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Activity theory: a framework for qualitative analysis

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Abstract

This paper aims to provide readers with a useful introduction to Activity Theory, regardless of their field of study. Examples are given which include areas of research such as: information systems development, information systems in organizations, health care, and education. Activity Theory is a theoretical framework for the analysis and understanding of human interaction through their use of tools and artefacts. Activity Theory offers a holistic and contextual method of discovery that can be used to support qualitative and interpretative research. Activity Theory is particularly relevant in situations that have a significant historical and cultural context and where the participants, their purposes and their tools are in a process of rapid and constant change. The paper begins with an overview and background to the theory. Then, after explicating the practical value of its use, the paper concludes with a summary of some recent research which has used the method for analysis and discovery. The key concept of Activity Theory arises through an understanding of human consciousness as it has been shaped by experience and the subjectivity of human awareness.

Activity Theory: A framework for qualitative analysis

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Introduction

Activity theory is based upon the work of Vygotski and his student Leont'ev from their studies of cultural-historical psychology in the 1920s (Verenikina, 2001). "Activity theory is a conceptual framework based on the idea that activity is primary, that doing precedes thinking, that goals, images, cognitive models, intentions, and abstract notions like "definition" and "determinant" grow out of people doing things" (Morf & Weber, 2000, p.81).

Activity Theory uses the whole work activity as the unit of analysis, where the activity is broken into the analytical components of *subject*, *tool* and *object*, where the *subject* is the person being studied, the *object* is the intended activity, and the *tool* is the mediating device by which the action is executed (Hasan, 1998).   Engestrom's modification of Vygostky's original theory provides for two additional units of analysis, which have an implicit effect on work activities. The first is *rules*, these are sets of conditions that help to determine how and why individuals may act, and are a result of social conditioning. The second is *division of labour*, this provides for the distribution of actions and operations among a community of workers. These, two elements affect a new plane of reality known as *community*, and through this, groups of activities and teams of workers are anchored, and can be analysed (Hyland, 1998; Verenikina, 2001). These concepts are illustrated in Figure 1.
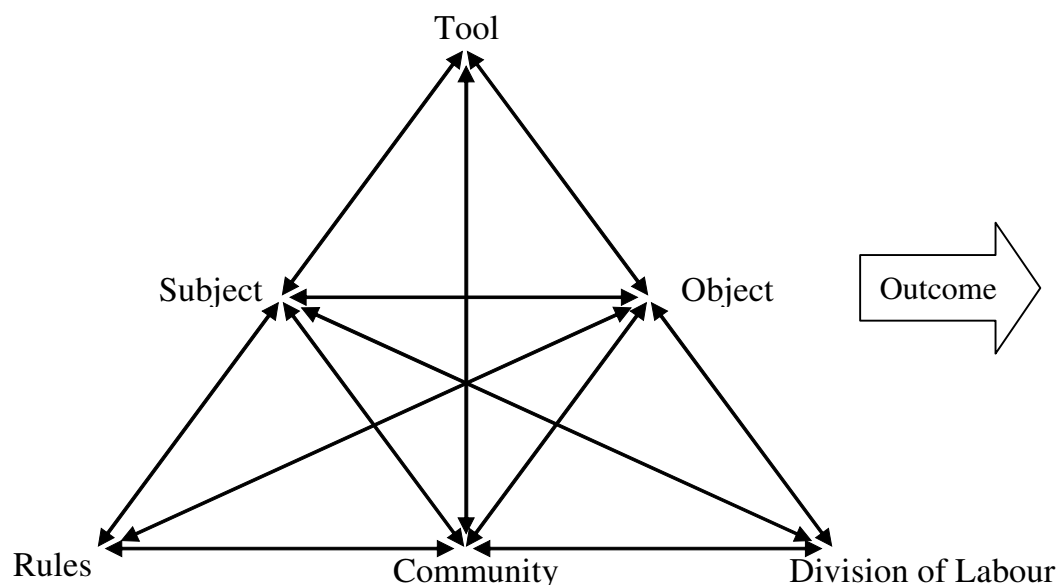
Figure 1. Engeström's Expended Activity Theory Model (Engeström, 2001).

Engeström (1996) states that the work activity system is comprised of the following components:

- individual workers, their colleagues and co-workers

- the conceptual models, tools and equipment they use in their work

- the rules that govern how they work, and

- the purpose to which members of the workplace community direct their activity.

Activity theory sees the integration of technology as tools which mediate social action. These tools, or artefacts, include instruments, signs, language, machines and computers. The relation between the individual and their environment is considered through the component of *community*. The relation between subject and community is mediated by *rules* and the relationship between object and community is mediated by the *division of labour* (Hettinga, 1998). Due to the fact that the tools which have been incorporated into the social system have been created and transformed by humans during the development of the activity itself they will carry with them remnants of the cultural and historical evolution, mediation through tools and technology is therefore not a neutral process, the tools will have an influence over the interaction between the subject and the object. Leont'ev refers to this phenomenon as *Ringstruktur*, or "ring structure", a combination of three code terminating elements – subject, activity, and object – where the subject is not primary and where the object completes the circle by influencing the subject. "For example, the object which the paleolithic tool-maker holds in her hand affects her mental representations (her plan, her goal) as much as those representations affect the changing object. Reciprocal relationships prevail" (Morf & Weber, 2000 84).

An activity is the basic unit of analysis which is used to understand individual actions. Leont'ev provides a good example of this paradox (Kuutti, 1996): primitive hunters embarking on a collective hunt would comprise two groups, one group would beat the bushes and scare the prey, and the other group would trap the scared animal and conclude the hunt. If taken out of the context of the larger activity, it would be difficult for an anthropologist to understand why individuals were 'beating the bushes', in fact individual members of the hunting party may not understand the subtleties of their role in the overall activity. It is only when viewing the larger activity that individual actions are comprehensible.

Leont'ev saw activities in a hierarchical system where activities comprised actions or chains of actions, and where these actions comprised operations. This hierarchy is illustrated in Figure 2. Therefore, in the case of the example given above, the activity is the exercise of hunting prey, one of the actions is to scare the animals, and shaking the branch of a tree is the operation. The activity will have a motive, in this case the team is motivated through the need to catch food. The action will have a goal, in this case to make as much noise and disruption as possible. Finally, the operation will have conditions, for instance altering the pressure on the branch according to its flimsiness, and variances in noise and activity in accordance with the proximity of the animal.

Activity — Motive

↑ ↓   ↑ ↓

Action   – Goal

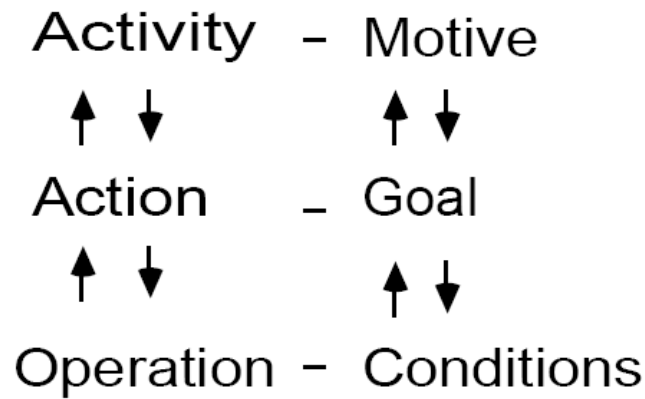↑ ↓   ↑ ↓

Operation – Conditions

Figure 2. Hierarchical levels of an activity (Leont'ev, 1981).

In Figure 3, Kuutti (1996, 28) provides some examples of varying structures of activity.

Activity level ↓↑	- Building a house	- Completing a software project	- Carrying out research into a topic
Action level ↓↑	- Fixing the roofing - Transporting bricks by truck	- Programming a module - Arranging a meeting	- Searching for references - Participating in a conference - Writing a report
Operation level	- Hammering - Changing gears when driving	- Using operating system commands - Selecting appropriate programming language constructs	- Using logical syllogisms - Selecting appropriate wording

Figure 3. Examples of activities, actions and operations (Kuutti, 1996, 28).

Activity Theory is a valuable tool for researchers to incorporate into their repertoire as it enables a means of discovering human activity without the express explication of tasks by participants, instead, through the mediated study of the participant's tools an understanding of activity is revealed which includes tacit and explicit actions. Activity

Theory is a practical framework which can be used to underpin the complex and dynamic problems of human research and practice.

The Practical Value of Activity Theory

The value of activity theory stems from the analysis of the individual, in pursuance of their activity and objective through an examination of their tools and its mediation through rules, community and history.   This dynamic is described in Figure 4. Consequently, the tool is known as the mediating artefact.
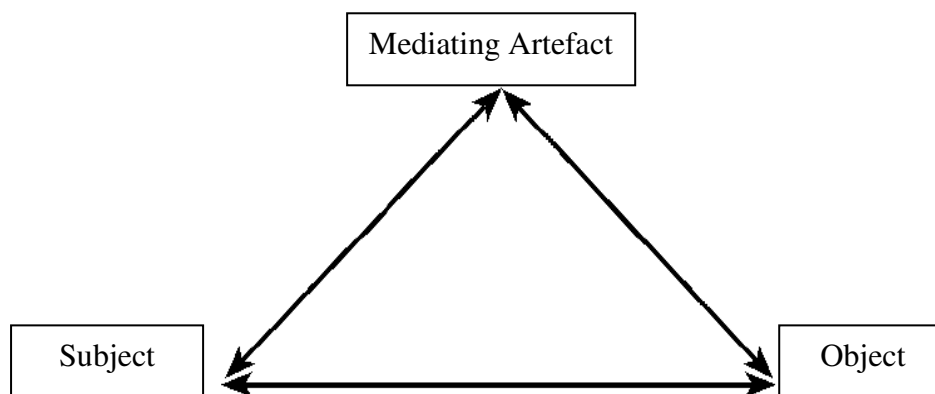

Figure 4. A derivation of Vygotsky's original model of a mediated act
(Engeström, 2001).

The assumption is that the artefact "attains its qualities of function, aesthetics, and ethics as it is integrated into the actual activity; only in practice does it become a tool. In other words to become a tool is to become part of someone's activity" (Christiansen, 1996, p.177).

While observation and interviewing may reveal the explicit aspects of the participant's actions, they will not assist in the understanding the implicit motivation

of actions and operations. While it is not always possible for people to articulate what they do: "it is certainly very difficult to say how you type, or how you see the winning pattern on the chessboard, or how you know when you have written a sentence that communicates well" Nardi (1996, p.41), it is possible to gain some understanding of actions and objectives when they are executed at a higher level "ask a secretary what the current problems are with the boss, or an effective executive what his goals are for the next quarter, and you will get an earful!" Nardi (1996, p.41). Activity Theory, however, through the examination of artefacts can render explicit the more tacit elements of an action. "Dancers, for example, use imagery and other verbal techniques to teach dance skills that are extremely difficult to verbalize. The ability to bring operations to a conscious level, even if only partially, is an aspect of the dynamism of the levels of activity as posited by activity theory" Nardi (1996, p.41).

Some Applications of Activity Theory

Activity Theory has inspired theoretical reflection in a variety of fields, for example in psychology, education, management, culture, and information systems, fields which in general incorporate approaches involving human activity. Many researchers recognised this theory as being holistically rich in terms of understanding how people do things together with the assistance of sophisticated tools in such intricate and dynamic environments (Crawford & Hasan, 2006; Hakkinen & Korpela, 2006; Hasan, 1998; Korpela, Mursu & Soriyan, 2002; Kuutti, 1996; Liaw, Huang & Chen, 2007; Scanlon & Issroff, 2005; Zurita & Nussbaum, 2007). The following section will

discuss some recent approaches to research using activity theory as a focus of analysis.

Information Systems

A key attribute of Activity Theory is its focus on argumentative (dialectic) analysis on the interaction between people (human) and their mediated tools or artefacts (purpose) which have been shaped by human activity (technical elements). With the advancement of the Internet, information systems and computer-based technologies Wartofsky (1979) proposes these information systems as tools of mediated human activities which have several characteristics: They can be *primary* – tangible, external or physical, *secondary* – internal, semiotic or mental, or *tertiary* – schematics where mind and culture act together such as environments or ecosystems. An activity comprises set of actions which aim for specific goals and operations, these actions are indicated clearly in the information systems domain and can be found in the routines and cognitive or behavioural processes which are a common element of activities involving information systems.

The human side of Information Systems is commonly referred to as Human Computer Interaction. This interaction involves the juxtaposition of the computer and its suite of supporting tools such as software applications and communications tools such as the Internet to ease and improve human working activities and communication processes. In the 1990s, researchers began to recognise the importance and relevance of Activity Theory to the study in Information Systems and Human Computer Interaction and many studies have proceeded (Bodker, 1990; Grifford & Enyedy, 1999; Hasan, 1998; Kuutti, 1996).

An early study on Human Computer Interaction was carried out by Bodker (1990). In his study Activity Theory was used to analyse levels of interaction using a tertiary tool in the knowledge creation processes. The research focused on interaction between activities of information technology developers and the activities of users of their products.

In another study, Korpela et al. (2002) analysed the Activity Theory framework in Information Systems Development as a work activity in context. They found the framework added value to their analysis through the enhancement and natural evolution of real-life data which can be applied instantly and is more easily grasped by people.

In later research by Hakkinen and Korpela (2006), Activity Theory was used to understand the practices of information management within a maternity care activity network (in health care application and software design). They found that the use of Activity Theory proved useful not only in understanding user group activities in their development of information systems, it also allowed a multi-faceted analysis of the information and its users and the dynamics between them.

Extending from the research of Korpela et al, Karlsson and Wistrand (2006) studied the coupling of Activity Theory with method engineering as a theoretical framework for the analysis of systems development. In this context, method engineering from an activity theory perspective can be distinguished through collective of actors following different rules and activities in form of methods in order to guide and further

improvements in work processes to gain better outcomes or results. As systems development is a socially collaborative activity, activity theory works well with method engineering which has benefits as a theoretical exercise and a practical tool.

In a study by Crawford and Hasan (2006) the researchers used various techniques of communication and collaboration to illustrate the value of Activity Theory in an information systems environment. They studied the elements of activities (how people do things) and the relationships between them (togetherness) with the assistance of sophisticated tools in a complex environment. In the paper, they developed a seven point Activity Theory framework and used it to present and analyse five research activities exemplified as vignettes, which leveraged the technical environment using Information and Communications Technology system tools and software such as Q-Sort Method, Leximancer, Stella, E-Viva and Go*Team as a way of shaping activities in different ways. Results demonstrated the advantages of applying Activity Theory to the study of socio-technical systems to reconcile the complexity of collective activities in the Information Systems environment. The study proved the Activity Theory framework was an appropriate approach which was able to add the richness and insight of the environment under study into the research.

As these research projects have shown, Activity Theory is not merely a methodology it is a theoretical framework valuable in the analysis of human practices on the multiple dimensions of individual activities and social interaction (Kuutti, 1996). Crawford and Hasan (2006) add to this with their claims that Activity Theory provides a rich, holistic understanding of how people do things together with the assistance of sophisticated tools in complex dynamic environments where socially-

constructed, collective knowledge is the predominant source of learning, creativity and innovation. Indeed, Activity Theory is geared towards a practice which embodies a qualitative approach that offers a different lens for analysing learning processes and their outcomes. It quite neatly focuses on human activities in areas such as those in the field of education.

Education

From the work of Scanlon and Issroff (2005) there is copious evidence that Activity Theory is appropriate for education research. Their research examines the current use of learning technologies in higher education, based on the experiences of students' and lecturers' in their use of technology-based teaching tools.

Using Activity Theory, the study adopted the learning technology as the *tool* in the community of a higher education institution, the *subject* was the student and the *object* was the purpose of the task, and the desired *outcome* is more learning for the student (refer to Figure 5). The Activity System was drawn by taking the perspective of the teacher, tutor or the any other member of the community, such as departmental administrator. These concepts allowed researchers to explore the consequences and examine different outcomes that have been influenced by the interaction between features of the learning situation.

Their research confirmed that Activity Theory, as a framework for analysing data, provides an a means for observing the emergence of patterns in human activity in terms of achieving goals and purposes, awareness, focus of attention and tools. In other words, Activity Theory views the core within a dialectic process between

subjectivity and objectivity, learning and doing, individual and collective, technical and social, and also tacit and explicit knowledge (Crawford & Hasan, 2006).
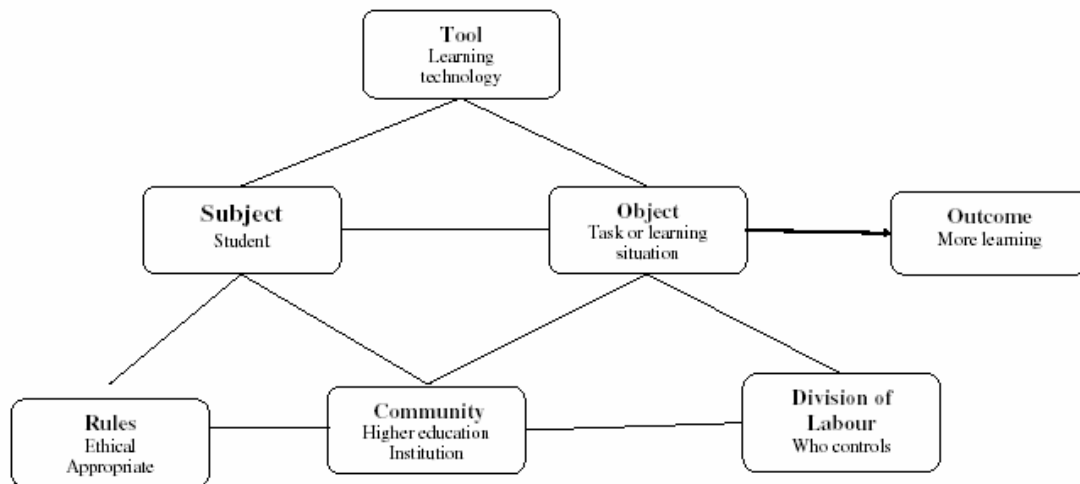

Figure 5. Scanlon and Issroff's model (2005)
on the use of technology in higher education.

In education, collaborative group activity is the key to promote student interaction in the classroom. Through a collaborative learning environment the student is encourage asking questions, explaining and justifying opinions, articulating reasoning, and elaborates and reflects upon the received knowledge. Another great challenge in education is the rise of computer-supported collaborative learning as new tools of teaching. According to Gifford and Enyedy (1999), Activity Theory is a suitable framework which involves models of knowledge building, perspectives and artefacts to guide the design of computer-supported collaborative learning activities. Activity Theory is able to clarify the nature of the collaborative activities, and indicate how people can socially participate while interacting with the technology. This enables a more optimum design of tools to support computer-supported collaborative learning

activities effectively in various contexts, and develop methods to put them into practice.

Another research project based on Activity Theory is from Liaw et al. (2007). These researchers used an Activity Theory approach to investigate learners' attitude factors towards e-learning systems. The research demonstrates that Activity Theory is an appropriate theory to use in understanding and solving problems involving e-learning systems and the associated environment.

Recent research by Zurita and Nussbaum (2007) presents a conceptual framework and design method for the analysis of a Mobile Computer-Supported Collaborative Learning system using Activity Theory (refer to Figure 6). This framework is designed for teaching basic mathematics skills for children aged 6 to 7 years old which incorporates human practices using artefacts (such as software design and the characteristics of handhelds) and how they interact with technological artefacts (structure, components, and interrelationships of collaborative activities using wireless interconnection handhelds).
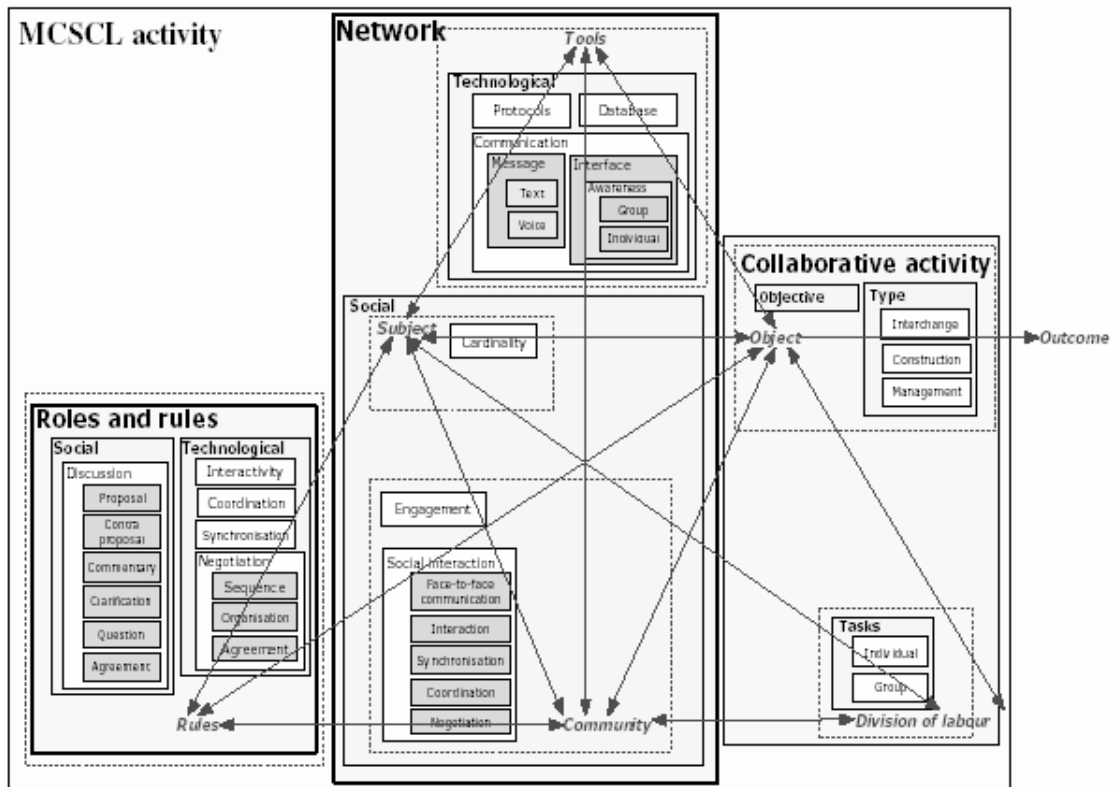
Figure 6. The Mobile Computer-Supported Collaborative Learning

(Zurita & Nussbaum, 2007).

Results of this research significantly showed an increase of participation activity and interest of basic math knowledge. In addition, they found the usage of wireless interconnected handheld computer facilities improve the participants' communication and social skills. Hence, this study provides an opportunity to change classroom pedagogical practice, whereby children use handhelds able to move freely in the classroom to engage in collaborative activity while receiving the support of wireless computer technology. For this reason, handhelds are considered as Activity Theory tools that best describe and support Mobile Computer-Supported Collaborative Learning activities. The theoretical framework permits its specification for any Mobile Computer-Supported Collaborative Learning activity.

These examples of research and those which exist in the field indicate that Activity Theory with its focus on accumulating factors positively affects the subjective interpretations, the purpose, and the sense making of individual and group actions and operations. It also provides a useful paradigm for understanding the ways in which human experience, needs and creativity shape the design and effectiveness of emerging technologies. The Activity Theory framework has proved to be useful in describing the multi-faceted system of information and its users regardless of its contextual environment.

Conclusion

Many researchers in the education, information systems and humanities have found that activity theory provides a worthwhile framework for understanding their field of study. Activity theory is useful because it describes activities as hierarchical in nature and provides a model for decomposing activities into actions and operations. It insists that activity is mediated by tools, which helps to explain relationships between the user and the tool. Activity theory views activity not as a simple individual action but as being culturally and historically located. In other words, activity theory stems from its fundamental view of purposeful activity in a cultural historical context as the fundamental unit for the study of human behaviour. Activity Theory is an approach which underpins the complex and dynamic human problems of research and practice. Hence, Activity Theory is geared towards a practice which embodies a qualitative approach that offers a different lens for analysing processes and the outcomes.

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