

# Group Maintenance Behaviors in Self-Organizing Distributed Teams

*(Abstract of a Poster submission)*

## **Introduction**

Scientific, industrial, and other corporate work is increasingly being conducted in self-organizing distributed teams enabled by information and communication technologies (ICTs). However, the limitations of ICTs and the geographical, organizational and social distance between distributed group members challenge them to maintain social relationships necessary for group effectiveness. Understanding group maintenance may provide insight into the success or failure of such teams. Group maintenance is defined as discretionary, relation-building behavior that enables group members to trust and cooperate with one another more easily [1]. This behavior has been found to affect group outputs such as team effectiveness and member satisfaction [2].

This study examines group maintenance behavior in Free/Libre Open Source Software (FLOSS) development teams as examples of distributed teams. Most FLOSS software is developed by dynamic, self-organizing distributed teams of professionals, users and other volunteers working in a loosely coupled manner [3-5]. These teams are close to pure virtual teams in that developers contribute from around the world, meet face-to-face infrequently if at all, and coordinate their activity primarily by means of computer-mediated communications (CMC) [6, 7].

## **Literature review**

Group maintenance behaviors are those that contribute to the creation of an environment that supports a work group's task-related activities. Based on literatures in social presence [8, 9], social-emotional behavior [10], politeness theory [11-13], and organizational citizenship behavior (OCB) [14, 15], we developed a coding scheme to identify group maintenance behaviors in virtual teams. The scheme, shown in Appendix Table 1, has four top-level categories: emotional expression, positive politeness, negative politeness, and OCB. Emotional expression refers to conventional and unconventional expressions of emotion. Positive politeness tactics are those that help group members locate common ground and bond as a group, whereas negative politeness tactics show respect for the autonomy of others and maintain appropriate distance [16]. Examples of positive politeness could be use of inclusive pronouns, expression of agreement and complementation. Use of self-depreciation, verbal hedges, and formal verbiages are good examples of negative politeness. Organizational citizenship behavior refers to "individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and in the aggregate promotes the efficient and effective functioning of the organization" [14]. Helping and courtesy behaviors are OCB examples.

## **Method**

This study employs a multiple case study method. We chose two FLOSS projects that developed Instant Messaging (IM) clients: Gaim and Fire. The two projects were similar in terms of their project goals, nature of tasks, and potential users. However Gaim has been more effective as a project, based on Crowston et al's multivariate measure of effectiveness in FLOSS contexts [17, 18].

The nature of FLOSS teams provides unique opportunities to observe group maintenance behavior since most FLOSS activities (if not all) are archived. We collected messages sent to the developers' email lists or forums by all contributors. We differentiated three stages in both projects. At each stage, twenty episodes were identified based on topics in discussion and attention from members. We took the first 20 episodes available as the beginning stage and last 20 as the ending stage. The middle stage is located around a major software release approximately halfway between the beginning and ending stages. Each episode consisted of multiple email messages focusing on a particular issue. A total of 60 episodes are under investigation for each project.

We conducted content analysis to examine group maintenance behavior in the two projects. We adopted a thematic measure as our unit of analysis: "a single thought unit or idea unit that conveys a single item of information extracted from a segment of content" or the "unit of meaning" [19]. Such units vary in size from an emoticon or punctuation to a word, a phrase, a part of a sentence, a sentence, or even a few sentences when appropriate. The coding scheme was initially created deductively from the literature reviewed above. We then revised it according to a small number of episodes in both projects. The revised scheme was then used to code more episodes and revised again. The iteration process repeated until a relatively solid coding scheme was achieved (see the appendix). Two coders coded the episodes independently with an inter-rater reliability of 0.79. The two coders then discussed disagreements to reach consensus.

## **Result & Discussion**

In this abstract, we report on 48 of the 120 episodes that have been fully resolved by the coders (24 for each project). The 24 Gaim episodes were consisted of 214 messages, receiving a total of 2230 group maintenance codes; while the 24 Fire episodes included 164 messages, to which 1756 codes were assigned. Usually, episodes containing more messages tend to reveal more group maintenance behaviors, so comparison between the groups on frequencies may be misleading. Therefore we calculated the densities of group maintenance behaviors. We define density as the number of codes in a unit/number of messages in a unit. Density can be calculated for an episode, a stage, or the whole project. Table 1 in the appendix shows the densities of each code and each category in both groups. The average densities across 4 categories of group maintenance behaviors are 10.42 and 10.71 for Gaim and Fire, respectively.

Positive politeness behaviors have been widely observed in the two projects. The densities are 7.14 and 7.63 for Gaim and Fire respectively. Specifically, group-specific jargon/metaphor, colloquialism/slang, inclusive pronoun, and vocative appeared most frequently. This suggests that members view their team as a cohesive group that has its own culture that bonds its members together.

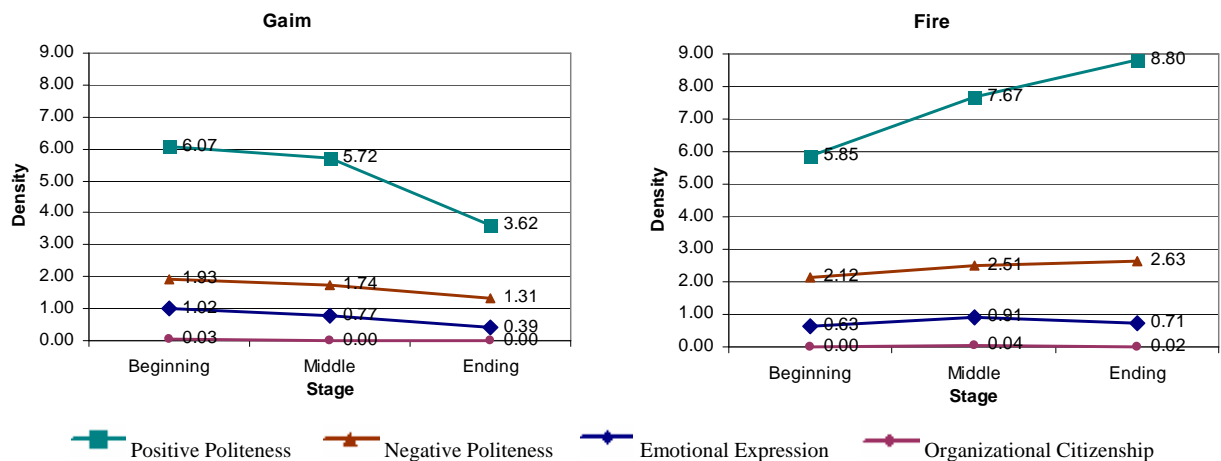
Negative politeness tactics densities for Gaim and Fire are 2.23 and 2.38 respectively. The most dense code found was hedges/hesitation/subjunctives (e.g., "I'm not sure...", "it would be nice if ..."), suggesting that team members are somewhat careful to respect the autonomy of others despite the casual atmosphere.

Emotional expressions have been employed to a moderate extent with densities for Gaim and Fire at 0.32 and 0.37 respectively. Both groups used punctuation most often to express emotions or emphasis. However, Gaim employed the other 4 types of emotional expressions (emoticon, capitalization, explicit emotion, and humor) more than Fire did.

On the other hand, organizational citizenship behaviors (OCB) were very rarely seen, with an average density of only 0.02 for both projects. The low density of these behaviors may reflect the fact that OCB theory was developed in traditional organizations, where member responsibilities are clearly defined. Under this condition, it is easy to identify behaviors such as helping or courtesy that go beyond what is required. In the FLOSS setting, however, most members contribute to the projects voluntarily and it is hard to distinguish the line between fulfilling one's own responsibility and helping others.

Figure 1 shows the change of emotional expression, positive politeness, negative politeness, and OCB over time by stage in both projects (the lines serve only to visually link related points). The figure demonstrates that, as the projects proceeded, all 4 categories of behaviors were decreasing in Gaim; while positive and negative politeness behaviors went up in Fire. This finding is opposite to our expectation as Gaim was the more successful project as noted above. One possibility is that the more successful team developed a friendlier atmosphere and higher level of participation earlier, so that less relationship maintenance behaviors were needed later; while the less successful team was still struggling with member relationship and recruitment until the end of the project. Another possibility could be increased usage of instant messaging tools over time in Gaim with group maintenance discussions migrating away from email.

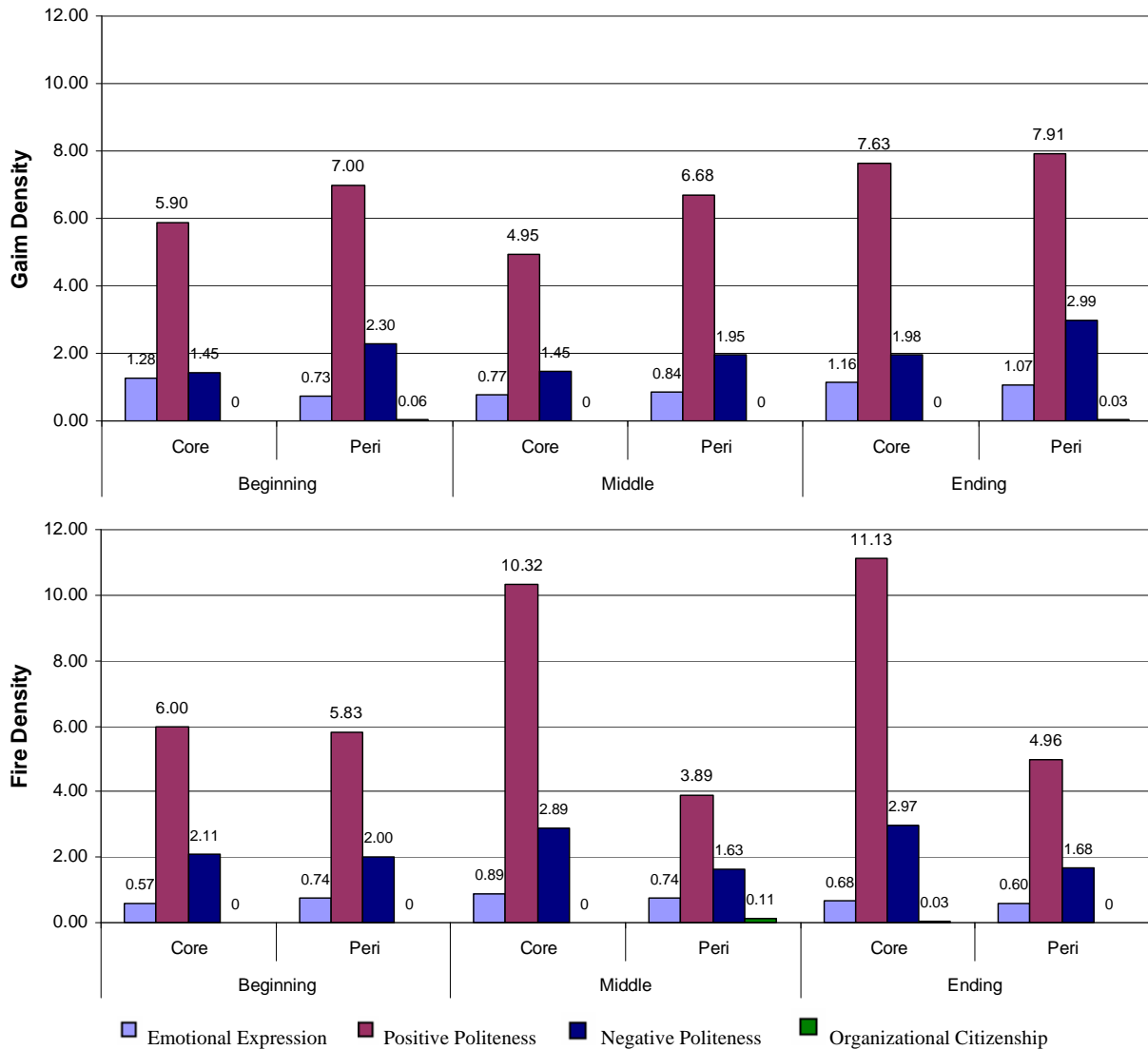
**Figure 1. Density of Group Maintenance Behaviors by Stage in Gaim and Fire**



We are interested in whether there was a difference in the use of group maintenance behaviors between core members (defined as project administrators and developers as indicated by status on the SourceForge system) and peripheral members (normal users). Figure 2 shows the densities of 4 types of behaviors employed by core and peripheral members at various stages in both projects. Fire started with both types of members performing group maintenance behaviors with similar densities. In the middle and ending stages, however, core members employed positive and negative politeness tactics in a much denser manner than peripheral members. In Gaim,

interestingly, we observed not much difference between core and peripheral members. Indeed, at all stages, peripheral members showed slightly denser behaviors than core members on OCB, positive and negative politeness. Meanwhile, core members expressed emotions a little more than peripheral members at the beginning and ending stages.

**Figure 2. Density of Group Maintenance Behaviors by Core and Peripheral Members**



### Future Research

Our plans for completing this work include finalizing the coding for the remaining episodes, as well as coding additional projects. We will conduct t-test and ANOVA to examine the difference between groups and within group (between core and peripheral members, among different stages). We also plan to investigate the relationship between group maintenance behaviors and the maintenance of membership and team effectiveness. Another step is to investigate how individual core and peripheral members change their way of conducting group maintenance behaviors over time.

**Appendix.**

**Table 1. Coding Scheme of Group Maintenance Behavior**

Category	Indicators	Definition	Example	Gaim Density	Fire Density
<b>Emotional Expression</b>	Expressions of emotion using emoticons.	Expressions of emotion or emphasis using emoticons.	:)	0.16	0.08
	Expressions of emotion or emphasis using conspicuous capitalization.	Expressions of emotion or emphasis using conspicuous capitalization.	“EVERYONE ON THE LIST” “AND” “THINK”	0.16	0.10
	Expressions of emotion or emphasis using (repetitious) punctuation	Expressions of emotion or emphasis using (repetitious) punctuation, exclamation point, underlining, italic fonts, or any other	“!!!” Underline “!”	0.32	0.37
	Explicit expression of emotion	Direct or explicit expression of emotion using emotional words. (we need to refresh ourselves to the hundred words at this moment)	“How exciting! The first post!”	0.17	0.11
	Use of humor	Teasing, cajoling, irony, understatements, sarcasm. So we will code every repeated signature, but not coded text.	“it also tells you how many twinkies it takes to run this mailing list. It's a lot of twinkies.” “The only way to keep your health is to eat what you don't want, drink what you don't like, and do what you'd rather not. -- Mark Twain”	0.21	0.08
<b>Positive Politeness</b>	Colloquialisms or slang	Spelling out phonological slurring, using colloquialisms or slang; beyond group specific; used to show familiarity.	“Saturdayish” “yep” “BTW”	0.56	0.36
	Group-specific jargon or metaphors	Use of group-specific jargon, language, or metaphors.	“Why is this a .mm file? what is .mm again? I know .m is ObjC”	4.65	5.40
	Vocatives	Referring to participants by name, or specifically addressing part of a message to an individual. Name used as the second or third or even first person. If there is a “you” or “your” specifically referring to a particular single person, we'll code it.	“As sean said” “Martin,”	0.55	0.56
	Inclusive pronouns	Incorporating writer and recipient(s)	"we"		
				0.69	0.78

Category	Indicators	Definition	Example	Gaim Density	Fire Density
			“us” “let’s” “our”		
	Phatics	Personal greetings and closures, including communication for purely social reasons	“Hi” “regards” “Thanks for the help.” (at the end of a message)	0.22	0.12
	Raising/presupposing commonalities	Assuming a stance that is in agreement with other group members – attributes of things that we share.	“If you have two patches that modify the same file, it is best to separate them. I know this is a pain, but I go through this every time I submit something to the gaim guys since we use their library.”	0.01	0.01
	Expressing empathy/sympathy	Expressing empathy and/or understanding	“I know this is a pain”	0.02	0.01
	Self-disclosure	Providing information specifically on self, opening up to the group (shouldn’t be coded as explanation”; if needed, we can assign it multiple codes)	“I am not working actively on Fire due to personal and professional issues right now.”	0.05	0.02
	Complimenting	Complimenting others or message content. It can go beyond agreement.	“The temporary message is a good idea”	0.06	0.04
	Expressing agreement	Expressing agreement with others previous statement	“Agreed” “I suppose.” “Correct.”	0.14	0.11
	Admitting Mistake/Fault	Apologizing for one’s own personal mistakes	“Sorry again if I stepped on any toes”	0.01	0.01
	Encouraging participation	Encouraging all the members of the group to participate	“Any comments welcome.”;	0.10	0.12
	Expressing appreciation		“Thanks for the help.”	0.07	0.08
<b>Negative Politeness</b>	Disclaimers; Self-depreciation	Use of disclaimers prior to an FTA; self-depreciation as a distancing tool; may include apologies as explanations	“dumb fire question#1: which MSNService.nib "file" is the real one?” “Sorry if I'm terribly ignorant somehow... I'm just getting into this stuff.”	0.24	0.22
	Stating rational for	Stating an FTA as a general rule to minimize impact or	“In general we want to avoid forking the	0.18	0.14

Category	Indicators	Definition	Example	Gaim Density	Fire Density
	FTA (State FTA as general rule + explanation)	as to not single out an individual; Explaining the reasons behind an action that might threaten someone's face.	MSN library with our own changes so any changes there need to be sent on to Meredydd." "Since this history thing requires a bunch of functions I created history.c."		
	Indirect inquiry	Using a phrase to diminish the force of inquiry. Inquiring into hearer's ability/willingness to comply through indirect speech (ie. Dropping hints)	"Is there nay chance you could apply my patch to the current version though?" "If you (see if this "you" is a specific person) want to take a look that would be great."	0.04	0.13
	Hedges; Hesitation; subjunctives	Use of words/phrases/subjunctives to diminish force of act; Use of hesitation in disagreement (ie. "well...")	"um..." "I'm not sure what the problem is..." "it would be nice to at least..."	1.63	1.77
	Honorifics	Use of honorifics	Mr., Miss., Dr., Prof., etc.	0.00	0.00
	Formal verbiage	Using formal wording choices	"please send the file to ..."	0.03	0.04
	Impersonalization	Avoid use of I or you to diminish the force of inquiry or action in cases where one would normally have to use you or I	"Can anyone point to any available docs. & how to start on it?"	0.05	0.02
	Passive voice used to create distance	Use of passive voice to create distance between the object from the performer	"What is it that isn't handled properly?" "Is it being worked on?"	0.07	0.05
<b>Organizational Citizenship Behaviors</b>	Helping	Behavior involving voluntarily helping others with a work problem. The immediate beneficiary is a specific individual person.	"I'll look into that."	0.00	0.01
	Courtesy	Subsumes all of those foresightful gestures that help someone else prevent a problem; avoiding practices that make other people's work harder.	"Note that, after applying this patch the SILC Toolkit 1.0.1 must be installed in the system in order to be able to compile."	0.00	0.00
	Peacemaking	Actions that help to prevent, resolve, or mitigate unconstructive interpersonal conflict.	"A compromise could be to..."	0.00	0.01
	Cheerleading	The words and gestures of encouragement and reinforcement of coworkers' accomplishments and professional development.	"You will be honored for contributing your time and skill to a worthy cause."	0.01	0.01
	Sportsmanship	A willingness to tolerate the inevitable inconvenience and impositions of work without complaining.		0.00	0.00

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