Identifying Socio-Technical Means to Support Small Loosely Coupled Groups of Volunteers

Alexander Nolte[1,2] and Rosta Farzan[3]

[1] University of Tartu, Tartu, Estonia
[2] Carnegie Mellon University, Pittsburgh, PA, USA
[3] University of Pittsburgh, Pittsburgh, PA, USA
alexander.nolte@ut.ee, rfarzan@pitt.edu

Abstract. Volunteers provide a large variety of valuable services to society spanning from local community efforts to global non-profit organizations and online communities. While larger volunteer groups and online communities in particular have been studied extensively, there is a lack of research on small loosely coupled volunteer groups especially with respect to the way they collaborate to organize activities. Our work attempts to shed light onto such groups. In this paper, we present results from an exploratory study of five student organizations. Based on a literature analysis we developed an interview protocol and corresponding coding scheme that allowed us to analyse how such groups cooperate and how they use technology to communicate and organize activities. Our findings indicate areas of improvement around higher levels of transparency, well defined procedures, effective knowledge management and exchange between similar groups. We discuss these potentials and propose an initial socio-technical conceptualization to overcome current issues and support collaboration in such groups.

Keywords: volunteer collaboration, exploration, loosely coupled groups.

1   Introduction

Technology that fosters group collaboration has been of continuous interest to researchers and practitioners alike [47]. The early years of research in this field, was mainly dominated by work on the needs of groups within large organizations. In more recent years however, the context has considerably diversified and researchers and practitioners have also started to investigate solutions to support unpaid volunteers in small locally oriented projects [52], large non-profit organizations [49] and online production communities [54]. Supporting volunteer collaboration poses a unique challenge compared to collaboration in large organizations as coordination is often loosely structured. Contributors within such groups oftentimes come from diverse backgrounds, have adopted a variety of team work styles, use a diverse set of tools, and may drop out at any point in time.

Most work investigating volunteer collaboration focuses on non-profit organizations and online communities [3, 10, 50] while small loosely coupled groups have not been a strong focus so far. Small loosely coupled volunteer groups often focus on organizing

series of dedicated activities such as discussion meetings, food giveaways or social events. Student organizations are one example of such small volunteer groups that organize series of activities – often for their fellow students. However despite studies showing that student organizations positively affect their members as well as the university community [2] they are rarely studied. Moreover, student organizations often do not focus on the university alone. Some organizations specifically aim to support local communities by using knowledge and skills that they gained during their studies for a good cause [53]. It thus appears reasonable to study and propose support for such groups as one important example of loosely coupled volunteer groups.

To cope with their loosely structured nature, members of such organizations have to develop practices and adopt technology well-suited to their fluid nature. At the same time, members of these groups often strongly identify with the cause of an organization and are often formed by individuals that are enthusiastic about similar values [6, 8]. At the same time however, they might not spend much effort on planning the way they collaborate since they are focused on the goals they set for themselves as a group.

Designing approaches to support collaboration within student organizations requires understanding their ad-hoc nature and their lack of a common organizational or technological infrastructure. Despite them all being students of the same university they typically have to establish common technologies and practices themselves since their activities take place outside of their studies and are thus not directly connected to the university infrastructure. We thus aim to first gain an understanding of the way these groups currently operate and the challenges they face in order to achieve their goals. Specifically, our work aims to the question of how volunteers in such organizations collaborate currently (**RQ1**) and what role technology plays in their current practices (**RQ2**). Based on our findings we propose means to improve collaboration within and between such groups.

To answer the two main research questions, we conducted an interview study with five student organizations from two large North-American universities. The interview protocol and the corresponding coding scheme are grounded in literature from the field of computer supported collaboration and volunteer group work to ensure that we cover relevant aspects that have been discussed as important in prior work on volunteer collaboration. Results from our analysis supported our initial assumptions about the unique challenges these groups face and provided insights into how they collaborate (section 4). Based on our findings we propose a socio-technical concept to support them (section 5). The contribution of this paper is thus threefold: (1) Developing and applying a coding scheme based on a comprehensive literature review, (2) conducting a qualitative study of collaboration practices in an under-studied context of small loosely coupled volunteer groups and (3) developing guidelines to foster collaboration in these groups

2   Background

Our work lies at the intersection between volunteer engagement and computer supported cooperative work. Throughout this section, we will situate our research within these fields and highlight where we intend to go beyond the state of the art.

2.1 Volunteer groups in computer supported cooperative work

Collaboration in small loosely coupled groups of volunteers shares commonalities with other similar groups in organizational contexts in which people are also *"mobile, widely dispersed, and autonomous, and team members communicate with each other only intermittently"* [42]. Such groups rely on suitable means of communication that allows them to coordinate and share information. The groups we study, however differ from those studied by Pinelle and Gutwin in that they do not operate within the confines of an organization which binds group members to certain explicit (contract) or implicit (norms) rules including common practices and technologies used. Such common practices and technologies that can facilitate collaboration within a group are not present for the groups we study due to episodic participation of members. Coordination can rather change based on individuals leaving and others joining a group which in the case we study is common due to members graduating and potentially even moving out of the are they studied. The episodic nature of participation also complicates designing technologies for such groups. There is a number of different approaches that focus on analyzing, structuring and supporting collaboration through technology [7, 18, 22, 25, 36, 38, 43]. Such approaches however are only marginally applicable in this context since they require upfront planning, do not take the episodic nature of membership of the groups we study into account or take place around a common technology that every member needs to use to participate. There are also approaches that propose light-weight means to analyze group collaboration using heuristics [38] or incremental process reflection and improvement [37]. These approaches are however also only marginally applicable since they require expert support which might not always be available for the groups we study.

More recently work has emerged around flash groups [45] or flash organizations [48] which are comprised of people that are not familiar with each other and come together to conduct a time bounded project. They are thus similar to the groups we study in that they consist of people that come together for a common purpose but have no common practices or technologies to build on. They are however different in the way that flash groups or organizations have a project leader ultimately deciding on the direction of the project. The groups we are studying instead are democratically organized. Moreover, flash groups typically disband after a project has been completed while the groups we study are more permanent and often continue even when no founding member is part of the group anymore.

2.2 Volunteering and volunteer collaboration

There is a large body of work around volunteering and volunteer collaboration. Scholars have studied volunteers supporting elections [3], sports events [10] or natural disasters [8]. There are also studies covering individuals that volunteer their time for longer term activities such as political activism [46] or contributing to online production communities [50]. The groups we study, operate in the latter space in that they follow a specific goal over a longer period of time.

Literature on volunteer engagement commonly distinguishes between different phases of volunteering: Before, during and after being a volunteer [24, 39]. Most work in this field has focused on understanding motivations for individuals to volunteer in order to attract more volunteers [6, 8, 27] and on volunteer retention to ensure that individuals continue to volunteer after they initially took the decision to do so [17, 20, 26]. In our work, we mainly focus on individuals that have already taken the decision to volunteer. We do however consider initial motivations as well as antecedents of retention behavior since both have been found to influence volunteer behavior.

Our main focus lies in the way volunteer groups collaborate (RQ1) and in the way they use technology for this (RQ2). Most studies that cover this aspect focus on (non-profit) organizations that employ coordinators which split larger projects into manageable tasks and distribute them to volunteers [12, 17, 23]. There is also work on groups in which a stable core of volunteers takes over coordination tasks while the remaining volunteers can decide on which tasks they would like to carry out [4, 10, 32]. Our study is related to this work in that the groups we study are organized around an elected leadership group who coordinates activities. Our study however differs from this work because the aforementioned groups usually have the potential to develop members and prepare them for a leadership role over time. This is not always possible for the groups that we study due to the way that they are organized. Our study thus adds to our understanding how leadership tasks are passed on between different generations of volunteer members.

3   Empirical method

To answer our research questions, we conducted an exploratory interview study. We developed an interview protocol and a corresponding coding scheme based on a systematic literature review [28]. We will provide a description of this process the following (section 3.1) before outlining the context of the study (section 3.2), the interview protocol (section 3.3) and corresponding coding scheme (section 3.4) and the data collection and analysis procedure (section 3.5).

3.1   Literature review

We started the systematic literature review with the identification of relevant search terms[1] that are related to how such groups collaborate (RQ1) and how they use technology (RQ2). We used them to search for articles in GoogleScholar that were published after 2006. During an initial screening we focused the first ten pages of the result list for each search term. In addition, we also analyzed papers from high ranking journals and conferences in both the fields of computer supported cooperative work and information systems using the same strategy (c.f. Table 1 for a complete list of the conferences and journals we considered). For those conferences and journals, we limited

---

[1] volunteer + {collaboration, team, work, organization, participation, sustainability, retention, turnover}, loosely coupled collaboration, ad-hoc teams, flash teams

our analysis on work that was published after 2006. This combined strategy led to a total of 130 papers that were examined more closely.

Table 1. Conferences and journals considered in the literature review

Name	Type
ACM Conference on Human Factors in Computing Systems (CHI)	Conference
ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW)	Conference
European Conference on Computer-Supported Cooperative Work (ECSCW)	Conference
ACM International Conference on Supporting Group Work (Group)	Conference
International Conference on the Design of Cooperative Systems (COOP)	Conference
Computer Supported Cooperative Work (CSCW)	Journal
International Conference on Information Systems (ICIS)	Conference
European Conference on Information Systems (ECIS)	Conference
Management Information Systems Quarterly (MISQ)	Journal
European Journal of Information Systems (EJIS)	Journal
Information Systems Journal (ISJ)	Journal
Information Systems Research (ISR)	Journal
Journal of the Association for Information Systems (JAIS)	Journal
Journal of Information Technology (JIT)	Journal

In a first pass we scanned the titles, abstracts and methodology sections of the identified articles in order to assess their fit to our context. We only included peer-reviews papers written in English that contained empirical studies of volunteer groups and reported findings related to the way they organize and use technology. We included both quantitative and qualitative studies. Moreover, we added referenced papers to our list of relevant papers if they met the aforementioned criteria. This procedure resulted in a reduced set of papers 60 which served as a basis for the interview protocol and coding scheme. We will discuss both in detail below.

3.2 Context

The student organizations we studied are volunteer groups that are created and run by students for students. Each organization defines its own mission (c.f. Table 1 for an overview of the groups we studied) and they are established upon students' request. They have to follow certain rules dictated by the university, such as alignment to a specific school, the ability to attract a certain number of members (usually ten), and electing and maintaining a leadership team. The leadership team is usually (re-)elected annually and is comprised of a president, a vice-president and a business manager. There are also examples of student organizations with a larger leadership board. Neither

leadership nor members receive any monetary compensation for their service. Minor funding that can be granted from the university has to be spent for activities related to the purpose of the organization.

3.3   Interview protocol

Our interview study is designed to investigate how volunteers in student organizations collaborate (RQ1) and the role of technology in such collaboration (RQ2). Interview questions included (1) motivations to join (e.g. *"What were the reasons for you to join this student organization?"*); (2) individual's commitments to the organization after joining (e.g. *"What were the commitments you made when you first entered this organization?"*); (3) the organization of specific activities (e.g. *"Please provide a short description of an activity [you recently (co-)organized]."*); and (4) the role of technology in their organizational activities (e.g. *"Which technology did you use to communicate / coordinate while organizing this particular activity?"*)[2].

3.4   Coding scheme

Our coding scheme was developed through an iterative process starting based on relevant dimensions from our literature review. The initial coding scheme covered different motivations (code 1, [6, 8, 27]), commitments and intentions (code 2, [16, 19, 40]) and coordination and decision-making activities (code 3, [11, 24, 29, 34, 35]) as well as aspects of awareness (code 5, [14, 21, 32]) and satisfaction (code 9, [5, 17, 19, 40]) which are partly based on different means of feedback (code 8, [5, 40, 41]). It was refined through multiple rounds of coding of a sample of interview responses following an open-coding process. Following this procedure was necessary since student groups engage in specific activities (code 3) related to themselves as well as individuals outside of their organization (code 4). They also have a specific organizational structure with unique roles (code 2) and they use different technologies (code 6) for specific purposes (code 7) that could not be identified from prior work on volunteer collaboration. Moreover, this procedure also allowed us to specify sources of feedback (code 8) and technologies that organizations we studied used (codes 6 and 7).

Our final coding scheme (Table 2) included codes on (1) individual characteristics of the organization and its leaders and members (code 1), their tenure and role within the organization, their commitment to the organization (code 2) and their satisfaction with their participation (code 9) which can be influenced by feedback (code 8); (2) organization and coordination of activities, communication, decision making, recruitment, turnover and transition (code 3) including the target of such activities (code 4); and (3) the role of technology (code 6) and its purpose (code 7). An important dimension orthogonal to most of the aforementioned processes is related to level of awareness about members and processes within the organization. Awareness can be related to individuals, technology and the group as such (code 5).

---

[2] The full interview protocol can be retrieved from the authors upon request.

Table 2. Coding scheme

Code	Category	Coded aspects
1	Motivation	Socialize (1a), Having fun (1b), Interest in topic (1c), Identification with values (1d), Networking (1e), Career opportunities (1f), Gain new skills (1g), Prior commitments (1h), Bonds with members outside of the organization (1i)
2	Official role	Current role (2a), Commitments and responsibilities (2b), Tenure within current role (2c), Previous role (2d), Intention to continue (2e), Intention to quit (2f)
3	Activities	Organize events (3a), Coordination (3b), Decision making (3c), Face-to-face gathering (3d), Manage money (3e), Marketing (3f), Recruitment (3g), Transition (3h)
4	Target of activities	Group internal (4a), Parent organization (4b), Externals (4c)
5	Awareness	Group as whole (5a), Individuals in the group (5b), Task awareness (5c)
6	Technology	Social media (6a), Email (6b), Instant Messenger (6c), Content management (6d), Wiki or Blog (6e), Phone (6f)
7	Purpose of technology	Coordination (7a), Marketing (7b), Reporting (7c), Communication (7d)
8	Feedback	From fellow officers (8a), From members and event participants (8b)
9	Satisfaction	Expectations met (9a), Support received (9b), Perceived effort (9c)

3.5 Interview study and analysis

We interviewed a total of ten officers of five student organizations from two different North American universities. Organizations were chosen based on their level of activity, diversity of their mission and diversity of students (c.f. Table 3 for more information). Since the focus of our study was on organization and collaboration processes, we exclusively interviewed officers who are responsible for all operational activities of the organizations. Our interview participants served in different leadership roles within the student organizations we studied including president, vice-president, business manager and board member. Some of the student organizations we studied require leadership to change every year (e.g. SO4) while others do not have such a requirement (e.g. SO2). The interviewees had varying tenures within the respective student organization ranging from seven months to seven years.

Table 3. Student organizations analyzed

ID	Goal / mission	Interview participants
S01	Support women in Information Sciences	President (I0, I2) and Business manager (I6)
S02	Support doctoral students in Information Sciences	President (I3)
S03	Support students in Library Sciences	President (I5) and Business manager (I4)
S04	Support international students in Information Sciences	President (I7) and Vice-president (I1)
S05	Support local community organizations by providing data-driven services	Board members (I8, I9)

The interviews lasted from 40 to 57 minutes each. After transcribing the interviews, we conducted three rounds of pre-coding in which two researchers independently applied the coding scheme (c.f. Table 2) to the same parts of the first interview. After each round, we calculated the inter-coder agreement based on Cohens-Kappa [9] for individual answers. We discussed codes with low agreement scores in order to refine the coding scheme and in order to reach a common understanding about how to apply the codes. After three rounds of pre-coding both researchers coded the remainder of the interviews. Following the guidelines by Landis and Koch [30] we found moderate (0.41 - 0.60) to substantial (0.61 - 0.80) scores for Cohens-Kappa for all but the codes related to socializing, prior commitments, and reporting which we subsequently removed from analysis. We then analyzed the coded content to discover emergent themes regarding our two main research questions. In total, our data set consisted of 660 answers and we analyzed a total of 2,045 codes.

4   Findings

The results of the interview analysis have been organized into three aspects (1) Individual disposition to volunteering in student organizations; (2) Current practices of collaboration in student organizations; and (3) The role of technology in current practices.

4.1   Individual disposition to volunteering in student organizations

Before analyzing current practices and the role of technology we first have to understand individual motivations and the fulfilment of expectations since those are important for volunteer engagement.

Individual motivations.
As expected, most students joined an organization because they identified with its values. This is not only evident by the fact that 22% of all mentions of any motivation were related to this but also by every interviewee stating this as one of their motivations

to join. Examples for such statements are: *"I definitely think that it is important that there is a space that is carved out for women and their specific issues"* (I2), *"our values [...] are very important to me."* (I5), *"I got very interested in this organization because I am a minority in the US"* (I7) and *"it seemed like a community of like-minded people"* (I9). Identification with the values of a student organization were followed by other motivations such as career opportunities (16%), interest in topic (15%), bonds with members outside of the organization (12%) and networking (11%). Having fun (7%) and gaining new skills (6%) were also mentioned but only in a few cases. It should also be noted that every interviewee mentioned between three and seven different motivations to join a particular student organization.

Moreover, we observed that there was a connection between specific motivations mentioned by the interviewees and the nature of the organizations. For example, for SO3 which serves as a student chapter of a professionally oriented library organization, interviewees highlighted career-oriented motivations. They mentioned that participation in this group allowed them to interact with other professionals working in the field of their desired future career *("this organization provided an opportunity for networking"*, I4). Similarly, for SO5 which has the main mission to support local communities using their technical skills, interviewees expressed related interests highlighted by the following quote: *"[the organization] really allows me to apply the data skills that I am learning in a real-world setting"* (I8). At the same time, student organizations with broader scope attract students with broader motivations as well. For example, interviewees of S01 expressed diverse sets of motivations as the organization tried to address a very set of interests related to women in technology. Examples for such diverse motivations are e.g. *"I think one of the core values is to provide a space where women [...] can come and share their experience"* (I2) and *"briefly summarizing what are the values of S01 I would say networking"* (I6).

Fulfilment of expectations.
Volunteer organizations rely on free participation of individuals who join a group with various motivations. Satisfying their expectations in response to their individual motivations, is essential for their continued participation. Our interviewees mainly expressed satisfaction with respect to their expectations about the goals of an organization being fulfilled. However, our interviewees were not always satisfied with their involvement in the organization. Most interviewees expressed both positive and negative attitudes when speaking about their expectations of their participation in the organization. Especially the oftentimes low attendance of activities they organized was mentioned as being disappointing *("sometimes you feel frustrated that there is not enough members"*, I0, *"we just had 3 or 4 students in the talk"*, I3, *"we didn't get that many people"*, I5). Low attendance, however was not the only negative aspect that was mentioned. Some interviewees also expressed their frustration with the coordination or the lack of such *("I think that we could have been more on top"*, I2, *"I think as an organization [...] we could be doing better"*, I4). Others also expressed dissatisfaction with the kinds of events organized by the group: *"I would definitely like to see more talks"* (I6).

In some cases, dissatisfaction was related to other students within the same organization. Some interviewees expressed their frustration that students did not fulfil tasks

they agreed to fulfil: *"People had agreed to send out emails and those emails still have not gone out"* (I4); *"There are some people that commit to something and don't make it"* (I9). This happens despite the generally responsible attitude: *"I would say my fellow officers have exceeded my expectations"* (I5); *"everyone was helping in all the process"* (I6); *"I cannot remember that I asked some of them to do something and then they just forfeited"* (I3). This contradictory observation might hint at challenges with respect to coordinating and organizing events. Individuals might have misinterpreted or misunderstood what was expected of them or might not had the right means to communicate challenges that arose from the tasks they agreed to carry out.

4.2   Current practices

In this section, we focus on the way students within student organizations collaborate (RQ1). Starting by analyzing their activities we then outline the process of their practices followed by an analysis of how they manage the inevitable turnover of individuals.

What do these organizations do?
Due to the nature of the student organizations we considered in this study, their main focus is on organizing events that cover a broad range of themes such as speaker series, brainstorming sessions, socializing, welcoming new students, or raising funds. This is evident not only by the fact that 54% of all mentions of any activity during the interviews were related to organizing events but also by responses of interviewees such as: *"My role [...] is to organize events"* (I0); *"My responsibilities are primarily to organize and oversee [...] events"* (I5); *"My particular responsibility would be to coordinate and initiate events"* (I7). The different student organizations we studied organize between four and more than 20 events per year. As a result, a major part of current practices involves coordination around organizing events (67% of all mentions of coordination were reported in the context of event organization). Other practices involved coordination around activities such as managing money, marketing and transition.

Student organizations are involved in activities that require collaboration with other groups outside of the university. A collaboration with members of the local community is an example of a non-event related activity *("the Boys and Girls Club [...] wanted to make sure that their clubs are in the places where they are most needed"*, I8). Student organizations also engage in the recruitment activities (12% of all mentioned activities). Recruiting new members and officers is particularly important, given the high-turnover nature of these groups. New officers are mainly recruited from within the organization as evident by the frequent co-occurrence of the code "recruitment" and the code "group internal". Some interviewees also mentioned that they recruit new officers among other students in the university (29%). However, despite all interviewees mentioning recruitment as an important activity, there is no evidence that that recruitment is organized. It rather takes place as an individual activity without much of coordination or organization which is evident by statements such as: *"I am still encouraging other people to go"* (I5) or *"she invited me to join"* (I0). Also focusing on recruitment within the same

group only seems feasible when students actually stay within the same group for a considerable amount of time. This is not always the case as some student organizations such as S03 are run by students that are on a one-year program which in turn results in the necessity of recruiting new members and officers every year.

What is the process of their practices?
We observed their current practices to involve the following five steps:

Initiation: The organization of an activity starts either as (1) an officer proposes an activity (e.g. *"I was the one who proposed that we make one of these"*, I2); or (2) based on an activity that is regularly organized by the organization (e.g. *"we host a couple of annual events during the year"*, I7).

In-person planning meeting: The initiation is then followed up by an officer meeting to discuss about the upcoming activity: *"We need an officer meeting to decide all of the logistic things"* (I0). These in-person meetings usually involve planning activities and identifying tasks that need to be conducted for the activity to take place *("that took some brainstorming and also some realistic talk about what we could get done"*, I1). Commonly, an activity is planned by a senior officer based on previous experiences *("it is kind of a routine"*, I3). This officer then sometimes serves as a coordinator for that particular event *("I was in charge of organizing everything"*, I3).

Distribution of tasks: Tasks are usually distributed among the officers by *"sort of self-picking"* (I0). Potential leftover tasks are then picked up by the coordinator who is in charge of the event (*"at the end whatever is left I pick them up"*, I3). The distribution of tasks rarely leads to conflicts as officers within an organization generally know each other well. Oftentimes they are able to even guide each other on which tasks fit their expertise (*"s/he is not good at business stuff"*, I2), the schedule of specific members (*"getting busy with school"*, I4), or their specific skills (*"some people are better with responding to emails than others"*, I4).

Following up: After tasks are distributed during the meeting, coordination mainly takes place on a needs basis. Sometimes individuals check on the progress: *"I would go to their office and ask them"* (I2). However, mostly individuals are expected to fulfil their responsibilities without any further input (*"tasks are divided once and considered done afterwards"*, I6). Communication and follow-up are thus quite infrequent.

Assessing success of an event: After an event, attendees or fellow officers oftentimes provide feedback which usually focuses on the event itself (*"some students came to me and said that this was a very helpful experience to them"*, I7, *"people said that they thought it was successful"*, I9). Feedback from attendees as well as fellow officers was reported on about equally often (attendees 46%, officers 54%) and there was no clear difference in the content or the quality of the feedback. Feedback is generally positive and focused on the event but sometimes participants were not happy with an event and would express that to the organizers: *"People might not be happy with a talk and say it is not useful for them"* (I3). This feedback however is never systematically evaluated. It rather stays with the person that received it and it is not used to reflect and discuss what went right and what can be improved in the future.

What happens next?

Student organizations face high turn-over and quick transition. Seven out of ten interviewees mentioned that they intended to stop serving in their current role after their term ends or cut down their engagement due to their studies (*"I knew I was going to have a lot of milestones for my PhD"*, I6, *"that is something that you can manage when you are in the first or second year of your PhD program"*, I7). It is thus not surprising that 13% of all mentioned activities are transition related.

Student organizations indeed dedicate some effort to the transition process (unlike recruitment which is mainly uncoordinated as discussed before). However, each organization has their own strategy. Some attempt to support the transition through documentation (*"we are trying [...] to create documents describing what we did"*, I4) while others try to manage it as part of their recruitment process by forming a leadership team consisting of tenured and new members (*"I was vice president last year and [...] this year I became the president"*, I0). One of the organizations even ran an event dedicated to passing on knowledge from one leadership group to the next (*"during the leadership retreat was a [...]we wanted to connect the incoming board members [...] with the outgoing ones"*, I9).

In all cases, however, we observed that the main focus of transition-related activities is on handling the interaction between the student organization and the university. Those interactions cover questions of how to *"start the organization"* (I4) or *"where we get our money"* (I5). There was no indication of passing on knowledge about the inner workings of the respective organizations. The transition of this knowledge however is particularly important for such loosely coupled groups since there is often no chance to repeat the same event within the same semester or year and mistakes or difficulties can easily be forgotten and repeated. Moreover, while the same person can serve as an officer for a few years, they eventually will have to leave as they finish their studies. Therefore, in cases that the same leadership group is in place for a long time, lack of transition of knowledge can become even more of an impediment as evident by the following statement: *"If I were the president for four / five years when I leave it will be kind of a bummer for the next president to realize how to do that"* (I3).

4.3   The role of technology in current practices

In addition to the way student organizations operate, we are also interested in how they use technology (RQ2). We will report on our findings related to technology in this section starting with which technology is being used followed by how it is used.

Which technologies do student organizations use?

Our anticipation that student organizations use a wide range of technologies was confirmed by the interview results. Starting with email as the technology that was mentioned the most (56% of all mentions of technology), most interviewees also mentioned using different instant messengers (15%) such as WhatsApp (I1, I3, I8, I9), Slack (I2, I6), iMessage (I5) and SMS (I5). We also observed an almost equal number of mentions of different content or document management systems (12%) such as GoogleDrive (I0,

I2, I4, I6, I9), Dropbox (I7) or Box (I8). There were also mentions of the usage of voice chat (7%), social media (5%) and wikis or blogs (4%) as well as other technologies such as the school website (I0, I4), doodle polls (I0, I1) and GoogleForms (I4). We also found individuals that use up to six different technologies for different purposes. This can lead to uncoordinated technology use among the members of an organization (e.g. I8 and I9, both part of SO5, use different document management systems, I8 uses GoogleDocs while I9 uses Box) which in turn can complicate coordination.

What is most cumbersome, however, is that none of the tools are being significantly utilized and most interviewees resort to emails for most activities. This becomes obvious when analyzing the way technology is being used.

Usage strategies

Overall, we observed that technology is mainly utilized for coordination purposes. Both email ($r=0.60$, $p<.001$) and instant messengers ($r=0.39$, $p<.001$) were significantly mentioned in relation to coordination activities. In fact, we observed that with relation to coordination, there is significantly more mention of technology (60%) than face-to-face meetings (40%). This does not imply though that coordination indeed mainly takes place using technology since most coordination happens during the first in-person planning meetings as discussed in section 4.2. However, most coordination that takes place after a meeting is done using technology (*"we send an email to ask what happened"*, I0). The organizing officers particularly utilize email threads (*"usually we just talk through our email threads"*, I4) which makes it hard for individuals that are not part of this thread to be informed about the planning of an activity. They have to either actively ask for information or wait for the involved officers to decide to inform them.

Coordination around the organization of activities as reported by the study participants mainly happens via email and instant messenger as evident by the significant correlation between the respective codes ($r=0.60$, $p<.001$ for coordination and email and $r=0.39$, $p<.001$ for coordination and instant messenger). However, considering the way that communication happens it is surprising that individuals do not perceive a general lack of task awareness. In fact, multiple interviewees stated that awareness is not a problem because *"I have the list in my booklet"* (I3) or they would *"go to office and ask"* (I2) if there was a problem. However, when looking deeper into the interview content it becomes clear that individuals are not really aware of tasks that are currently conducted and that this indeed leads to issues. Individuals assume that *"tasks are divided once and considered done afterwards"* (I6) which is not always the case (*"a day before I was notified that the meeting would happen tomorrow"*, I6). There is thus a clear need to improve task awareness.

For activities other than coordination, technology only plays a minor role. Feedback is never delivered via technology but rather face-to-face. This significantly limits the potential for documenting and reflecting on feedback in order to improve the organization of activities. Technology is also only marginally considered as a means to support the transition from one generation to the next or to recruit new members. In fact, only one interviewee stated that s/he currently working on creating a GoogleDocs document that focuses on the interaction between the student organization and the university (*"describing what we did to start the organization"*, I4). This document however does not

cover information about how the student organization operates internally. Similarly, recruitment is only marginally conducted using email as a technology (*"I sent out the email to the new PhD students that I knew that came to the school"*, I0).

5 Discussion and limitations

Our findings provide an insight into how volunteers within student organizations currently collaborate (RQ1) and how they utilize technology for their collaboration (RQ2), indicating a number of areas where technology combined with well-designed practices can improve collaboration within such small loosely coupled volunteer groups. Specifically, we identified three main areas of improvement: (1) **higher level of transparency**, (2) **well defined task procedures**, (3) **more effective knowledge transfer within and between groups**.

Awareness is an essential ingredient of effective collaboration. Our results indicate a **lack of transparency and awareness**, especially with regards to planning of activities. This can become a significant roadblock in effectively managing organizations as previously discussed in the context of collaborative work [14, 21]. Similarly, **well-defined procedures** play a significant role to support the organization of activities, especially if those activities are recurring. Common means to achieve this are approaches related to business process management [15]. The student organizations we studied have a clear need for such processes since activities are currently organized on a needs basis and guided by individual experiences. There are also no practices in place that support organizations in dealing with feedback and reflecting on past activities to improve their practices. This lack of well-defined procedures does not only harm the organization of activities. It also harms the process of recruiting new members and new officers. Such procedures are commonly designed managed by employed coordinators [12, 17, 23] or a stable core of volunteers [4, 10, 32] both of which are not available in the context we studied. Lack of transparency and well-defined procedures can further lead to challenges in **knowledge transfer**. Within current practices, we observed only non-structured arbitrary knowledge exchange between current members and officers as well as between current and future members and officers. As a result, existing knowledge often gets lots and does not transfer from one generation of members and officers to another. This finding is similar to work discussing corporate knowledge management [1] and it is particularly hard to overcome for small loosely coupled volunteer groups as they face high turnover and loose commitment levels. Membership in such organizations has by definition an expiration date as it depends on a terminal education period. Therefore, designing and practicing highly transparent, well-defined procedures to document and transfer knowledge is critical to their longer-term success. Also, despite the fact that the student groups we studied undoubtedly have commonalities and similar problems, there is almost no exchange between the leadership of different groups about their practices. There is work suggesting structured process reflection [38] but such approaches can be difficult to implement in the context we studied.

We also observed that technology currently is significantly under-utilized even though many different tools are used by different members. There is no standard procedure for how technology can support their collaboration effectively without adding additional barriers in the process. Currently, there is high reliance on email as a main means of communication which can introduce additional challenges, especially with regards to transparency, awareness and transfer of knowledge as mentioned before. Common technology can serve as a means to overcome such challenges as evident e.g. in the context of online communities [44]. We will discuss this aspect in the following.

5.1   A proposal towards a solution

An important goal of our research was to discover how technology can support collaboration within small loosely coupled volunteer groups. We aim to complement existing practices since these groups have been around for some time and thus exemplify an interesting success story. While we provide a first step towards a solution in this direction, we believe that a longer term solution needs an iterative participatory design process [7, 18, 22, 36]. The future direction of our research aims at introducing our proposed technology to a number of student organizations for a trial period. We will then analyze their practices in presence of the new technology in order to refine the technology and practices over time as best fits the needs of each individual organization.

In particular we propose an approach that is based on complementing current practices, orchestrating existing technologies and providing support for the missing opportunities. In particular, we propose to use the group messenger Slack [51] as a core means of communication since it is light weight and it can easily be adapted to suit the needs of a student organization. Slack is easy to set up, easy to use and maintain, works on almost any device and has been successfully applied in similar collaborative contexts such as small software teams [33]. Slack also provides a lot of flexibility in that it allows users to connect it with other technologies of their choice such as Facebook, Google-Drive, Dropbox and others.

Slack promotes **transparency** in that all individuals that are part of a channel can follow the stream of messages and have the opportunity to become part of the conversation at any point of time. This allows individuals that were not part of the initial planning meetings to become part of the conversation and offer ideas and support. It provides a basis for assessing the membership of an organization in that it allows members of a channel to see who is a part of it, assess the level of engagement based on interaction in the channel and get in contact with them. It also supports **knowledge transfer** within and between organizations in that previous messages can be retrieved and used for future purposes which makes it a light weight and simple knowledge management mechanism [13]. Furthermore, it provides a communication channel for the leadership of different volunteer groups to discuss about common ideas and challenges. Finally, it provides the opportunity for former members to stay in touch and potentially offer support if required. Slack by itself does not solve the previously mentioned lack of **procedures**. It does however provide a basis for procedures to evolve because it provides a platform for sharing documents, discussing feedback and organizing reflection even beyond the boundaries of a single organization. The evolving of those practices can

also be supported by bots [31] which can monitor the activity in specific channels and e.g. suggest towards reflecting on a previous activity based on the date of that activity or suggest for engaging new and old members in transfer activities based on the typical transition period of an organization. Bots can enable or promote practices, but they cannot guarantee for them to form. It still remains in the responsibility of the members and officers to build them and pass them on to future generations. We also acknowledge the fact that following these suggestions requires student organizations to commit to this particular technology and that it might steer resentment by individuals since it is another tool to use and to maintain. We are however confident that its ability to blend in with other technologies, its aforementioned potential to support the operation of student organizations and its ease of use will serve as a means for them to try and potentially adopt it. Moreover, some interviewees even mentioned that they use it in their professional life and suggested using it for their student organization as well.

5.2 Limitations

The exploratory nature our research poses limitations. First, we focused our work on one particular type of small loosely coupled volunteer groups by studying student organizations. While it can be argued that these organizations are generally comparable to other similar organizations it has to be noted that these organizations operate within a specific context that has an impact on the way they collaborate. We aimed at mitigating this effect by including organizations of different sizes from different universities that have different goals. Second, our work was driven by an interview guide and a corresponding coding scheme that were developed based on existing literature. While we conducted and exhaustive literature analysis, it is possible that we did not cover all aspects that can be found in real life volunteer organizations. We tried to mitigate this effect by conducting an analysis that allowed for adding codes based on our interview data. Third, our conclusions are based on a relatively small sample of ten interviewees and five student organizations from two North-American universities. This poses a threat to the generalizability of our results. However, our work is meant to shed light onto an area that has not been extensively studied by focusing on small volunteer groups. It thus seems reasonable to conduct a study that provides initial insights which are rather informative than generalizable. Finally, we calculated percentages and correlations between codes and included them into our analysis which can lead to misinterpretations since just the fact that certain aspects are mentioned more often together does not constitute causality between them. To mitigate this threat, we abstained from drawing causal conclusions based on the calculations but rather utilized them as a complement to our qualitative analysis. We also backed them up with interview quotes to set them into context.

6 Acknowledgements

References

1. Alavi, M., Leidner, D.E.: Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Q. 107–136 (2001).
2. Baker, C.N.: Under-represented college students and extracurricular involvement: The effects of various student organizations on academic performance. Soc. Psychol. Educ. 11, 3, 273–298 (2008).
3. Boulus-Rødje, N., Bjorn, P.: Design Challenges in Supporting Distributed Knowledge: An Examination of Organizing Elections. In: Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems. pp. 3137–3146 ACM (2015).
4. Cataldo, M., Herbsleb, J.D.: Communication networks in geographically distributed software development. In: Proceedings of the 2008 ACM conference on Computer supported cooperative work. pp. 579–588 ACM (2008).
5. Chevrier, F. et al.: Factors affecting satisfaction among community-based hospice volunteer visitors. Am. J. Hosp. Palliat. Med. 11, 4, 30–37 (1994).
6. Clary, E.G. et al.: Volunteers' motivations: A functional strategy for the recruitment, placement, and retention of volunteers. Nonprofit Manag. Leadersh. 2, 4, 333–350 (1992).
7. Clegg, C.W.: Sociotechnical principles for system design. Appl. Ergon. 31, 5, 463–477 (2000).
8. Cobb, C. et al.: Designing for the deluge: understanding & supporting the distributed, collaborative work of crisis volunteers. In: Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing. pp. 888–899 ACM (2014).
9. Cohen, J.: Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit. Psychol. Bull. 70, 4, 213 (1968).
10. Crowston, K. et al.: Self-organization of teams for free/libre open source software development. Inf. Softw. Technol. 49, 6, 564–575 (2007).
11. Crowston, K., Howison, J.: A Ten-Year Retrospective. Hum.-Comput. Interact. Manag. Inf. Syst. Found. 120 (2006).
12. Cuskelly, G. et al.: Volunteer management practices and volunteer retention: A human resource management approach. Sport Manag. Rev. 9, 2, 141–163 (2006).
13. Dennerlein, S. et al.: Web 2.0 Messaging Tools for Knowledge Management? Exploring the Potentials of Slack. In: European Conference on Knowledge Management. p. 225 Academic Conferences International Limited (2016).
14. Dourish, P., Bellotti, V.: Awareness and coordination in shared workspaces. In: Proceedings of the 1992 ACM conference on Computer-supported cooperative work. pp. 107–114 ACM (1992).
15. Dumas, M. et al.: Fundamentals of Business Process Management. Springer (2013).
16. Farmer, S.M., Fedor, D.B.: Volunteer participation and withdrawal. Nonprofit Manag. Leadersh. 9, 4, 349–368 (1999).

17. Farrell, J.M. et al.: Volunteer motivation, satisfaction, and management at an elite sporting competition. J. Sport Manag. 12, 4, 288–300 (1998).
18. Fischer, G., Herrmann, T.: Socio-technical systems: a meta-design perspective. Int. J. Sociotechnology Knowl. Dev. IJSKD. 3, 1, 1–33 (2011).
19. Galindo-Kuhn, R., Guzley, R.M.: The Volunteer Satisfaction Index. J. Soc. Serv. Res. 28, 1, 45–68 (2002).
20. Garner, J.T., Garner, L.T.: Volunteering an opinion: Organizational voice and volunteer retention in nonprofit organizations. Nonprofit Volunt. Sect. Q. 40, 5, 813–828 (2011).
21. Gross, T. et al.: User-Centred Awareness in Computer-Supported Cooperative Work-Systems: Structured Embedding of Findings from Social Sciences. J. Hum.-Comput. Interact. 18, 3, 323–360 (2005).
22. Grudin, J.: Why CSCW applications fail: problems in the design and evaluation of organizational interfaces. In: Proceedings of the 1988 ACM conference on Computer-supported cooperative work. pp. 85–93 ACM (1988).
23. Harrison, D.A.: Volunteer motivation and attendance decisions: Competitive theory testing in multiple samples from a homeless shelter. J. Appl. Psychol. 80, 3, 371 (1995).
24. Haski-Leventhal, D., Bargal, D.: The volunteer stages and transitions model: Organizational socialization of volunteers. Hum. Relat. 61, 1, 67–102 (2008).
25. Herrmann, T. et al.: Evaluating Socio-Technical Systems with Heuristics - A Feasible Approach? In: Proceedings of the 2nd International Workshop on Socio-Technical Perspective in IS Development (STPIS'16). pp. 91–97 ceur-ws (2016).
26. Hibbert, S. et al.: Understanding volunteer motivation for participation in a community-based food cooperative. Int. J. Nonprofit Volunt. Sect. Mark. 8, 1, 30–42 (2003).
27. Karr, L.B., Meijs, L.C.: Sustaining the motivation to volunteer in organizations. In: Solidarity and prosocial behavior. pp. 157–172 Springer (2006).
28. Kitchenham, B.: Procedures for Performing Systematic Reviews. (2004).
29. Kraut, R. et al.: Dealing with newcomers. Evidencebased Soc. Des. Min. Soc. Sci. Build Online Communities. 1, 42 (2010).
30. Landis, J.R., Koch, G.G.: The measurement of observer agreement for categorical data. biometrics. 159–174 (1977).
31. Lee, M. et al.: Bots mind the social-technical gap. In: Proceedings of 15th European Conference on Computer-Supported Cooperative Work-Exploratory Papers. European Society for Socially Embedded Technologies (EUSSET) (2017).
32. Liao, Q.V. et al.: Improvising Harmony: Opportunities for Technologies to Support Crowd Orchestration. Urbana. 51, 61801 (2016).
33. Lin, B. et al.: Why developers are slacking off: Understanding how software teams use slack. In: Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion. pp. 333–336 ACM (2016).
34. Malone, T.W., Crowston, K.: The interdisciplinary study of coordination. ACM Comput. Surv. CSUR. 26, 1, 87–119 (1994).

35. Malone, T.W., Crowston, K.: What is coordination theory and how can it help design cooperative work systems? In: Proceedings of the 1990 ACM conference on Computer-supported cooperative work. pp. 357–370 ACM (1990).

36. Mumford, E.: Effective Systems Design and Requirements and Analysis - the ETHICS aproach. Macmillan Press LTD, Houndsmill, Basingstoke, Hampshire and London (1995).

37. Nolte, A.: Exploring Potentials of Process Reflection to Support Communities of Small Volunteer Groups. In: Workshops and Work-in-Progress Contributions at S-BPM ONE 2018. CEUR-WS (2018).

38. Nolte, A. et al.: Supporting Collaboration in Small Volunteer Groups with Socio-Technical Guidelines. In: Proceedings of 16th European Conference on Computer-Supported Cooperative Work - Exploratory Papers, Reports of the European Society for Socially Embedded Technologies. (2018).

39. Omoto, A.M., Snyder, M.: Considerations of community: The context and process of volunteerism. Am. Behav. Sci. 45, 5, 846–867 (2002).

40. Pearce, J.L.: Volunteers: The organizational behavior of unpaid workers. Routledge (1993).

41. Peterson, D.K.: Recruitment strategies for encouraging participation in corporate volunteer programs. J. Bus. Ethics. 49, 4, 371–386 (2004).

42. Pinelle, D., Gutwin, C.: Designing for loose coupling in mobile groups. In: Proceedings of the 2003 international ACM SIGGROUP conference on Supporting group work. pp. 75–84 ACM (2003).

43. Qiu, H.S. et al.: Going Farther Together: The Impact of Social Capital on Sustained Participation in Open Source. In: International Conference on Software Engineering. IEEE (2019).

44. Ransbotham, S., Kane, G.C.: Membership turnover and collaboration success in online communities: Explaining rises and falls from grace in Wikipedia. Mis Q. 613–627 (2011).

45. Retelny, D. et al.: Expert crowdsourcing with flash teams. In: Proceedings of the 27th annual ACM symposium on User interface software and technology. pp. 75–85 ACM (2014).

46. Saeed, S. et al.: Analyzing political activists' organization practices: findings from a long term case study of the european social forum. Comput. Support. Coop. Work CSCW. 20, 4–5, 265–304 (2011).

47. Schmidt, K.: Riding a tiger, or computer supported cooperative work. In: Proceedings of the second conference on European Conference on Computer-Supported Cooperative Work. pp. 1–16 Springer (1991).

48. Valentine, M.A. et al.: Flash Organizations: Crowdsourcing Complex Work by Structuring Crowds As Organizations. In: Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems. pp. 3523–3537 ACM (2017).

49. Voida, A. et al.: Homebrew databases: Complexities of everyday information management in nonprofit organizations. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. pp. 915–924 ACM (2011).

50. Wang, L.S. et al.: Searching for the goldilocks zone: trade-offs in managing online volunteer groups. In: Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work. pp. 989–998 ACM (2012).
51. Slack, https://slack.com/.
52. Social Kitchen - the Other Person, http://www.aljazeera.com/indepth/inpictures/2015/09/greece-social-kitchen-person-150921110028671.html.
53. SUDS, http://suds-cmu.org/.
54. Wikipedia, https://www.wikipedia.org/.