Strategic Thresholds and its Implications

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- Trust game in Social context

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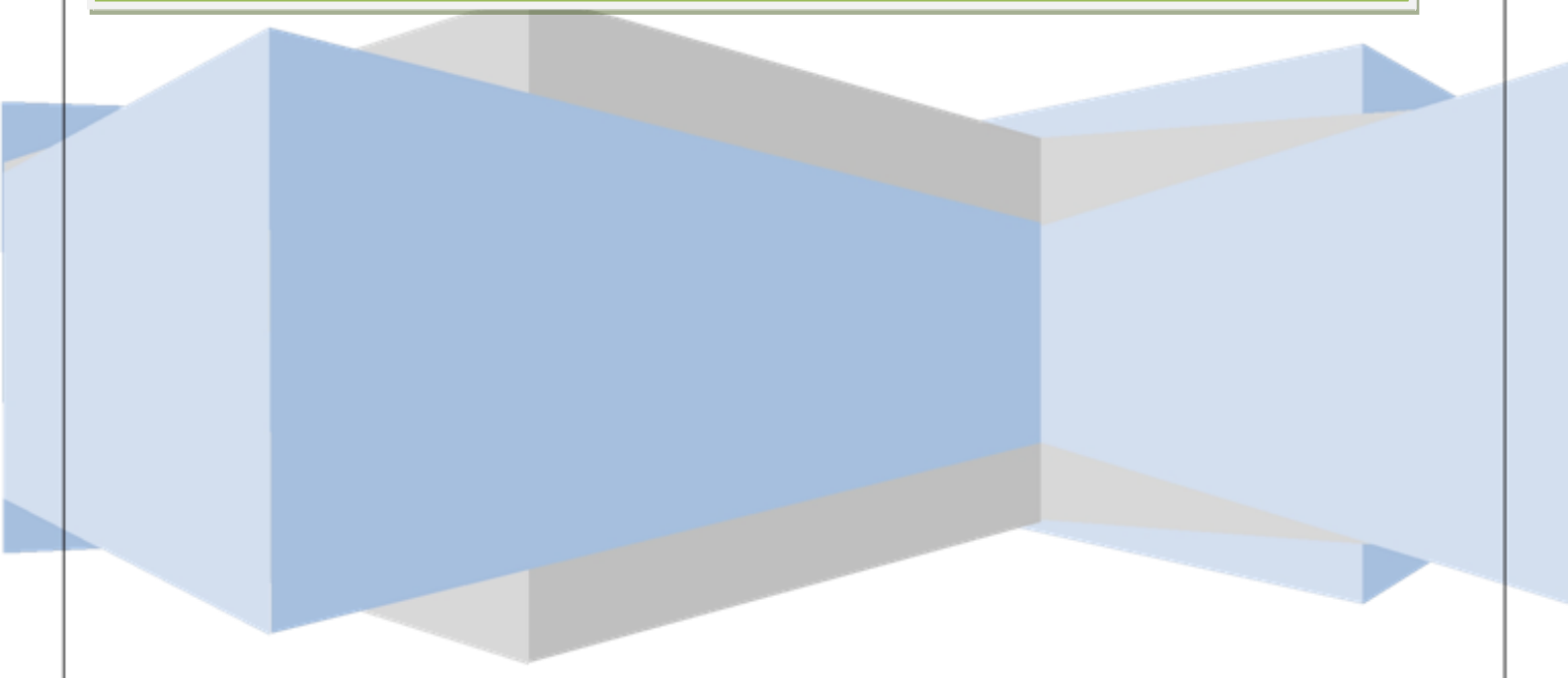


Executive Summary

This paper aims at defining a Strategic Threshold or Flash points for each strategy followed by the society as a whole. The paper attempts at analyzing interactions between two groups and the effect of change in trust on the path traversed. The paper draws analogy to the behavior of atoms/molecules during a chemical reaction to the influence of Information (positive or negative) on the trust level and the resulting shift in the general social strategy. A society can be considered as a collection of molecules (people) at various energy states (trust level) normally distributed. This implies the presence of a minority of population of high energy state (catalysts in case of chemical reaction OR leaders/influential people in case of societies) . The whole path traversed by the moderate population is influenced by the energy (in the form of propaganda) of these high energy particles until a majority of the population cross the activation energies towards higher macro state (lower trust/social capital).

The theory may be used to analyze a variety of social interactions like the ethnic conflicts in Africa and some South Asian nations. The paper also lays out the role of leaders to soothe the conflict and bring back the society to a lower energy state (Higher trust/social capital).

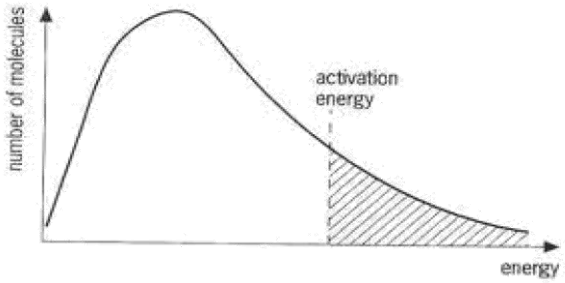
Keywords- Detrimental Factor of defection, Trust Breaking Threshold Factor, Equilibrium Strategy, Game Theory

Biographical Notes- Dr. Sandhya Mishra is currently Principal in Charge of EAST Engineering College, Bhubaneswar, Orissa. She holds a Doctor of Philosophy degree in Mathematics from Utkala University, Orissa. Her research work includes application to mathematical programming problems with specific focus on convexity and concavity. She has over 20 years of work experience in teaching Statistics, Linear Programming, Game Theory to Engineering students. She has received several State awards for her outstanding service to teaching field.

Introduction

In a chemical reaction particles are at a certain energy level (free energy) which is usually low. In order to initiate a chemical reaction, activation energy needs to be provided to the reactant which is usually greater than the final energy state of the compound formed. The new compound may exhibit different properties compared to the reactants. This is the analogy that has been used to study the effect of trust reduction in social interactions. The two parties (societies) usually start with a higher trust level (a low energy state) but repeated inflow of propaganda (negative information) causes the trust to decrease at each stage. Inspite of the decrease in trust the parties usually follow their initial strategy i.e. both Co-operate until the point when the detrimental effect of decreasing trust is just greater than the payoff for co-operate. The point is an indication of the shift in strategy for the parties- taking a more aggressive stand against the opponent. This point where the trust level reaches a threshold level may be defined as the Strategic threshold.

The general tolerance level of a system/society affects the rate of reaction/shifting. This tolerance level may be called as the Negentropy (potential) of the system. This is the ability of a system/person to stay at lower energy state with respect to the society.



Usually the social change is brought about by external forces (heating in case of chemical reactions OR negative information affecting the general trust level in the case of society) to increase the number of elements above the activation energy.

Social strategies are at various macro levels corresponding to different trust levels and rate at which the threshold is reached depends on the strength of the negative information (the factor takes into account the initial energy state of the system).

There is a tendency for the trust to regain a bit after reaching the flash points. But this movement would be irrespective of the new defect strategy adopted. This is because usually after the flash points there is an increased effort to bring order to the system hence the flow of negative information is restricted usually by government or others. But in absence of strong institutions the trust deficit escalates towards the next macrostate.

GAME- AN ILLUSTRATION

Consider a society where two parties (religions or casts etc.) are living and they take actions according to the trust they have for each other. We assume that initially they have a strong trust relationship and thus we define $t_0=1$ (Trust at time period=0) where 1 represents the highest level of trust. They can be considered as 'reactants' in the chemical reaction analogy. Initially, both parties cooperate as their payoffs from cooperating with each other is higher (can be considered as sharing of common resources and helping each other in times of difficulties). Usually political parties and influential people in society are instrumental in changing the overall trust level of the society.

Dixit [1999] in his book Games of Strategy has given the payoff diagram for 2*2 matrix in a game.Payoffs of the game played at time=0 are shown below:

Time=0	MUSLIMS: Co-operate	MUSLIMS: Defect
HINDUS: Co-operate	10,10	$10\bar{\delta}$,$10*(\eta t_0/t)$
HINDUS: Defect	$10*(\eta t_0/t)$,$10\bar{\delta}$	$10\bar{\delta}$,$10\bar{\delta}$

where $\bar{\delta} < \delta$

δ can be defined as “Detrimental Factor of defection” meaning the quantum of decrease in the payoffs if both parties refuse to cooperate.

If either of the parties tends to defect (other being cooperative), their payoffs will be inversely proportional to the existing trust between the parties (if higher level of trust exists then defection will attract adverse effects). And the factor ‘ηt_0’ gives us indication about the threshold level of trust after which, party might think of defection.

So for defection to occur,

$$10*(\eta t_0/t) > 10,$$

$$t< \eta t_0$$

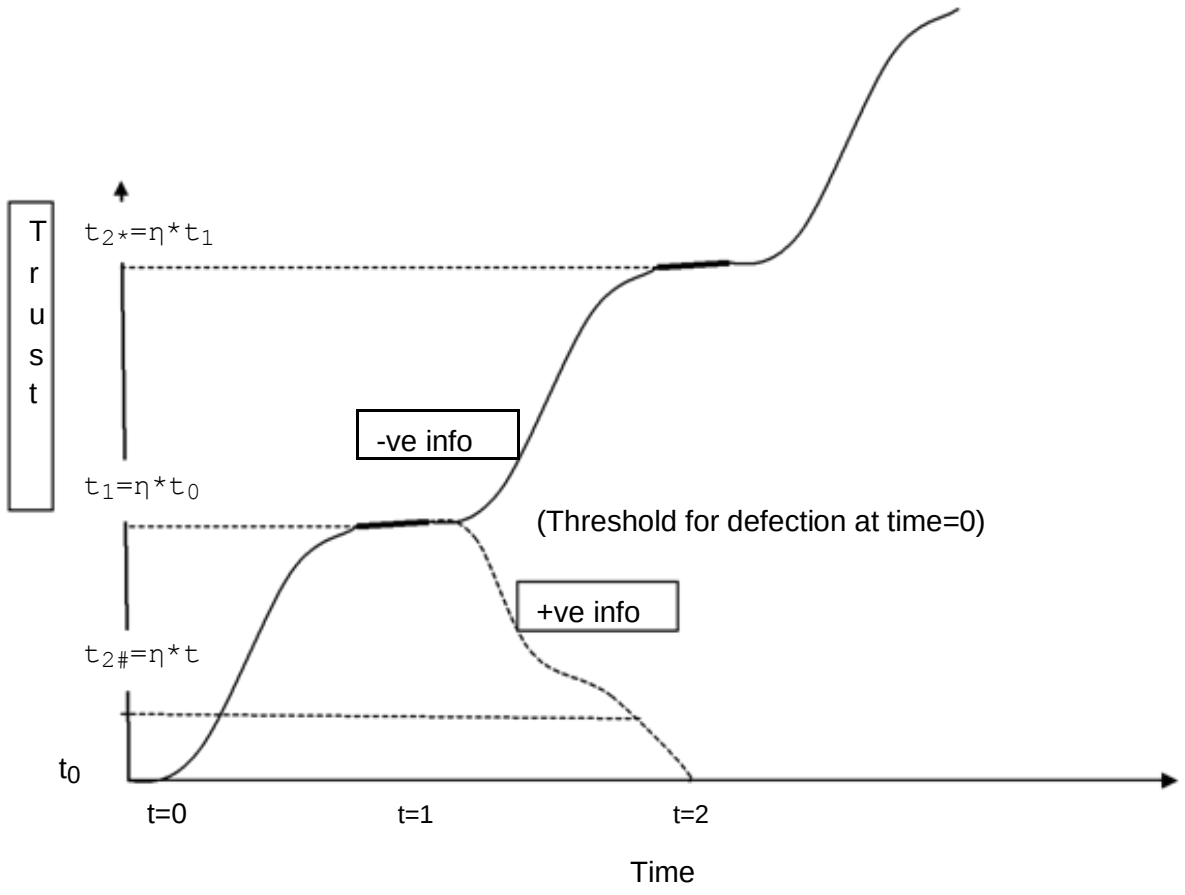
So t is the threshold trust at time=0, after which people might tend towards defection. And consequently the other party will also defect (because $10\delta^- < 10\delta$) and hence giving 10δ payoff for both the parties. This example has also been described by *Wydick in his book “Games in Economic Development”, 2008.*

It implies that if trust is somehow broken down to the threshold level of ηt_0 by propagating negative information given to parties against the other party, defection will occur. Defection can be considered as refusal of sharing resources etc.

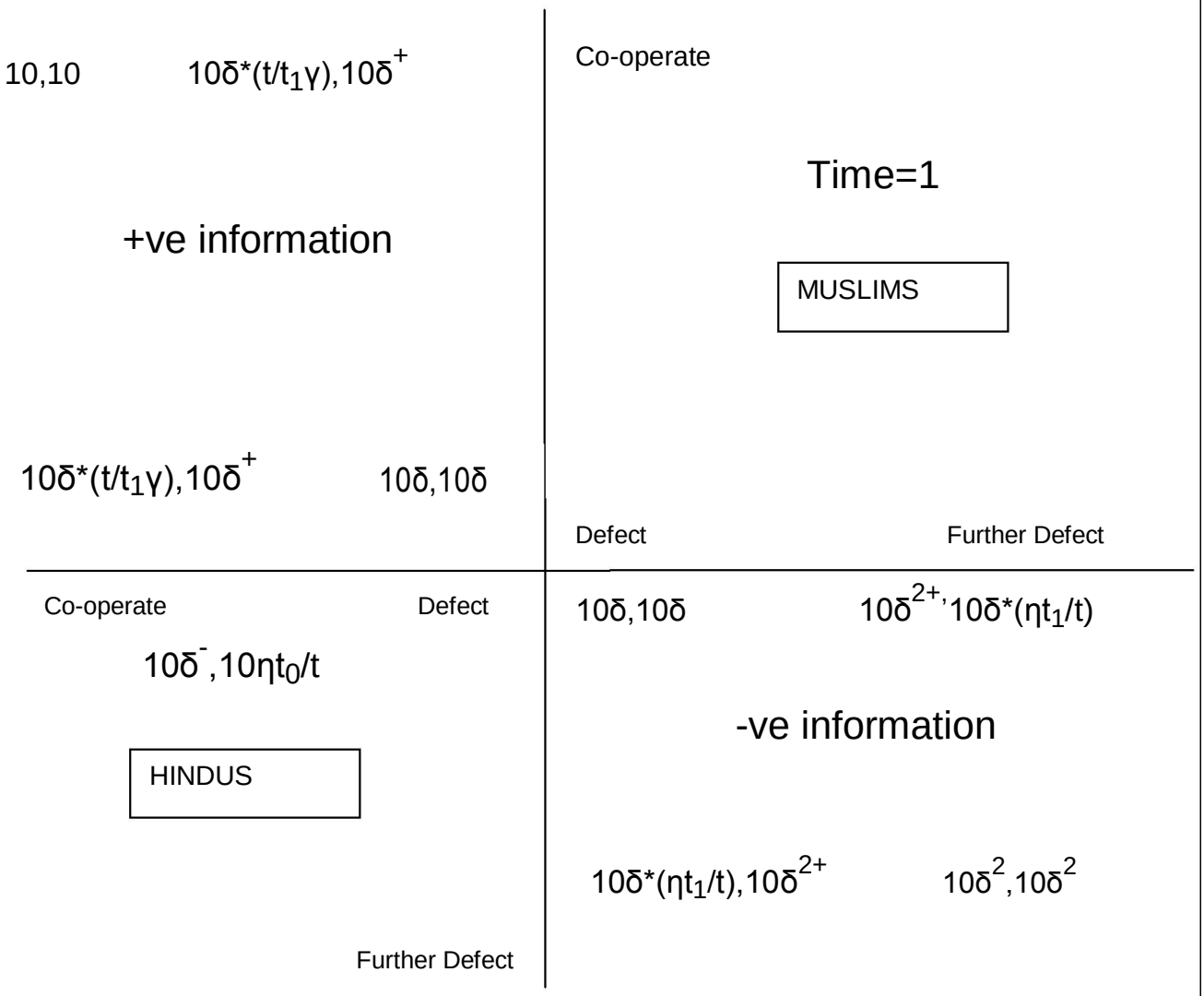
Where η is “Trust Breaking Threshold Factor” which is defined as the minimum level by which trust needs to be broken for the players to change their strategy from cooperation to defection.

Value of η will depend on the initial trust and inter-relatedness of the parties. If two parties are linked in a very loose way their trust can be broken easily (implying high value of η). If value of η is low (e.g =0.1), it implies that trust of the parties needs to broken down from 1 to 0.1 which is very huge, and will be possible only if very, very strong negative information is given to parties.

After defection has occurred once, there will be important role of leaders (whether they try to soothe the conflict by filling up the gap with positive and good information to the parties and ask them to seek cooperation or whether they try to further break their trust by feeding them negative type thoughts against each parties and pursue them for further defection).



So moves of both parties at time=1 depend on the type of information they come across and hence payoffs at time=1 are shown below:



The payoffs with the negative information are similar to the payoffs of game at time=0, where parties will tend to further defection if,

$$10\delta^*(\eta t_1/t) > 10\delta;$$

$$t < \eta t_1$$

And hence if trust decreases further to this level, parties will end up getting further reduced payoff $10\delta^2$, $10\delta^2$ by both defecting.

Whereas if leaders or political parties try to soothe out the conflict situation and pass on +ve information, then trust might again start developing between the parties. The factor $(t/t_1\gamma)$ implies

that the tendency towards cooperation is directly proportional to the increasing trust between the parties and $t_1\gamma$ is the level of trust which needs to emerged for the party to consider cooperating even if the other party is defecting. So for cooperation to emerge as the equilibrium strategy, feeling of trust needs to be infused to such an extent such that,

$$10\delta*(t/t_1\gamma)> 10\delta$$

$$t> t_1\gamma$$

Where γ is “Trust building threshold factor” which is defined as the minimum level by which trust needs to be amplified such that players consider playing cooperation as their equilibrium strategy.

So we can conclude by saying that if there is a conflict/fight/defection among two parties in a society the situation can either be soothed by good and positive type of information infused by leaders so that cooperation can be emerged again or be even escalated if leaders for their own personal interest try to persuade the parties for further defection.

Handling Escalation of Social Distrust

As seen in the game explained above, the root cause lies in the flow of biased information. The information flow may be through print media, TV or through direct interactions with certain influential people etc. The rate of reaction is dependent on to Trust Building threshold factor (γ), Trust breaking threshold factor (η) and Detrimental effect (δ). The institutions should select an optimum trust level that would be manageable. This is because trying to maintain a trust level =1 is very difficult if the present trust level is low. Confidence building measures with a trust building factor greater than trust building factor, γ, at each stage would result in a slow and steady buildup of trust level.

The Trust breaking threshold factor is a function of the (initial state) Negentropy of the system and the quantum of information and also its perceived quality. With a very low initial energy state the trust breaking factor tends to decrease with increase in influencing power of the information. Hence trying to keep a strong floor on the value of Eta is instrumental for the harmony in the society. It should be brought about by a considerable check on the flow of biased information in the society.

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