). The given information is integrated into the individual view. This is the most rational way to find a solution through argumentation. These different ways are described in GST by the weighting of the informational components : the social value, the group standard, the argumentation and the differences between them. GST also gives a prediction of the different informational processes under specific combinations normative dimensions, which determines the information integration process. However, there is no description of the way how the normative components are changing during discussion and why. This changing process from the information exchanged to the variation of the normative dimensions has to be modelled theoretically in the future.

Thus , the two kinds of theories describe the change process on different levels : On one hand ,the reaction change is predicted as a revision of the individual choices from one group configuration (distribution of individual reactions) to the next; on the other hand the dynamic process is modelled as an interplay between normative and informational components which at the end leads to dissent or consent in the group. However, there is also a convergence of these two kinds of models assuming that an unobservable internal shift of certainty exists, which is comparable to the change of the normative dimension called "verifiability of choice" from a high level to a medium level. However, this change describes a personal variable in SIS , while in GST it is a variable describing the stimulus.Of course, both aspects have to be combined in order to explain the individual reaction. If the average individual is taken as the reference basis there might be no fundamental difference at all.

One main question of these two kinds of models has to be answered : Do people change their reactions or do they change their internal impressions without a fluctuation of the reaction until they have found their final decision ? Since Hawkins (1960) reported that his mock jurors almost never switched votes (guilty or not-guilty) more than once , it is not the process of switching which has to be modelled , but the internal influence processes which produce the switch in one direction.The voting process does not fluctuate , it seems to be a goal-directed process with a final result, differing from a learning process where reactions change more randomly . The reaction change

theories (STS,SIS,DTSI) describe the process rather in the sense of such learning models , while the GST is an approach that models the internal normative-informational exchange with mainly a final decision.Of course, this depends on the the reaction scale which usually is nominal . If it were an interval scale, the conditions might be different.

Furthermore, GST is also able to predict the consensual reaction on a reaction scale with interval character instead of a nominal scale.This is another fundamental difference between the reaction shift models and group situation theory.

It seems that GST is broader in two respects : the measurement level of the reaction scale and the differentiation of the normative dimensions with their complex interplay of the informational and normative influence.However, the integration of a variable measuring certainty has to do with these internal processes.The formalization of this variable through a multiplicative constant  $\alpha$  does not differentiate between the two qualitative states of people who are certain and who are uncertain.Under the assumptions of GST the certain people have the impression of a stimulus which has a high verifiability of choice. Under this normative condition the individual reaction is consistent with an objective standard as in the Asch-studies or with a socially valued position . The consequence is the same as described in the SIS model, but the different information integration processes are given explicitly in GST .

In the DTSI mainly the internal variables are brought into play.Compared with GST 'number' has to do with an increase in uniformity pressure with the consequence that the social value

SV gets a higher weight . This is a classical conformity effect. The variable 'strength' has to do with leadership and power. It is a variable to discriminate between the group members. The influence of this variable comes into play when the group standard is determined. It differentiates the weighting of the individual choices before combining them into an aggregate parameter of the whole group. The consequence is a more or less deviation from the individual position before discussion depending on the influence factor of the group member. The DTISI has only been developed for binary choice problems as the SIS model so that the deviation can only be measured as a change. The third parameter is 'immediacy' . It has to do with the relationship between sources and target of influence. It might be the emotional basis of power. Then it is handled comparably to strength in GST changing weights of the sources to build up an informational element - the group standard (GS). The general proposition of DTISI is that by an increase in uniformity pressure and by opposing sources with high power the measure of change increases under otherwise constant conditions. This expression is in accordance with GST. However, there are some inconsistencies in the original model of social impact (Witte, 1990) which have been eliminated and the innovative ideas of this theory have been integrated into GST forming an extended version of it. This extended version (EGST) also has to be formalized in a dynamic manner in the future (Witte, 1992).

What also has to be done in the future is to give an explanation of the changing normative status by the communication process. For this reason the information exchange process has to



be described by dynamical variables which are able to give a prediction and explanation of the change in the normative dimensions. Sometimes, as a first step, self-ratings of the group members can be used as indicators of the relevant normative dimensions.

Thus the prediction of a reaction's change depends on the changed normative status of the group situation and not directly on the prior distribution of the reactions in the group as in the SIS or STS model. These models mainly use the informational influence as a prediction of the subsequent distribution. On the contrary, the DTSI model mainly uses normative variables of the group situation (number) and the status of the group members (strength, immediacy) combined into a normative influence called social impact as a prediction of the subsequent reaction. Under this model it is secondary what is said; the change depends on how many and with what kind of status opposing group members force the target to change his or her mind. In the GST model the change is a combination of what is said (information integration), how it is said (normative status of the group situation), and by whom (weighting of the individual choices). Thus the reaction change might depend on the change of the normative dimensions and/or the differentiation of the group members' status on one hand and on the content of the argumentation itself on the other hand. The information integration process itself changes with a change of the normative status. The same informational input predicts different changes under different normative conditions. And the same normative conditions predicts different changes under different

group discussions. The individual group members are influenced by the normative dimensions to use the given information differently and by the information exchanged to find a new viewpoint. Sometimes time both influence processes are combined. This combination of both processes usually needs time more than it is available in standard experimental settings. Thus dynamical models need a different experimental procedure with an integration of more time for group development (Lacoursiere, 1980) or group socialization (Moreland & Levine, 1982). The categories of observation, however, should be specific for the normative dimensions in GST. The consequence of this discussion is that a dynamical version of GST needs observational methods which could indicate what is said - a registration of the arguments exchanged and the distribution of the individual speech rates - and how it is said as indicators of the normative dimensions' change.

#### Explanation of important data by a first step dynamic group situation theory as examples

In the two fundamental articles of Stasser & Davis (1981) and Kerr (1981) empirical results of changes in mock juries are reported (see Kerr, 1981, p. 699, Table 9; Stasser & Davis, 1981, p. 544, Table 8). These data have to be reconstructed by GST, as two other models have also been used to predict the results, so a further prediction is a comparable test with all these models. The data are given as a specific distribution of votes in a 6-person mock jury with the probability of shift to the following distribution.

The first question is **why**, with an equal distribution of 3

guilty (G) and 3 non-guilty (NG), the probability of change into the non-guilty direction is .75 and in the other direction .25. This is clearly an **asymmetry effect**.

The prediction of GST is the following :

There is a standard group situation which will remain stable during discussion : AT = 0, GA = 2, DIC = 2, VC = 2, CC = 1 .

Then the information integration is the following :

$$Y = SV + 1/2 (GS - SV) + 1/3 \{AR - [SV + 1/2 (GS - SV)]\}$$

The social value (SV) is the classical rule " in dubio pro reo", which means non-guilty. The group standard (GS) is the arithmetic mean of the individual votes : .50 G and .50 NG .

The arguments exchanged during discussion reproduce the individual votes and the social value, which means that the third term is zero :  $AR = SV + 1/2 (GS - SV)$ .

Thus we get :

$$Y = NG + 1/2 ( .50 G + .50 NG - NG ) = .75 NG + .25 G .$$

The explanation is that group members have learned as a social rule to vote for acquittal if there is any doubt. Thus, three quarters of average individuals change towards acquittal which is also the final result of all groups. There is no change of the normative dimensions.

The next distribution we look upon is 5 G and 1 NG . Under these circumstances it is assumed that the information exchange leads to a change of the normative dimension which is called distribution of choice (DIC) . Under this small distribution of choices the deviate member is highly forced to follow the majority. Now it is predicted that GS is the variable which determines the average individual reaction :

$$Y = GS = 5/6 G + 1/6 NG = .83 G + .17 NG .$$

The observed results are .86 G and .13 NG which corresponds with the prediction quite well. Now the predicted results depend on a different information integration process compared with the standard setting above with an equal faction size of guilty and not guilty voters.

Usually, such a distribution leads to conviction, but a strong opposer is able to modify the majority to some extent. This is only possible if the group atmosphere does not become aggressive which results in the group falling apart or the jury hangs. Such a relatively large amount of influence through a single member is only possible if this member argues in favor of a social orientation. Only then will his arguments and his position be accepted .

The inverted distribution does not lead to such an influence because in this case the opposer has to argue against the social norm. Now the assumption is that this distribution of votes and the argumentation during discussion changes the verifiability of the trial and the group members are going to feel certain (VC=3) that no conviction is possible. The prediction under this normative condition is :  $Y = SV = 1.00 NG$  .

The observed result is .99 NG .

The comparison of the last two results demonstrates an asymmetry effect, but the kind of influence in these two situations is different. Under the assumption of GST the same amount of individual differences in a group has a different meaning depending on the deviation from a socially valued position. If someone is arguing in favor of the social value all individual

positions are taken seriously including that of the minority. If, however, the minority position is against the social value then the majority becomes quite certain to be correct and the influence of the deviating individual is neglectable, because his position is ignored.

In the next distribution there are 4 G and 2 NG with a majority for conviction. If it is assumed that there is no change of the normative dimensions and which describe a standard group situation then the normal information integration process predicts the following results :

$$Y = NG + 1/2 ( 4/6 G + 2/6 NG - NG ) + 1/3 \{AR - [\dots]\}$$

with  $AR = 4/6 G + 2/6 NG$

$$Y = 0.56 NG + 0.44 G .$$

The observed results are 0.45 NG and 0.55 G, which is a remarkable deviation between prediction and observation. The prediction is somewhat surprising because a minority of two members should be able to convince a majority more often than the other way around. Other data from research on minority influence speak in favor of the predicted direction. It is called the zeitgeist effect if a minority changes a majority due to the minority being on the side of the socially valued position. The main idea behind the prediction is that the general orientation is more influential than the specific small group. This deviation may be, of course, an interesting point for future research and it gives an impression that it is not possible to reconstruct all data from GST.

The last distribution is the inverted of the one just discussed. The assumptions remain the same concerning change in normative

dimensions , but differ in the determination of the argumentation. It is assumed that there are no convincing arguments in the discussion in favor of conviction ,as the majority opposes conviction and is able to destroy the convincingness of the arguments pro conviction :

$$AR = NG .$$

Then we get :

$$Y = NG + 1/2( 0.33 G + 0.66 NG - NG) + 1/3 \{ NG - [...] \}$$

$$Y = 0.89 NG + 0.11 G .$$

The observed results are 0.92 NG and 0.07 G .

This is a small deviance from observation but it is acceptable if compared with the predictions of other models given in Kerr (1981, p.699,Table 9).

Of course, the assumptions must be proved . They seem plausible on the background of other research on small groups. From the GST's point of view research is needed which comprehends the internal influence processes and their consequences for the normative and informational changes predicted by the GST . These are some examples showing a first step dynamical version of GST explaining some change data. The most interesting part is that the information exchange in groups has different consequences depending on the starting pattern of normative and informational dimensions.It seems to be promising to go on an extension (Witte,1992) and a dynamization of GST as a general framework to explain behavior in group situations.

#### Concluding remarks

The dynamization of fundamental theories in small group research results in interesting approaches.However, it does not seem very

promising to use models which are independent of the prior path as a Markov chain. It seems to be a complex interaction between normative and informational components which alone could explain the results. Neither informational centered models (STS, SIS) nor normative centered theories (DTSI) seem to be able to give an explanation of the observed results. However, the more descriptive models are giving the framework of where to find an explanation. The more explanative models have to give the reason why a majority or asymmetry effect should be observed and why path dependence exists. In the future GST has to be developed by an integration of observational methods which diagnose the normative dimensions and the informational exchange. These supplementary data are necessary to fill in the assumptions to be made now. One main point in future also will be to use GST as a theory to develop a more rational strategy in group judgment or problem solving. The change processes of the individual members should be based on rational arguments as much as possible. This is one main intention of a dynamic version of GST.

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