Activity Theory: A Useful Framework for Analysing Project-Based Organizations

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This paper contributes to the efforts to understand the dynamics of project mode of work and project-based organizations by highlighting the usefulness of Activity Theory and the associated concepts from practice-based approaches to organizations. The author utilizes his experiences during his doctoral work in the setting of software development firms in India. Initially, the theoretical roots of the Activity Theory are explored in the context of other practice-based frameworks. Through an elaborate structuring of the elements in social and organizational situations, the concept of “activity” tries to overcome the separation of human action from the relevant elements embedded in the context. By engaging with various aspects of systemic and individual peculiarities in understanding a situation, the Activity Theory strives to make the analysis of organizational situations richer and deeper. The importance of such an approach for analysing project mode of work is explored and its feasibility is illustrated by suggesting that projects in software development can be analysed effectively as “activities”.

While conceptualizing organizational units like software projects as activities, it is important to also visualize devices for understanding their interactions with other activities within and outside the organization. This is especially true for outsourced software development work. For this, the ideas of “boundary objects” and “boundary spanners” are conceptualized in an activity theoretical way. By utilizing these ideas, it is illustrated how two dimensions of inter-activity interactions can be identified and studied. It is especially noted that multiple activity memberships and trajectories of organizational actors and tools can be profitably incorporated into research efforts that strive to bring such interactions in project-based organizations to the limelight.

From a practice perspective, the ideas associated with the Activity Theory can help in looking at the challenges of project management in newer ways. For example:

• It can give them a vocabulary to understand expertise in newer ways.
• Resultantly, it can help them explore ways of facilitating the creation and maintenance of expertise in the project.
• The theory can also help them create processes for inter-activity interactions creatively by considering the socio-historical aspects of other activities both within and outside the company.

Like other frameworks used for organizational analysis, the Activity Theory focuses on certain aspects of human action and interprets them using a unique vocabulary and theoretical standpoint. This inevitably results in concerns, limiting factors, and the grey areas where the framework may not be as illuminating. These are explored and some directions in which they could be addressed are pointed out at the end of the article.
Project mode of work, and consequently, project-based organizations have become conspicuous in many sectors in recent times. As a result, organizational researchers have increasingly focused their attention on various issues that arise in such work settings (e.g., Child and McGrath, 2001; DeFillippi and Arthur, 1998; Whitley, 2006). It has been pointed out that embedding new management knowledge in such organizations is especially challenging because of the complex interplay of a number of factors (Bresnen, Goussevskaia and Swan, 2004). In this context, this paper attempts to examine the promise of the Activity Theory framework for the analysis of project-based organizations so as to help generate relevant and useful management knowledge. This is done by drawing from the author’s doctoral research experiences, and utilizing the framework in the setting of software development in India.

The Indian software industry has become one of the most visible faces of economic resurgence of India in recent years and many software clusters have emerged in different parts of the country. The software companies are typically involved in consulting, supporting applications on legacy systems, customizing software, and implementing and maintaining complex systems such as Enterprise Resource Planning (ERP) software for clients across the globe. Most projects in this setting adopt a mode of development utilizing Offshore Development Centres (ODCs). The companies form a number of ODCs catering to different client companies simultaneously. They operate from specific areas earmarked for each project. Entry into these areas is restricted for employees other than the project personnel. The project managers lead each project and a number of team leaders working within the projects coordinate the software teams. Most often, developers are also sent to client locations on extended onsite postings. The project members are taken from common horizontal talent pools. The size and duration of these projects vary a great deal, some of them even lasting a few years and employing a few hundred people.

Bhardwaj and Saxena (2005) view the software development process as a course of action that involves a high degree of uncertainty. Paradoxically, there is also the need for a very high level of precision. Uncertainty in software development may arise from the fast-changing nature of technology, intangibility of the product, and the difficulties in obtaining accurate user requirements. Indian companies need to deal with these issues of uncertainty and yet be able to produce high-quality work at a very low cost to compete in the global market. This is a big challenge for many of these companies. Additionally, the very nature of software development makes it a complex process of problem-solving involving competing goals and priorities. While the clients want speed and effectiveness at a lower cost, companies attempt an optimal use of their resources to attain their goals across various projects and clients.

These projects have two important dimensions with regard to the expertise of its members. The first dimension denotes the technical expertise of the developers, who have training and experience in certain specified software technologies. The second dimension denotes expertise in the client’s domain of operation. For example, if the client company operates in the domain of banking and insurance, a certain level of knowledge regarding the sector and regulations applicable in the country where the client operates are important for the project personnel. Thus at a broad level, projects exhibit their diversity through a combination of people with domain knowledge and technology expertise in varying degrees. Many researchers have pointed out that software teams are the sites of multiple diversities and boundaries (e.g., Herbsleb and Moitra, 2001; Faraj and Sproull, 2000; Borchers, 2003). Inter-project interactions are often seen as problematic in such situations. In this article, the promise of the Activity Theory (AT) in exploring such interactions is examined.

THEORETICAL ROOTS OF ACTIVITY THEORY

The roots of the Activity Theory are often traced to the works of the Russian psychologist, Lev Vygotsky (as cited in Sawyer, 2002). He sought to avoid the reductionist ideas of two schools of psychology namely, behaviourism and introspectionism. Vygotsky drew heavily from the earlier approaches such as Gestaltism and the Durkheimian sociology that advocated sociological wholism in studying social phenomena. He thus developed the functionally integrated and irreducible whole of “activity” as his unit of analysis. He declared that the origins of individual actions could be traced to collective life. As a result, all higher mental functions have their origins in social phenomena (Sawyer, 2002). Many frameworks that have evolved in the study of
socio-technical systems have adopted this inseparable unity of the person and context (Valsiner, 2001). One example is the framework of “distributed cognition,” advanced by Hutchins (1995). Here the unit of analysis is the cognitive system that is composed of individuals and the artifacts they use. He studied the piloting of planes, focusing on the cockpit system which consisted of people and artifacts that constantly interacted with each other. His premise was that it would not be possible to understand it by concentrating merely on individuals. And therefore a cognitive system needed to be analysed as distributed among people and artifacts.

Nardi (1992) opined that though there was no explicit mention of where the system goals were conceived and located, it was likely that most theorists following this approach would locate them within the minds of people. Thus the primary interest is not really to locate knowledge and objectives unambiguously at some location, but to redirect the focus of analysis to the system level phenomena. Thus they would prefer to refer to functional rather than cognitive systems to denote this.

Here, and in similar conceptualizations such as the Situated Action Theory (Suchman, 1987), the emphasis has been on the emergent and contingent nature of human activity. Scholars adopting this approach have downplayed social factors such as inter-personal relationships, knowledge or values. Contexts are not just external settings for human behaviour; they in fact form part of this behaviour. Such an approach advances a vision of human action as clearly grounded in social practice. Consequently, this approach is at the heart of what is known as the “practice turn” in social sciences. Practice theorists conceive of mediated human activity with a shared practical understanding (Schatzki, Knor-Cetina and Von Savigny, 2000). A historically-rooted vision and an acknowledgement of the community involved in human actions are the key elements of the practice approach. Organizational research and related fields have utilized practice-oriented approaches to varying ends. For example, Jarzabkowski, Balogun and Seidl (2007) and Whittington (2002) viewed strategizing from a practice perspective; Orlikowski (2000) examined the role of technology from this perspective; Brown and Duguid (1991, 2001) advanced the concept of communities of practice, and Cook and Brown (1999) examined organizational knowledge and knowing from a practice perspective.

Activity Theory is one of the most well-known frameworks among the broader practice-based approaches to organizations. Here, the focus is on the notion of “activity” rather than on individuals or collectives. According to this approach, human behaviour is embedded in collectively organized and artifact-mediated activities. Blackler (1993) observed that “much of the interest in activity theory stems from the point that it is the product of a tradition which consciously set out to avoid the pitfalls of separating thought from action, individuals from collectivities, and so on that typified Western intellectual tradition.” As mentioned above, Vygotsky emphasized that internal activities cannot be understood if they are analysed separately from external activities. Thus, cognition, learning, and development have social origins. As a result, signs and other cultural artifacts mediate human action. The model proposed by Vygotsky and its common reformulation (Foot, 2001) are represented in Figure 1.

Figure 1: The Idea of Mediation

This insertion of tools or artifacts into human action was a significant proposition. Engestrom (1987) observed that it served to overcome dichotomous split between the Cartesian individual and the external, cultural, and social structure and thus played a key role in our quest to understand human action more intimately.

The ideas of Vygotsky were carried forward and expanded by other researchers in the 1930s such as Luria (1976) and Leontyev (1977). However, their work remained virtually unknown outside the Soviet Union until the 1970s when these works were translated and consequently generated much interest in the Western world concerning those ideas. One strand of the Activity Theory that emphasized the collective nature of human activity especially drawing from the ideas of Leontyev had most notably been advanced by Engestrom (1987) at the Centre for Activity Theory at the University of Helsinki. Engestrom’s (1987) formulation of an activity is represented in Figure 2.

An activity consists of subjects that act on an object by employing mediating tools in a relevant community.
adopting various norms and a division of labour associated with it. As in the case of Vygotsky’s formulation described above, the key components of an activity are subject, object, and mediating tools. Engestrom, however, introduced the concept of a community drawing from Leontyev’s idea of collective activity. The community has a number of explicit and implicit regulations and conventions that define the interactions within an activity. There is also a division of labour involved, resulting in the differentiation in power and status of subjects (Foot, 2001). The subject is the entity from whose perspective the activity is analysed. It has often been argued that the Activity Theory does not give enough emphasis on the importance of the subject in an activity. There have also been various other attempts to conceptualize the individual’s place more firmly in the Activity Theory (e.g., Stesenko, 2005). Yet, according to Leontyev, the differences between various activities essentially lie in the difference of their objects. Objects are driven by motives as opposed to mere goals that motivate individual actions. Objects provide activities their particular orientations. It is something that is given and yet denotes the future outcome of the activity which is projected or anticipated.

The basic, constituent feature of activity is that it has an object. In fact, the very concept of activity (doing, Tätigkeit) implies the concept of the object of activity. The expression “objectless activity” has no meaning at all. Activity may appear to be objectless, but the scientific investigation of activity necessarily demands the discovery of its object. Moreover, the object of activity appears in two forms: first, in its independent existence, commanding the activity of the subject, and second, as the mental image of the object, as the product of the subject’s “detection” of its properties, which is effected by the activity of the subject and cannot be effected otherwise (Leontyev, 1977).

The third component, “tools,” mediate the actions of the subject on the object. They can be both material (such as a spanner) and conceptual (such as theories). Tools themselves are produced by other activities and thus they have own histories. They are created through some activity and are used in a number of activities. Wartofsky (1973) considerably developed the concept of artifacts. He pointed out the uniqueness of humans with respect to tool use.

What is distinctively human about this activity (since all species fall under this injunction of reproducing the species life) is that human beings do this by means of the creation of artifacts. Their production, as distinct from the foraging, scavenging or hunting activity of other animals, proceeds by a transformation of part of the environment into an extension of the animal organs-as, e.g. tools are….The crucial character of the human artifact is that its production, its use, and the attainment of skill in these, can be transmitted, and thus preserved within a social group, and through time, from one generation to the next.

He separated three levels of artifacts from one another. Primary artifacts are those used directly in production and other human interactions with the world and include both physical (a spoon), or non-physical (a word) entities. Secondary artifacts are representations of modes of interactions with primary artifacts and are involved in the action of preservation and transmission of certain practices. Examples of secondary artifacts are algorithms and procedures. Tertiary artifacts are abstracted from the representational function of secondary artifacts but are themselves agents of change. They represent future possibilities and imagined worlds which may exist as complex entities such as scientific theories. (McDonald, Higgins and Podmore, 2005)

The Activity Theory focuses attention on what participants actually do within a community and how it may be understood contextually. The unit of analysis for Vygotsky was the individual. In Leontyev’s approach, communities and collective practices acted as the context for individual action. Taken together, this formed the unique unit of analysis of “activity”. Foot (2001) stated that it fulfilled the following demands: “…it is rep-

Figure 2: Activity: A Basic Representation

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resentative of the complexity of the whole, it is analyzable in its contextuality, it is specific to human beings by being culturally mediated, and it is dynamic rather than static.” The concept of activity thus overcomes the dichotomy between the individual and collective levels of analyses of organizational phenomena.

The concept of activity is a relatively durable formation that is useful in a number of areas. To clarify the idea, Leontiev (1977) gave the example of a hunt. This activity is driven by the motive of obtaining food to satisfy hunger. However, a person involved in this activity must perform actions that are not directly aimed at getting food such as making trapping gear. This, however, is the immediate goal that drives a particular action. Thus a goal may not always coincide with a higher level motive and analysing it without considering the motive is meaningless. Thus Leontyev differentiated between activity, actions, and operations. At the first level is activity, which is driven by a “motive” that flows from human needs. The activity is always directed toward an object. Attainment of the desired result satisfies the need. At the second level are actions, which are conscious and “goal”-driven. At the third level are operations that are “routine” and do not require conscious effort of the subject. As actions are routinized, they become operations, and, as new forms of activity break through, operations are exposed to reflection, and are turned into actions constructing the emerging activity. This linkage between the individual action and collective activity is especially important in examining complex situations in organizations often involving multiple teams. This is because individual actions become fully meaningful only when the unit of analysis is the broader concept of “object oriented activity.”

Such collective practices are not reducible to sums of individual action; they require theoretical conceptualization in their own right. When individual action is the privileged unit of analysis, collective practice can only be added on as a more or less external envelope. Human conduct tends to appear as a string of goal-directed acts of rational actors (Engestrom and Miettinen, 1999 as cited in Havnes, 2002).

This example points to the difficulty of analysing human action in its own right, detached from the context. In certain situations, actions can appear meaningless and irrational. The significance of such actions can be analysed only if the higher level activity is taken into account. However, the subjective view involved in individual action is also important. It is this dialectic between the systemic and the individual view that gives the Activity Theory its characteristic richness. The notion of activity helps us in conceptualizing the mutual construction of structure and agency. The subjects’ actions on the objects are mediated by the structural aspects of tools, norms, and division of labour. Yet, it is these very actions that produce and reproduce these tools, norms and so forth.

The static depiction of an activity does not capture its constantly evolving nature. The idea of the activity with its dialectical emphasis on the developmental potential of tensions and contradictions represents a wide array of forces that operate in organizational systems. Activities are conceptualized as constantly evolving through developmental cycles. Blackler (1995) summarized the key features of this unit of analysis:

- **Activities are mediated** – they are performed by using artifacts and tools.
- **Activities are pragmatic** – they are driven by objects and motives.
- **Activities are situated** – they are located in specific time and space, involves particular communities of practice and consequently there is an emphasis on the norms, rules, and roles of such communities.
- **Activities are provisional** – they evolve continuously and are reproduced without replication.
- **Activities are contested** – they are sites of varied interests, viewpoints and perspectives. These can often give rise to contradictions both within and between activities.

Different aspects of software development has been explored by many researchers using the framework of Activity Theory. For example, Adler (2005) used the framework to focus on the object of software development. Barthelmess and Anderson (2002) explored the process-centred software development environments using the Activity Theory framework. They pointed to the potential of the Theory for understanding collaboration and human interaction better. De Souza and Redmiles (2003) researched how it could help in bettering collaborative tools used in software development. A number of other researchers (e.g., McGrath and Uden 2000; Martins and Daltrini, 1999) demonstrated how the
Activity Theory was suitable in incorporating the softer, people-related aspects of software engineering. These studies pointed to the feasibility of productively applying the Theory to the software development settings. Advancing this further, in the following section, I focus on how the framework can be utilized to better model the inter-community interactions. To illustrate the various elements of an activity, a software project is represented as an activity in Figure 3.

A key feature of the Activity Theory is the idea of “contradiction.” Contradictions denote misalignments and tensions that drive change and development in an activity. They are manifested through various types of problems and occasionally through the breakdown of an activity. This concept is the key to understanding how activity systems evolve through developmental cycles. Engeström (1987) identified four types of contradictions. Primary contradictions indicate the inner conflicts in each element of the activity. Secondary contradictions are those arising between the elements of the activity system as between tools and division of labour. Tertiary contradictions represent the conflict between the current activity and a culturally more advanced form of the activity. Quaternary contradictions represent the tension between the central activity and its neighbouring activities. It is important to note that these contradictions and the resultant development of the activity do not always proceed in a pre-determined sequence.

**ACTIVITY THEORY AND INTER-ACTIVITY INTERACTIONS**

The idea of activity provides sufficient flexibility to researchers for choosing their levels of analysis while using the framework. Many studies employing the framework have adopted the entire organization as an activity. Thus they have examined themes associated with inter-organizational collaborations. Toivainen (2007) identified various levels of activity in the formation of inter-firm networks and examined how learning took place at those levels. Puonti (2004) analysed the dynamics of inter-organizational collaboration in economic crime investigation. It was found that such collaboration involved learning challenges which were often addressed by new tools. Lehenkari (2006) observed that tensions in activities were the motivations for learning across the fields of expertise. Those learning connections were found to be temporary and fragile. Kerosuo (2006) investigated the impact of boundaries in health care and found that the border zones of activities were fragmented by practice-related and organizational boundaries.

Unlike these studies, activities can also be conceptualized as intra-organizational units. To illustrate, many authors have pointed out that organizations can be conceptualized as interacting activity systems (e.g., Engeström, 2001, Engeström, Engeström and Vahana, 1999). In the project mode of work in general and software development in particular, while interaction of teams within the same project is considerably intense, strict boundaries are maintained with the outside environment even within the same company (Venolia, DeLine and LaToza, 2005). Blackler, Crump and McDonald (2000) recommended that “rather than analysing organizations as single activity systems, therefore, it is more satisfactory to analyse them as networks of overlapping activity systems.”

Along these lines, software projects, other units such as training and development, or client teams can conveniently be treated as activities with the components indicated above. According to this illustrative formulation,
a field can thus contain a number of activities that interact with each other in a number of ways. However, in outsourced software development, these activities can span multiple organizations. The boundaries of the company become less important while trying to understand the spread of various interacting activities in a field. Figure 4 illustrates how interacting activities span intra- and inter-organizational boundaries.

In the above illustration, the central activity could be a software project implementing an ERP application for a client. The tool producing activity represents the technology companies that produce technologies used in developing the system. The subject producing activity could be the training division of the company that creates the subjects (development teams) with the adequate expertise level. The object is the customized implementation and the client's activity that uses this as a tool in their business operations.

Two concepts from practice-oriented studies come handy while conceptualizing interactions between various activities. These are the ideas of “boundary objects” and “boundary spanners.” These ideas have been deemed especially useful as they relate to two key components of the concept of activity. Thus, we can visualize cross-boundary connections in terms of these two components, namely, subjects and tools of an activity. Firstly, tools crossing activity boundaries such as a common programming technology or a central database of code can be visualized using the idea of boundary objects. Secondly, the notion of subjects crossing boundaries can illustrate how people constantly move between boundaries and are parts of multiple projects simultaneously in project-based organizations.

**BOUNDARY OBJECTS AS MULTI-ACTIVITY TOOLS**

Star and Griesemer (1989) coined the term “boundary objects” while studying the establishment and development of Berkeley’s Museum of Vertebrate Biology from 1907 to 1939. According to them, boundary objects “are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites.” They visualized the museum as a boundary object that linked different communities. To the curator of the museum, it was a means of supporting and explaining the theory of evolution by demonstrating how natural selection was influenced by the changes in the environment. For the conservationists, it was a means of preserving the vast flora and fauna of California that was fast disappearing. To the university administration, the project was an opportunity to serve California and its people and to compete with the well-known Eastern universities. Bowker and Star (2000) elaborated this idea further:

They are weakly structured in common use and become strongly structured in individual-site use. These objects may be abstract or concrete... Such objects have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities (Bowker and Star, 2000).

Star and Griesemer (1989) described four types of boundary objects. The first type, called repositories, are piles of entities that are ordered and indexed in certain ways. They deal with heterogeneity by a standard indexing or

![Figure 4: Some Inter-activity Relationships](image-url)
classifying system and have the advantage of modularity. The second category, labeled as ideal types, are representations that can fit into more than one context on account of their vagueness. These include objects such as maps that are abstracted from a complex base and have the advantage of adaptability. The third category, described as objects with co-incident boundaries, share boundaries but have different internal contents. They are thus useful for aggregation work and serve to resolve varied goals across diverse areas of operation. The last type, comprising standardized forms, are objects developed for effective communication across contexts. They are effective in dealing with local uncertainties.

Thus boundary objects are not merely material things. They include a variety of entities such as “stuff and things, tools, artifacts and techniques, and ideas, stories and memories” (Bowker and Star, 2000). Wenger (2000) stated that boundary objects found their value, “not just as artifacts of one practice, but mostly to the extent that they support connections between different practices.” His elaboration of the typology of boundary objects differed from the above. He delineated three categories. The first, labeled as artifacts, included entities such as tools, models, documents and so forth. He cited the example of medical records that connected multiple groups such as doctors, nurses, and insurers, and architectural blueprints that enabled architects, city planners and contractors to collaborate. Described as discourses, the second category pointed to a common language employed to ensure that people were able to communicate across boundaries and negotiate meanings across communities. The final category, processes, included routines and procedures that sought to achieve coordination across various groups.

According to Wenger (1998), boundary objects have four important characteristics:

Modularity. This means that one particular group can cater to a single portion of the overall boundary object and yet the object will be coherent.

Abstraction. This denotes the commonness that boundary objects possess after the deletion of particularities associated with each group that is involved.

Accommodation. This means that boundary objects are capable of lending themselves to various activities in different communities.

Standardization. This implies that there is a pre-specified format with regard to the information content of boundary objects. Because of standardization, various groups are able to deal with it locally in an effective manner.

The idea of boundary objects has been utilized by studies on project-based organizations. For example, Yakura (2002) examined the characteristics of timelines and Gantt charts widely used in project management as boundary objects. She found that although timelines seem to be inflexible, they allowed organizational subgroups to employ different assumptions to negotiate and manage project time. Carlile (2002) and Miller (2005) used the concept of boundary objects to examine how barriers to knowledge flows across boundaries in organizational activities like new product development can be overcome. Briers and Chua (2001) identified boundary objects in an organization’s accounting system and examined how their network was involved in effecting changes within the system. Sapsed and Salter (2004) examined the limits of project management tools as boundary objects in work involving globally distributed project teams. They found that they were particularly ineffective when there were no opportunities for face-to-face interaction or when the lines of authority were blurred.

The role of boundary objects has been discussed in many activity theoretical studies. For example, Engestrom, Engestrom, and Karkkainen (1995) described the case of interaction between various units in an industrial manufacturing plant. When parts did not comply with specifications, a host of problems arose. The dialogue between representatives from both units gave rise to standards that were used as boundary spanning objects. A representation of such tools functioning as boundary objects is given in Figure 5.

Here a common tool is used in three activities. This could be a pre-specified standard, a database or repository, or a representation such as a map. The three activities use it in three different ways, yet the possibilities of their

Figure 5: Boundary Artifacts Connecting Activities
use are governed by the commonality of the object. Software programs or technologies (software bundles from companies such as Microsoft, IBM or Oracle) are predictably used as a predominant criterion for categorization of various organizational efforts in outsourced software development. In these companies, it is not uncommon to categorize people in terms of their technology expertise. An expression like, “We need a Java,” would typically mean that they require persons with the skill to code in Java language. In an activity theoretical analysis, these technologies are considered as tools used in various object-oriented activities. However, by providing a common vocabulary, such tools exhibit the capability to connect different activities. They form the basis of many group formations and inter-group efforts as various ODCs often use similar technologies for their coding. In addition, technologies contribute to the establishment of standards that can function as effective boundary objects. Processes followed across projects can be similar because of the constant movement of people between projects. These standard processes and procedures also function as effective boundary objects. There are also non-technological taxonomies that can serve similar purposes. For example, the training programmes in companies are often categorized as initial level programmes, continuing learning programmes, leadership programmes and so forth. So, when a project team requests for a person who has undergone a particular programme, both the project manager and the persons at the manpower allocation unit understand what this entails in terms of skills.

Bowker and Star (2000) further developed the idea of boundary objects and proposed what they called boundary infrastructure. They spoke of boundary infrastructures as “stable regimes of boundary objects” and highlighted how any working infrastructure served multiple communities of practice simultaneously. On similar lines, Engestrom (2000) proposed that we should analyse the entire system of tools, instead of single tools as stand-alone artifacts. This would make it possible to view them as a constantly evolving set-up of multiple artifacts, the old tools continually being modified and the new ones being created.

**BOUNDARY SPANNERS AS MULTI-ACTIVITY SUBJECTS**

Boundary spanners are individuals who connect various communities. In organizational literature, this could often mean connections beyond the organization. For example, Keller, Szilagyi and Holland (1976) defined boundary spanning as “interpersonal transfer of information across organizational boundaries.” However, as we have seen above, in outsourced software development, the boundaries are both within and outside the organization. Thus in this context, boundary spanners cross both intra- and inter-organizational boundaries. Other terms such as “knowledge brokers” (Eckert, 1989 as cited in Wenger, 1991) were also used to describe boundary spanners. Eckert observed that by virtue of their positions at the periphery of their communities and because of their simultaneous membership in other communities, knowledge brokers were able to bring new ideas into these communities. She especially noted that they were able to function as agents of change in their communities – a role which the community leaders found difficult to play because of their core positions. Propagating a similar idea, Kelly and Littman (2005) talked of cross-pollinator as an important role that could drive innovation in groups and organizations. Wenger (2000), used the term, “brokering,” to mean four different types of inter-community interactions by people. According to him, “spanners” are those that take care of a certain specific boundary over a long period of time; “roamers” go to various places on boundaries and create connections in a number of locations; “outposts” constantly explore new territories and bring news from the frontiers; and “pairs” form connections and maintain long-term relationships by constantly interacting with each other.

Many organizational theorists have stressed the importance of such boundary spanning roles that are deemed critical for an organization’s survival in complex environments. Aldrich and Herker (1977) examined boundary roles in relation to organizational structure. They emphasized that boundary spanners acted both as filters and as facilitators in the process of information sharing. Hvinden (1984) suggested that “organizational turnover – the way individuals cross the boundaries of work organizations – may be a suitable basis for the convergence and integration of elements from the occupational, labour market and organizational theory.” He differentiated individual and collective instances of boundary spanning within organizations. In one type of spanning, individuals aim to get another position
within the existing allocation pattern in the organization. Its impact is individual in nature and involves the possibility of moving to another organizational division by acquiring broader skill sets. Another type of spanning involves change in the combinations of benefits and costs associated with their positions. This is collective in nature and might affect relationships between several categories of jobs. This might result in increasing autonomy for lower level participants or in leveling out rewards. Tushman and Scanlan (1981a) differentiated between informational and representational boundary spanning roles. They concluded that the former were more open to new opportunities and ideas from outside and were thus valued in organizations. According to them, informational boundary spanning is a two-step process. The first step involves obtaining information from external sources and the second step involves disseminating it internally. As a result, for informational boundary spanning, individuals need to be well-connected both within the work unit and outside it. They are often considered as technically competent in their units, and have characteristics for establishing effective linkages with external areas. They also found that the characteristics of boundary spanners varied according to their work unit’s activities and the information boundary they spanned which often overlapped across multiple communication boundaries (Tushman and Scanlan, 1981b).

The representation in Figure 6 is an activity theoretical depiction of the idea of boundary spanning, illustrating how individuals can simultaneously be subjects in a number of activities.

**Figure 6: Boundary Spanners’ Connecting Activities**

The notion of *subject* in the Activity Theory need not necessarily be individuals. The idea of the individual has often been problematic in the post-Vygotskian Activity Theory. Some critiques of Activity Theory centred around the shift from the original Vygotskian emphasis on the individual to the Leontyevian adaptation which gave primacy to the community (Stetsenko and Areivitch, 1997). However, this concern was addressed by many researchers in this tradition who attempted to bring in the individual as an important part of their analyses. One idea that was developed in this connection was the concept of *horizontal expertise* (Engestrom, Engestrom and Karkkainen, 1995). Standard conceptualizations of expertise indicated how individuals progressed vertically from the lower levels to the higher levels in specific domains. They argued for a broader, multi-dimensional conception of expertise, in which the vertical notion of expertise was complemented by a horizontal, boundary-crossing movement.

In their work, experts operate in and move between multiple parallel activity contexts. These multiple contexts demand and afford different, complementary but also conflicting cognitive tools, rules, and patterns of social interaction. The criteria of expert knowledge and skill are different in the various contexts. Experts face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid solutions. The vertical master-novice relationship, and with it, in some cases, the professional monopoly on expertise, is problematized as demands for dialogical problem solving increase (Engestrom, Engestrom and Karkkainen, 1995).

The vertical conceptualization of expertise pre-supposes stable environments where the experts who have gained knowledge can apply it continuously in unchanging ways. However, project mode of work is characterized by complex changes including frequent disruptions and changes. The importance of adopting a multi-activity perspective in understanding the notion of expertise should thus be noted in these settings. Along these lines, Hakkarainen, Lonka, and Paavola (2004) observed:

> Expertise in a certain domain may also be represented in a hybrid expert who is able to translate one expert culture’s knowledge into a form that participants of another expert culture can understand …… innovation emerges in networks of these kinds of communities. Creation of innovations supports gradually developing division of labour and increased specialization as well as combination of existing dispersed resources for novel purposes.
Thus, expertise is described by making use of the frame of reference of practice contexts rather than an individual’s professional qualifications or individual performance. Several attempts have been made to suggest that a strictly individualistic view of expertise is insufficient for yielding theoretical insights. Inter-activity connections in project-based organizations brings into focus, this changing notion of expertise. Consequently, horizontal expertise can be viewed as the ability of the individual to generate expertise in a number of activities in which the individual operates.

**DIMENSIONS OF INTER-ACTIVITY INTERACTIONS**

The movement of tools and subjects across various activities can be visualized along two dimensions. One denotes a dimension that represents the two or more activities that are co-existent. We can label this as the spatial dimension of interaction. The other would enable us to see how over time, these artifacts and individuals have crossed over from one activity to another. This can be labeled as the temporal dimension of interaction. Firstly, the spatial dimension is illustrated by how individuals and subjects operate in multiple activities at any given point in time. While one is part of an activity, he/she may also be part of other activities simultaneously. These multiple roles affect how one functions in each of these activities. Thompson (2004) opined that:

> In addressing how activity systems may come to affect one another, it is to the actual linkages between the various selves deployed in practice by each participant (many of which may lie outside the organizational domain) that the analyst should turn... Thus potential explanations can be developed to account for observed differences in people’s attitudes and behaviour within the same activity system; and explanations can be developed for linkages between activity systems, by looking at the way in which the identity deployed by a person within one activity system is influenced by other identities which that person may also be deploying in other contexts.

Hammersley (2006) made a similar observation and opined that we “tend to treat people as if their behaviour in the situations we study is entirely a product of those situations, rather than of who they are and what they do elsewhere - simply because we do not have observational data about the rest of their lives.” Even in the case of tools, this is true. Often the use of a technological artifact is influenced by who else uses it. The adoption of these tools by multiple activities shapes their use in others. The ways in which they are defined, executed, and evolve in one activity affects another where the same tools are applied. Thus tools themselves have multiple presence and this presence influences each other. We can label the simultaneous existence of artifacts and spanners in multiple activities as the spatial dimension of inter-activity relationships (Figure 7).

**Figure 7: Spatial Dimension of Inter-activity Interactions**

To illustrate this in the context of software development, it is easy to visualize domain experts who are parts of more than one project or programming tools, processes, or databases that are shared by more than one project at a given time.

The temporal dimension of interaction enables us to see boundary objects and spanners as evolving through varied influences over time. This dimension is more pronounced in the case of boundary spanners. We have seen that spanners who cross over to participate in various activities at different points in time are not left unchanged. They are deeply influenced by these leaps across boundaries. Consequently, the way in which they operate in their original activities is likely to change (Figure 8).

**Figure 8: The Temporal Dimensions of Inter-activity Interactions**
On similar lines, the concept of trajectories was proposed by Wenger (1998) in the context of his work on communities of practice. He observed that communities achieved continuity by displacing individuals over successive generations. On the other hand, individuals achieved continuity through trajectories of participation. Thus, the individual is formed through participation in multiple communities and the community is formed through the participation of many individuals. This tentativeness of the concept of the self justifies why unlike other approaches to analysing the agency of individuals in a social situation, an activity theoretical analysis does not give analytical priority to an individual’s actions but views them in the context of the overall activity. Thus the idea of trajectories can help us to understand the evolution of individual goals and their two-way influence on the object of the activity. A similar argument was also put forward by Edwards (2005) who proposed the idea of relational agency. She highlighted the importance of pre-existing understandings gained in other activities in mediating new situations. Wenger (1998) affirmed that membership in a community is defined at least in part by membership in other communities. Along these lines, Davenport (2005) reported that there was little correlation between high performance and traditional indicators of expertise such as education, tenure, self-rated expertise and so forth. While lack of expertise indicated poor performance, high levels of expertise alone was not enough to explain consistent high performance. He found that “high performers often had unusual and often somewhat illogical career paths” and that “these different jobs provided them with unique perspectives and expertise in solving problems.” In an application of this idea, D’Mello and Sahay (2007) located their investigation in a global software development firm in India and focused their attention on the interplay of mobilities across communities and the resultant influence on identities of employees. In project-based software development work, the nature of the projects that a person has been part of previously is of extreme importance in understanding his/her actions in the current project.

We can thus visualize interactions involving boundary objects and boundary spanners across spatial and temporal dimensions. The following representation (Figure 9) illustrates this by showing how boundary spanners can be visualized along the double dimensions.

Thus, any activity is the site of multiple influences that originate in other activities. In the case of connected activities, these influences are rather easily visible. The influences of trajectories are not too easily visible and can easily be ignored in the analysis of these activities. Doing so will impoverish organizational analysis in such project-based modes of work. The recognition of multiple influences in an activity has been described by Engestrom, Engestrom and Karkkainen (1995) as poly-contextuality. This characteristic of activities can make it the site of contentions because of the influence of multiple activities in it. Thus activities are inherently polycontextual in two senses. Firstly, tools and subjects could exist simultaneously in multiple activities. Secondly, subjects and artifacts in activities are characterized by their individual trajectories. Simultaneous memberships and the trajectories of both tools and subjects make it the site “contradictions” which are deemed

**Figure 9: The Double Dimensions of Inter-activity Interactions**
important to understand how the activity evolves over time.

**IMPLICATIONS FOR PRACTICE**

One of the implications of seeing things differently is to be able to act differently. While the concepts described above can provide a rich repertoire for researchers exploring the dynamics of project-based organizations, it is also worthwhile to explore how they can impact actual practices in the field.

The Activity Theory illuminates both the socio-organizational and the personal-behavioural spheres in achieving work. One dimension where this is especially noticeable is the way in which expertise is visualized as having both horizontal and vertical dimensions as pointed out above. The visualization of expertise as a horizontal, social achievement rather than as an individual, rising through levels would be useful for project managers. Demands for expertise in projects are often met by training and development initiatives that are essentially aimed at the individual in most software development firms. Recently, there are indications of an increased reliance on e-learning initiatives to train personnel, driven by compulsions of scale and the possibility of responding to customized learning needs. These efforts are also in response to an increased diversity in educational backgrounds of new employees as more and more non-engineers are being recruited. However, the sense of a community and associated norms and rules are either missing or non-explicit in e-learning modules. Thus, the new tool creates a contradiction in the activity by catering to an exclusively individual, cognitive idea of learning. Resultantly, project managers find that expertise creation is a much more complex process than a cognitive intervention that enhances knowledge or information.

Adopting an activity theoretical lens should enable efforts by project managers to respond to the horizontal dimension of expertise development in such situations. One way to do this is to design collaborative arrangements in a manner in which their learning potential is maximized. Outsourced software work, for example, is essentially a collective achievement of objectives by teams belonging to various organizations across locations. Each of these ties across boundaries is managed by a system of tools and persons functioning at the intersection of diverse activities. For example, onsite postings of coders at client companies are a common practice where coordination between teams is of particular concern. However, these assignments also bring back valuable client knowledge into the offshore teams. Resultantly, the “onsitters” function as boundary spanners who have to navigate more than one activity at the same time. There needs to be systems and processes that enable the team to better leverage these connections. There are also a number of tools that are created and deployed to attain smooth interactions and effective achievement of multiple objectives. For example, an expert locator database within large projects or across multiple projects is likely to enable the achievement of timely, collaborative solutions to problems. The successful creation and utilization of boundary objects and boundary spanners is thus a mandate of the project manager in such settings. These efforts will enhance the potential for horizontal expertise in their teams.

Another direction in which project managers can utilize the Activity Theory lens effectively is by being more responsive to the double dimensions of inter-activity interactions described above. Personnel belonging to a project are often transferred across to others even before the close of earlier projects. In such situations, creating processes for maintaining ties with the earlier project can be a productive recognition of the temporal dimension of interactivity interactions described above. This can be useful in two ways. Firstly, it creates smoother ways of drawing from earlier learning and connections to solve problems in the current project. Secondly, it enables the earlier project to draw from connections being established in the newer assignment to solve their problems. This can often be challenging as inter-project interactions would be limited by requirements of data security and confidentiality. Project managers need to be especially resourceful in overcoming these challenges and enabling people to draw more meaningfully from their history of experiences in various settings.

To enable the above, project managers need to collaborate more closely with units that support such interactions. Efforts such as training and knowledge management can be valuable in helping them achieve this. Here, an activity theoretical perspective would help them understand that these activities themselves have their own histories, and associated norms, rules, division of labour, etc. Consequently, they may not always be responsive.
in the manner expected and would function with a set of priorities different from their own. To understand it better, the professional evolution of these activities in the context of the current business compulsions need to be further examined. Collaboration would thus entail developing a common vocabulary that might help negotiate differences in goals and priorities. For example, while the performance of the training department is often evaluated by referring to the number of hours of training imparted, project managers would be more likely to be concerned about the timeliness of training so that people can be deployed when the need arises. However, in client-driven work such as outsourced software development, predicting future requirements is especially troublesome. This would point to the necessity for long-term engagements between project managers and training designers so that better responsiveness can be achieved. To enable this, activity theoretical concepts can make project managers sensitive to the dimensions of historicity involved when collaborative efforts are developed and nurtured.

In activity theoretical terms, software development can be viewed essentially as a tool-producing activity. Essentially, the connection between software developers and users centres on the concept of tool in the activity theoretical representation. The production of tools, however, requires an intimate understanding of the subject’s perspective concerning the object at hand. We saw that boundary spanners and objects could help enhance this understanding. However, to be really effective, new ways of engaging with client/user activities need to be worked out. Often, tools created are used in novel and unforeseen ways. Efforts to make the tools as versatile as possible are naturally a consequence of this realization. However, standardization and the resultant loss of freedom in usage are inevitable for efficiency and project managers are likely to face this dilemma constantly. The Activity Theory helps by focusing attention on the evolving nature of an activity and the developmental cycles involved in this evolution. Consequently, project managers might seek new ways of escaping the limitations of analyse-design-deploy cycles. In this setting, looking at client compulsions and contradictions from an activity theoretical perspective can be helpful for reasons indicated above. For example, a deeper understanding of the “community” of client activity is likely to provide valuable insights for designers. This would start with an understanding of the language and vocabulary used in the field and the way norms evolve and change. Here again, a cultural, social and historical understanding would supplement the cognitive perspective.

**CONCLUSION**

Though the Activity Theory has a number of strengths that make it attractive for organizational analysis, there are concerns about certain aspects of the theoretical framework. For example, Thompson (2004) pointed towards the drift in the Activity Theory away from its original Vygotskian concerns. He said that the newer interpretations that aimed at the study of collectives inspired by Leontyev’s idea of activity did not reconcile well with Vygotsky’s approach that focused on the individual. It has also been pointed out that the relationship between the individual subject and the collective activity is vague in Activity Theory (Davydov, 1999 cited in Nathanael et. al, 2002). According to Stetsenko and Arievitch (1997), activity theoretical analysis focuses on the dynamics of shifting divisions of labour, mediating artifacts, roles and rules of participation. However, it relatively neglects the individual psychological processes that might play an important role in this dynamics. Toomela, (2000) opined that the Activity Theory advocated a uni-directional approach to the mental phenomena. The higher order mental functions were recognized as having social and cultural origins. He said that this cannot explain certain novel qualitative aspects of the mental phenomena and thus “externally the same ‘activity’, which ‘determines’ a child’s emotions, for example, may psychologically be qualitatively different depending on the individual mental qualities of a child. [The notion of] ‘Activity’ cannot be sufficiently informative regarding psychological mechanisms that underlie that activity.” To remedy this deficiency in activity theoretical analysis in the organizational settings, Thompson (2004) argued that the various roles played by individuals other than the predominant organizational one needed to be brought into focus.

Another problem that has been identified is the lack of clarity of what development means for an activity. It has also been pointed out that no set of clearly formulated and universally acceptable stages of development has been identified. Engestrom (1999) affirmed the futility of trying to do so and outlined the importance of adopting a developmental perspective that avoided fixed se-
quences. However, he opined that to be practically relevant, it was often necessary to identify the one that was culturally more advanced. This could be relativistic and thus problematic. Another weakness of the Activity Theory related to its lack of rigid specifications. The Activity Theory is often described not as a strong predictive theory but a descriptive tool. Some construe this as a weakness of Activity Theory. Others, while acknowledging this, point out that one of the strengths of the Activity Theory is the acceptance of the impossibility of prediction (Nathanael, et al, 2002).

Frank Blackler (1995) pointed out another issue of concern. He opined that the “analysis of power in everyday life has featured far less in the writings of activity theorists than it has in the work of others who are theorizing practice from different traditions.” The components of an activity are often accorded equal significance. This, he said, was misleading as “social systems are fundamentally unequal.” He argued that Activity Theory therefore “must acknowledge the often self-producing, dynamics of domination and subordination that are a feature of everyday life.” Many researchers are making attempts to address this issue and strengthen the capability of the Activity Theory to deal better with issues of power and control (e.g., Daniels, 2002). Lastly, there are concerns about whether the notion of activity can handle the exigencies in the study of fast changing boundary crossing work. Blackler (1995) observed that technological advances combined with other developments in the economic and organizational spheres were giving rise to fast changing contexts of action where previously segregated activities were becoming interlinked. In outsourced work, the opposite could also be true. While the theory has progressed by including multiple activities and focusing on their connections in such dynamic fields, Engestrom (2000) cautions that extending the unit of analysis should begin with “internal systemic connections” of these activities. He reiterated that “activity theory is at its best in analysing such poorly understood processes of developmental transformations over time.”

The potential of any framework for organizational analysis is fully realized when it is applied in a number of fields and the experiences are utilized to further improve it. The Activity Theory is increasingly being applied in many areas and it would be interesting to note the insights that can be teased out of such an application to inter-activity relationships in project-based work spanning global boundaries. Towards this aim, certain useful conceptual tools and the particular ways in which they can be used have been highlighted here. Multiplicity of ideas and application settings give theorizing in any field the richness necessary to generate useful knowledge and this is equally true for the multidisciplinary field of organization studies. It should be reiterated here, that the call to explore this particular framework is intended to enhance this multiplicity. In the current settings, there is much interest in the challenges faced by temporary, provisional arrangements of work as exemplified by software development and in the resultant uncertainties of actors that span national and organizational boundaries. As illustrated above, the Activity Theory has the potential to help researchers and practitioners to focus on a set of key issues by providing them with a rich vocabulary and a repertoire of enabling concepts.

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Doubt yourself and you doubt everything you see. Judge yourself and you see judges everywhere. But if you listen to the sound of your own voice, you can rise above doubt and judgment. And you can see forever.

— Nancy Kerrigan