



# Implementation of Activity Theory in Umeå University Library

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## Abstract

*Information technology is playing a vital role in our every field of life. The most common use of information is in the field of education. Use of information technology in libraries is very important. People from different works of life extract information from these libraries. In this paper, we have tried to identify how can we facilitate the Umeå university library users for better interaction with the information? We have used different methods for collection of data to identify the Umeå university library problems and then we analysed the whole library system with the help of Engeström Activity theory, to find out which factors are affecting the interaction between users and library and creating main problems. In the end we have given some suggestions for the improvement of interaction between users and Umeå library to facilitate them for accessing information.*

## 1. Introduction

Technology has been playing a vital role in almost all fields of life i.e. shopping markets, military, heavy industries, airports, schools, colleges etc. The most common use of the information technology is in the field of education. This kind of education can be distance or LMS (learning management system). We compel to say that we cannot ignore the information technology in our life. *“Why We Expect More from Technology and Less from Each Other? That asks a simple question: Do digital methods of communication connect us the way interaction in the real world does?”*(Melnick, 2011) It is an important question by Melnick. It is true that we are expecting more from technology and less from each other. Why? because technology is part of a person, we are connected with each other through technology, so technology is an important medium for communication among each other. Human behaviour has changed ever since they have started using internet. Now the information is available at a distance of one click with the help of internet. For example if a student wants to explore a book from the library, he will use internet explorer and then from library web site he will check out whether that book is available in the library system or not. We want to say that without information technology we are blind and we cannot survive. Technology is a wide term which is used for different means to support human activities. Some people think that technology is any hardware or software which is used to facilitate us during any activity. According to our point of view technology is more than that. It has changed the way of our thinking and behaving. Today the most common examples of technology in educational field are printed books & e-books. Technology is improving so much by every passing day that today everyone has some kind of technical devices such as laptop, mini laptop, tablet, e-book readers and desktop computers for accessing information.

Technology has different impact on different organizations and information societies. Use of information technology in libraries has its own importance. A great saying by Rolling Stones guitarist Keith Richards that, *“When you are growing up, there are two institutional places that affect you most powerfully – the church, which belongs to GOD, and the public library, which belongs to you. The public library is a great equalizer”* (George M. Eberhart, 2006). Now the question arises what is a library? and what is the purpose of a library? the answers of these questions are very well defined in this definition that

*A library is collection of resources in a variety of formats that is (1)organized by information professionals or other experts who (2)provide convenient physical , digital, bibliographic, or intellectual access and (3) offer targeted services and programs (4)with the mission of educating , informing , or entertaining a variety of audiences(5)and the goal of simulating individual learning and advancing society as a whole. (George M. Eberhart, 2006, P. 3)*

Libraries are used by people to acquire information according to their choice. Today libraries are not only embedded with books, instead they are also consisted of maps, videos CDs, Games, e-books, prints, thesis, audio books, etc. Umeå university library is a modern form of library which is equipped with latest technology, and latest books. It is the largest academic research library in Norrland. Currently “the library offers a wide range of services and resources, such as bright and well-suited rooms, a substantial amount of computer desks and freely available reading areas, printing and copying access, several book table group study rooms, and three well equipped computer labs” (Umea University Library Website). Students, teachers and researchers are using the library for reading, examination’s preparations and research purposes. According to Umeå University Library website they have a collection of about 30,000 books and lending number of books is about 250,000 during a year. The library visitors per year are about 900,000 and they provide their users about 300 computers and 1850 study spaces (Umeå University Library Website). Mostly teachers refer some course books and extra reference books for reading and to explore regarding some problem issues for the project or research. Then students or researchers explore Umeå university library system to check for the availability of that specific book. Conventionally one or two copies of books are available for (30 to 35) students and teachers and one book for silent room or within university library. They borrow books from the library by logging into university web site through internet. It is an integrated library system or library management system which is a part of Umeå University. Each book has unique ID in the database for tracking. This system is used to track items, order books and also shows information about those which are for loan or otherwise.

Actually, the problem arises when many students of a same subject try to issue same book from the library. But only few students who have applied earlier for the issuance of book are allowed to borrow the book for two weeks, meanwhile when its time for the next student’s turn to issue the book, the course term duration is almost at end or near to an end, so the other students do not get a chance to study properly the course book. Secondly, If the students are going to silent rooms for studding they again refer to Umeå University Library System (UULS) to explore the book, the UULS shows that the book is available but when someone goes physically to the library shelves in reading room, they can not find the book, as the book may be taken by some one, or someone has hiden it or has put it in wrong shelve, which creates lot of problems for the other students who are looking for that particular book.

These are some important issues for those students and researchers who cannot buy books. These issues which we have discussed are genuine problems within Umeå University library which are being faced by students, teachers and researchers. The emergence of these issues in Umeå University library system has encouraged us for a research study in our thesis. The main intention of our research is to explore how to improve the interaction between users and Umeå University Library, so that users can easily acquire information, whenever they need, without any obstacle. The research activities were inspired and enclosed by this particular research question.

*RQ: How can we facilitate users in reading room of Umeå University library for better interaction with information?*

The Research question will be addressed by the support of activity theory. We will discuss and explore Activity Theory, so that we can use it for finding solution of our research question that is to facilitate users of reading room of Umea University Library for better interaction with information.

## **2. Review Of Activity Theory**

Activity theory (AT) was derived in the Soviet Union .Activity theory was designed for cultural and psychology. The basic aim of activity theory is to understand the human activities. In 1980 activity theory had been developed for human computer interaction. ?. In 1970, the Scandinavian researchers has described that the activity theory could be used in different fields such as computer, human computer interaction and information technology. (Bertelsen, 2003) Kaptelinin and Nardi (2006) have written in their book that Leontév has described activity theory in “small theoretical book”. Leontiev did not explain activity theory in detail but the book of Leontiev is only a compilation of short essays and intoduction. Curently there is no any systematic intoductory level of activity theory. “There is a clear need for such an intoduction, especially in interdisciplinary fields” (Kaptelinin and Nardi,2006). Activity theory has been used in different fields of science and psychology. Activity theory is widely used in the field of human computer interaction, information communication technology and software engineering. “*Activity theory is a general conceptual approach rather than a highly predictive theory*” (Kaptelinin, Nardi and Macaulay, 1999 p. 28). Different parts of activity theory consisting of subject, object, tools and division of labor. Each and every part in AT is playing a vital role. We cannot ignore a single part of human activity, just like necessity is the classic part of invention i.e. no necessity no need. We think that the understanding the human activities is a complex part in the activity theory. Kaptelinin, Nardi and Macaulay (1999 p. 28) presented two basic ideas, which are as follow

*1) The human mind emerges, exists and can only be understood within the context of human interaction with the world.*

*2) The interaction, that is activity, is socially and culturally determined.*

Five basic principles are very important for understanding the structure of Activity theory, which are as follow

### **2.1 Object Oriented-Ness**

The construction of the object oriented-ness means that any kind of activity is directed towards something that already exists in this world. This is called object oriented-ness. Activity of human has two types of objects. One is thing and other is people. In AT object can be physical, chemical and biological property. Social and cultural entities are also the characteristics of the object i.e. software, RFID (Radio-frequency Identification) technology, computers, students, teachers etc. (Kaptelinin, Nardi and Macaulay, 1999)

### **2.2 Hierarchical Structure Of Activity**

In Hierarchical structure the activity is the interaction between artefacts and the activity hierarchy. This hierarchy contains three basic levels i.e. activity, action and operation. Activity is a basic phenomenon of human beings. Humans try to do activities to full fill their needs and desires; motive is a tool to achieve the goals. Humans use their actions to achieve their goals or to accomplish the motive. In Umea University Library System (UULS) our goal

is to provide the user friendly environment to students by improving the reading room functionality of library system. The steps which we are trying to complete our goal is called the action. Goals can be broken into the sub level of goals. i.e. in UULS we will break our desired goals into sub goals. In first step, we will gather all the data, will review the literature and then will analyse the data according to goal decomposition. (Kaptelinin, Nardi and Macaulay, 1999)

## 2.3 Internalization And Externalization

There is a big difference between internal activity and external activity. We can say that the mental processing in the cognition interaction design is an internal activity. In activity theory internal and external activities cannot be understood if we analyse it individually. As Internal activity and external activity are directly proportional to each other. If we want to find out the internal activity then first and foremost, we will find out the external activity (Kaptelinin, Nardi and Macaulay, 1999). According to Kaptelinin, Nardi and Macaulay (1999 p. 29)

*learning to calculate may involve counting on the fingers in the early stages of learning simple automatic. Once the arithmetic is internalized, the calculations can be performed in the head without external aids. Internalization provides a means for people to try potential interaction with the reality without performing actual manipulation with real objects (mental simulation, imagining, considering alternative plans, and so forth).*

Communication between some humans requires externalization of their activities.

## 2.4 Mediation

The activity theory is more concerned with the social issue as compared to technical issue. Mediation is a tool that plays an important role in human and machine interaction or human and their environment (Kaptelinin, Nardi and Macaulay, 1999). Kaptelinin, Nardi and Macaulay (1999 p. 31) states that

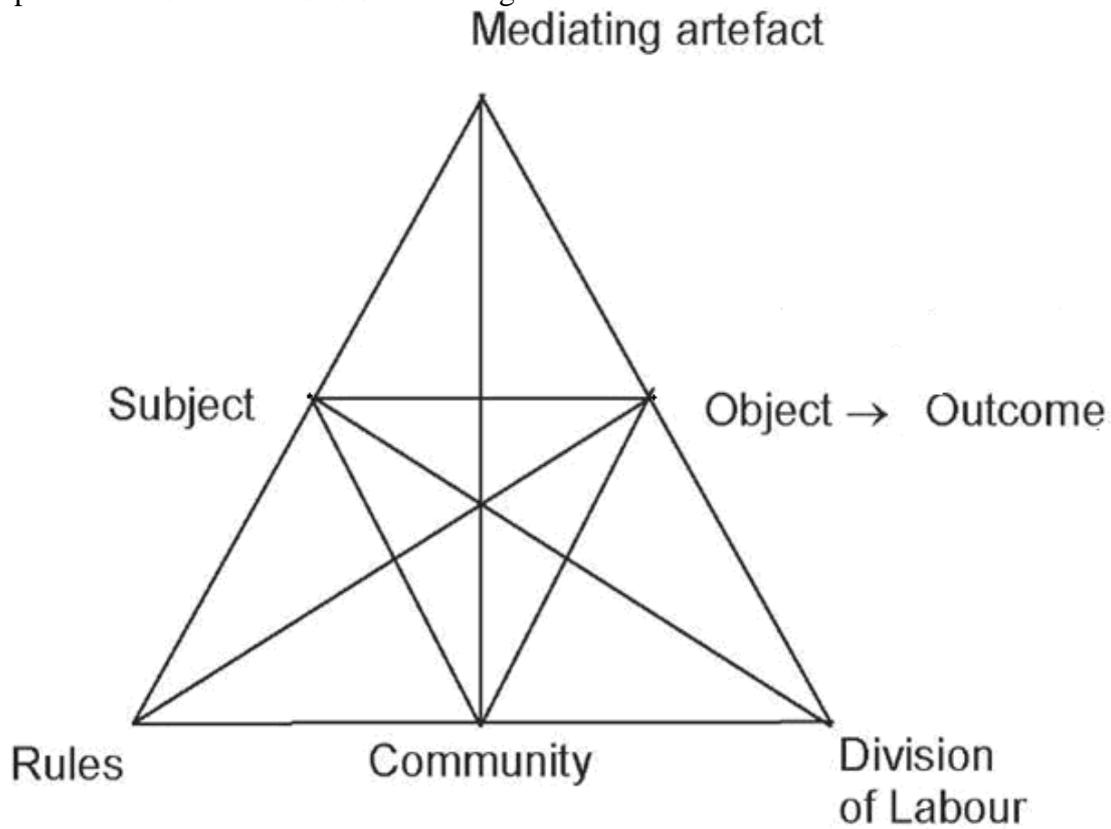
*first tools shape the way human being interact with reality. Shaping external activities results in shaping internal activities. Secondly, tool usually reflects the experience of other people who tried to solve similar problems before or invented or modified the tool to make it more efficient and useful.*

## 2.5 Development

Development in activity theory plays a vital role. It is not only a part of activity theory but it is also a research methodology. This tool is more useful, user-friendly and efficient in observation and data gathering. (Kaptelinin, Nardi and Macaulay, 1999)

So the activity theory is “*set of basic principles which constitute a general conceptual system which can be used as a foundation for more specific theories*” (Kaptelinin, Kuutti, & Bannon, 1995, p. 190). These principles create the fundamental data collection in the human activities and computer interaction field. In a sense activity theory is not especially for the technology or technical devices but when we want to accomplish our needs or desires then we need some human activities. For example in our project UULS, when a student wants to search any book from the library he uses the library system. That system is one object but the

activity that a student is doing is the part where the activity theory is purely implemented. Engeström diagram which he presented in 1987, shows the activity flowing and how we can conceptualize these activities as shows in figure 1.



**Figure 1:** Basic model of activity (Adopted from Engeström, 1987. p)

The artifact intercedes (mediating) the association between subject and object. So, the rule intercedes (mediating) the association between subject and community. In the same way, division of labor intercedes (mediating) the association between object and community. These three factors which we have described above are the hierarchical structure of the activity. In activity theory an action is a task of any human to achieve goal. Human actions are self-motivated and dynamic. When a subject wants to achieve an object then it performs activity during achieving goal. So that activity is called the outcome in activity model. The outcome is a basic factor that motivates the subject to achieve his objects. Goals motivate to perform actions and actions are strings of functions. These functions are the rules by which human perform actions. Human actions change day by day. When they want to perform new actions they perform new action with a more skilled and experienced manner. Activity is not fixed it is vibrant. These vibrant activities are creating the change in the hierarchal structure, which manipulates the user's activities in the environment. Sometime activities can be influenced by the environment. So this influence creates critic between the subject and object "Critics would like to add to the research object the users and their work tasks in real life" (Kuutti, 1996, p.18). So the activity theory has the ability to handle these critics in well manner. According to Bertelsen and Bodker (2003) "activity theory is an answer to the problem". This theory does not handle the contradictions but it provides complete solution of problems. So that's why we have chosen activity theory as investigating tool for our research work. The concept of critics or contradiction gave the critical evaluation in activity theory and these critics can provide good concept and evaluation to improve the UUL system.

## 2.6 Why Activity Theory Is Used For UULS

Activity theory is a tool for investigation and analysis. Designing new system for human's improvements is a fundamental issue. Commonly, activity theory widely has been used in information and communication technology, distance learning education systems and library system. Scientists are trying to implement it in "subfield of human-computer interaction (HCI) known as computer supported cooperative work (CSCW) attempts to build tools that will help groups of people to more effectively accomplish their work, as well as their learning and play" (Kraut , 2003). Kraut has focused the activity theory in computer support collaborate work. Human computer interaction (HCI) focuses mostly on embodiment process. But the relationship between activity theory and human computer interaction provides the huge mediation in the field of technology and library based system. Human computer interaction and activity theory is a gadget that creates the revolution in the field of HCI. In 1992 Kuutti and Aeronen presented a paper that computer supported cooperative work (CSCW) is a basic tool for investigation in research area. (In HCI field the term ethno methodology is a technique that, the researchers are using for the data gathering (Button, 2003)) .CSCW uses ethno -methodology for investigation of for data collected. CSCW, activity theory and ethno -methodology can be used in library based system to bring revolution in technology and we can provide to students a good learning environment. Activity theory is functional tool for interactive designer to build an attractive and user-friendly system. In our library based project we will apply this theory in conventional logic. We investigate all alterations in library to find out the activities and work flow of the system and machines. i.e. Engeström applied this activity theory in a hospital (Engeström, 2001). He (Engeström) applied this theory for observation, learning and practice. He also investigated and analysed the hospital work that, how the technology works plus behaviour of machine and activities of peoples.

For example in our UUL system, the assumption is that all students have a goal to find out the books in reading room and read it. The main goal is to read the book within the University. But the current system does not provide the full details to users to get books. So we will investigate this problem through activity theory. "Therefore, activities are understood by Engeström as collective phenomena, both with respect to their object (as directed towards an object shared by a community) and with respect to their form (as carried out collectively rather than individually)" (Kaptelinin and Nardi, 2006). By using the activity theory in any organizational field (UULS) we have three main benefits which are; first, the activity theory can provide observation and data collection in easy way. Second the activity theory provides those solution and concepts that other theories cannot provide (actor network and distributed cognition). We can say that it is a tool that monitors all the intensions and interaction of subject and technology. Third, the AT is an application which provides most appropriate solution according to requirements (Kaptelinin and Nardi, 2006).

## 3.Methodology

Research design plays an important role in formulating a research process. Research design is very important to describe, predict and understand the research question. In context of research design, it's a methodology that can help in understanding, gets us tools to answer our questions and can be very effective and reflective in everyday life (Mark L.Mitchell & Jannia M. Jolley, 2010). The basic purpose of research design is to organize the research questions and methodological considerations. In our research design we have 1<sup>st</sup> developed research question, then we have selected a methodology to gather relevant data to find the solution for our research question.

Selection of an appropriate research methodology for data collection is very important. *“Research methodology is a way to systematically solve the research problem”* (C. Rajendra Kumar, 2008 p.5). The method which we have selected for data gathering is Contextual Inquiry as Activity Theory does not emphasise us, to use any specific method to gather data, instead it suggest to determined it by the research question (Nardi,1996). Our reaseach design is based on library students, teachers and librarians, for which we need a detailed analysis of the users and system activities. So that we have selected Contextual Inquiry to observe, interview and analyse the the users behaviour and ask questions during observations to know the overall process and nature and complexity of the system and users approach of dealing with the problems. We have selected this CI as main method for collecting data as in one of the research project on Mobile Applications Development in USA, Virpi Roto & Heli Vaataja they used the Contextual Design approach as main method for the collection of data (Virpi Roto & Heli Vaataha, 2010). According to Holtzblatt and Beyer (1999, p.34) there are several parts to consider when using the design approach Contextual Design. According to Hugh Beyer & Karen Holtzblatt Contextual Inquiry is *“The first problem for design is to understand the customers: their needs, their desires, and their approach to the work. Contextual Design starts with one-on-one interviews with customers in their workplace while they work.”* (Hugh Beyer & Karen Holtzblatt, 1998, p.22) After performing the Contextual Inquiry phase, where contextual interviews have taken place, the process enters the work modelling phase. The main focus there is to produce models for representing the data collected in the first phase. Working with these models include a clear structural picture of the work done on the results got and also gives the designer teams a “language” with which to share thoughts between all involved (Holtzblatt & Beyer, 1999, p. 35). It was necessary to gather useful data and information regarding library activities, goals, sub-goals and other parts involved in the Umeå university library project, so we thought that we should apply Contextual Inquiry method. So, for the effective qualitative type of data we collected data by interviews, observations and questionnaires, this type of collecting data is known as Contextual Inquiry. *“Contextual inquiry means living in customers’ environment and walking in customers shoes to understand the customer real situation”* (Shōji Shiba & David Walden, 2001 p.244). Contextual Inquiry begins with the interviews and observations at workstation, where we put emphasis on the users which are working there. The investigator starts his investigation from user by observing and interviewing him during his work and gathers his relevant data on paper or by audio or video means, which can help in data analysis. *“Contextual Inquiry produces documents that are strategically designed to be effective inputs to subsequent development stages”* (Richard W. Pew, Anne S. Mavor, 2007, p.177). As by Nardi 1996, Activity Theory does not suggest any specific method for the collection of the data, as it is determined upon the context of research question. Another main reason of selecting the Contextual Inquiry method in our project was that, in one of the research project in Belgium they used Contextual inquiry method as main data gathering method in activity theory for finding the frame work of Digital libraries (Jorn De Boever, Dirk De Grooff, 2009). The other reason was that we were also very familiar and have experience of using this data gathering technique. We have previously used CI data gathering technique in our different academic research projects like blood pressure & sugar patients of Vårdcentral, trend of using internet on different digital artifacts and Trends in Media & News Production. We know that gathering relevant data is a difficult task, which demands clear understanding of the problem, system and users and the problems which the users faces. This type of research requires time, required proper information of the system and other constraints which can affect our work. *“People know everything—everything—about what they do. They just can’t tell you.”* Karen Holtzblatt (Founder & CEO, In Context). Another reason of choosing Contextual Inquiry Method was that, it gives the flexibility of observing users working and performing their task

normally, and asking them questions if we didn't understand their activities at the work environment. "Contextual inquiry is way for the users to participate in design of general purpose system" (Douglas Schuler & Aki Namioka,1993). The CI can help us in finding the main kinds of problem which users are facing in the library and what are their reactions when they face any problem and how they deal with those problems. In the meanwhile we can note their activities, kinds of problem, and the reactions of users for our analysis purpose to find out the possible solution for our research question.

Data collection was occurred in period of one week in which we observed, interviewed and also did some survey from students, researchers and librarians to strengthen our research. We have observed the whole libaray system instead of only library Red Room beacause, the Umeå libaray provides their users the same mediating artificat (website) for accessing the libaray information. As the both main libaray and red room of libaray is accessed through the same tool which is website, then we thought to analse the whole libaray system to know the overall problems. After that we can select which problems are related to our research question and how can we handle and rectify those problems after collecting data.

### 3.1 Observations

In the First step we have asked some students to help us in geathering data, when they use library and libaray website so that we can observe their activities. Observation is a best way to find out how people perform their work with help of interviews and qeuestionnaires. It can help us in knowing the problems, needs and other tasks which they do to perform the certain work. After arranging few users (Students), we went to Umeå university library and red room for the observations, to know how users interact with the library to extract information. We asked those students to perform their work in front of us; in meanwhile we noted their actions, operations and activities on notepad. i.e How do they use library system to search and lend books? how do they perform these activities? and how do they use reading room facilities? What kind of problem they faced during accessing the library ? how do they handle and solve with those problems?

### 3.2 Questionnaires & Interviews

In the 2<sup>nd</sup> step we have formulated some guideline questions for the interview to understand the complexity of library system and the difficulties, which students and administrations are facing. The research from the interviews will enable us to identify each area of user and library interaction.

The following interview questions have aided us in Identifying trends that arise in projects with complex working environments of library which we did not understand during our observations. We asked these questions both from the librarian and the library users after observation, which has helped us to identify gathering more data from Umeå library.

Type of Users	No of Users	Questions
Students /	25	Why do you use library?
		Do you prefer reading book by taking loan or read in library?
		Do you prefer textbook or e-books?
		What is your impression of using digital artefacts such as e-book, digital

<b>Researchers</b>		machines?
		Are the facilities provided by the university library are enough?
		What is your experience of reading in library?
<b>Librarians</b>	<b>3</b>	What kind of problems are you facing in University study room?
		How do you find the book, if they are placed wrongly in the shelves?
		How do you handle locate for those books which are not for loan?
		Is the library system showing all the information about books?
		Which are the main factors which can improve the library system?
		What are opportunities and challenges you faced working or studding in library?

### 3.3 Survey

In the 3<sup>rd</sup> step of data collection we have also used a survey. As mentioned above that due to lack of time, we used a survey to identify the users, library and the users of library , that can help us in our project. We went to library and give the survery form to those users who were present in the Umeå libray and also did the online questionnaire survey by putting a link on Umeå University and buddy program fan pages, on the Facebook to get their opinion. <https://spreadsheets.google.com/spreadsheet/viewform?formkey=dHFLZDdHVFl2ZGN2b1RoaXhrU1U3MWc6MQ>

### 3.4 Results from Observation & Interviews

#### 3.4.1 Booking & Borrowing Scenario

We observed that that for the booking of book, users have to login to Umeå university library system (website) through library card. After the login,user can see the menu bar on the left side of the library website, from their user can select the book option button in album and search for his desired book,. When the users will click the search option button, then they can see different titles of the book with their author name, year of book published and there location in the library. After the selection process of desired book, the system will show them details of book and availability process. The Umeå university is using bar code system to locate and manage the books inventory system. After knowing the desire information of books the user will go to library and find his book. Here the Umeå university library online system shows two types of books; one which can be requested for the booking and borrowing purpose and others are for the No Loan, which means the NO Loan books can only be used

with in the library for studying. The Loan period for the normal text books is 14 and for the regular book is 30 days. If a book is out for loan you may sign up in the waiting list in Album by putting up a request. When that particular is available for borrowing or lending purpose, a text message and an e-mail will be sent to your e-mail account to take your requested book. You can pick that requested book within three days, otherwise that book will be given to the next person in queue, who has also requested for that book. Borrowing procedure was almost the same as booking procedure.

**3.4.2 Returning Scenario**

When the students’ loan period is over, they need to return the book according to library loan period rules. The students can return the book in main university library or at the return desk in the medical library. During the library off hours user can also return the book by dropping book in one of the book drops put outside the Umeå university library. Generally he returning procedure is that, the user or any person can go to the Umeå library and return it using machine installed at the main Umeå library room , which will automatically receive the book and gives the user a receipt showing that his loan is deactivated.

**3.5 Results From Survey**

**1: No of Respondents who filled the Questionnaires.**



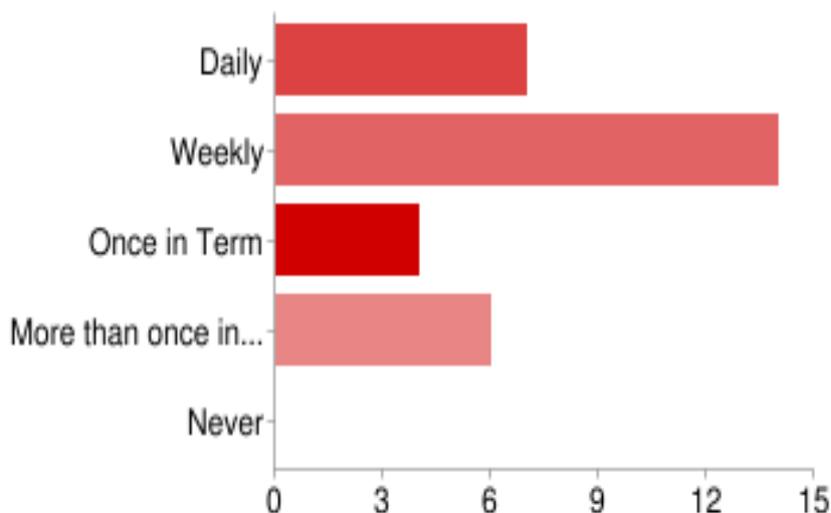
<b>Male</b>	<b>27</b>	<b>87%</b>
<b>Female</b>	<b>4</b>	<b>13%</b>

**2 : what is the occupation of Resondents?**



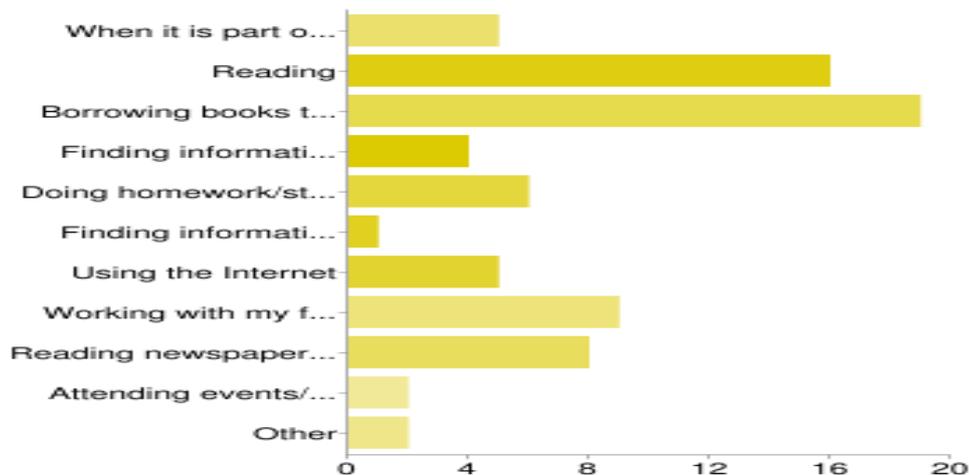
<b>Student</b>	<b>28</b>	<b>90%</b>
<b>Researcher</b>	<b>2</b>	<b>6%</b>
<b>Teacher/Professor</b>	<b>1</b>	<b>3%</b>
<b>Other</b>	<b>0</b>	<b>0%</b>

### 3: How often users use library?



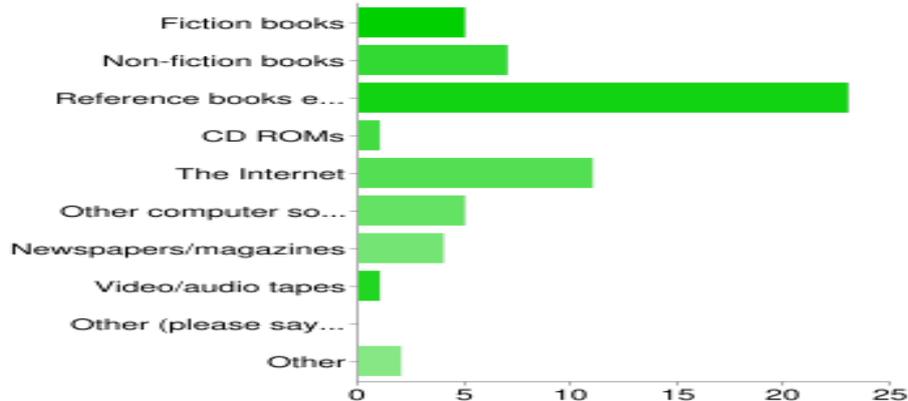
<b>Daily</b>	<b>7</b>	<b>23%</b>
<b>Weekly</b>	<b>14</b>	<b>45%</b>
<b>Once in Term</b>	<b>4</b>	<b>13%</b>
<b>More than once in term</b>	<b>6</b>	<b>19%</b>
<b>Never</b>	<b>0</b>	<b>0%</b>

### 4: Why do they use library?



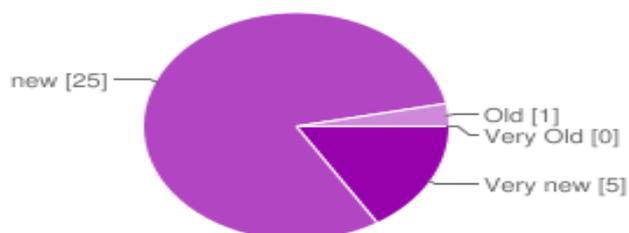
<b>When it is part of a lesson</b>	<b>5</b>	<b>16%</b>
<b>Reading</b>	<b>16</b>	<b>52%</b>
<b>Borrowing books to read at home</b>	<b>19</b>	<b>61%</b>
<b>Finding information for homework</b>	<b>4</b>	<b>13%</b>
<b>Doing homework/studying</b>	<b>6</b>	<b>19%</b>
<b>Finding information for hobbies or interests</b>	<b>1</b>	<b>3%</b>
<b>Using the Internet</b>	<b>5</b>	<b>16%</b>
<b>Working with my friends</b>	<b>9</b>	<b>29%</b>
<b>Reading newspapers/magazines</b>	<b>8</b>	<b>26%</b>
<b>Attending events/activities e.g. book clubs, book fairs</b>	<b>2</b>	<b>6%</b>
<b>Other</b>	<b>2</b>	<b>6%</b>

**5 : Which library resources they oftenly use**



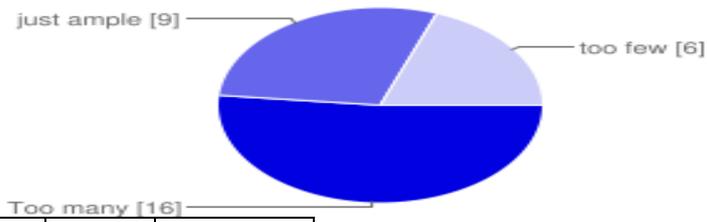
<b>Fiction books</b>	<b>5</b>	<b>16%</b>
<b>Non-fiction books</b>	<b>7</b>	<b>23%</b>
<b>Reference books e.g. encyclopaedias</b>	<b>23</b>	<b>74%</b>
<b>CD ROMs</b>	<b>1</b>	<b>3%</b>
<b>The Internet</b>	<b>1</b>	<b>35%</b>
<b>Other computer software</b>	<b>5</b>	<b>16%</b>
<b>Newspapers/magazines</b>	<b>4</b>	<b>13%</b>
<b>Video/audio tapes</b>	<b>1</b>	<b>3%</b>
<b>Other (please say what)</b>	<b>0</b>	<b>0%</b>
<b>Other</b>	<b>2</b>	<b>6%</b>

**6 : Books in library are generally?**



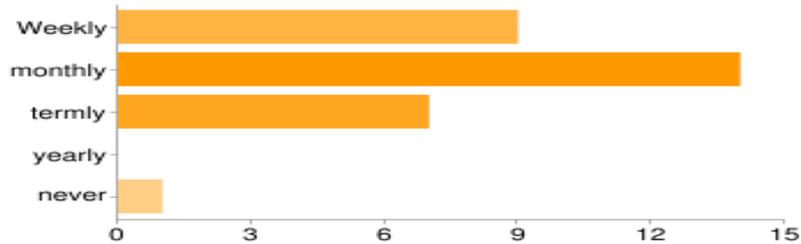
<b>Very new</b>	<b>5</b>	<b>16%</b>
<b>new</b>	<b>25</b>	<b>81%</b>
<b>Old</b>	<b>1</b>	<b>3%</b>
<b>Very Old</b>	<b>0</b>	<b>0%</b>

**7: Number of books in library?**



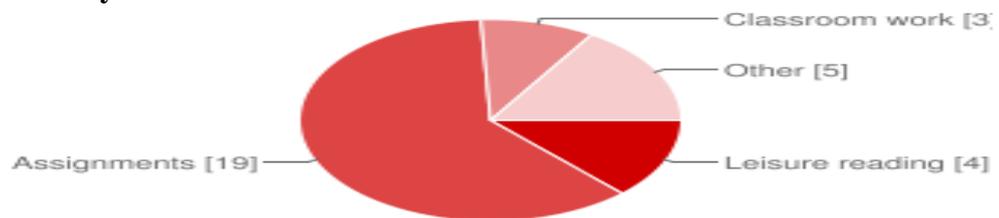
<b>Too many</b>	<b>16</b>	<b>52%</b>
<b>just ample</b>	<b>9</b>	<b>29%</b>
<b>too few</b>	<b>6</b>	<b>19%</b>

**8: I borrow books from library?**



<b>Weekly</b>	<b>9</b>	<b>29%</b>
<b>monthly</b>	<b>14</b>	<b>45%</b>
<b>termly</b>	<b>7</b>	<b>23%</b>
<b>yearly</b>	<b>0</b>	<b>0%</b>
<b>never</b>	<b>1</b>	<b>3%</b>

**9: Users use library books for?**



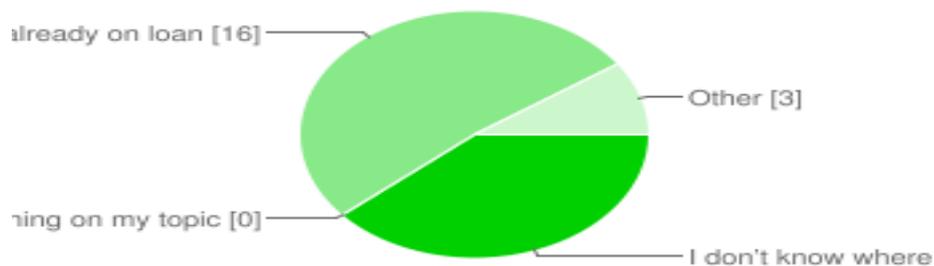
<b>Leisure reading</b>	<b>4</b>	<b>13%</b>
<b>Assignments</b>	<b>19</b>	<b>61%</b>
<b>Classroom work</b>	<b>3</b>	<b>10%</b>
<b>Other</b>	<b>5</b>	<b>16%</b>

**10: Users find the books usually from library?**



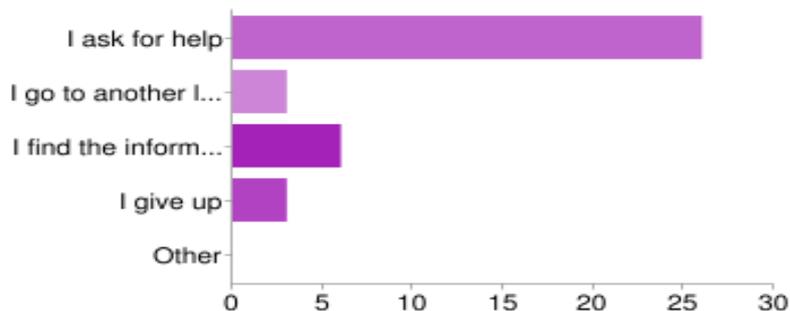
Always	<b>7</b>	23%
most of the time	<b>22</b>	71%
rarely	<b>2</b>	6%
never	<b>0</b>	0%

**11: When you don't find books, whats the reason?**



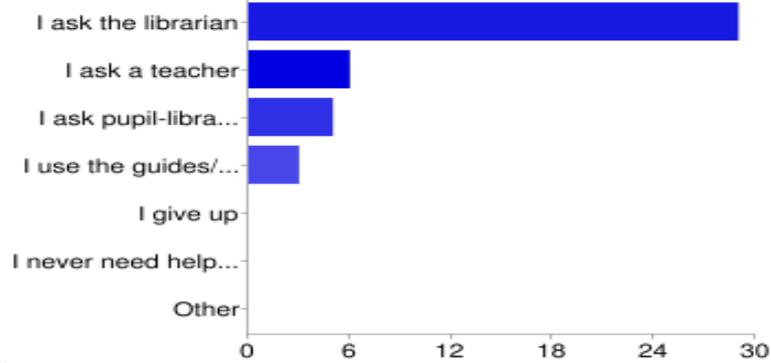
I don't know where to look	<b>12</b>	39%
The library has nothing on my topic	<b>0</b>	0%
The materials are already on loan	<b>16</b>	52%
Other	<b>3</b>	10%

**12: If i dont find the required book what i do?**



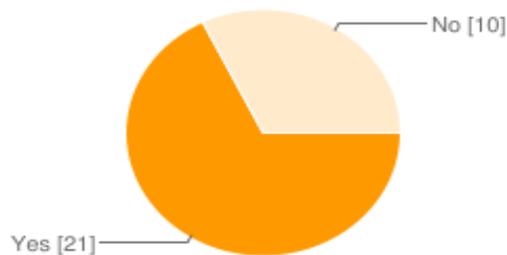
<b>I ask for help</b>	<b>26</b>	<b>84%</b>
<b>I go to another library</b>	<b>3</b>	<b>10%</b>
<b>I find the information at home</b>	<b>6</b>	<b>19%</b>
<b>I give up</b>	<b>3</b>	<b>10%</b>
<b>Other</b>	<b>0</b>	<b>0%</b>

**13: When I need help in using library?**



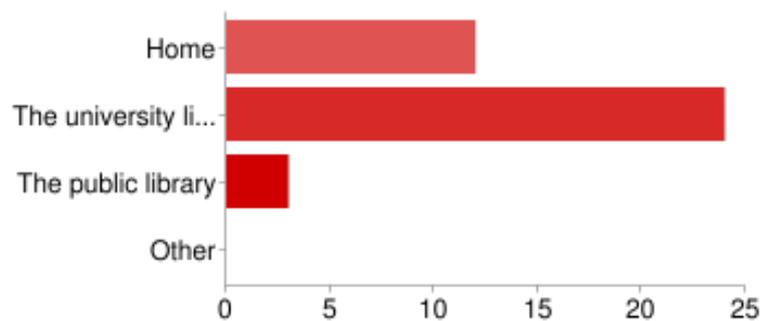
<b>I ask the librarian</b>	<b>29</b>	<b>94%</b>
<b>I ask a teacher</b>	<b>6</b>	<b>19%</b>
<b>I ask pupil-librarians or other pupils</b>	<b>5</b>	<b>16%</b>
<b>I use the guides/leaflets</b>	<b>3</b>	<b>10%</b>
<b>I give up</b>	<b>0</b>	<b>0%</b>
<b>I never need help using the library</b>	<b>0</b>	<b>0%</b>
<b>Other</b>	<b>0</b>	<b>0%</b>

**14: Would you like training to use library?**



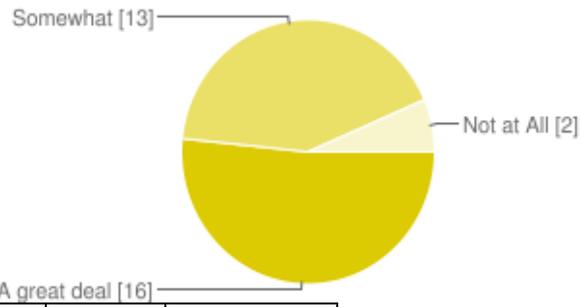
<b>Yes</b>	<b>21</b>	<b>68%</b>
<b>No</b>	<b>10</b>	<b>32%</b>

**15: When i need information for assignment, I most often use resources from ?**



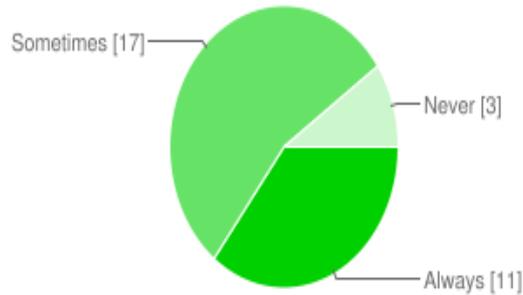
<b>Home</b>	<b>12</b>	<b>41%</b>
<b>The university library</b>	<b>24</b>	<b>83%</b>
<b>The public library</b>	<b>3</b>	<b>10%</b>
<b>Other</b>	<b>0</b>	<b>0%</b>

**16: If the particular book is not available in library, would it affect my work?**



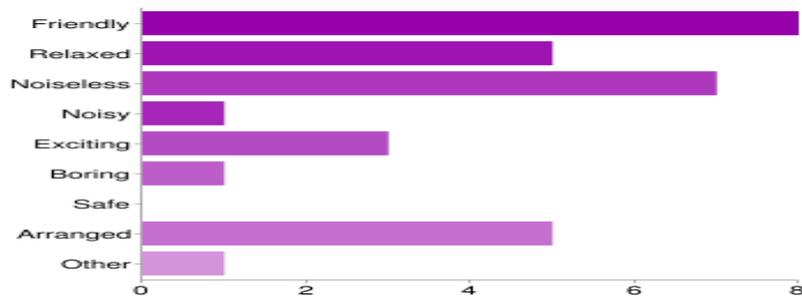
<b>A great deal</b>	<b>16</b>	<b>52%</b>
<b>Somewhat</b>	<b>13</b>	<b>42%</b>
<b>Not at All</b>	<b>2</b>	<b>6%</b>

**17: When i choose a book, i mostly found the book on shelves?**



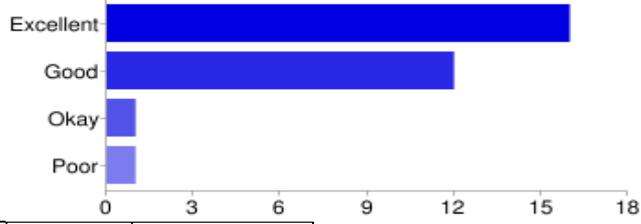
<b>Always</b>	<b>11</b>	<b>35%</b>
<b>Sometimes</b>	<b>17</b>	<b>55%</b>
<b>Never</b>	<b>3</b>	<b>10%</b>

**18: I would library as :**



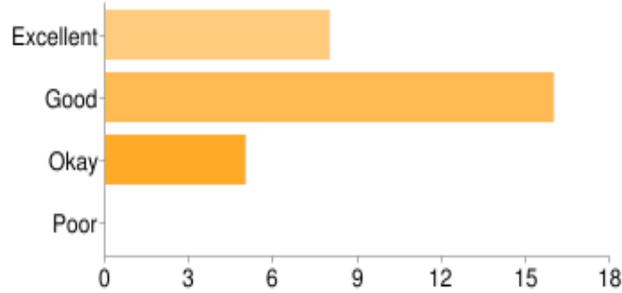
<b>Friendly</b>	<b>8</b>	<b>26%</b>
<b>Relaxed</b>	<b>5</b>	<b>16%</b>
<b>Noiseless</b>	<b>7</b>	<b>23%</b>
<b>Noisy</b>	<b>1</b>	<b>3%</b>
<b>Exciting</b>	<b>3</b>	<b>10%</b>
<b>Boring</b>	<b>1</b>	<b>3%</b>
<b>Safe</b>	<b>0</b>	<b>0%</b>
<b>Arranged</b>	<b>5</b>	<b>16%</b>
<b>Other</b>	<b>1</b>	<b>3%</b>

**19: How would you describe this library?**



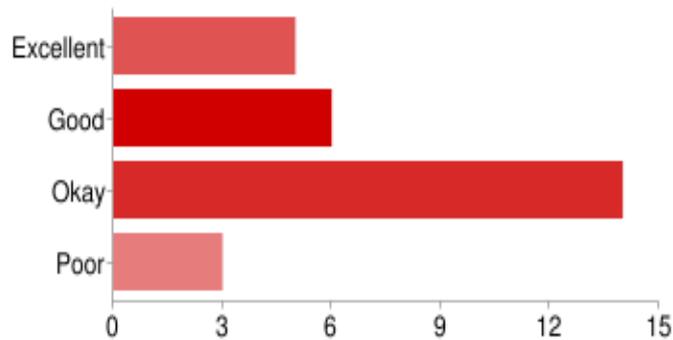
<b>Excellent</b>	<b>16</b>	<b>52%</b>
<b>Good</b>	<b>12</b>	<b>39%</b>
<b>Okay</b>	<b>1</b>	<b>3%</b>
<b>Poor</b>	<b>1</b>	<b>3%</b>

**20: Rate the reference are of library ?**



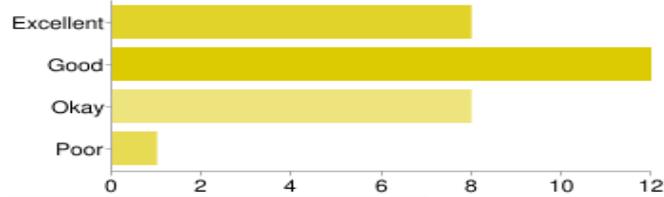
<b>Excellent</b>	<b>8</b>	<b>26%</b>
<b>Good</b>	<b>16</b>	<b>52%</b>
<b>Okay</b>	<b>5</b>	<b>16%</b>
<b>Poor</b>	<b>0</b>	<b>0%</b>

**21: Rate library by availability of books ?**



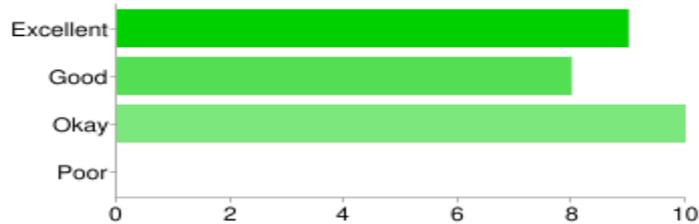
<b>Excellent</b>	<b>5</b>	<b>16%</b>
<b>Good</b>	<b>6</b>	<b>19%</b>
<b>Okay</b>	<b>14</b>	<b>45%</b>
<b>Poor</b>	<b>3</b>	<b>10%</b>

**22: Rate the computer area of library?**



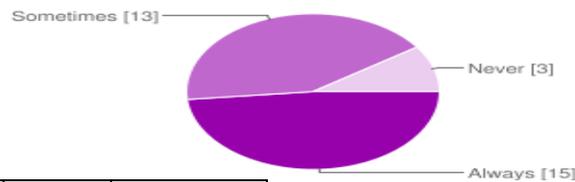
<b>Excellent</b>	<b>8</b>	<b>26%</b>
<b>Good</b>	<b>12</b>	<b>39%</b>
<b>Okay</b>	<b>8</b>	<b>26%</b>
<b>Poor</b>	<b>1</b>	<b>3%</b>

**23: Rate the reading area (Red room) of library ?**



<b>Excellent</b>	<b>9</b>	<b>29%</b>
<b>Good</b>	<b>8</b>	<b>26%</b>
<b>Okay</b>	<b>10</b>	<b>32%</b>
<b>Poor</b>	<b>0</b>	<b>0%</b>

**24: Does the library system shows all information of the books in reading room?**



<b>Always</b>	<b>15</b>	<b>48%</b>
<b>Some times</b>	<b>13</b>	<b>42%</b>
<b>Never</b>	<b>3</b>	<b>10%</b>

**3.6 Findings from Observation & Interviews**

After the data collection through observations, interviews and survey, we noticed that the current system for booking and finding of “No Loan books” has some flaws which are:

1. Few textbooks for the purpose of loan for large number of students of a same subject.
2. No selection or booking procedure for the No Loan text book in library study room.
4. Some users don't return the book in time, which affect the studies of other students.
5. Overlapping reservations.
6. Difficult to find books if wrongly placed.

**3.7 Findings from Surveys**

After the data collection through survey, we have some findings based upon our survey results which are:

1. *61% of the library users use books as loan and 52% of the users prefer to read in the library.*
2. *74% of the library users read the text books and 35% of the users go in the library for using internet.*
3. *45% of the users lend books for a period of a month.*
4. *61% of the users use the library for making their assignments.*
5. *71% of the users find the books most of the time when they apply for particular book.*
6. *52% of the users said that books are already on loan and 12% of the users don't know where to look for that book.*
7. *52% of the users said that it affects their work a great deal when book is not available or they can't find it.*
8. *Only 55% of the users find the books on shelves rest of students work is affected.*
9. *45% of the users said that availability of books is just ok and only 16 % said it's excellent.*
10. *48% of the users said that they find all the information about book from UULS, 42% users said some times and 10% said never.*

### **3.8 Problems Identified**

After the observations, interviews and survey results we identified few main problems which are related to our research question that is affecting the interaction of users with library to extract information:

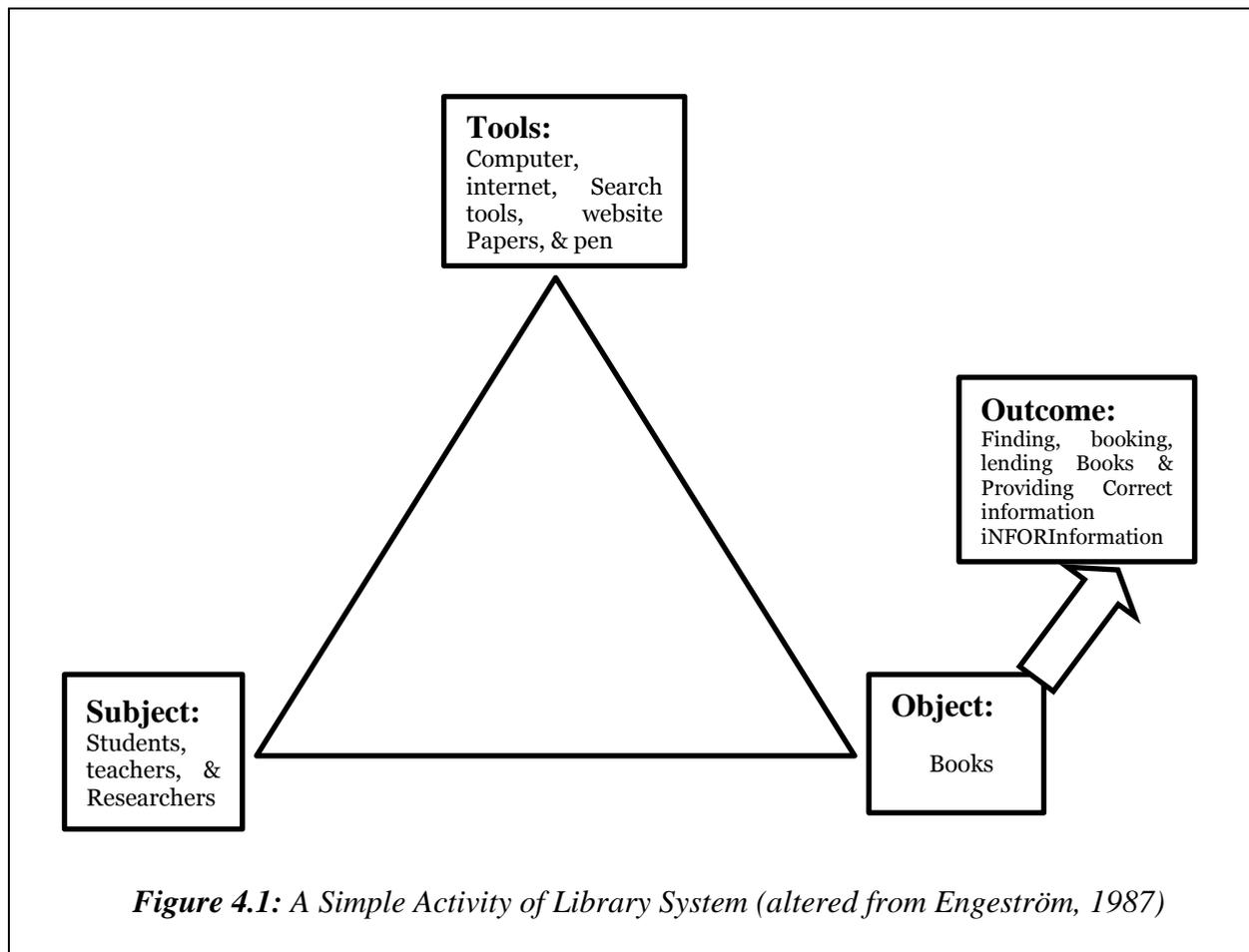
1. The tracking system of the library system is very poor which does not show correct and full information about the books regarding there availability and location.
2. It is very difficult for the usersto locate the books in Red room if wrongly placed or to find out that it is being reserved by other user.

## **4. Analysis of Library by Activity Theory**

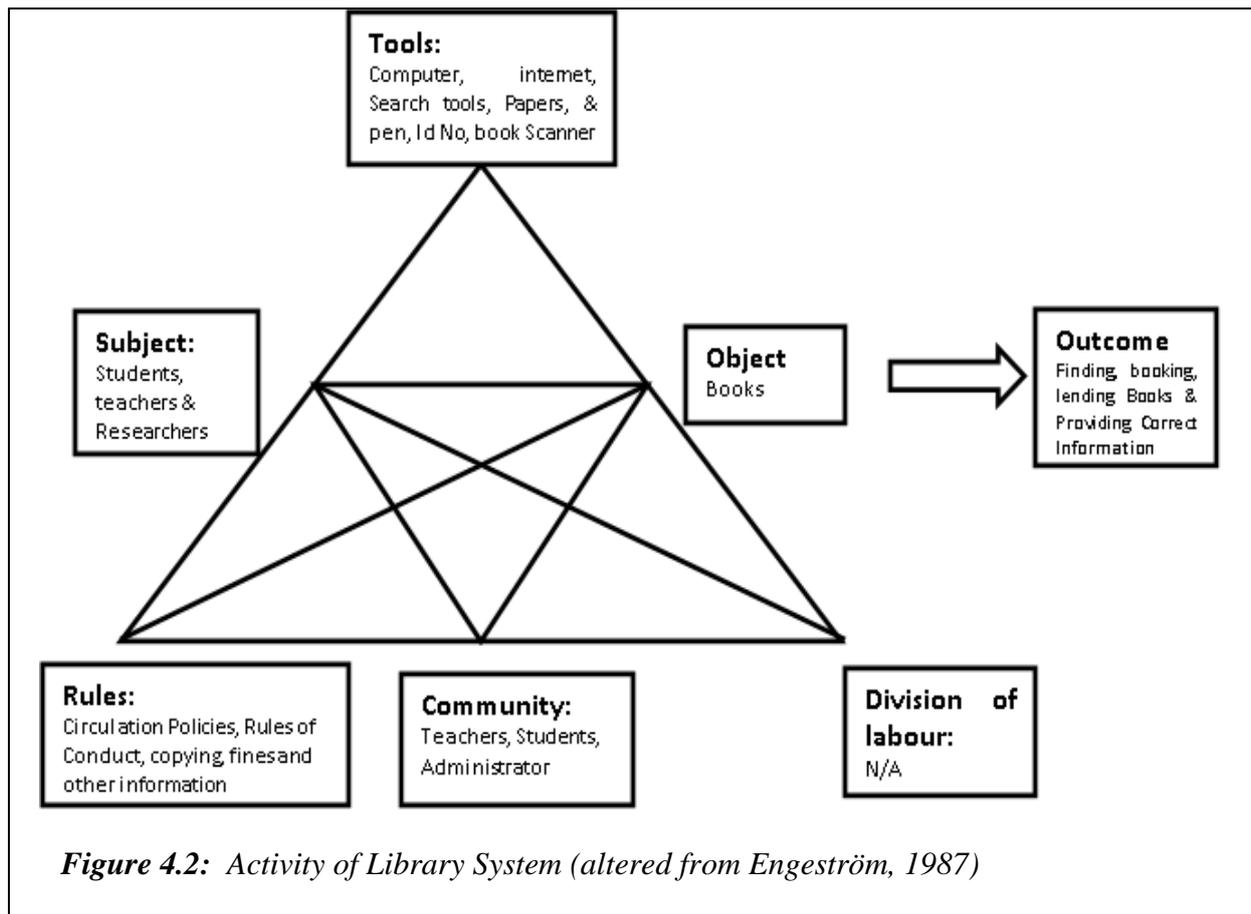
In this section we will analyse the overall activities which are performed by users in umeå university library to interact and extract information from library. As we have mentioned that we will use the concepts of Activity Theory to analyse our research question. The activity of user interacting with books in Umeå library has several components. Engeström (1987) structural model of an activity as discussed earlier, provide a clear understanding of the system as shown in the following figure 4.1. The figure shows the basic structure of an activity in the context of user interaction with library books.

### **4.1 Activities**

The main activity which is performed in the Umeå university library system is to provide the students the required book to help him in their studies during a course work. To perform this activity the system should have an inventory system maintained by the community and administrator to facilitate the students during their course work.



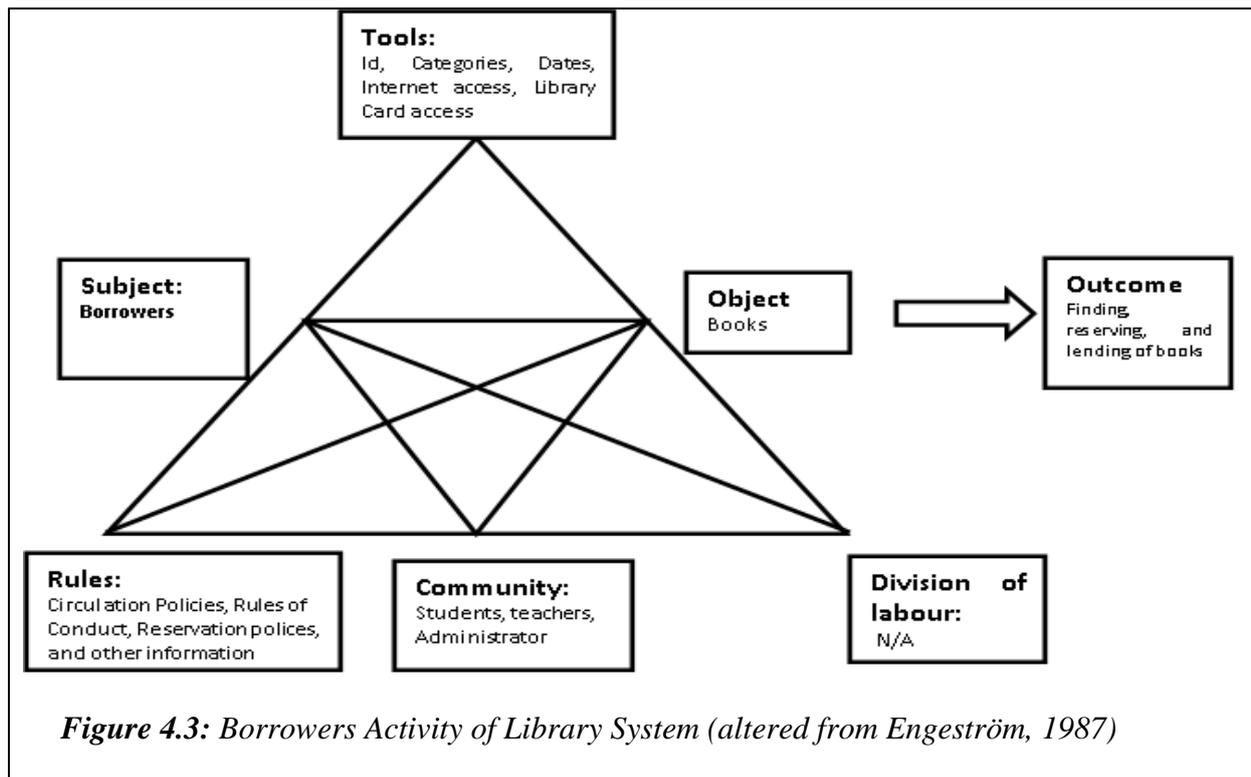
According to Engeström (1987) structural model, there is a subject who performs some kind of an activity. The subject knows the aim of the performing activity; this particular aim is known as the object of an activity. The subject gets the anticipated outcome with the help of some mediated tools which are used to perform an activity. After applying the AT on Umeå university library system, we saw that the subject (Student, Researcher or Teacher) uses some kind of tool (Computer, Internet, Website search tool, paper etc.) to locate an object (book) as shown in the above figure of library activity system. In this activity the tool is an association between the subject and object to perform an activity. When the subject (student, researcher or Teacher) performs an action on the mediating artifact (library website or library) to achieve an object (book), this is an activity for achieving an outcome. This outcome is also the basic factor that motivates the subjects to achieve their objects. These outcomes motivate the subject to perform an action, and actions are strings of function and these functions are the rules by which subjects perform their activities. When we analysed this activity further we found that, this activity is usually performed within the community and therefore the object is shared with the community as well. The relationship between the subject and community is mediated with the help of some kind of rules and relationship between the object and community is mediated with the help of Division of Labour. The figure 4.2 shows overall activity of student for accessing the library system to get a book.



Now, the subject (Student, Researcher or Teacher) will have to search, identify and borrow book for lending or reading purpose based upon the Umeå university library system (UULS). The UULS will work as per currently applied descriptions within the community (Rules). The UULS designers (Involved Community) will try to design such system that the users don't need to ask others to find book while locating book in reading room of library (Division of Labour). After analysing these things we will further elaborate the library interaction system activity with the help of Engeström (1987) triangle. The above figure 4.2 shows the structure of library system activity.

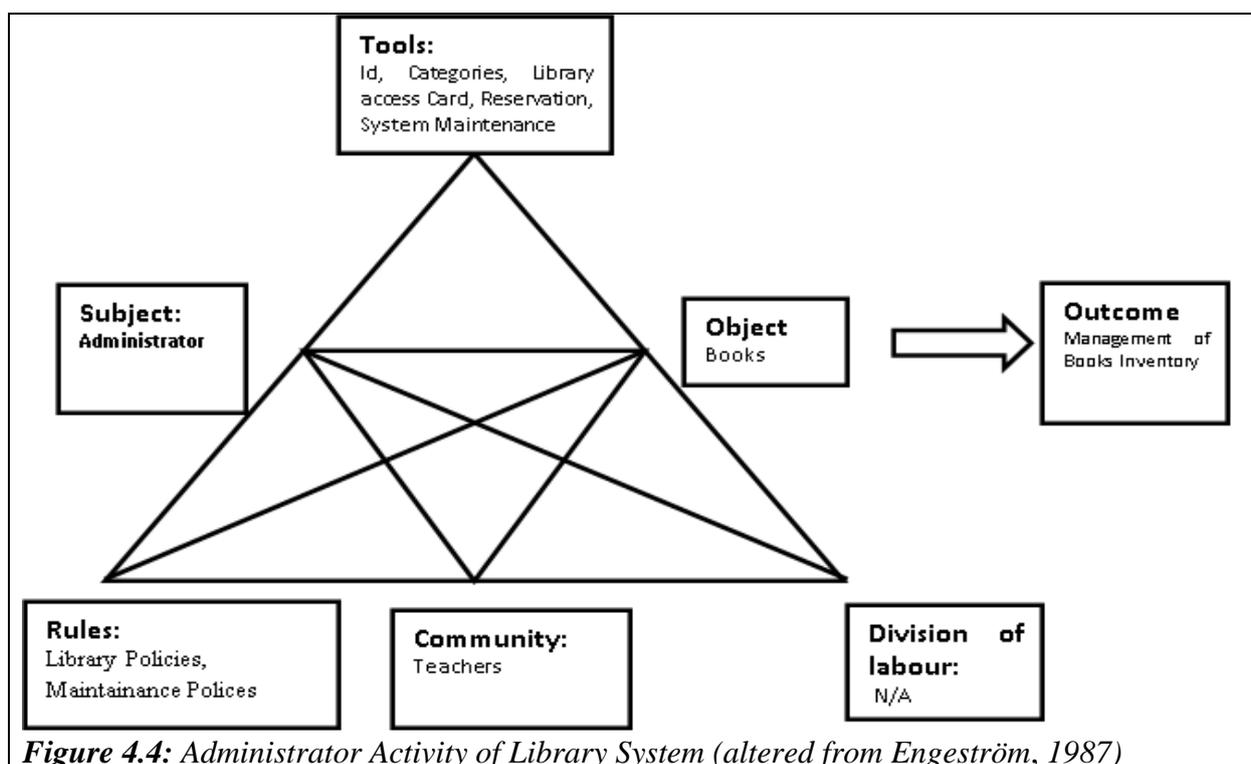
#### 4.1.1 Sub Goal of Library system (Borrowers Activity)

If we analyse the main library system, we identified during our observation that there is one main sub activity that is relevant to main users of the system who are borrowers, being students/teachers. Their main activity is to find the book by using the library system and the role of teachers here, is to make sure that the required book is available in the library and the administration role is to organize the inventory and category accordingly.



#### 4.1.2 2<sup>nd</sup> Sub Goal of Library system(Administrator Activity)

During over observation and analysis we came to know that the administrator who is taking care of all the inventory system of books also perform an activity to facilitate the students in locating the books. The following figure shows how borrowers perform their sub activity in order to complete the main activity.



## 4.2 Discussion

*We begin our discussion with our research question i.e.*

*RQ: How can we facilitate users in reading room of Umeå University library for better interaction with information?*

For finding the answer of this research question we did interviews, observation, and online survey and then we analysed the whole process with the help of AT performed by the students to interact with the information provided by Umeå library. When we analysed the process in whole with the help of Activity Theory, we found that the main system consists of several sub tasks to perform an activity.

In the 1<sup>st</sup> sub activity we found that the borrowers performs the main activity as they are involved in accessing information from the library system. If we further analyse this borrowers activity in detail we found that in this activity subject are the borrowers(students, teachers, researcher) who are accessing the library system through a set of tools (Id, Categories, website, Library Access cards) provided by the Umeå university library system to access the object(Book ) in order to get the desired outcome( Finding, reserving, lending of books). When the borrowers accessed the Umeå library website they use some tools like library access card, book id, dates, and then they search for the required book. In return, the system shows them the required information which borrowers (users) are looking for. The subjects (borrowers) has to follow some set of rules provided by the community regarding book borrowing procedure.

To complete the main activity of accessing information from Umeå library system the 2<sup>nd</sup> sub task, which is performed by the library administration is also very important which helps the borrowers to perform the 1<sup>st</sup> sub activity. In the administrator activity the subject (administrator) performs some activity with the help of tools (Id, Categories, Library access Card, Reservation, System Maintenance) in order to manage the books inventory system. In order to manage the books inventory system he(administrator) has to follow the rules provided the library and the community to add particular book information and its borrowing rules.

After analysing the main activities of library system to interact with information, we came to know that both the sub activities are inter related with each other. If one of the sub activity is not performed accordingly, the subject (student, teachers and researcher) of the main activity will face problem in acquiring the desired outcome to access the object (Book) with the help of mediating tool. But according to our problem identification during our research we found that the students are facing problem like

- The tracking system of the library system is very poor which does not shows correct information about books regarding there availability.
- Overlapping reservations.
- Difficult to locate the books in library if wrongly placed.

After analysing the whole activities of the Umeå library system with the help Activity Theory we found that most of these problems occur due to administrator activity. e.g. In the Umeå library system, when the users try to search book from the UULS the system shows that the current book is available in the Red Room. But it does not show the whole information that the book is being taken by somebody or it's on the shelf. The UULS administrators are responsible for giving such information to the users to interact with the system effectively. As we said earlier, that the borrowers and administrator activities are inter related with each other to perform main activity in the UULS to extract information. So, if the Administrator activity is not performed accordingly, (whose function is to manage the UULS

and they also responsible for provide the full information of book and its related polices for acquiring book from library or reading in red room). Then the borrower activity will also be affected which is that, the borrowers cannot find the required information about his desired item (books) form the inventory system of UULS.

After analysing the whole process of acquiring information from UULS with help of Activity Theory, we have found that the administrator activities are the main activities which are affecting the main activity for batter interaction and acquiring the information from UULS.

### **4.3 Suggestions**

*When we started our discussion we formulated a research question which is*

*RQ: How can we facilitate users in reading room of Umeå University library for better interaction with information?*

When we did our research to find our answer of this research question we identified many problems from interviews, observations and surveys in the Umeå University Library system during. When we analysed the whole Umeå University Library System with the help of Engeström Model we found the basic reason why these problems are occurring which are affecting the users from interacting with library and accessing information. Now, we are suggesting some points which we think, that can facilitate users in reading room of Umeå University library for better interaction with information.

#### **The 1<sup>st</sup> problems which we identified is**

1. The tracking system of the library system is very poor which does not show correct and full information about the books regarding there availability and location.

#### **4.3.1 Suggestion for betterment**

We think that if the administrators of the Umeå university library makes sure that all the information given on library website is up-to-date regarding its location of books in Red Room, time of reservation, lending time etc. then the user will never face problem to issue and find books from the library.

#### **The 2<sup>nd</sup> Major problem which we identified was**

1. It is very difficult for the usersto locate the books in Red room if wrongly placed or to find out that it is being reserved by other user.

#### **4.3.2 Suggestion for betterment**

To handle this problem we say that instead of using barcode tracking system, Umeå university library should install RFID system. Now the question arises, what is RFID ? and how can it make the UULS better ? RFID is an acronym for radio frequency identification, which is wireless communication technology that is used to uniquely identify tagged object or people. (V. Daniel Hunt, Albert Puglia & Mike Puglia, 2007)” Installing RFID system in library can bring a lot of benefits and it can also solve the existing problem which we have mentioned. The RFID system uses Chip instead of Barcode to give unique id to books. RFID system has many benefits which can help the Umeå University to facilitate its users by providing better information. The RFID system can also help the administrators in making book inventory vvery easily, it can be used at self, check in and check out and also used as anti-theft detection. The RFID system is currently installed and successfully running in the Canadian Public Library.

Coming back to our problem,if the book is wrongly placed or taken by any user in Red Room then with the help of PDA RFID detector, the user or administrator can easily locate

the book which will save his and administrator time as well as help the other students to read the book in time.

## **5. Conclusion**

We conclude that Activity theory can be very useful in finding the human activities in any field of information technology. We know that use of information technology in libraries has its own importance and with the help of Activity theory we have further analysed to know the overall activities of Umeå university library system. After analysing we have successfully able to find out which factors were involved in the field of education regarding library problems. AT has helped us to locate which part of Umeå library system is creating problems and also helped us to review the whole Umeå library system to find new solutions which can help the Umeå library and their users to interact with information more consistently and effectively.

## 5.References

- Bertelsen, Olav, W.,Bodker, S., 2003. Activity Theory. In: John M. Carroll, ed. *HCI Models, Theories and Framworks*. San Francisco: MORGAN KAUFMANN, pp.291-324
- Beyer, H., Holtzblatt, K. Contextual design. *Interactions*, January-February, 1999
- Button, G., 2003. Applying Social Psychology Theory to The problems of Group Work. In: John M. Carroll, ed. *HCI Models, Theories and Framworks*. San Francisco: MORGAN KAUFMANN, pp. 366-380
- Carroll, John M., 2003. Introduction: Towards a Multidisciplinary Science of Human Computer Interaction. In: John M. Carroll, ed. *HCI Models, Theories and Framworks*. San Francisco: MORGAN KAUFMANN, pp. 01-09
- C.Rajendra Kumar (2008). *Research Methodology*, Balaji offset .New Delhi,India
- Douglas Schuler & Aki Namioka,(1993).*Participatory Design Principles and Practices* .New jersey: Lawrence Associates,Inc
- Dourish P., 2004.where the action is. Massachusetts MIT press
- Engeström, Y., 2001. Expansive learning at work: towards an activity theoretical reconceptualization. *Journal of Education and Work*, 14(1), 133-156.
- George M. Eberhart, (2006), *Whole library handbook four, Volume 4*, American Library Association. USA
- John, E. B., 2003. Information Process and Skilled Behavior. In: John M. Carroll, ed. *HCI Models, Theories and Framworks*. San Francisco: MORGAN KAUFMANN, pp. 55-101
- Jorn De Boever & Dirk De Grooff (2009). Activity theory as a framework for Contextual inquiry: a case study
- Kaptelinin, V., Kuutti K., & Bannon, L., 1995. Activity Theory: Basic Concepts and Applications. In *Human-Computer Interaction* (Vol. 1015, pp. 189-201): Springer Berlin/ Heidelberg.
- Kaptelinin V., Nardi B.A. and Macalury., 1999. The Activity Checklist: A tool for representing the “space” of context. *Journal of ACM*, July, 28-31.
- Kaptelinin Vand Nardi B. A., 2006. *Acting with Technology*. [E-book] Cambridge: MIT Press. Available through: Umea University Library<<http://site.ebrary.com/lib/UMEAUB/docDetail.action?docID=10173577>> [Accessed 4May 2011
- Kuutti, K., 1996.Activity theory as a potential framework for human computer interaction research, In B.A Nardi (ED.), *Context and consciousness: activity theory and human computer interaction* Cambridge, MA: MIT press, pp.17-44

- Kuutti K., & Arvonen, T., 1992. *Identifying Potential CSCW Applications by Means of Activity Theory Concepts: A Case Example*. Paper presented at the 1998 ACM Conference on Computer-Supported Collaborative Work, Toronto, Ontario, Canada, pp. 233-240
- Mark L. Mitchell & Jannia M. Jolley. (2010). *Research Design*. USA
- Meredith Melnik., 2011. Is Technology Making Us Lonelier? Time in partnership with CNN
- Moser, Paul K., eds. 2005. *Epistemology*. [E-book] Oxford: Cary, Nc, USA Pub. Available through: Umea University Library website <site.ebrary.com> [Accessed 19 May 2011]
- Perry, M., 2003. Distributed Cognition. In: John M. Carroll, ed. *HCI Models, Theories and Frameworks*. San Francisco: MORGAN KAUFMANN, pp. 193-223
- Richard W. Pew, Anne S. Mavor (2007), *Human-system integration in the system development process: a new look*, National Academy of Sciences. USA
- Robert E. Kraut., 2003. Studies of Work in Human Computer Interaction: John M. Carroll, ed. *HCI Models, Theories and Frameworks*. San Francisco: MORGAN KAUFMANN, pp. 325-353
- Shōji, Shiba & David Walden (2001), *Four practical revolutions in management: systems for creating uniquepp*, Library of Congress Cataloging-in-Publication Data. USA
- Umea University Library., 1969, Services [online] (Updated 10 May 2011) Available at: <<http://www.ub.umu.se>> [Accessed 10 May 2011]
- V. Daniel Hunt, Albert Puglia & Mike Puglia, (2007), *RFID: a guide to radio frequency identification*, John Wiley & Sons.Inc, Hoboken, USA
- Virpi Roto & Heli Vaataha, (2010), *Utilizing Contextual Data in Mobile Applications Development*, April 10-15. Atlanta Georgia, USA