DEFINING COMMUNITY OF PRACTICE IN THE CONTEXT OF ACTIVITY THEORY

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Abstract Knowledge is significant part of the assets of any organisation. The utilization and continuous creation of knowledge are the most important managerial challenges organisations face today. While the technology for collecting, storing, and accessing information continues to grow exponentially, the ability to effectively and efficiently use this information to enhance job performance, as well as deliver quality products and services remains elusive. The challenge is to foster human interaction and Knowledge Sharing (KS) by creating an environment that truly values KS. The sharing of knowledge (not just information) among the members of an enterprise created the communities of practice (CoPs), which aimed at learning from one another to achieve a common goal, e.g. that of a group of people with common interests. We believe that creating the right environment to foster sharing and collaboration is a critical component of knowledge management. The environment should connect people, processes, and information. However, the design of an effective knowledge sharing environment is not trivial. Technical knowledge is inadequate. It also requires social and cultural knowledge. Based on our experience with communities of practice, we have created a knowledge sharing community model using activity theory to allow users to co create value in sharing knowledge. This paper describes the design of a knowledge sharing environment that incorporates technical, social and cultural aspects of CoP.

Keywords: Activity Theory, Community of Practice, Knowledge Sharing, Learning Community

1. Introduction

Knowledge Management (KM) and knowledge communities have been recognized as major enablers for personal learning and job performance in achieving organisational business objectives. (Hickok 2005).

The sharing of knowledge (not just information) among the members of an enterprise created the communities of practice (CoPs), which aimed at learning from one another to achieve a common goal, e.g. that of a group of people with common interests. The challenge is to foster human interaction and Knowledge Sharing (KS) by creating an environment that truly values KS.

Knowledge in organisations manifests itself in one of two forms -explicit and tacit. Explicit knowledge can be easily articulated, captured, and transferred. Tacit knowledge is intangible and not easily transferable. The question is how do we share and transfer the tacit knowledge that resides in an organisation?

We believe creating the right environment to foster sharing and collaboration is a critical component of knowledge management. That environment must stress the importance of leadership, people, culture, process, learning, and enabling technology as well as connecting people, processes, and information through Communities of Practice (CoP).

Building a system for sensing the existence of CoP characteristics is not a trivial task and the approach is not technological per se. Activity theory, which considers social and cultural aspects, is the most appropriate to be considered in the system design for CoP where communities, social behaviour, social rules, social artefacts, learning objects are among the essentialities that need to be considered. Based on our experience with communities of practice, we have created a knowledge sharing community model, using activity theory, to allow users to co-create value in sharing knowledge.

The paper begins with a brief review of community of practice for knowledge sharing followed by an overview of activity theory. The next section describes a Building System for Capturing CoP Values using activity theory. The paper concludes with suggestions for further research.

2. Community of Practice

The literature provides various definitions and illustrations on Community of Practice, but commonly emphasises the informality of the community organisation, knowledge network based on socialisation, learning through in-depth participation, commonalities in terms of passion and problem interest and recognition of individual identity. Wenger (Wenger 1998 & 2006) categorised three general characteristics of CoP which are the domain, community and practice. The members in a CoP establish themselves in a similar domain of interest through internal recognition of members' expertise and identity that are not obvious to non-members. The domain reveals the bonding among the members as the group with common interests and goals. As the result of the shared domain, the community engages in the joint activities through peer-to-peer learning, mutual interaction and common project. The community members get together in practice to demonstrate resource sharing and shared repertoire.

Common jokes, clichés, local practices and experiences are the resources that are shared in practice.

CoP theory is based on Situated Learning (Lave & Wenger 1991), which is rooted in social learning theory (Bandura 1977). There are numerous social learning tools and technologies that have been developed to support the CoP activities for the community. The tools and technologies range from a knowledge portal that provides central resources for CoP community; community management to manage the community's calendar, events, and communication; online teaching and learning for student and teacher; and knowledge exchange to facilitate queries to domain experts, based on systematic expert profiling (Wenger 2001).

Despite the growth in CoP, there are very few guidelines existing to examine the theoretical underpinnings for the design of systems.   It is our belief that Activity Theory (AT) is ideally suited as a socio-cultural, socio-historical lens through which we can understand, analyse and design CoP systems. This is because AT focuses on the interaction of human activity and consciousness within its relevant environmental context.   Activity theory incorporates notions of intentionality, history, mediation, motivation, understanding, culture and community.   In particular, AT provides a framework in which the critical issue of context can be taken into account as well as the social and cultural aspects.

The design and development of CoP focus should be on facilitation capacities first, before any substantial investment in technology. The technical solutions should be determined by the emerging needs of the group. A usable and effective CoP should provide a social container for linking and learning between practitioners, knowledge producers and policy processes to analyse, address and explore solutions to problems. (Hearn & White 2009). This is more than the exchange of knowledge. It is about the making sense of and the interpretation of knowledge within the members' specific contexts. It is about their ability to use knowledge, reject it or improve upon it.

The impetus for a new community usually comes from the recognition of a specific need or problem. From there, next steps will revolve around; defining the scope, finding participants, identifying common needs and interests and clarifying the purpose and terms of reference (Buckley 2007). In order to sustain a CoP one should maintain members' interest and involvement, growing the community, developing the body of knowledge and moving the agenda forward and adding value.

According to Wenger, McDermott and Snyder (2002) there are seven principles in cultivating communities of practice, namely: Design for evolution; open a dialogue between inside and outside perspectives; invite different levels of participation; focus on value; private and public; familiarity and excitement; as well as rhythm. To make a CoP grow it is necessary to legitimise participation, to be in line with real practices and be supported not controlled by the organisation.

Wenger (1998) argues that participation of the people who were engaged in the process of creating, refining, communicating and using knowledge became an imperative if collective knowledge was to be used as a competitive advantage. This means that learning is a social activity and that people learn best in groups (collaboratively). Another factor that influences knowledge sharing is that of culture. Recent research on organisational learning and knowledge creation indicates that knowledge sharing, communication, and learning in organisations are profoundly influenced by cultural values of individual employees (Hutchings & Michailova, 2004). Studies also showed that cognitive strategies, methods of learning and knowledge generation differ by national and ethnic cultures (Korac-Kakabadze & Kouzmin, 1999). It is therefore important when designing a knowledge-sharing environment in CoP to take account of cultural issues.

3. An Overview of Activity Theory

The basic unit of analysis in activity theory is human activity. Human activities are driven by certain needs where people wish to achieve certain purposes. The activity is mediated by one or more instruments or tools. It is obvious that activity cannot exist as an isolated entity. The very concept of activity implies that there is an agent who acts (an individual or collective 'subject'). An activity is directed at something, so there should be things the agent is interacting with. According to activity theory terminology, activity mediates interaction between subjects (agents) and objects (things).

According to Kuuttti (1996), an activity is a form of doing directed at an object. The object can be a material thing, a less tangible thing such as a plan, or totally intangible such as a common idea, as long as it can be shared for manipulation and transformation by the participants of the activity. Transforming the object into an outcome motivates the existence of an activity. Activities are distinguished from each other according to their objects. It is possible that the object and motive themselves will undergo changes during the process of an activity: the object and motive reveal themselves only in the process of doing.

An activity always contains various artefacts (e.g. instruments, signs, procedures, machines, materials, laws, forms of work organisation). Artefacts have a mediating role. Relations between elements of an activity are not directed, but mediated. For example, an instrument mediates between the subject and the object of doing. The object is seen and manipulated not 'as such', but within the limitations set by the instrument (Kuutti 1996). Artefacts are created and transformed during the development of the activity itself and carry with them a particular culture - a historical remnant of that development. The relationship between subject and object of activity is mediated by a tool. A tool can be anything used in the transformation process, including both material tools and tools for thinking. The relationship between subject and the community is mediated by rules and the relationship between object and community is mediated by the division of labour - how the activity is distributed among the members of the community, that is, the role each individual in the community plays in the activity, the power each wields and the tasks each is held responsible for. Rules cover both implicit and explicit norms, conventions and social relations within a community as related to the transformation process of the object into an outcome. Each of the mediating terms is historically formed and opens to further development (Kuutti 1996). The basic structure of an activity can be illustrated as in Figure 1.
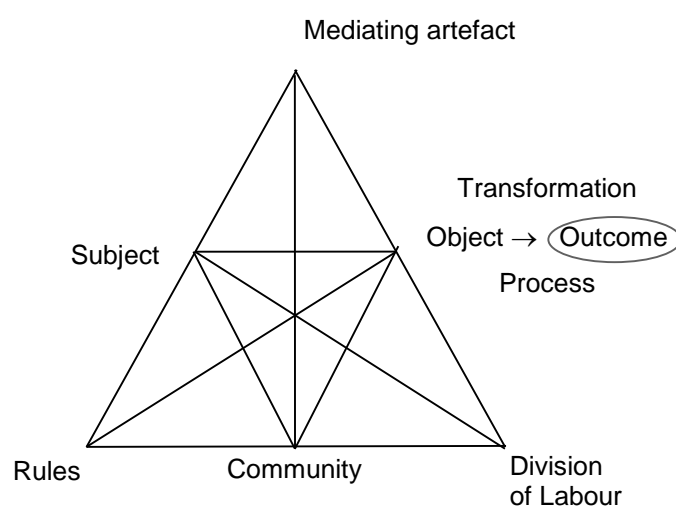

Figure 1: Basic structure of an activity

AT is a philosophical and cross-disciplinary framework for studying different forms of human practices as historically developed cultural systems that inter-link individuals and society. The individual's actions are always situated in a culturally determined context and are impossible to understand outside of that context. The context of individual action is a historically developed activity system, which is the smallest possible unit of analysis that still preserves its distinctly human activity. Activity as a historically developing system is always

collective, but it is realised through individual actions. Thus, several individuals participate in the same activities and an individual can, and usually does, participate in several activities at the same time.

3.1. Benefits of using AT in Designing CoPs

Activity Theory in design for human and computer interaction has brought in significance advancement to the development of computer software that requires other aspects such as community rules, social practices and interest. Kaptelinin and Nardi has given excellent literature on the application of AT in the research of HCI (Kaptelinin and Nardi, 2012). Hence, there are several benefits of using AT for the design of CoP in which the interaction design is more than just designing the screen input and output interface. One of the main advantages that AT offers to the study of CoPs stems from its fundamental view of purposeful activity on a cultural historical context as the fundamental unit for the study of human behaviour. There are several advantages to using Activity Theory to understand and design CoPs. First, Activity Theory describes activities as hierarchical in nature and provides a model for decomposing activities into actions and operations. Secondly, Activity Theory insists that all activity is mediated by physical or mental tools. In the case for knowledge sharing, these are the non-human aspects of the system. However, the concept of tools in Activity Theory is richer than what is assumed in traditional approaches. In the case of Activity Theory, the tool both affects the user and is itself affected by the user. Thirdly, Activity Theory views activity not as a simple individual action, but as being culturally and historically located. Because of this, it is able to address the importance of organisational influences on the use of CoP.

3.1.1. Building System for Capturing CoP Values

Community of Practice has become commonly accepted and adopted by major corporations worldwide (e.g. British Petroleum (Prokesh 1997), IBM (Gongla & Rizzuto 2001) and Shell (Shell 2001)) as the approach for engaging people in knowledge sharing and organisational change. The reason for this adoption is that CoP has proven to enhance social capital and also the productivity performance index of an organisation, as well as to improve the technical skill and know-how of an individual (Fontaine & Millen 2004). Due to proliferating demand on CoP implementation, there is a drastic need of CoP facilitators. The facilitators play two major functions, which are firstly to build, facilitate and stimulate the environment of CoP and secondly to observe and

analyse the existence of the CoP values in an organisation. Even though by tradition it is argued that a CoP group is a natural formation and practice among members induced by the common interest in learning, of late, there have been initiatives to inculcate the members in embracing CoP values through training and facilitation. This is called "sponsored CoP" while the former is called "informal CoP". In a "sponsored CoP", guidelines and indicators are established during the initial stage of promoting and nurturing members with the support of continuous facilitation. At the follow-up stage, the organisation needs to oversee the continuous presence of CoP values and to ensure the adoption has reached maturity state and is stable. This stage is essential and applicable for both "sponsored CoP" and "informal CoP" since presence of CoP values at this point is believed to be the natural creation by the members. It is important to note that CoP values have tendency to become extinct, even though the organisation has gone through a maturity cycle, if they are not preserved through consistent monitoring. Experienced facilitators are in high demand, but are rarely available in the market and usually attached to an organisation on contract basis. Such an arrangement can be costly when such consultancy exercise is frequently needed. Due to this problem, our research is motivated to build a system that could sense and capture the presence of CoP values. In Syed Mustapha (2010), a CoP framework that will perform such tasks is described, based on the CoP values that have been identified.

Table 1 describes the CoP characteristics and the CoP objects that need to be captured in order to sense the presence of the CoP characteristics as reported in Syed Mustapha (2010).

Table 1.   CoP Characteristics and Objects

CoP Characteristics	CoP Objects
Community Structure	- the community structure is volatile where the membership is not fixed - the hierarchy is not rigidly established (i.e. no member dominates the others in consistent order) - the members are formed due to common interest - there is a fluid movement between members of different groups - members are beyond the formally defined structure - strong ties between members
Learning through participation and reification	- repetitive participation and deep relationship - reification as the result of community participatory - formation of unprecedented solutions or practices

Negotiation of meaning	- evolutionary of community artifacts in the content due to repetitive visit - evolutionary of community cognitive process over a subject matter
Learning as temporal	- process of learning that takes place over a period of time - process of learning involves a shift in the knowledge content
Boundary objects	- learning objects that are shared by different groups of communities - multiplicity in how the learning objects are used, understood and interpreted
Boundary encounters	- occasional events where there are distinctive groups encounter - issuance of new learning objects from the group encounters
Mutual engagement	- agreed community activity - same level of participation - mutual significance in contribution
Joint enterprise	- sense-making, coordination, cooperative, responsibility, ownership and interactivity - strong relationship and link among members
Shared repertoire	- identifiable social products that are shareable within a community - identifiable unique social products of certain community group
Identity	- community's recognition on an individual's identity - identification of an individual's identity

3.2. How AT can be used for understanding CoP characteristics?

Activity theory can be used as a framework for understanding the totality of human work and praxis and the deliberate processes changing this, i.e. a totality encompassing organisational development, design and use of computer artefacts (Bodker 1991).

3.2.1. Community Structure

AT provides a basis for studying the social interactions of computerised work. It provides the relationship by maintaining that any artefact, be it computer or otherwise, can only be understood within the human social context, that is, by examining the way in which it is used, how it is developed and what needs it is likely to serve. AT pays attention to the mediating role of tools in relating humans to their world of goal-directed activities by providing the context for both mental processes and external actions. According to Bodker (1991), humans use the computer not because they want to interact with it, but because the wish to reach certain goals by acting through its interface. We believe that only having a better understanding of human activity will allow us to conceive and design more flexible systems, responsive to human needs and use.

The object of this activity system network is constantly in transition and under construction and it manifests itself in different forms for different stakeholders and at different stages of the activity. In the context of an organisation, CoPs are artefacts or tools used by people to carry out the knowledge sharing more efficiently and effectively.

3.2.2. Learning through participation and reification

The main purpose of system design is to try to predict the future use activity. However, we will never be able to fully make such a prediction. The future will always shape itself differently from what we predicted. This gives rise to new conflicts, which in turn lead to new design. By using the Activity Theory framework, this understanding can be included explicitly.

Design using Activity Theory is discussed in relation to the activity that it is aimed to change – the use activity. The idea of conflicts as a basis for organisational change has important implications for system design (Bodker 1991). These include:

- The development of a new artefact moves on simultaneously with the development of the organisation in general. If the organisation is not considered together with the artefact, one may introduce new contradictions instead of helping out with the original one.

- Conflicts are considered fundamental, and used as a resource in the change process.

- System design starts out from the users, and it is the development of their praxis that is in focus.

Design is seen as a collective (users and designers) learning process where two principles are fundamental: the application of a methodological cycle and the notion of the 'zone of proximal development' or known as ZPD (1978).

3.2.3. Negotiation of Meaning

Current system design lacks tools for dealing with many of these aspects, as well as the dynamics of the understanding that Activity Theory provides. Activity is always in a state of flux. Activity systems are interrelated, providing each other with input and serving as instruments for each other. Contradictions are inevitable, occurring within and between activity systems; they lead to transformation of the processes. Activity is constantly developing as a result of contradictions and instability, and due to the construction of new needs. Activity theory understands human beings as dialectically recreating their own environment. Subjects are not merely choosing from possibilities in the environment, but actively creating the environment through activity. According to Engeström (1987), any activity system has four levels of contradictions that must be attended to in analysis of a working situation. Contradictions are present in every collective activity. They indicate emergent opportunities for the activity development. Contradictions are not weakness, but signs of richness, and of mobility and the capacity of an organisation to develop rather than function in a fixed and static mode. In order to analyse an activity system's development, it is important to identify contradictions. By identifying the tensions and interactions between the elements of an activity system, it is possible to reconstruct the system in its concrete diversity and richness, and therefore explain and foresee its development (Engeström 1999b).

In Activity Theory, design and use are tightly coupled where changes, including changes of computer applications go on continuously, driven by the conflicts occurring at different levels in organisations and society (Kaptelinin and Nardi, 2006). Activity Theory gives us certain instruments that make it possible to deal deliberately with these change processes, and emphasises that all levels and aspects of the activity need to be dealt with in the design.

3.2.4. Learning as Temporal

Another AT concept that is useful for CoP design is that all activity is located culturally and historically. This means that all activity is influenced by the cultural setting in which it occurs and in view of the events that have happened previously. This historical context of an activity is also an important factor in tool mediation as the experience that a person has with the available tools will influence the way the person uses the tool and hence the way the person carries out the activity.

3.2.5. Boundary Objects

Objects became cultural entities and the object-orientedness of action became the key to understanding human psyche. (Engestrom, 2001, p. 134) Activity Theory offers us the possibility of seeing use and system design as a multitude of change cycles, where computer applications as well as other parts of the work activity are constantly reconstructed using more or less well-known materials, design tools and techniques, with a more or less clear understanding of the product. An explicit awareness of these cycles may change our way of doing design. This suggestion (Floyd 1987) is taken further in Activity Theory because conflicts can be acknowledged and taken seriously in design.

It is important to focus on research in how computer applications can be designed to mediate human work. The idea of computer applications as mediators emphasises the connection of human beings with each other and with the objects that they work on through a transparent computer application. System design does not stop when the design process ends. As people start to use the products they learn, i.e. they go on developing the artefact.

3.2.6. Joint Enterprise

Artefacts, in human activity, have a double character: they are objects in the world around us that we can reflect on and they mediate our interaction with the world, in which case they are not themselves objects of our activity. The normal use of artefacts is done through operations, and is not conscious. When we encounter difficulties with artefacts, the world does not come to a standstill. Instead, breakdown leads to actions that 'work around' the problem so that we carry on. Artefacts are seen as historical devices reflecting the state of practice up until the time they are developed. It is now generally accepted by researchers that designing the technical core alone is insufficient. In order to design and

implement successful systems, some kind of 'context' has to be taken into account - a context that contains people and their relations (Kuutti 1991).

3.2.7. Mutual Engagement

Activities consist of processes, sequences and networks of activities, each contributing something to a common object of activity and are carried out by a collaborative community of actors sharing the object. The object, in our case the development of a CoP, gives a motive to the existence of the corresponding activities, and is thus the context against which actions make sense. Activities are object-oriented; an activity exists when several people do something together to the same object, manipulating and transforming it to achieve something. The central concept of an object contains the 'material' to be transformed, the outputs to be achieved and the motive that determines usefulness of the transformation process. It is normal that the conception of an object will undergo changes during the course of an activity; the object will reveal itself only in the process of manipulation and transformation.

3.2.8. Shared Repertoire

In order to participate in a collective work activity, it is necessary to have some common conception about the object of the activity. This conception is constantly formed and reconstructed during participation in the processes and in discussion about the work between the participants. The better the shared conceptions about the object, the more efficient the funding of an activity. In a turbulent environment, it is essential to adjust the object of the work according to the conditions. Thus, the question is not how to understand something once it has been determined, but also how to construct and reconstruct it together.

3.2.9. Identity

An important dynamic is addressed by AT in the active nature of the subject of an activity. A person (user) brings with them a whole range of biases that affect how they approach an activity. These include their previous experience, cognitive skills, personality and culturally-determined traits. These will continue to evolve as the person undertakes that activity. This is why capturing the correct user's conceptual model for the system we are designing becomes crucial.

Using AT to analyse the development of a CoP involving different stakeholders offers several benefits. AT suggests that if the members of the networked activities could see themselves as participants in a broader work activity, then it would enhance their ability to coordinate themselves by reflecting their action against the overall object of work and the status of the overall transformation process.

3.2.10. Boundary Encounters

Activity theory places voice and dialogue at the centre of its pedagogy (Engestrom, 1995; Engestrom et al., 1999). The multivoiced and multilayered nature of activity systems can be a source of co-operation, but also of conflict and rivalry pointing to the need, if learning is to be effective, for procedures and traditions of conversation and dialogue, translation and negotiation. Of particular importance is the management of the boundaries of learning environments to enable learners to move coherently between settings. The challenge over time for a community of learners is to develop shared understanding and agreement - a common voice - about the learning process, its purposes, beliefs and activities. This shared system of meaning will need to be negotiated to enable mutual appropriation of ideas. (Ranson 2000).

4. Conclusion

We believe that current approaches to CoPs design lack an effective theoretical basis to deal with the complexities involved their development concerning the identification of the requirements of the different stakeholders involved in the system development. We believe that there is a need for a holistic theory capable of addressing the complex nature of these systems, the tools that provide it and the use of those tools by people in a day-to-day context. Such a theory needs to encompass not only the technology, but also the human users, their tasks and the organisational context in which these users work.

Although activity theory offers benefits for CoP research, its main problem is that AT is very abstract and difficult for non-experts to use. However, despite this, the main advantages of activity theory is that it avoids simple causal explanations of CoP analysis by describing an organisational setting as an ensemble of multiple, systematically interacting elements including social rules, mediating artefacts and division of labour. It also explicitly perceives an activity as a dynamic phenomenon in which not only consensus and stability, but also conflicts, breakdown and discontinuities play a crucial role. Further research is currently

being undertaken by the authors to make operationalising AT principles into guidelines or procedures that non-experts can use to model CoPs.

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