

# A Practical Analysis of a Collaborative Work Using Activity Theory

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## ABSTRACT

This paper examines how activity theory can be applied to group work. Based on Cole and Engeström's analysis of activity and the mediating relationships among the individual, tools, or artifacts and organization participating in the activity, we tried to understand the complex interaction within a group of international students.

## Author Keywords

Activity Theory, Human Computer Interaction, Human Machine Interaction, Computer Supported Collaborative Work, Activity System Triangle

## INTRODUCTION

We observed a group of international students at IT-University, who were involved in solving an assignment. There were four students from different countries and only one of them was having English as his native language.

The group started with understanding the problem definition and started a kind of brainstorming session with everyone trying to put his solution to the problem. As most of them were not conversant with English many times it becomes difficult for them to express what they have in mind, at this point they started making gestures, or use drawing boards or laptop, to materialize and present their ideas. Quite often confusion was seen among members, as someone was not able to convey what he has in mind and others understood entirely different thing. Sometimes this lead to frustration among the group members, or at times some of them opted to keep quite not coming up with their ideas.

## OBJECT OF STUDY

The interaction of these students is important not only for solving their assignment, but to enhance their knowledge in the field of study and also to improve their communication skills. In such a competitive environment students who are not comfortable with English feel left out and even though they have sound technical skills they cannot express them. This problem doesn't restrict itself to the university students but to other fields, especially in industry where stakes are

even higher, this problem persists and at times it can cost a fortune for a company.

Instead of ignoring this problem or stating it as an individual problem, some aid in form of technological artifact should be developed to overcome this. We try to analyze this problem using activity theory.

## CHOICE OF METHOD

In order to investigate our study, we conducted an empirical study of a group of international students working on an assignment in IT-University, Kista. Using qualitative research methods, we studied how the groups coordinate, communicate and collaborate in order to make the study session as efficient as possible.

We used ethnographic techniques to collect data, i.e. video recording and participating observation. Hammersly and Atkinson describe ethnography as follows:

"In its most characteristic form it involves the ethnographer participating, overtly covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions – in fact, collecting whatever data are available to throw light on the issues that are the focus of the research." [1]

Ethnography should last for an extended period of time, our study did not, but we used ethnographic techniques during our data collection phase. We made participant observations of a group study. While studying the group study we participated during 5 days, approximately 15 hours. We recorded these sessions by video. The empirical data was analyzed using the Activity Theory framework.

## THEORETICAL PERSPECTIVE

We analyzed the data using the Activity Theory framework. The Activity Theory seemed to be very suitable because it proposes that activity cannot be understood without understanding the role of artifacts in everyday existence, activity theory is concerned with practice, that is, doing and activity. According to Nardi, Activity Theory is a powerful and clarifying descriptive tool rather than a strongly

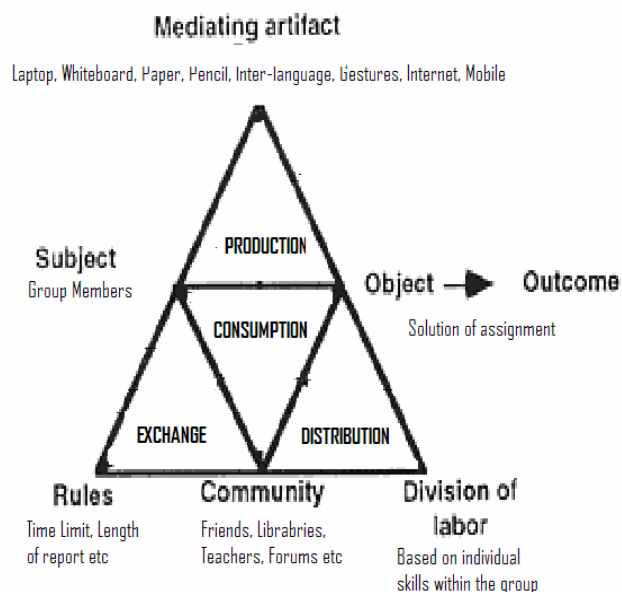
predictive theory. The purpose of activity theory is to explain the unity of consciousness and activity. Activity theory amalgamates strong notions of intentionally, history, mediation, cooperation and development in constructing consciousness [2]. Activity theorists argue that *you are what you do*. Because consciousness is not a set of discrete disembodied cognitive acts, and certainly it is not the brain. It is located in everyday practice.

Although activity theory focuses on practice, it is primarily a descriptive tool rather than a perspective theory. Though activity theory does not offer ready-made techniques and procedures for research, its widespread application as a lens for analyzing the activity has yielded some generally accepted practices. First is that activity must be studied in real-life practice with researcher as active participant in the process. Second, activity theory necessitates a qualitative approach to analysis.

### DATA MATERIAL

After 15 hours field study, we had long hours of raw video data and many pages of hand notes from observation. We analyzed the whole data material and extracted required data which are relevant to our study. We concentrated more on interaction between group members. The evaluation of the data material resulted in valuable information on using interactive artifacts in face-to-face communication. The data we collected during the experiments will be presented and analyzed in the following sections.

### ANALYSES OF ACTIVITY SYSTEM COMPONENTS



**Figure 1. Cole and Engeström's triangle showing activity system components of the group under study.**

When analyzing this activity, we examined not only the kinds of activities that the group was engaged in, but also

who else is engaging in that activity, the rules, the norms that circumscribe that activity, and the larger community in which activity occurs. This step involves defining in depth the components of the given activity, namely, the subject, object, community, rules and division of labor.

The subject of this interaction activity was individuals in a group of five members, who establish the goals of the system based on the contradictions they perceive in the system. We described not only their activity structure but also how they perceived their roles in the relationship to the goals of the system, that is, to come up with a solution to the problem.

The object is the thing to be acted on, tangible or intangible. It can be a product, a communication, a theory, or any combination of elements. In our case, the object of this activity system was the solution to the assignment which was given to a group of international students.

Community: Very little, if any, meaningful activity is accomplished individually. People may perform individually in different contexts, but their ability to perform is predicated on groups of people. That is an individual is concurrently a member of a community. A primary assumption of activity theory is that activity cannot be understood or analyzed outside the context in which it occurs, thus in this activity system the individuals of the group along with some other communities from which these individuals are taking help, collectively form a community. Other communities can be friends, libraries, teachers, work groups, and forums etc. So if we see a broader picture, community in this activity is not restricted to a group at a university but covers a lot of society, in that domain.

The components of the activity system (subject, object, community) do not act on each other directly. Instead their interaction is mediated by tools and signs which provide the direct and indirect communication between the objects. The mediators in our system were laptops, paper, pencil, white board, human gestures, inter-language (English), internet technology and mobile.

The rules of solving the assignment, mediated the relationship between the subject and the communities in which they participated. The rules were to what extent you can take help from other communities? What is the time frame in which you have to solve it? How to share responsibilities? What is expected in the solution? How long a report should be for the solution?

### Analyzing the Activity Subsystems

Not only it is important to analyses the components of any activity system, but it is also necessary to analyze the interaction and contradictions among those components. Those interactions and contradictions are manifest in the production, consumption, exchange and distributed subsystems. Analyzing the production subsystem involves observing how the subject interacts with tools, signs, and other mediator in order to transform the object. How does

the object unfold? What effects do the mediators have on the nature of activity? Do they change the performance, abilities and beliefs of subject?

In this activity system the subject interacts with mediators (laptops, paper, pencil, white board, human gestures, inter language, internet technology and mobile) to transform the object (solving an assignment) into a correct, quality and on time (as time limit set by rules) solution.

The group members were using these mediators for solving various parts of the assignment; also whenever they have problem expressing their ideas using an inter-language, they found these mediators to be very useful for them to express what they have in their mind. The mediators not only help the subject with information gathering about the problems but also to communicate effectively and clearly. Mediators help the subjects to come up with the ideas quickly and efficiently there by increasing the production rate, that is the increasing the problem solving rate. Like laptop was the most frequently used artifact along with internet, which helps them to navigate it to find the exact words, phrases or pictures etc they need to express their ideas, also surfing provide them with a lot of additional information relevant to their problem . They use white board, paper, pen to sketch figures or write when the have difficulty in expressing verbally. Gestures too played an important role as they were frequently used to clarify and lay emphasis on what a person was trying to say, for example when one of the members tried to explain the pin code feeding procedure via mobile phone he made a gesture as if he was holding a phone and feeding the number. Language (English) was the main mediator, as it was the only common language through which these group members were communicating. Mobile and email were other mediators that were used to organize their meetings, to coordinate among themselves and to send their work reports to each other.

When analyzing the consumption subsystem, we observed how the activity community members interact with the group members? How the community members consume resource? Do community members impede or support production process? What effect does consumption have on the production system?

Here the various community members like friends, libraries, teachers, work groups, forums and the individuals of subject itself are member of some of these communities, they interact with each other to find a solution for the problem, and doing so communities are using the resources in the form mediators, subject and time, at the same time production process requires these resources. But on the other hand these community members are helping the production process for finding the solution. An inherent contradiction surfaces here i.e. one activity subsystem (consumption) is contributing to activity of the other subsystem (production) and at the same time it is consuming the resources of later. This contradiction cannot

be resolved, but a balance should be maintained to optimize the production rate.

In analyzing the distributed subsystem, we examined how they have distributed the work among themselves, that is, their division of labor. Were the actions and obligations of the students were formalized or ad hoc? What rules dictated their performance? What were the expectations of the members from each other and also of the teachers concerned with assignment? How well they carried out the task?

The group had divided the work (division of labor) among themselves according to the skills that an individual have, like person A was good in information gathering, B in analyzing, C in writing reports, D in coordinating and E in communication. All though there wasn't a formal group leader but D was coordinating and everyone was reporting to him. All of them were expected to deliver their hundred percent. There were no formalized rules for working but certain constraints were imposed like the time limit, type of resources that can be used (cannot copy from other group). The expectation that group members had from each other were to be on time in meetings, try to finish home work before a meeting, do your work honestly and sincerely (don't expect others to do it for you). The performance of the group was judged by the concerned teacher on the basis of their solution of the assignment.

In analyzing the exchange subsystem, we examined how the norms and rules within the subject, between subject and communities, were negotiated.

The exchange subsystem engages the subject and the two contextual components: the rules that constraint the activity (described in distributed subsystem) and the community with which subject interact. As the group consists of students from different countries, they exchanged personal, social, cultural norms while interacting, which lead to creation of a new norms and work culture for this group. They have their own rules for interaction and communication among themselves, like who will coordinate the meetings? Who will gather information? What artifacts they will be using? Is new member allowed? When they will sit for a new assignment, they have these new norms which help them to work in a better and efficient way. This also will affect their (subject) interaction with communities. This exchange if viewed in a broader aspect will regulate the overall performance of the activity system.

## **DISCUSSION**

Activity theory provides a framework for analyzing systems which not only involves complex human- human interactions but also human- machine interactions. It fragments the system into various level of consciousness which is present in the society. So a system in spite of been viewed as an individual entity, is observed as a social structure which interacts with different domains of the

society. But there are contradictions in the activity system, contradiction within elements, between them, between different activities or development phase of a same activity, between subsystems. These contradictions manifest themselves as problems, clashes, breakdowns etc. Activity Theory sees these contradictions as sources of development; real activities are practically always in the process of working through some of such contradiction [4].

### **CONCLUSION**

This analysis of group work provided us with a deep understanding of how people interact in spite of the barrier posed by the language and how a small group of students involve a big part of society other than the University for solving an assignment. This also helped us to understand how consciousness and activity are dynamically related.

This observation also provides us with an idea of how to develop a technological artifact for a scenario where people from different countries interact and language proves to be their biggest hurdle.

### **ACKNOWLEDGMENTS**

We thank Jakob Tholander, Harko Verhagen and all guest lecturers at Cognitive and Social Sciences at HMI. They encouraged us to work on this subject. We also want to thank Jeffrey Burkham, Taufique Sayeed, Mustafa Taher and Carme Brion. They are students of ISE and helped us for group study observation.

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