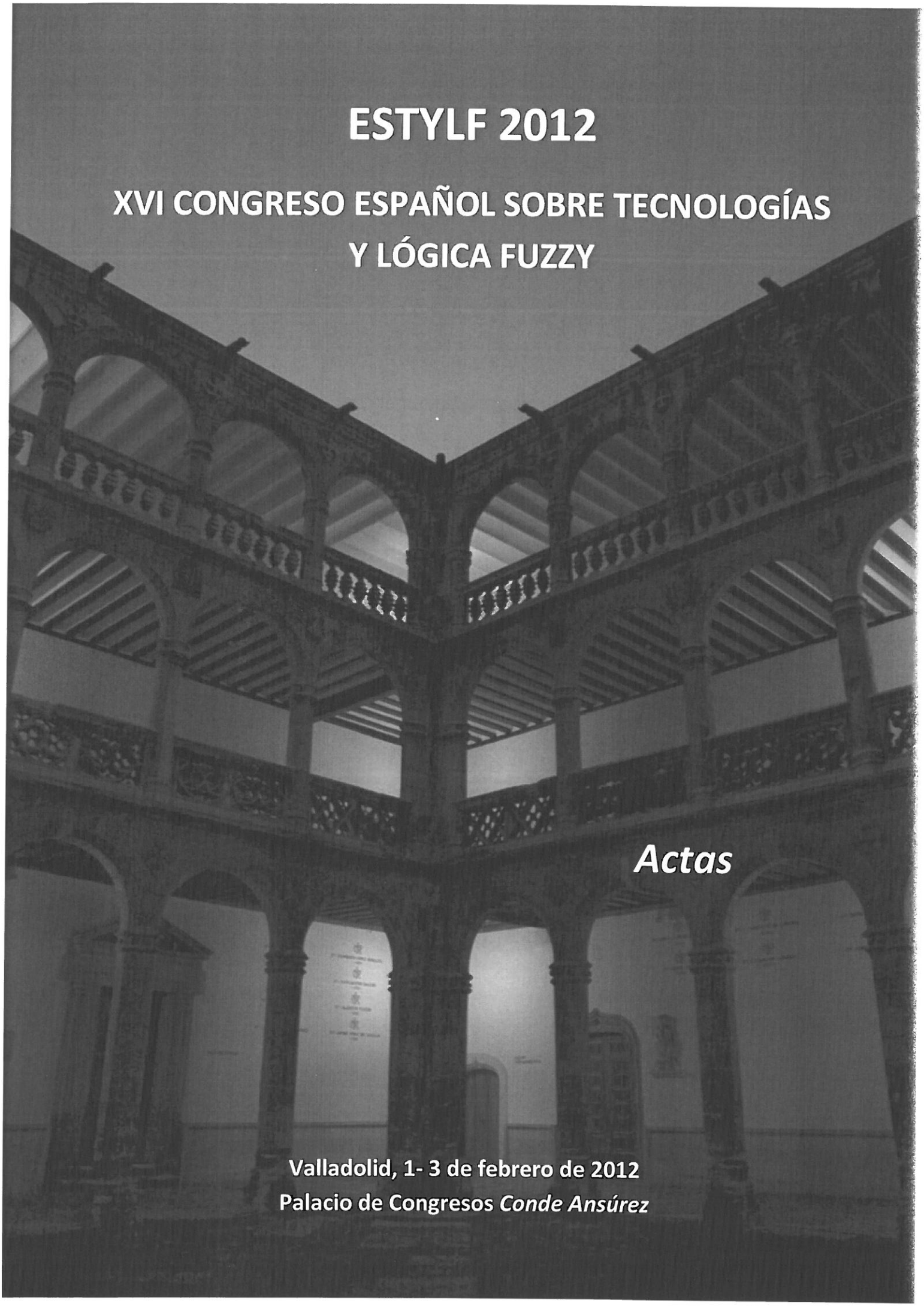

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MODELLING INFLUENCE AMONG INDIVIDUALS IN GROUP DECISION MAKING PROBLEMS

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Abstract

With the recent spreading of social networks and digital communities, a new virtual environment has been born where users can share opinions or resources and make decisions. But involving many people in decision making doesn't guarantee success. In addition, in all the societies, there are people that try to exert pressure in order to persuade others that can easily be influenced. In these situations, classical group decision making models fail. Thus, there is still a necessity of developing tools to help users to reach good group decisions as if they where in a real face to face meeting. In such a way, understanding decision making psychology can lead us to reach quick and successful conclusions. Therefore, we propose to analyze the most usual weapons of influence among people and model them with the help of the moderator in order to improve the new virtual decision scenarios making them more precise and realistic.

Keywords: Group decision making, consensus reaching process, weapons of influence, persuasion.

1 INTRODUCTION

Group Decision Making (GDM) arises from many real world situations. Thus, the study of decision making is necessary and important not only in Decision Theory but also in areas such as Management Science, Operations Research, Politics, Social Psychology, Artificial Intelligence, Soft Computing, and so on. In these situations, there is a problem that can be solved in different ways and a group of experts trying to achieve a common solution.

In an ideal world, GDM problems would be solved just regarding the experts self-interest, that is, desire to maximize benefits and minimize cost when driving their decisions. But in the real world GDM problems, experts are suffering continuous attempts by their partners to influence their own opinions. In such a way, experts interaction involves a person trying to change another person opinions and behavior. According to professor Cialdini [2], although there are thousands of different tactics that people employ to influence others, the majority fall within six basic categories:

1. *Social Proof*: People will do things that they see other people are doing.
2. *Authority*: People will tend to obey authority figures, even if they are asked to perform objectionable acts.
3. *Liking*: People are easily persuaded by other people that they like.
4. *Scarcity*: Infrequent items or resources will generate demand.
5. *Consistency*: If people commit, verbally or in writing, to an idea or goal, they are more likely to honor that commitment.
6. *Reciprocation*: People tend to return a favor.

Each of these categories is governed by a fundamental psychological principle that directs human behavior and gives the tactics power of persuasion [2]. These principles of persuasion or weapons of influence can be used as a support for the GDM process as they address the use communication in order to change attitudes, beliefs or the behavior of others in a voluntary manner avoiding the use of coercion.

In this contribution, we propose a preliminary study to overcome such problem by analyzing each one of these weapons of influence on the GDM framework. In such a way, the moderator, who is the only person that interacts with the decision makers, has to manage the influence that each member of the group can exert on the remaining ones, and take it into account when advising members to change their preferences.

In order to do this, the paper is set out as follows. Some general considerations about GDM are presented in Section 2. Section 3 presents the use and modelling of some weapons of influence in GDM problems. Finally, Section 4 draws our conclusions.

2 PRELIMINARIES

In this section, we introduce some concepts and approaches about classical GDM models and the consensus reaching process.

2.1 Group Decision Making

A decision making process, consisting in deriving the best option from a feasible set, is present in just about every conceivable human task. It is obvious that the comparison of different actions according to their desirability in decision problems, in many cases, it cannot be done by using a single criterion or an unique person. Thus, we interpret the decision process in the framework of GDM.

There have been several efforts in the specialized literature to create different models to correctly address and solve GDM situations. Some of them make use of fuzzy theory as it is a good tool to model and deal with vague or imprecise opinions[6, 9, 10, 17, 21].

In a classical GDM situation there is a problem to solve, a solution set of possible alternatives, $X = \{x_1, x_2, \ldots, x_n\}$, $(n \geq 2)$ and a group of two or more experts, $E = \{e_1, e_2, \ldots, e_m\}$, $(m \geq 2)$ characterized by their own ideas, attitudes, motivations and knowledge, who express their opinions about this set of alternatives to achieve a common solution [13, 14, 15]. To do this, each expert has to express his preferences on the set of alternatives by means of a fuzzy preference relation, that is defined as $P^k \subset XxX$, with a membership function, $\mu_{P^k} : XxX \rightarrow [0,1]$, where $\mu_{P^k}(x_i, x_j) = p_{ij}^k$ denotes the preference degree of the alternative x_i over x_j for the expert e_k.

- $p_{ij}^k > 1/2$ indicates that x_i is preferred to x_j.
- $p_{ij}^k < 1/2$ indicates that x_j is preferred to x_i.
- $p_{ij}^k = 1/2$ indicates indifference between x_i and x_j.

When cardinality of X is small, the preference relation may be conveniently represented by the n x n matrix $P^k = (p_{ij}^k)$.

Usual resolution methods for GDM problems are composed by two different processes [6] (see Figure 1):

1. *Consensus process:* Clearly, in any decision process, it is preferable that the experts reach a high degree of consensus on the solution set of alternatives. Thus, this process refers to how to obtain the maximum degree of consensus or agreement among the experts on the solution alternatives.
2. *Selection process:* This process consists in how to obtain the solution set of alternatives from the opinions on the alternatives given by the experts.

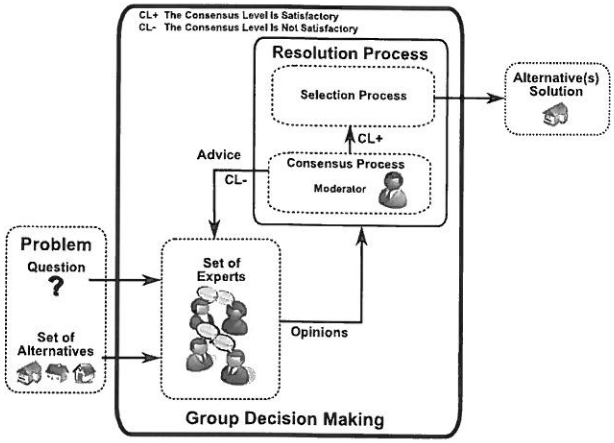

Figure 1: *Resolution process of a GDM*

2.2 Consensus Reaching Process

In group decision making, there are several methods that can be applied. These methods can be classified along a spectrum, from directive to participatory decision making (see Figure 2). The methods that are closer to the directive range, mean that the decision is made by a limited, small number of decision makers in the group. For example, individual dominance method, where one person in the group has the authority or power to make the final decision, or minority influence method, that usually takes the form of decisions delegated from larger groups and made by sub-committees [1]. On the other hand, the methods that are lower on the spectrum, towards the participatory range, mean that the decision is made by all the parties involved. For example, majority rules method usually involves the group voting on the alternatives and the alternative receiving the most votes, wins, or consensus method where the consensual agreement is achieved through group discussion of the alternatives, where every group member can agree on an option and commit to the outcome.

In this contribution we assume the widely studied consensus method [6, 8, 12], going one step further in the way that experts discuss on the alternatives and the relationships and influence among them.

A consensus reaching process in a GDM problem is an iterative process composed by several discussion rounds, in which experts are expected to modify their preferences according to the advice given by the moderator.

Directive	Individual Dominance
↕	Minority Influence
	Majority Rules
Participatory	Consensus

Figure 2: *GDM methods*

Usually, to achieve consensus among the experts, it is necessary to provide the whole group of experts with some advice (feedback information) on how far the group is from consensus, what are the most controversial issues (alternatives), whose preferences are in the highest disagreement with the rest of the group, how their change would influence the consensus degree, and so on.

In such a way, the moderator plays a key role in this process. Normally, the moderator is a person who does not participate in the discussion but knows the preferences of each expert and the level of agreement during the consensus process. He is in charge of supervising and driving the consensus process toward success, i.e., to achieve the maximum possible agreement and reduce the number of experts outside of the consensus in each new consensus round.

Usually, the moderator carries out three main tasks: (i) to compute the consensus measures, (ii) to check the level of agreement and (iii) to produce some advice for those experts that should change their minds.(See Figure 3)

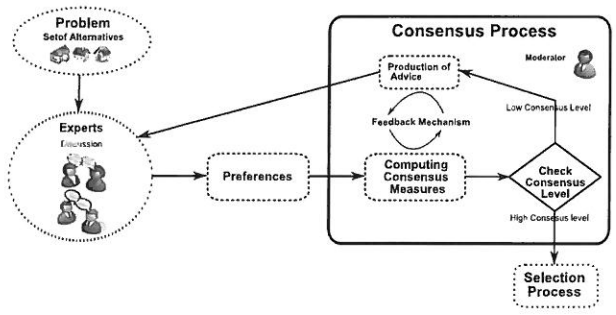

Figure 3: Classical consensus reaching process

Is in this third task where resides the power of the aforementioned weapons of influence. Thus, in the next section we analyze how a GDM moderator can use them in the best way in order to model the real world GDM scenarios where people is persuaded or influenced by others.

3 INFLUENCE AMONG INDIVIDUALS IN GDM PROBLEMS

In any GDM problem, it is desirable that experts reach a high consensus degree on the solution alternative(s). But, when experts' opinions are different among them, it is necessary that some of the experts change their mind in order to achieve the consensus, and is the moderator who has to persuade them to do it.

Usually, persuading people is a difficult task. Our proposal to model this situation is based on the psychology theory that models the human behavior with some built-in automatic responses to stimuli called "fixed-action patterns" activated by a "trigger feature"[2]. In such a way, the moderator should discover the most appropriate trigger feature in each case in order to drive the consensus reaching process in a convergent way.

In this section, we describe the six basic principles of influence among people and their use in GDM problems.

3.1 Social Proof

The principle of social proof states that one important means that people use to decide what to do in a situation is to look at what others are doing or have done there. If many individuals have decided in favor of a particular idea, we are more likely to follow them, because we perceive the idea to be more correct, more valid. Powerful imitation effects have been found among both children and adults and in such diverse activities as purchase decisions, charity donations or phobia remission. This principle can be used to stimulate a person's compliance with a request by informing the person that many other individuals have been complying with it.

Social proof, as weapon of influence, is more influential under two conditions:

1. Uncertainty: When people are unsure, they are more likely to attend to the actions of others and accept them as correct.
2. Similarity: People are more inclined to follow the lead of similar others.

The main advantage of this behavior is that, as there are no many controversial opinions, the consensus is achieved quickly. On the other hand, this principle has no sense if the experts have their own ideas or motivations. In such a case, they will need other reasons, instead of copy the social opinion, to change their minds.

Even though it seems an irrational behavior, this weapon of influence has been successfully used in several GDM models as the only way to compute advice or recommendations to the experts [1, 6, 8, 12, 16].

In these approaches, a collective opinion is computed by aggregating all the individual preferences. Then, those experts whose proximity to the collective opinion is not high enough, are requested to change their minds in order to close their preferences to the collective one.

However, there are more weapons of influence that could help the consensus reaching process under specific circumstances in a more appropriate and realistic way.

3.2 Authority

Sometimes, some individuals with valuable experience, expertise degree or scientific credentials may be seen as authority figures and people will tend to obey them, even if they are asked to perform objectionable acts. This human behavior comes from our education as members of a society where the obedience to legitimate authorities constitutes a correct conduct.

When this obedience is focused to follow individuals with high level of knowledge or wisdom, there is nothing wrong. The problem comes when we are subjected by people with so much power that sometimes abuse of their authority.

The existence of such authority figures has been taken into account in GDM models by giving to their opinions more importance [7, 11, 19, 20]. Even, when advising experts, computing a customized amount of advice recommendations according to their own knowledge level [16]. However, it has never been modeled as a weapon of influence.

To do so, the moderator could act just showing to the experts the opinion of each member considered as an authority, or aggregating all the authorities' opinions and showing to the experts how far are their opinions to the authorities one.

3.3 Liking

Research has pointed out that people tend to rely more on recommendations from people they like than on online recommender systems which generate recommendations based on anonymous people similar to them [18].

There are several examples of research areas where the issue of liking or trust is becoming increasingly important, for example, the semantic web, social networking, virtual communities and, of course recommender systems. In such cases, a kind of trust network is computed in order to model the trust degree between each individual and the remaining ones.

Modeling liking as a weapon of influence in GDM problems could be done by following the same strategy that we explained in the previous subsection for the authority individuals. However, in the previous case, the authority individuals were common to the whole group, but in this situation the moderator needs a trust network [3] in order to recognize the members of the group that are liked by each expert.

3.4 Scarcity

According to the scarcity principle, people assign more value to opportunities when they are less available. This principle holds for two main reasons:

1. Because things that are difficult to attain are typically more valuable, the availability of an item or experience can serve as a shortcut cue to its quality.
2. As things become less accessible, we loose freedoms. According to the psychological reactance theory [5], people respond to the loss of freedoms by wanting to have them (along with the goods and services connected to them) more than before.

This principle of persuasion is most likely to hold true under two optimizing conditions.

1. Scarce items are heightened in value when they are newly scarce. That is, we value those things that have become recently restricted more than those that were restricted all along.
2. We are most attracted to scarce resources when we compete with other for them.

In this case, the only way to use scarcity as a weapon of influence by a moderator in GDM problems, is to present to the experts all the updated information about the alternatives at the beginning of each consensus round. In such a way, every expert always know if an alternative is more valuable than before and they can change their opinion if necessary.

3.5 Consistency

Psychologists have recognized a desire in most people to be and look consistent with their words, beliefs, attitudes and decisions [4]. This tendency for consistency is fed from three sources:

1. Good personal consistency is highly valued by society.
2. Aside from its effect on public image, generally consistent conduct provides a beneficial approach to daily life.
3. A consistent orientation affords a valuable shortcut through the complexity of the modern way of life.

Therefore, this principle can be considered as a weapon of self influence. Once we make a choice, we will encounter personal pressures to behave consistently with that commitment. Those pressures will cause us to respond in ways

that justify our earlier decision. We simply convince ourselves that we have made the right choice and, no doubt, feel better about our decision [4].

By being consistent with earlier decisions, one reduces the need to process all the relevant information in future similar situations. Instead, one merely needs to recall the earlier decision and to respond consistently with it. Commitment decisions, even erroneous ones, have a tendency to be self perpetuating. That is, people often add new reasons and justifications to support the wisdom of commitments they have already made. As a consequence, some commitments remain in effect long after the conditions that spurred them have changed.

Accordingly, the moderator has nothing to do here to influence expert using this principle. However, it is interesting to know which experts change their preferences frequently and which ones have a high level of consistency. This information can be used by the moderator to predict if the use of other weapons of influence on each expert will be successful or it just will be a waste of time.

3.6 Reciprocation

One of the most widespread and basic norms of human culture is embodied in the rule for reciprocation. This rule requires that one person tries to repay what another person has provided. By obligating the recipient of an act to repayment in the future, the rule for reciprocation allows one individual to give something to another with confidence that is not being lost. This sense of future obligation within the rule makes possible the development of different kinds of continuing relationships, transactions, and exchanges that are beneficial to the society.

Moreover, people who do not comply are assigned with labels, such as ungrateful or deadbeat. This happens in reason that it is unpleasant to society in general to be faced with people who take favors and make no efforts to repay them.

One of the reasons for reciprocity is so effective is that this rule has the power to produce a yes as a response to a request that, in the lack of a debt, would surely have been denied. In such a way, this principle can be used by the moderator to remind experts, in a soft way, that they could comply with the change of their opinions in order to close them to the preferences of some expert that previously did the same in the contrary direction.

To model this powerful weapon of influence in the GDM scenarios is not an easy task. To do so, it is necessary to define a framework where the same group of experts has to make several different decisions. Moreover, the moderator has to manage a memory or favor network to remember the different favors among experts. Once the first decision is reached, the moderator can use the network trying to influence experts who received some favors in the previous decisions.

4 CONCLUSIONS

In this contribution, we have done a preliminary study about some of the ways to persuade experts to change their opinions in order to make the consensus process a convergent process. We assume that the moderator has to drive the process by using, if necessary, some weapons of influence to persuade some experts to change their mind as if they were in a real face to face meeting. To do so, we have proposed the introduction of some psychology concepts (or principles or persuasion) in the consensus process, and we have discussed not only the advantages and drawbacks of each of them, but also the way in which they have been or could be used by a virtual moderator in GDM situations.

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