

# An Approach to Collaborative Management of Informal Projects

Luma Maia Ferreira, Juliana de Melo Bezerra and Celso Massaki Hirata  
*Instituto Tecnológico de Aeronáutica, Division of Computer Science, São José dos Campos, Brazil*

**Keywords:** Collaborative Management, Project Management, CSCW, Informal Project.

**Abstract:** Informal projects, such as elaborating a schoolwork, organizing a social event, and planning a trip, are performed commonly in groups. Current approaches of project management are complex, rigorous, and do not explicitly exhibit the flexibility to manage informal projects. We propose an approach based on cooperative work concepts in order to support the participation of members in the collaborative management of informal projects. The proposed approach requires a tool support for the collaborative management. Aiming to verify the effectiveness of the approach, we developed and employed a mobile application to support collaborative management of informal projects. Two case studies were conducted to investigate if the approach, along with the tool, assists in the management activities and encourages participation of project's members. Our preliminary results show that the approach improves planning and monitoring and control during project management, encourages the participation of members and helps in the recognition of members compared to existing approaches.

## 1 INTRODUCTION

The Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI, 2012). Projects can be managed and executed in two types of organization: formal and informal (Gulati, 2009). Projects in formal organizations due to their complexity generally are more rigorous in terms of management, requiring more detailing, effort and time in the planning and monitoring of activities (Carroll, 2003). In general, specific responsibilities are assigned to roles, in which management is individually assigned and rarely shared (PMI, 2012).

Informal Project is a project without formal processes of management. Examples of informal projects include community projects, schoolwork, and the social events such as birthday parties and open house meetings (Schatz, 2016). In general, the management of informal projects does not have specific support tools. In these projects, members share responsibility for the results, and the success of the project depends on the participation, motivation and commitment of the members (Donker, 2008). Since informal projects are managed and executed collaboratively, there is growing use of communication tools, including email, instant messaging, text messages and chats (Battestini, 2010)

(Farnham, 2006) (Kowitz, 2005). Mobile applications such as WhatsApp and Facebook benefit the management and execution of informal projects, since the users are always connected and accessible (Dillman, 2014) (Venkatesh, 2012).

We claim that there is no suitable approach to conduct the management of informal projects that require collaboration. In informal projects, communication tools are used to plan, monitor and control the activities. However, these tools are not sufficient to perform project management activities and motivate participants. Among the problems, we include the lack of support for coordination mechanisms, lack of awareness of project progress, difficulty to manage activities, and lack of motivation mechanisms (Schuler, 2014). On the other hand, using traditional approaches and conventional project management tools is not a solution. The main reason is that they require detailed information for monitoring and control and rigidity, which do not match the reality of informal projects that need to be dynamic, flexible and decentralized (Counts, 2007).

We propose a novel approach consisting of guidelines to assist members in the collaborative management of informal projects. The goal of the approach is to allow collaboration and enable an exchange of information according to the convenience of the project members, in a way to

encourage the participation of members in project management. The approach is based on concepts, techniques, tool support, and recommendations of project management, cooperative work, and motivation mechanisms.

Section 2 presents related work. Section 3 describes the proposed approach to collaborative management of informal projects. Section 4 details the requirements, design and implementation of the tool. Section 5 describes how we evaluated the proposed approach, including the tool. Section 6 discusses implications and limitations of our proposal. Finally, conclusions and future work are presented in Section 7.

## 2 RELATED WORK

This section describes research on communication, management and coordination of informal projects. Existing research includes how groups are currently organized, how management occurs, what tools are used and the problems encountered. Informal project management does not necessarily follow a project management methodology (Lawson, 2009). It is conjectured that the informal project management has the following advantages: less bureaucracy and faster management of activities; team members more motivated and proactive; and team members feeling that they are project owners.

Counts (2007) identifies how people communicate to organize their day-to-day, especially leisure, such as dinner and party, and detects that there is direct exchange of messages. Counts proposes a system that allows people to organize themselves into groups, and coordinate their leisure activities together, and provides a history and overview of what is happening in the groups. The proposal of Counts provides mechanisms for creating groups and centralizing communication; however, it is not structured in project management guidelines to help manage the group's activities.

Battestini et al. (2010) conducted a study with 70 students at a university where they collected nearly 60,000 text messages. It was discovered that the recurrent subject is related to planning. The study showed that the conversations are not restricted only to SMS text messages, but other mechanisms were used, such as email, Facebook, online chats and phone calls. The result emphasizes the lack of a tool for planning in project management.

Schuler et al. (2014) investigate groups of social activities in order to understand the coordination dynamics in the current context of technology. The

groups surveyed were undergraduate students performing activities such as birthday party, bachelor parties, reunions, barbecues, cinema, football game, and lunches. The tools used include text messages (SMS), group messages (WhatsApp, e-mail), chat (Facebook chat), phone calls and event systems (Facebook event and Google invite). Decentralization, lack of focus and overhead of information in the conversations were identified as major problems faced mainly because coordination occurs in a decentralized manner and information is distributed in message flows that are not structured by subject or activity, which led to a lack of understanding and confusion about the details of the activity. The researchers point the way groups are organized and the problems faced, but they do not suggest an approach for coordination and management of social activities.

Donker and Blumberg (2008) describe the problems faced by virtual teams that are less effective and have a limited ability to work. The problems of these teams were linked to lack of relationship between the project management tools and collaboration tools because project management tools do not support collaboration and do not integrate the results of activities performed and incurred costs, generating distortion and problems in planning. The problems identified by them were the motivation to define the guidelines of our approach.

In general, the presented research shows that people are organizing in groups to coordinate some kind of social activity, herein represented by informal projects, and they have suffered from the lack of an approach that meets their needs, since the project management and collaboration tools alone are not able to provide the necessary assistance for the management of informal projects. In the next section, we present a collaborative approach to manage informal projects.

## 3 PROPOSED APPROACH

The proposed approach to collaborative management of informal projects is based on concepts and technology of four areas: project management, cooperative work, motivation mechanisms, and tool support.

The project management (PMI, 2012) brings to the approach the basic elements of management of informal projects. With respect to project management, the approach has to aid planning, and monitoring and control without requiring excessive overhead. The approach has to allow the creation of

projects, group definition, definition of activities, time control, assignment of responsibilities, and workspace for monitoring and control. We claim that informal project management requires a flexible approach.

Concepts of cooperative work (Beaudouin-Lafon, 1999) (Borgohoff, 2000) complement the approach in terms of models and techniques for communication, coordination and cooperation. The aim is to have an approach that provides effective communication, enables cooperation and necessary coordination of members to carry out the management activities, and enable efficient collaboration in the execution of project activities.

The management must be motivated, encouraged and carried out by the cooperation of the participants in the project. All group members should be encouraged to participate so that overhead of activity work on few members should not occur, which can lead to dissatisfaction in the group. In the proposed approach, all members share responsibility for the management and coordination of project activities. Any member can define project activities, deadlines, responsibilities, and even termination of activities at any time. In our proposal, we opted to employ incentive mechanisms (Bezerra, 2015) (Kim, 2000) that encourage the participation of members through the needs of belonging, esteem and self-actualization.

The approach requires a tool to support the collaborative management of activities. The tool has to not only aid the management activities but also support the collaboration among the project members in a convenient manner. The tool also has to have mechanisms to motivate members to contribute to the project in an effective manner.

We structure the proposal of informal project management as guidelines. In our proposal, a guideline is an indication or instruction that directs project members in the way that the management activities are performed. The subsections below describe the seven guidelines of the proposed approach.

### 3.1 Define Project and Group

The basic definition of the project includes project identification, purpose (objective) and duration. Any member can create a new project, describing the project and its purpose and setting a deadline. The group definition is the definition of the group members. The creator of the project invites members to participate and collaborate with the project. Members who accept the invitation become part of the project group.

Any group member who participates in the project may at any time redefine the project features and invite new members. Allowing the participation of members from the beginning of the project, including the definition of the participants, is an incentive mechanism related to belonging and esteem. It is a way to recognize the competence of members to appoint new participants, which results in greater involvement and motivation, demoting the relevance of a possible "owner" of the project. By allowing everyone to have equal authority, it is understood that all will share responsibilities. In order to have an easier coordination and ensure individual motivation, it is important that all members be aligned with the objective of the project.

### 3.2 Define and Manage Activity

The definition of the activities to be performed in the project is part of the project scope management and happens not only in planning but also in implementation and in response to the monitoring and control. To define an activity one must describe its identification, deadline and responsible participants for the activity. The information may change during the execution of the project and in our approach; any project team member can redefine activities and their attributes.

Any activity can be excluded if it does not make sense for the scope of the project to achieve the project goals. It is expected that all activities are completed. Finishing the activity means that the activity made its contribution to the execution of the project. It is important that the activities have progress status information. When an activity is completed, it is important that the information of completion and its results be shared, so that everyone in the group can follow the progress of the project.

Allowing any project member at any time have access to the activity definition and related actions (e.g. change, finish) is an incentive mechanism for belonging. This empowerment allows for dynamism and flexibility and encourages members to participate in the project.

### 3.3 Assign Responsibility

The responsibility for the success of the project should be encouraged to all the members. For each activity, it is encouraged that one or more members be responsible, in order to decentralize responsibilities and increase the likelihood that the activity is performed. The responsibility for an activity may come in the form of an invitation or

voluntarily. The assignment of responsibility should never be of mandatory acceptance. It is important that members have knowledge of competences, skills and abilities of themselves so that they can suggest specific members to be responsible for the activities.

At any time, members may suggest or invite other members to be responsible for a given activity. The invited member may not accept the invitation. No member can undo an invitation, except the member who invited. This way of assignment of responsibility aims to encourage active participation of the members, fostering cooperation and project management. The fact that someone is invited to be responsible is related to incentive mechanisms of esteem, since the invitee can feel recognized and valued by the group and decide to contribute actively. Assuming responsibility relates to incentive mechanisms of self-actualization, as the member is faced to meet new challenges. The invitation is also characterized as a mechanism to inhibit social fear; since the invited member can feel more comfortable to participate.

### **3.4 Promote Contribution**

The contributions are intended to assist in planning, monitoring and control of activities. One member even without being responsible for a particular activity can and should be encouraged to participate actively in the activities. We believe that mechanisms that promote contribution are necessary.

The contribution may happen at any time in the project management, and in various ways. The promotion of contribution may occur with the suggestion of new activity and opinion that contributes to the execution of an activity. A member can also promote contribution by encouraging the participation of other members. For management of informal project, we believe that promotion of contribution is the key mechanism to the active participation of members in the project.

### **3.5 Encourage Recognition**

Demonstrating recognition aims to encourage collaboration and ensures a conducive environment to the involvement of everyone in the project, which in turn raises the esteem of the participants. Recognition can happen indirectly, for example, when a member invites other member to be responsible means that he/she relies on the member's ability to perform the activity and recognizes his/her competence and skill. Recognition can happen directly by thanking

someone or issuing a positive comment about a contribution provided by a given member.

By providing the opportunity to members to be recognized, the goal is to increase the esteem of the participants, giving visibility of their contributions and favouring the feeling of prestige, and consequently encouraging further participation in the project.

### **3.6 Provide Visibility of Project Progress**

Providing the project visibility allows the project members have access to everything that is happening. It is about giving transparency of the project management, facilitating monitoring and control and aligning the expectations of everyone with regard to project objectives.

The visibility should be provided in a simple way and should be easily accessible to all members. Preferably, members should be warned of the events, so that they do not stay away from the project. To encourage the participation, members need access to everything to find out what has to be done and what was done, since in order to cooperate, it is necessary to know when, where and how to cooperate.

Among the information that must always be visible to all members of the project, we highlight the information about the activities. All members must be aware of critical project activities, their deadlines and status. In addition to the information of the activities, members have to be aware of the interactions among members in order to be aware of the group's contributions and attempts to accomplish the activities.

Providing visibility is an incentive mechanism that includes several motivations. The member can feel within the group once he/she knows everything that is being accomplished in the project. The member may also feel prestige because his/her contributions may be perceived by the group. In addition, visibility helps avoiding late contribution if information about activities and deadlines are available immediately.

### **3.7 Tool Support**

In order to make the approach feasible, we consider that a tool through which members follow the guidelines in timely and convenient manner should be available. We advocate that the tool should be a mobile application. A mobile application enables members to perform the management activities collaboratively anywhere anytime. The mobile

application should implement the incentive mechanisms related to the aforementioned guidelines.

Without a proper tool support, members would experience more difficulty to perform the management activities and they would be less aware of work performed by other members. They would not see recognition of their work and they would feel less motivated to contribute. The next section details the tool.

## 4 TOOL

A mobile application was developed to enable members perform the management activities collaboratively in the proper time. The advantages of mobile applications are convenience of use and mobility to the users. The system includes as front-end, smartphones and tablets with Android version 3.0 or later. This section describes the requirements, design and some implementation issues of the application. We aim to demonstrate that the approach is feasible by building and experimenting with the mobile application.

### 4.1 Requirements

The requirements are composed of prerequisites (restrictions), functional requirements and non-functional requirements. As prerequisite, the Android platform was adopted to develop our application. The system includes as front-end, smartphones and tablets with Android version 3.0 or later. Another prerequisite is that the application depends on constant connection to the Internet to work due to the cloud solution adopted. To have access to the application, a member downloads it from Google Play. The user can search for the app using “COLAB – Atividade colaborativa” (in Portuguese).

Functional requirements describe the system functions. The application has the functional requirements described in Table 1.

The functional requirements were defined in order to meet the guidelines proposed by the approach. Each guideline resulted in one or more functionalities. In general, association of a guideline to requirements is immediate. In what follows, the associations of the last three guidelines are detailed.

The guideline *promote contribution* gave rise to functionality *comment on activity* (FR09), where members can contribute with comments, which can be praise, criticism, suggestions or any other comment to assist in planning, implementing or monitoring and control of the activity. In addition to

textual comment, the contribution can happen with image attachments in the comment.

Table 1: The guidelines and the functional requirements.

Guideline	Id	Requirement
Define project and group	FR01	Create Project
	FR02	Associate members to the project
	FR03	Edit Project
Define and manage activity	FR04	Edit new activity
	FR05	Edit existing activity
Assign responsibility	FR06	Invite responsible
	FR07	Accept invitation to be responsible.
	FR08	Accept responsibility
Promote contribution	FR09	Comment on the activity
Encourage recognition	FR10	Like comment
	FR11	Like project change
Provide visibility of the project progress	FR12	Provide project list
	FR13	Provide activity list
	FR14	Provide activity status
	FR15	Provide responsible list
	FR16	End activity
	FR17	View project changes
	FR18	Be notified of interaction

The guideline *encourage recognition* gave rise to the mechanism of *like* where members can demonstrate their satisfaction with a comment (FR10) or a particular contribution to the project (FR11). The *like* mechanism is a simple way to someone appreciate something and make the member (who contributed) feel recognized.

The guideline *provide visibility to the project progress* led to many features. The features are: provide a list of all projects that the member belongs (FR12); provide a list of activities of a particular project with activities' deadlines (FR13); provide the status of the activities (FR14) that can be completed, in progress and late; provide a list of members in charge of the activity (FR15); enable a member to finalize an activity (FR16) so that he/she provides a resolution and makes it visible to other members; view project changes (FR17) so that the member has an overview of what is happening in the project who is contributing with the change and how is the progress of the project; and be notified of interactions (FR18) so that the member is notified and reminded about the changes of the project so that his/her participation is encouraged.

A non-functional requirement that deserves consideration is synchronization. The application must provide a synchronous interaction where information should be shared simultaneously, i.e. the

notifications of change shall be immediately available to other users. We adopted the model WYSIWIS (What You See Is What I See) that is used in multi-user environments, where all participants have the same on-screen information simultaneously.

## 4.2 Design and Implementation

For data storage services, notifications, user management and client-server infrastructure the Parse platform was used. Parse offers a range of services, including data storage and notifications, which allows developers to focus on building their applications without having to worry about managing servers and back-end infrastructure.

The API Parse implicitly employs the client-cloud architecture, where the server is in the cloud. Figure 1 shows the architecture of the application where the client part is installed on mobile devices that communicate with the server Parse through requests to ParseObject. The server Parse is responsible for executing queries to the data. Parse is also responsible for sending and managing notifications to warn members of the interactions that occur in the project. The app was developed taking into account the usability. Figure 2 illustrates the interface that contains information of a specific project - the project *Farewell Party* - and Figure 3 illustrates the interface of current informal projects that a user participates.

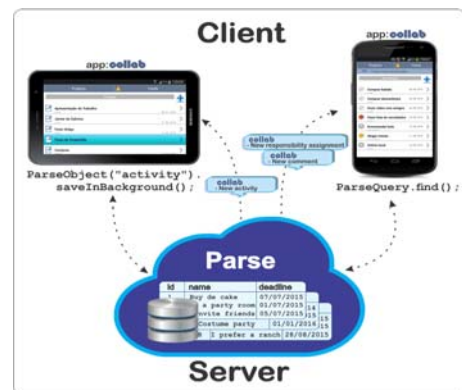


Figure 1: Architecture of the application.

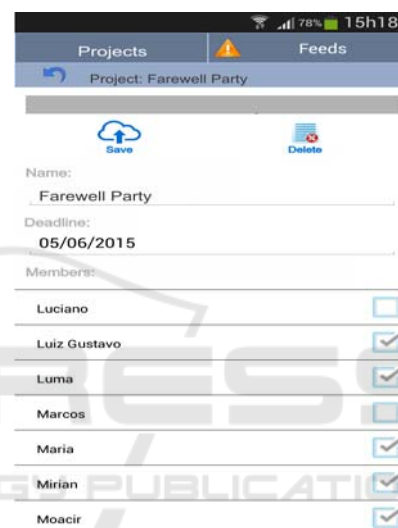


Figure 2: Interface for the Farewell Party project.

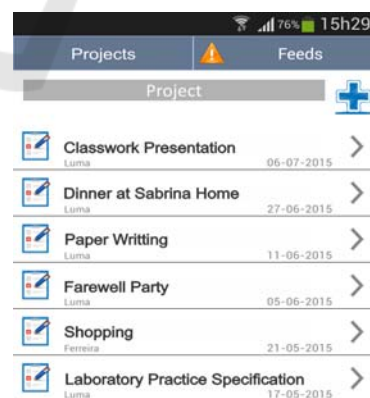


Figure 3: Interface of current informal projects that a user participates.

## 5 EVALUATION

We conducted two case studies in order to assess whether the proposal can meet the needs of groups with respect to the collaborative management of informal projects.

### 5.1 Design of Experiment

Ten students divided into two groups were invited to use the application and assess the proposed approach. Participants were between 15 to 24 years old. Group 1 with three participants, was composed of teenagers attending high school course. Group 2 with seven participants was formed with undergraduate students.

In the initial questionnaire, we analysed the groups' maturity with respect to the members' experiences with projects, communication tools and project management tools. We aimed to identify the profile of the participants. In both groups, the participants rated their experiences with projects mostly as "Good". They also rated their experiences in the use of communication tools such as "Excellent"

and assessed their experiences with project management tools as "Little" or "None". The results, shown in Figure 4, indicate that the participants have

not yet been presented to the project management tools. This can be explained by the fact they do not participate in formal projects.

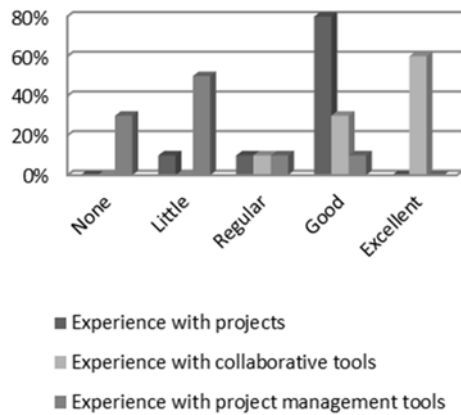


Figure 4: Previous experiences of the participants.

We were also interested in identifying the communication tools previously used by the participants. All participants cited WhatsApp and half of them cited e-mail as shown in Figure 5. The participants could answer more than one alternative.

The fact that all participants use as the primary way to manage their projects a communication tool, WhatsApp, strengthens the need of an approach to manage informal projects. The fact that the participants do not have experience with project management tools emphasizes that these tools are not disseminated or used to carry out the management of informal projects. The use of WhatsApp also emphasizes that the combination of smartphone with app is the right choice to develop the application for our proposed approach.

Each group was in charge to decide what project to manage and execute, but its duration was limited to two weeks. The first group chose schoolwork of History, and the second group chose a definition of a programming exercise. With the project definition, they started defining the activities, deadlines and responsibilities.

In order to verify whether the approach met the expectation to help groups in the collaborative management of their informal projects, the answers of the initial and final questionnaires were compared. In the initial questionnaire, applied before using the tool, participants comment on both how their informal projects were generally managed and tools they were used to. In the final assessment (after using the prototype), all participants responded about the usage of the app in project management.

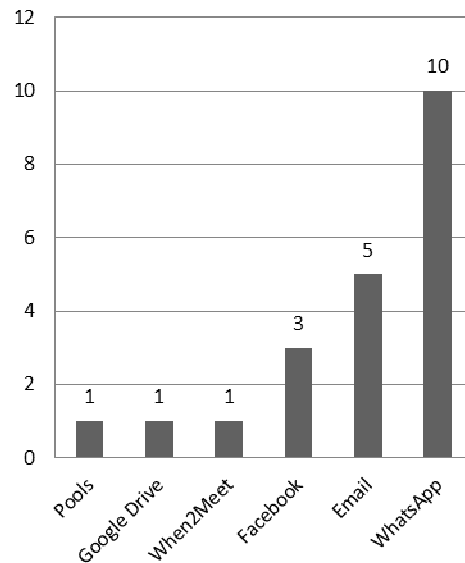


Figure 5: Communication tools previously used by participants.

In both initial and final questionnaires, there were similar questions to compare experiences when not using and when using the proposed approach. To assess whether the application aided in project management, three statements were presented: “The used approach aided in Project Planning”, “The used approach aided in Project Execution” and “The used approach aided in the Project Monitoring and Control”. Two other statements were made to assess whether the approach helps in the Project Management (statement: “The used approach helps in the project participation”) and whether the members were recognized for their participation in project management (statement: “The used approach helps in the project recognition”). They were also asked whether they were satisfied with the current management of their informal projects (statement: “I am satisfied with the used approach to manage my informal projects”).

For all the statements, respondents should answer using a scale from 0,2 to 1, where “0,2” means “Strongly Disagree”, “0,4” means “Disagree”, “0,6” means “Neutral”, “0,8” means “Agree”, and “1” means “Strongly Agree” with the statement.

## 5.2 Results

Figure 6 shows the “averages” of the responses with respect to aid in Project Management without and with the approach. With respect to the statement “The used approach aided in Project Planning”, most of the answers were “Neutral” and “Agree” without using

the app. In the final questionnaire, almost all respondents answered “Agree” and “Strongly Agree” about the usefulness of the app in planning.

With respect to the statement “The used approach aided in Project Execution”, most of the participants answered “Neutral” or “Agree” before using the app. In the final questionnaire, all respondents answered “Agree” or “Strongly Agree” about usefulness of the app in the project execution.

With respect to the statement “The used approach aided in Project Monitoring and Control”, most of the participants answered “Disagree” before using the app. In the final questionnaire, all respondents answered “Strongly Agree” about usefulness of the app in the project monitoring and control.



Figure 6: Aid in the Project Management.

The members were asked if they were encouraged to participate and if they were recognized for their participation in project management before and after the experience with the app. The purpose of the comparison is to verify whether the provision of information for monitoring, the like mechanism and the notifications of the app contributed to participation and recognition.

Figure 7 shows the “averages” of the responses with respect to participation and recognition of members using the project management approach. With respect to the statement “The used approach helps in the project participation”, most of the participants answered “Agree” before using the app. In the final questionnaire, most of the respondents answered “Strongly Agree” about usefulness of the app in the project participation.

With respect to the statement “The used approach helps in the project recognition”, most of the participants answered “Neutral” or “Agree” before using the app. In the final questionnaire, most of the respondents answered “Agree” or “Strongly Agree” about usefulness of the app in the members’ recognition.

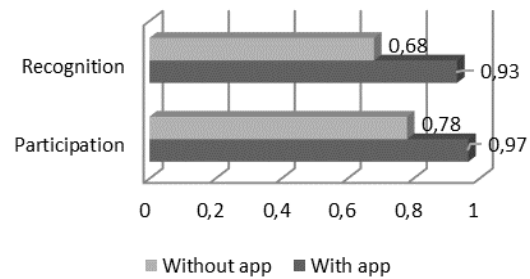


Figure 7: Incentive to participation and recognition of members.

With respect to the statement: “I am satisfied with the current approach to manage my informal projects”. In both groups, most of the participants answered that they were neutral with their previous approaches. In the final questionnaire, they were asked again about satisfaction, but this time in relation to the proposed approach. In both groups, the participants answered that they agreed or strongly agreed with the proposed approach.

Considering the results, the proposed approach was able to meet the expectations to support the participation of members in the collaborative management of informal projects and satisfy the participants with respect to the project management.

## 6 DISCUSSIONS AND IMPLICATIONS

In order to support members on the participation of the collaborative management of informal projects, it is essential to have an approach that assists and encourages the members in the management processes. Although the communication is an essential mechanism in collaboration, it does not suffice. Other mechanisms need to be considered for a successful management of informal projects. In this work, we employed and analysed the mechanisms of motivation to encourage the participation and recognition of participants.

Our proposal considers that the management is decentralized, and that members share responsibilities. If members have different views, the management may result in conflicts and deadlocks, which may hinder the project progress. We understand that when these situations occur, the members must assume their responsibilities also in solving the aroused issues. The approach does not assure project completions with success. The approach leaves to the members to discuss and come to decisions. We also understand that the decision



can be hard, for instance, the decision can indicate removal of a member, or even end the project. We did not provide any investigation about conflicts and ambiguities and we did not identify any specific mechanism to identify, avoid, and solve ambiguities and conflicts. We consider that this is a future work.

The incentive mechanisms were designed, implemented, and used however; it is difficult to evaluate how each incentive is separately effective. Incentives work as package, and they depend how the participants perceive and experience them.

The case studies consider only informal projects, but nothing prevents the approach of being used in formal and organizational projects. We think that other types of project can benefit from the proposed guidelines. We believe that the basic condition to use our approach successfully is that the members must be motivated and committed to the goals of the project.

Collaborative research projects have emerged as a particular form of academia-industry interaction. They present specific features and demand adaptations and adjustments to existing project management approaches. Research projects operate under considerable uncertainty and depend on creativity and collaboration. They require freedom and flexibility, specific management and new forms of organization, commitment and involvement of all project parties aiming to achieve success (Brocke, 2015). For the features discussed, we believe that collaborative research projects are a potential target to our proposed approach.

Agile Project Management (APM) is an approach based on a set of principles, whose goal is to render the process of project management simpler, more flexible and iterative in order to achieve better performance, with less management effort, and higher levels of innovation and added value for the customer (Chin, 2004) (Conforto, 2014). APM theory recommends the use of certain practices and tools, such as the concept of product vision, iterative development; and the use of visual artefacts such as boards, panels, and sticky-notes. There are at least two “enablers” necessary for APM implementation: dedicated and co-located teams and the active customer involvement during the entire product development cycle. Our approach differs from APM at least in three ways. First, our approach is not customer involvement-oriented. It does not employ iterative development process either. Third, it does not require co-located teams. Nevertheless, our approach shares some common elements with APM. They include creating the project scope with little

description and creating the project plan collaboratively with shared responsibility.

In the case studies, only individual member satisfaction with the approach was asked. The answers of satisfaction cannot be generalized and does not imply that the results of the project will be achieved. Corporatism may emerge, i.e. the members may be focused only on their interests and not on project’s goals. In order to avoid such a situation, we conjecture that group values and rewards based on project’s goal must be considered.

We think that the results of the case studies are preliminary and limited, but they are also encouraging indications. More experiments must be made to improve the confidence in the initial findings.

We also remind that our approach was only possible because of current available technology for communication and mobility provided by mobile devices. The technology enables instant and timely communication for almost all users. It is difficult to imagine applying the approach without the aid of the technology.

## 7 CONCLUSIONS

We proposed a novel approach to support the participation of members in the collaborative management of informal projects. The approach is based on cooperative work and motivation mechanisms. In the approach, members share responsibility for the project management. Guidelines for the project creation, definition of activities, assignment of responsibility, incentives to contribution, incentives to recognition, and project visibility were considered as requirements in a mobile application that was implemented and used in the case studies. The results of the case studies showed that the proposed approach aids in the planning, monitoring and control, and encourages the participation and recognition of members in project management.

Some future work can be derived from this work. The first is the use of the approach in large groups, to verify the scalability of member participation. Some mechanism of hierarchy of groups and activities may be necessary if the group is large.

In addition to use of the approach in larger groups, it is necessary to validate the use of the approach with more experienced professionals who are more used to project management methodology and tools. It is interesting to identify what factors are relevant in terms of success. For instance, it is of interest to check if the proposed approach suffices when it is

used in groups with committed participants or if it requires some complements.

In general, groups are not fixed over time; they evolve due to the members' interests and demands. Groups that promote their own evolution, are called self-organizing groups. We believe the self-organization aspect is an aspect for further investigation in our proposal. In a self-organizing approach, the guidelines could be redefined or adapted to satisfy the group's needs.

## REFERENCES

- Battestini, A., Setlur, V., and Sohn, T. A large-scale study of text-messaging use. In *Proceedings of the 12th international conference on Human computer interaction with mobile devices and services*. ACM, 2010.
- Beaudouin-Lafon, M. *Computer supported co-operative work*, New York: Wiley: s.n., 1999.
- Bezerra, J. M., Hirata, C.M., and Randall, D. A Conceptual Framework to Define Incentive Mechanisms for Virtual Communities. *Journal of Universal Computer Science (Online)*, 21, 1107-1135, 2015.
- Borghoff, U. M., and Schlichter, J. H. *Computer-supported cooperative work*, Springer Berlin Heidelberg, 2000.
- Brocke, J.V., and Lippe, S. Managing collaborative research projects: A synthesis of project management literature and directives for future research. *International Journal of Project Management*. 2015.
- Carroll, J. M., et al. Notification and awareness: synchronizing task-oriented collaborative activity. *International Journal of Human-Computer Studies*, 58:5, 605-632. 2003.
- Chin, G. *Agile Project Management: How to Succeed in the Face of the Changing Project Requirements*, New York: Amacon. 2004.
- Conforto, E; Salum, F., Amaral, D., Da Silva, S.L., and De Almeida, L.F.M. Can agile Project Management be adopted by industries other than Software Development? *Project Management Journal*, 21-34, 2014.
- Counts, S. Group-based mobile messaging in support of the social side of leisure. In *Proceedings of the Computer Supported Cooperative Work (CSCW)*, 16:1, 75-97, 2007.
- Dillman, D. A., Smyth, J. D., and Christian, L. M. *Internet, phone, mail, and mixed-mode surveys: the tailored design method*, John Wiley & Sons, 2014.
- Donker, H., and Blumberg, M. Collaborative process management and virtual teams. In *Proceedings of the 2008 International Workshop on Cooperative and Human Aspects of Software Engineering*. ACM, 41-43, 2008.
- Farnham, S., and Keyani, P. Swarm: Hyper awareness, micro coordination, and smart convergence through mobile group text messaging. In *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS)*, IEEE, 2006.
- Gulati, R., and Puranam, P. Renewal through reorganization: The value of inconsistencies between formal and informal organization. *Organization Science*. 20:2, 422-440, 2009.
- Kim, A. J. *Community building on the web: Secret strategies for successful online communities*, Addison-Wesley Longman Publishing Co., Inc., 2000.
- Kowitz, B., et al. Gather: Design for Impromptu activity support utilizing social networks. CMU. 2005.
- Lawson, B., et al. Knowledge sharing in interorganizational product development teams: the effect of formal and informal socialization mechanism. *Journal of Product Innovation Management*, 26, 2, 156-172, 2009.
- PMI. *A Guide to the Project Management Body of Knowledge*, 5th Ed. PMI, 2012.
- Schatz, T. Basic Types of Organizational Structure: Formal & Informal. Small Business. Available at <http://smallbusiness.chron.com/basic-types-organizational-structure-formal-informal-982.html>. 2016.
- Schuler, R.P., et al. The doing of doing stuff: understanding the coordination of social group-activities. In *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2014.
- Venkatesh, V., Thong, J.Y.L., and Xu, X. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36, 1, 157-178, 2012.