Case-based Model of Emotional Expression Influence on Work Group Socialization and Performance

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1. Introduction

By means of experiments with a computational model that simulates reactions to emotional expression, we show that although positive emotional display accelerates work group socialization, it can have a negative effect on work group performance. The agent-based computational model is based on longitudinal ethnographic data about the dynamics of intra-group behaviour and work group performance obtained from observing an organizational group in the service sector.

2. Background

Organizational socialization has attracted much research attention recently, as workers in some sectors feel less loyalty to their jobs, temporary work becomes more common and organizational restructuring occurs more frequently (Moreland & Levine, 2000). Moreland and Levine argue that better socialization can enhance work productivity and decrease the turnover rate. The most recent work group socialization theory focuses on three psychological processes: evaluation, commitment and role transition (Moreland, Levine, & McMinn, 2001). When a new group forms, one of the first concerns of all members is to know something about each other. When a newcomer enters an established group, the old members want to gather as much information as they can about him/her, and vice versa. Evaluation involves the newcomer as well as the established group members assessing one another's worthiness in relation to the other individual's personal needs and the group's achievement as a whole. Based on constant interactions, each individual develops commitment to the others. In this way, the relational ties between individuals can be strengthened or weakened over time. When the level of commitment reaches a certain threshold, a role transition occurs. The newcomer's membership switches from out-group to in-group. They start experiencing similar group culture and norms, and hence engage in collective behaviours. The process is described as self-categorization theory by Hogg and Terry (2000).

Through the socialization process, newcomers and established members adapt to the new environment and culture, and individuals coordinate with each other to achieve the group's goals.. Whether the work group exists within a larger organisation or not, outsiders evaluate the group as a whole entity, rather than ascribe the outcomes to the individual members. Hence, a group's ability to function to meet external needs is crucial to the group's performance (Staw & Cummings, 1998).

One way to measure a group's performance is its productivity. Gedye (1979) defines productivity as the ratio of goods or services produced or offered, to the resources it is given, such as material and labour costs and capital assets. In this study, we compare group productivity based on constant resources. We measure the number of group tasks that have been completed per unit time interval as the simulation runs. The group tasks here refer to any piece of work that group members have to do in order to contribute to the group's goal successfully.

Individuals in the group may work on some tasks independently, as well as jointly with one another. Hackman's (1987) group process framework examines group functioning as an social interaction process. In our model, we investigate two major elements that have an influence on group members' interactions: group demography and emotional expressions.

Any visible or salient demographic characteristics can be used for categorising individuals, regardless of whether they are relevant to their work tasks or not (Staw & Cummings, 1998). Tsui et al (1992) note that certain demographic attributes such as race, sex and age are more visible and more likely to be salient under most circumstances. Some research supports the proposition that demographic attributes affect social integration (e.g. Hoffman, 1985; McPherson, Smith-Lovin, & Cook, 2001; Ward, La Gory, & Sherman, 1985).

Emotions or affect arising during social interactions have some bearing on the perceptions of workplace relationships (Rafaeli & Sutton, 1989). Two kinds of emotion are often distinguished. One is emotion as an internal process of the individual: it is what you feel. The other is 'emotional expression': what others see of you through facial expression, gesture, etc. Morris and Keltner's (2000) recent research draws attention to emotional expression's social functions. They focus on the relations between and future behaviours of an emotion's 'sender' and 'receiver'. They also show how emotions occur in response to particular problems in social relations, and have positive effects in changing relational problems. In our work, we are interested in what effect emotional expression has for the dynamics of interpersonal behaviour in work groups, particularly for groups that have recent newcomers.

3. Case study and methods

An agent-based computational model has built using the above perspective as well as detailed empirical data. A service team workgroup was studied by participant observation for a period of 30 weeks. Observations were taken for around four to five hours each time, two or three times a week. The service team members were employed part-time. Extensive fieldnotes were coded and analyzed by the first author, who participated in the work group as one of the team members.

Ever since researchers drew attention to the area of emotions in organisations in the early nineties, the service sector has been the main research focus, perhaps because frontline services, which link an organisation and its market, directly affect an organisation's profit and image. The work group observed by participant observation for this study was the lending service in a large university library. This group is appropriate for our study because:

- It has all three attributes of work groups (Hackman, 1990: 4):
    - It is a 'real group': This means that it is a group that is an intact social system, complete with boundaries, interdependence among members, and differentiated member roles (Alderfer 1977, cited in Hackman 1990). The library work group has its own structure and relations, clearly differentiated from other groups. Its members have roles based on their tasks.
    - It has 'one or more tasks to perform': the outcomes that the group produce can be 'identified as its product, such as service, decision, [etc., and it should possibly be able to] measure and evaluate the product'. The product of the group is library service. To provide this service, all the members are required perform either individual or collective tasks.
    - 'Operate in an organizational context': That is, this social system 'belongs to a larger social system in which the group operates'. The group in the library belongs to the public service team in the library, which is a division of the university library. The university library is under the management of the University.
- It is a customer service group that has a frontline service, serving the public. Although customer service satisfaction is evaluated every year using a survey, this is not our main concern. What we focus on here is how the group's performance is affected by other factors, including emotional expressions.
- The library work group has some general characteristics shared by most groups in the service sector. For instance, there are similarities with catering: for both, the work is mainly manual, and there are 'rush hour' periods as well as quiet ones. The organisation it belongs to is a non-

profit organisation, a characteristic shared by groups in organisations engaged in government public service, charity work, etc.

Based on the field work data, a computational model was developed. It simulates the gradual socialization of newcomers into the team and is formulated as an agent-based model (Gilbert, 2005) in which both workers and tasks are represented as agents.

4. Model design

This agent-based simulation aims to investigate the effects of emotional expression on work group performance and the socialization process. We designed the model to reproduce reality in the virtual environment, expecting to have similar results compared to the empirical data collected from the field.

The baseline model was as simple as a number of people working on a number of tasks. Then step by step, we added attributes to the agents, and applied more behavioural rules according to the observational data:

- In the library work group, people differed in their age, gender, race, personality, etc. and it was observed that people with similar characteristics interacted more frequently. Therefore, the worker agents were given different characteristics and a rule to assign their initial attraction to other agents based on their demographic characteristics.
- All work tasks have a degree of priority. For instance, sorting the book trolleys in order has higher priority than shelving short loan books; serving customers has the highest priority of all. Based on these, the tasks in the simulation model were designed to have priority levels from 0-9. Priority level 9 represents frontline service; priority 8 means sorting book trolleys, and so on. The tasks were also assigned to certain spatial areas in the simulation world according to their priority level. Figure 1 shows the distribution of the tasks according to their priority in the simulation environment.

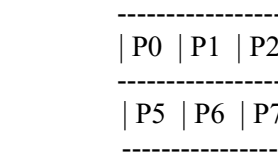

Figure 1: Task distribution

- The time for newcomers to become established group members is based on the official probation time of newcomers in the organisation.
- As in the library, new agents replace agents who leave the group.
- Tasks have a fixed completion time. In the library, although task completion times vary, the variation is small.
- A fixed time period represents one work shift. After each shift, the group performance is measured by counting the number of tasks completed by the whole group.
- When there are few tasks and they are all of low priority, workers rest, gossip or attend to personal tasks.
- Emotional expressions are divided into two categories: extreme and moderate. In the simulation model, agents are also assigned to different emotional states. For instance, agents who work on a task at priority level 9 (frontline service) can only show positive emotions. Agents who display happiness attract other agents to join and stay with them for a while; while those who display anger decrease their attraction level to others.
- Agents build up their own network. Social relations between the agents can be strong or weak. These network ties are represented as commitment values in the simulation model, and are constantly updated over time by agents' interactions and emotional displays.

Initially, a group of agents representing workers are introduced in the centre of the virtual environment, with a maximum of ten tasks scattered in ten geographically divided areas according to the task completion priority level. The goal of the worker agent is to accomplish the maximum number of tasks

in a given time interval. Random tasks reappear after a set time provided that the total number does not exceed the maximum. This keeps the simulation going in repeated cycles. Individual as well as group performances are measured by the total number of completed tasks after each time interval.

During the initialization stage, the worker agents evaluate each other by their demographic characteristics, including age, gender, race, and aggression level. Based on this initial evaluation, they initialize a 'commitment' matrix that represents the agent's perception of its social network ties within the group. Every worker agent has a tendency to move towards the other worker agent with whom it has the highest commitment value. Furthermore, the commitment values are updated every time the worker agents meet together or accomplish a common task.

The commitment values are also influenced by the emotional expressions of the workers through workers' interactions. Two types of emotional expression are included in the model: extreme (i.e., happy, sad and angry) and moderate (i.e., moderately positive or negative emotions). When a worker expresses certain emotions, other worker agents make decisions about their own behaviour based on the expressed emotion and their commitment ties. When a new worker agent's commitment value reaches a certain threshold, it is considered to be socialized into the group. The model design is also described in figure 2.

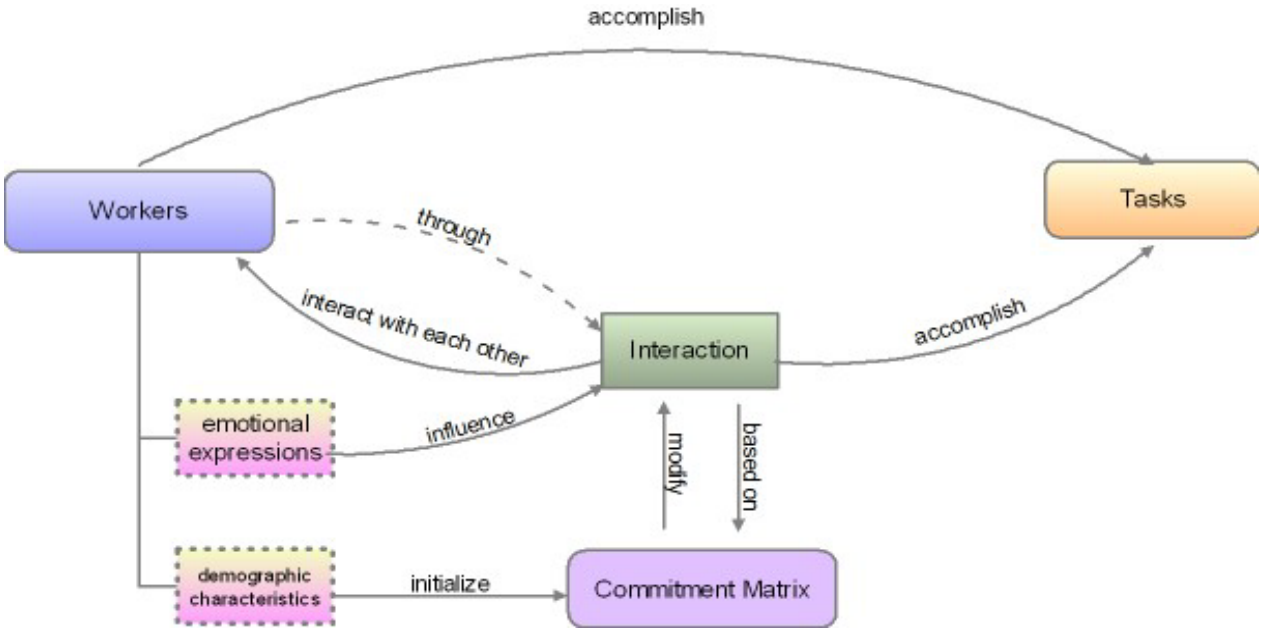

Figure 2: Simulation model design

5. Experiments and results

The simulation was constructed using NetLogo 3.0 (Wilensky 1999). A number of simulation runs were carried out to examine how the group performance and group commitment differ with workers' different emotional displays. These assumed that the workgroup has no internal hierarchy, seeking information from other agents is not the agents' goal and that the agents' behaviour changes are not influenced by factors other than emotions. Figure 3 illustrates the model process. The experiments are run with happy and moderate positive emotions. For each experiment, we take the mean value of every set of data exported from the simulation run.

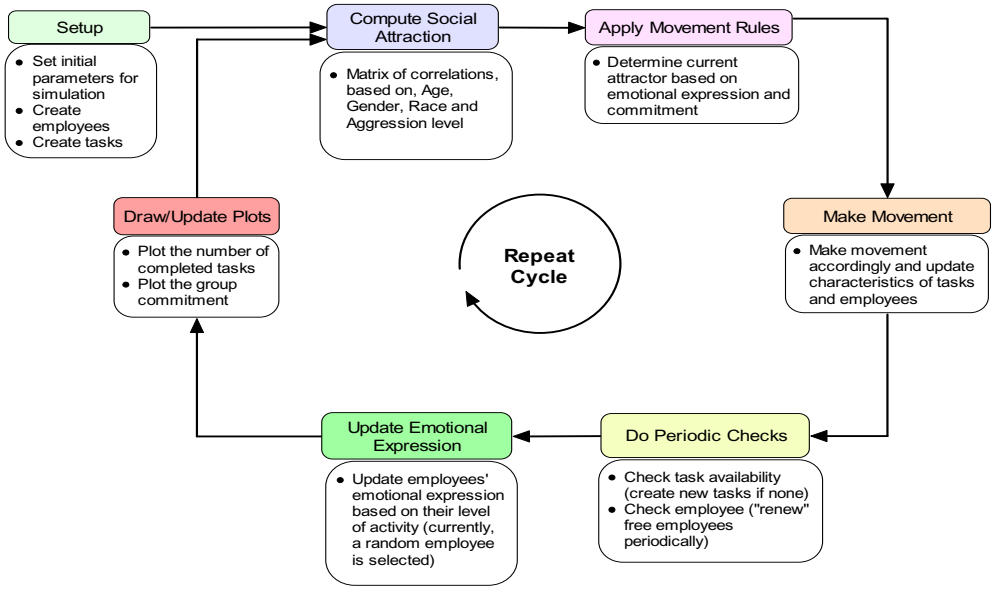

Figure 3: Process of the simulation model

5.1 Experiment 1: Emotional display frequency – high vs. low

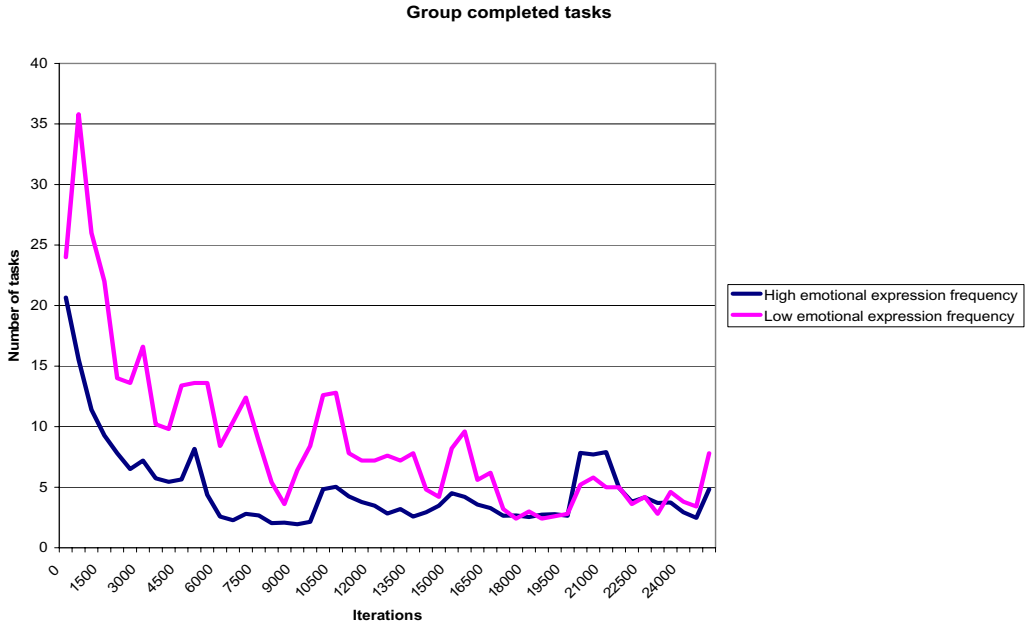

Figure 4a: Group completed tasks for groups with high and low emotional display frequency

Figure 4a shows the number of completed tasks after 25000 iterations. The general trend of the graph is down. However, the total numbers of group completed tasks oscillates. Before the new employees join the group (every 5000 time steps), the number of completed tasks drops dramatically. This is because most of the agents have developed high commitment value towards others; they have reacted to the others' positive emotions. Agents leave the tasks they are supposed to do, and interact with other group members. The number of tasks completed bounces back for a while until the next time a new employee joins the group. Each time a new agent joins the group, the simulation recalculates their initial commitment matrix. Comparing high with low emotional expression frequency, we can see that the whole group generally performs better with low emotional expression frequency.

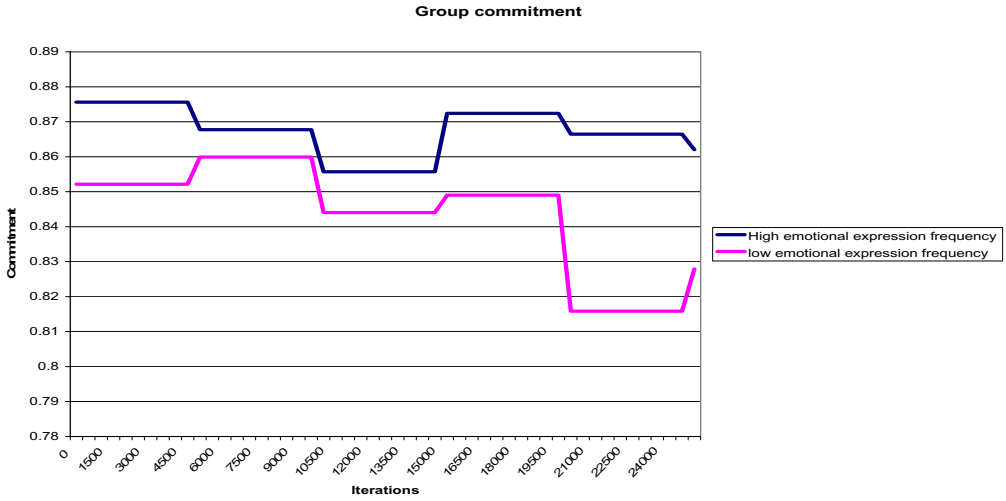

Figure 4b: Group commitment for groups with high and low emotional display frequency

Figure 4b is generated from the same simulation runs. The commitment value is affected by the arrival of new employees every 5000 time steps. If we compare the commitment graph with the group completed task graph, we can see that the rate of group completed tasks rises when the group commitment drops. In the simulation model, the agents' initial commitment value is based on the correlation of their demographic characteristics. Those characteristics are randomly set at run time. Consequently, two new agents who join the group and share the same randomly generated demographic characteristics have a higher commitment value, and hence raise the overall group commitment value. The results show that a group with high emotional display frequency has a higher group commitment value.

5.2 Experiment 2: Group diversity – high vs. low

In the second experiment, we modify the agents' demographic attributes. Clear differences are shown in the following two graphs (Figures 5a and 5b) . The group with high diversity had a lower group commitment value, but better group performance; while the group with low diversity tended to have a higher group commitment value, but lower productivity.

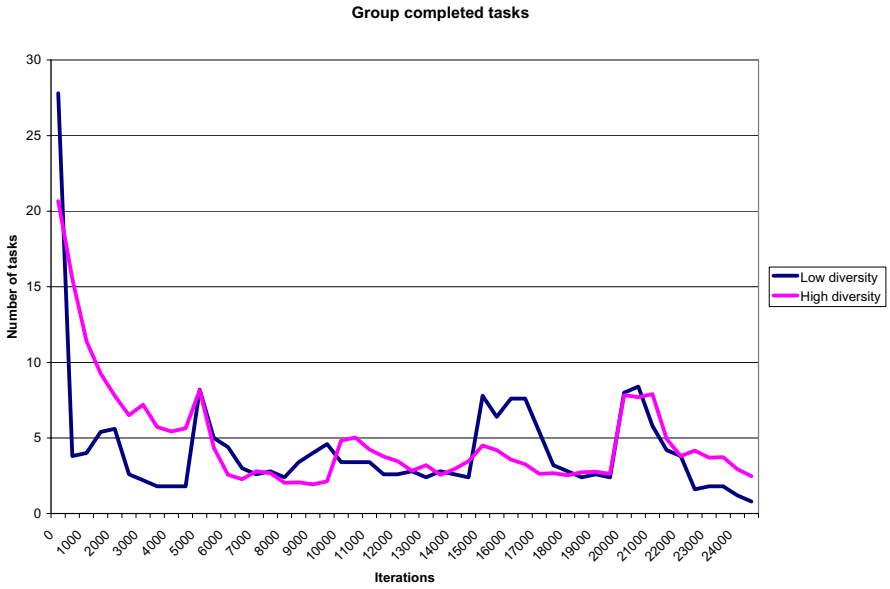

Figure 5a: Group completed tasks for groups with high and low diversity

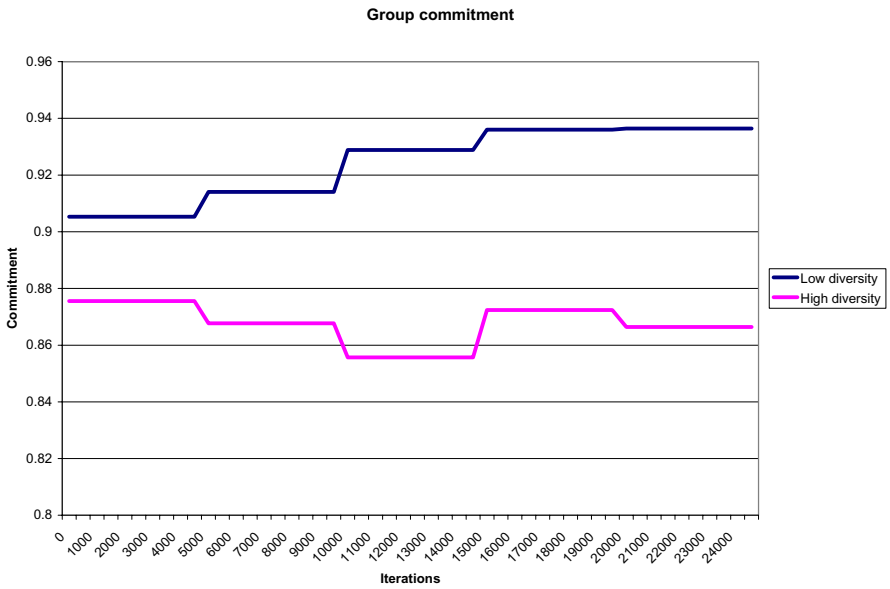

Figure 5b: Group commitment for groups with high and low diversity

The plots of group performance and group commitment show that positive emotional display increased the commitment value, which help secure the socialization process. However, the group performance went down, as agents interacted with each other more often and fewer tasks were accomplished. The main patterns of the simulation results are similar to the results obtained from the observations of the library work group.

6. Conclusion and future work

In this paper, we have shown that the use of ethnographic method in combination with social simulation can be used to study the factors which influence socialization processes, to obtain a better understanding of the effect of emotional expressions on the work group socialization process.

However, the model is developed as a case-based model. The social phenomenon investigated in this model maybe limited to one specific workgroup. The project aims to construct a computational model that applies to various organizational groups in the service sector. Hence, the challenge remains about how to move forward from the cased-based model to typification (Boero & Squazzoni, 2005). Future work will consider extending model to a generalized model of service groups by obtaining empirical data from other groups to compare with the current model. "All one can do is to gradually increase one's confidence in a model by testing it against observation in more and more ways" (Gilbert, 2005b: 6).

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