

Communication Needs, Practices and Supporting Structures in Global Inter-Organizational Software Development Projects

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Abstract

This paper presents communication needs, supporting structures and communication practices collected from global software development projects. The data was gathered by 32 interviews from seven global inter-organizational projects. We identified four important communication needs: problem solving, informing and monitoring, relationship building, and decision-making and coordination. Structures supporting communication were: organizational structure with communicating roles, partial synchronization of inter-organizational processes, and project level coordination. Communication practices are built upon and facilitated by these structures. A surprising finding was that companies rarely had any company level practices that were used in all inter-organizational projects. Instead, the practices were formed by trial and error and were mainly project specific.

1. Introduction

Global inter-organizational software development projects, including outsourcing, subcontracting or partnership relations, are becoming increasingly common [4, 5]. The fact that such projects cross both country and organizational borders makes them extremely challenging. Advice for outsourcing and acquiring large projects or modules with well-defined requirements can be found in literature (e.g. [6]). However, in many new product development software projects a lot of uncertainties exist and subcontractors or partners are needed long before these uncertainties can be resolved and the requirements thoroughly specified. Therefore, in such projects parties usually cannot receive clear requirement specifications at the beginning. Instead, close cooperation and communication between parties are required during the whole project. Problems often arise, since practices needed for collaborating and communicating across distances and organizations are not well established. Companies often underestimate the need for specific practices when collaborating

across distances, and start global inter-organizational projects without first planning how to work together. This often leads to quite problematic situations. Most of the problems are related to communication difficulties (e.g. [1, 7]), which mainly arise due to geographical distance, which e.g. limits the number of face-to-face meetings [2, 5].

Current literature does not provide much help for managers planning their projects; only a few articles can be found presenting practices used in case projects (e.g. [1, 3, 4]). We believe that collecting successful practices, especially to support communication could help managers better plan and execute global inter-organizational software development projects.

In the research presented in this paper, we studied global, inter-organizational software projects, which used parallel development and had lots of uncertainties and interconnections between tasks. Since pure partnership projects were difficult to find, we concentrated on projects involving subcontractors, and focused on the structures and practices between the customer and the subcontractor(s) in parallel development situations. The projects chosen had also a global distribution aspect, either inside or between the companies. The focus of this study is illustrated in Figure 1.

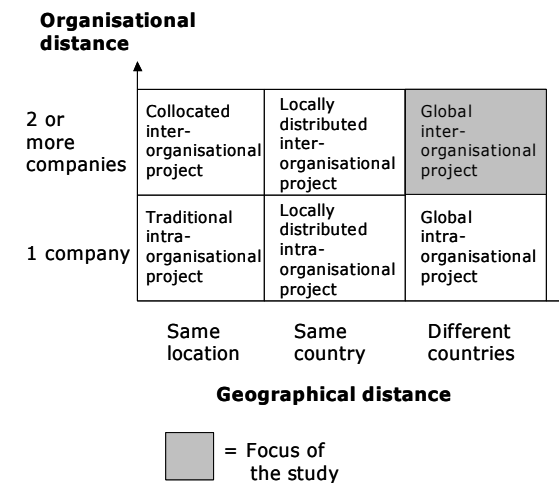


Figure 1. Project type classification

The aim of this paper is to present communication needs, structures that support communication, and communication practices collected from globally distributed inter-organizational projects.

2. Methodology

The research presented in the paper is based on a multiple-case study approach [10]. Seven successful, Finnish companies that develop software were chosen for the study. Three of the companies developed software products, one customer specific systems and three embedded systems. All of these companies used software subcontractors and were expected to be quite experienced in inter-organizational software development. All companies, except one, were large and well-known in Finland.

From every company we chose one globally and organizationally dispersed project that was studied closely. The chosen projects had sites or partners in two or three different countries. Four projects were distributed between continents, two of them between Europe and Asia, and two between Europe and North America. The rest three projects had a bit shorter inter-site distances, since all their sites were located in Europe.

We gathered data from 32 interviews. In each customer company we interviewed, if possible, both a partnership manager responsible for software subcontracting, and a process developer involved in subcontracting process development. From a chosen case project we interviewed project manager and, if possible, also one or more team members and a representative from the supplier company. We tape recorded all interviews, transcribed them and used Atlas/TI for grouping and analyzing the results.

3. Results and discussion

The most surprising result of our study was that companies did not have almost any clear structures and practices that were commonly used in all their inter-organizational software development projects. The practices we encountered were mainly project specific and created by trial and error. The structures and practices found and presented in this paper might seem quite basic. However, in our experience, they are often not implemented in real life projects, even though a lot of problems could be avoided by using them. Next, the observed communication needs, supporting structures, and communication practices are presented.

3.1. Communication needs

We identified four main types of communication needs: 1) problem solving, 2) informing and monitoring,

3) relationship building, and 4) decision-making and coordination. This classification is very close to classification presented by Stahl et al. [9] about communication in distributed product development. Our classification adds monitoring and relationship building. Monitoring is needed to give transparency of the project progress. Relationship building includes all kinds of social communication, which is especially important in a distributed project and therefore needs to be emphasized.

The identified communication needs were found in all projects studied. However, the importance of each need and the suitable communication practices depended on the type and phase of the project. The most important finding was that communication needed for problem solving was almost totally forgotten when planning projects. This type of communication was needed especially in projects involving a lot of uncertainties, since problems demanding communication just cannot be totally avoided.

The purpose of this communication need classification is to bring out communication needs that managers should take into account when planning their own distributed projects. Next, each communication need is briefly discussed.

3.1.1 Problem solving. Problem solving communication is easily forgotten in project planning, even though it is commonly needed in distributed projects, especially when facing a lot of uncertainties, e.g., concerning new technologies. If channels for problem solving communication are not agreed upon at the beginning of the project, it might take a long time before problems are solved and this delays the whole project. If there does not exist a suitable communication practice, project members will ask around, and hopefully find a person who can help them, but a lot of time and energy is lost.

3.1.2 Informing and monitoring. The customer normally remembers to monitor how the supplier's work is progressing, even though it is difficult if only time reports are used. However, the supplier's personnel and other distant sites would also like to get information about the progress of the whole project. This information would, besides helping personnel in distant sites to accomplish their tasks, motivate them, e.g., to keep-up the schedule, when they know why it is important. For a customer it is also very easy to forget to inform supplier about decisions and changes made, or new documents produced. The informing and monitoring should happen in both directions from the customer to the supplier and the other way around.

Besides informing, suppliers also expect feedback from their work, e.g., about the quality of the work. They would like to get comments also when they are doing something right, not only when things go wrong.

3.1.3 Relationship building. It is easier to communicate with a person that you have met at least once. Therefore, face-to-face meetings are crucial, especially in the beginning of the project. These meetings facilitate later electronic communication. Moreover, it is important that distant sites and companies have "faces". Otherwise they are easily forgotten and, e.g., their questions might not be regarded as important and urgent to answer.

Building a good relationship with suppliers requires also that they are treated more like partners and experts in their field, not like second class citizens. Normally, even suppliers want to do high quality work.

3.1.4 Decision making and coordination. Coordination and decision making is in a networked project concentrated to a network level steering group, the project managers and the team level meetings. All these should take part of the responsibility. Define what kind of decisions each of them can make and how the whole project is informed about those decisions.

3.2. Supporting structures

We identified three aspects that create supporting structures for an inter-organizational project: 1) a clear organizational structure with communicating roles, 2) partial synchronization of inter-organizational processes, and 3) structures for project level coordination (Table 1).

Table 1. Supporting structures

Structure	Actions	Support for communication
Organizational structure with communicating roles	<ul style="list-style-type: none"> - Create roles - Link communicating roles between organizations - Make the organization chart, with roles and contact info easily available 	<ul style="list-style-type: none"> - Roles include communication requirements and identify which roles need to communicate with each other between companies - Roles and the organization chart make it easier to know whom to contact
Inter-organizational process	<ul style="list-style-type: none"> - Synchronize the main process milestones between organizations - Use iteration cycles of similar length and frequent builds 	<ul style="list-style-type: none"> - Milestones synchronize communication - Several iteration cycles and builds create transparency, and facilitate follow-up and communication
Project level coordination	<ul style="list-style-type: none"> - Create a project level steering group with members from all organizations and sites - Arrange inter-organizational groups with weekly (teleconference) meetings 	<ul style="list-style-type: none"> - Meetings (face-to-face / video- / teleconference) facilitate problem solving and decision making, they provide transparency and facilitate later electronic communication

When these structures are planned and implemented carefully and used constantly during a project, they support work and communication. Next, we presented the structures in more detail.

3.2.1 Clear organization structure with communicating roles. Creating roles, assigning the roles to team members and indicating which roles need to communicate with each other between companies, was a successful practice and it also stabilised the project structure. Defined roles make the inter-organizational project structure more clear to all participating team members and helps them to find the correct person to contact.

Each role description includes tasks to perform, decision-making rights, responsibilities, and identified communication contacts. The roles and their descriptions can be similar in all projects. Each project chooses the roles needed and names persons to the roles. At the beginning of a project it is easier to give team members roles than many separate tasks. Moreover, it is important that some roles have comparable roles at the customer's and the supplier's side. These roles take care of tasks demanding a lot of communication between companies.

At the management level in both companies there could be one named person, e.g., a subcontracting responsible who communicates with the other company's corresponding role about future projects, prices, infrastructure needs, etc. At the project level, project managers communicate on a daily basis. At the team level, there are often experts on both sides who need to communicate with each other, e.g., persons responsible for related modules, software architects, etc.

Such a simple thing as an organization chart of the whole inter-organizational project was often missing. This kind of a chart makes it easier to find the correct persons to contact when questions emerge. A simple web page with information about project personnel, including names, roles, photos, and contact information can also help a lot.

3.2.2 Partial synchronization of inter-organizational processes. Our study showed that it is possible for both customer and supplier to use their own development processes in inter-organizational projects. Only the main phases and milestones need to be synchronized between companies.

Many of the projects we studied had iteration cycles and builds. In some project phases even weekly builds were used. Frequent iterations and builds were noticed as a very suitable practice for distributed use, since they prevented different sites and partners from developing totally incompatible parts for long time periods. Frequent iteration cycles also bring partners transparency of the work done in a project. However, if all parties do not have the same interval between builds, problems will

arise. Therefore, frequent iterations and builds with cycles of similar length in every company and site can be recommended.

3.2.3 Project level coordination. A project steering group at the inter-organizational level having members from all participating companies has been a good practice. It could meet, e.g., once a month and discuss important high level matters. This meeting can be either face-to-face or using video/teleconference.

3.3. Communication practices

The case companies did not agree upon communication practices at the beginning of their projects, a fact that caused problems later. Even many basic guides recommend doing a project communication plan first, e.g. the PMBOK® Guide [8], but that just did not seem to be a common practice in our case projects. Especially the need for problem solving communication was huge in the case projects. However, agreeing about it was often neglected partly because anticipating when and who would need it seemed to be difficult. Other important, but neglected, needs were relationship building and monitoring communication between distributed team members. These communication gaps limited transparency and caused, e.g., team members not always knowing whom to contact and made following the progress of the project difficult. Next, communication practices related to each four types of communication needs are presented (Table 2).

3.3.1 Problem solving. If a project does not have a suitable communication practice for problem solving, project members will ask around when they have questions, and might finally find a person who can answer their questions. After sometime one specific person, e.g. a system architect, might end up receiving a huge number of questions just because other team members have noticed that he or she can help them. However, answering questions and finding the answers takes time and this person’s own duties suffer easily. This practice is not a very good one, but many projects use it.

Chat between developers was regarded as a very useful way of communicating in problem solving situations, since when chatting clarifying counter questions can be posed easily and chat session can be open all the time.

Discussion lists about specific technological areas were used in some larger projects and were found helpful, since know-how and experiences might exist somewhere in a large project.

Project wide mailing lists were used in smaller projects for asking questions. In an email questions asked need to be explained very carefully, otherwise readers do not understand questions and they have to send several mails

asking clarifying questions before the question is understood correctly.

3.3.2 Informing and monitoring. Weekly meetings are a good arena in which to inform and monitor the project progress in both directions, from the customer to the supplier and the other way around. Team level weekly face-to-face meetings are often difficult to arrange in a distributed project, therefore, e.g., video- or teleconferences have been a very good alternative. Weekly meetings should be arranged among a group small enough, e.g., a project team or a subteam, to be efficient. It is important that everyone participates. The length of these meetings vary, half an hour can be enough. Inter-organisation representation is needed in these meetings, if there are dependencies across companies. The agenda could concentrate on tasks done, tasks to be done, problems and open issues. In a larger project subteam leaders could have their own meeting to get information about other teams and the whole project progress.

Table 2. Communication needs and practices identified

Communication need	Important	Practices
Problem solving	<ul style="list-style-type: none"> - Often neglected -> lack of answers delays the project - Organization chart and roles help to find the correct person to contact 	<ul style="list-style-type: none"> - A person who “solves problems” - Mailbox for questions - Chat between developers - Discussion lists - Project wide mailing list with well explained questions
Informing and monitoring	<ul style="list-style-type: none"> - Follow-up in both directions, inform also the subcontractor - Customer should comment all points in the follow-up report 	<ul style="list-style-type: none"> - Weekly meetings inside a subgroup (teleconference) - Follow-up reports including tasks done open questions, problems, and future outlook.
Relationship building	<ul style="list-style-type: none"> - Give a “face” to distant sites - All communication affects relationship building especially face-to-face meetings 	<ul style="list-style-type: none"> - A common kick-off meeting - Circulating meetings or trainings - Planning / problem solving meetings
Decision making and coordination	<ul style="list-style-type: none"> - Define the correct forum for different type of decisions - Inform about decisions 	<ul style="list-style-type: none"> - Network level steering group meetings - Weekly project/team level meetings

3.3.3 Relationship building. A common kick-off meeting for the whole project or a sub-project is often a good idea. If it is impossible to arrange due to large project size and long distances, you should arrange other face-to-face meetings for important communication link persons. For example, project architects or other key persons can go to

the supplier's site to train them, or some supplier's key persons can be invited to the customer's site for training or a short collocated working period. When major problems arise they are best solved face-to-face.

3.3.4 Decision making and coordination. In an inter-organizational project coordination and decision making is concentrated to an inter-organizational steering group, project managers and weekly team meetings. All these should take part of the responsibility. Define what kind of decisions each of them can make and how the whole project is informed about those decisions.

4. Summary and conclusions

This paper presented communication needs, structures that support communication, and communication practices collected from globally distributed inter-organizational software development projects. The most surprising result was that case companies, even though successful in their field, did not have clear structures and practices that were commonly used in all inter-organizational projects. The practices encountered were mainly project specific and created by trial and error. The structures and practices found and presented in this paper might seem to be quite basic. However, in real life projects a lot of problems could probably be avoided by using them constantly. For example, the case companies did not agree upon communication practices in the beginning of their projects, which caused them problems later. Especially the need for problem solving communication was recognized to be huge in the case projects, but agreeing about it was often neglected. Other important, but neglected, needs were relationship building and project monitoring communication between distributed team members.

5. Future work

In the future we plan to extend this study and concentrate especially on communication, since it seems to be the biggest problem and is related to almost everything in global software development. We plan to study more projects and collect successful communication patterns and practices used in them. Furthermore, we plan to classify the communication patterns and practices according to projects type and communication needs. This collection should help managers choose suitable communication practices for their projects.

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