Application of activity theory implemented in information systems psychology essa...

Activity theory is a theory of understanding the unobservable mental processes of the human, and their response and perception to a stimulus. Philosophers have established many definitions and explanation of activity theory, however it can be most clearly defined as:

“ Activity theory theorizes that when individuals engage and interact with their environment, production of tools results. These tools are “ exteriorized” forms of mental processes, and as these mental processes are manifested in tools, they become more readily accessible and communicable to other people, thereafter becoming useful for social interaction” (Kim 2010 p: 1).

The activity theory has been made well known especially in the field on psychology by the likes of Leont’ev, Vygotsky, Luria (1977) and recently Engestrom (1999). Its main use it that of an explanatory nature in multiple disciplines, to enable us to gain a clear understanding of they way systems work and how change may occur.

In this study we will introduce the origin of the activity theory, its framework and constructs, and identify its use. Furthermore we will analyse the activity theory from a philosophical, ontological and epistemological perspective. To analyse the application of the activity theory, we look at three examples from which we will draw out the theoretical framework.

History of the activity theory

The origin of the Activity Theory lies within the work of Russian psychologist, Lev Vygotsky (1896 – 1934). Vygotsky spent his time discovering the relationship between words and consciousness, and studied human mental development (Vygosky, 1986). In the 1920’s, Lev Vygotsky worked on a way

to develop a psychological theory based on Marxist philosophy and thinking (O'Leary, 2010).

During the 1920's and 30's, Vygotsky worked alongside two other psychologists, Alexander Romanvich Luria (1902 – 1977) and Aleksei Nickolaev Leont'ev (1903 – 1979), together they formed the Troika (Radzikhovkii & Khomskaya, 1981). The work of these three psychologists were developed and carried out at the Institute of Experimental Psychology and the Krupslcaya Academy of communist Education (Radzikhovkii & Khomskaya, 1981). Luria was one of Vygotsky's students and worked on this project with Vygotsky. After working with Vygotsky on this theory, Leont'ev went on to extend Vygotsky's work develop a more practical structure of the Activity Theory, which only became well known in the 1990's once it was translated form Russian into English (Levy, 2008).

As mentioned above, the Activity Theory was developed by the philosophers, namely; Vygotsky, Luria and Leont'ev (Engestrom, 1999).

Three general themes are present throughout the research done on the Activity Theory by the three Philosophers:

The use of genetic or developmental method.

The claim that higher mental functioning in the individual emerges out of social processes.

The claim that human social and psychological processes are fundamentally shaped by cultural tools or mediation means. (Vygotsky, 1978).

Figure 1 below shows the basic structure of the Activity Theory developed by Vygotsky.

Tool

Subject

Object

Figure 1: The basic schematic of mediated Activity as developed by Vygotsky (1978, 1987 p: 201).

General overview of the activity theory

Although the Activity theory originates from the three Russian psychologists, a key set of structures were developed in the late 1970's by Engestrom (1970), which was used to explain the Activity Theory in a more clear and informative manner. This frame work was developed and used over multiple disciplines.

The following quote by various philosophers provide a brief explanation of the Activity Theory;

According to Hasan and Crawford (2003 p: 155), " Activity theory is based on the idea that human activity is a dialectic relationship subject (person) and object (person)." This means that the relationship is not harmonious and that human perform actions with a predetermined outcome in mind. These actions however are influence d by tools, words, or cultural signs (Hasan and Crawford, 2003).

Engestrom (1989 p: 30) philosophically describe Activity Theory as a “ system of collaborative human practices and sees it as a generator of a constantly and continuously emerging context.”

Morten et al (2002 p: 158) specified that the individuals’ interaction with other humans and their surroundings leads to thoughts and perceptions. Thus, Morten derived two types of activities (Levy 2008);

Goal directed activities: the action occurs due to the goal that was set.

Goal derived activities: an action occurs before goals are set.

Shchedrovitsky (1995) on the other hand noted two approaches in his study of the Activity Theory;

Formulation of the activity: This means that the individual carries out a set task or activity.

Activity as an attribute of individuals: where the subject is the cause of the activity.

When comparing Morten and Shchedrovitskys’ approaches we can see that they are alike, Morten’s goal directed activities and Shchedrovitsky’s formulation of activities are alike as individuals do not have control over the activity to be performed. The goal derived activity and activity as an attribute is the same as the individual makes the decision of what and how the activity will be carried out.

Theoretical constructs of the activity theory

After Leont'ev expanded on Vygotsky's theory, a modern philosopher, Engestrom developed a general theoretical construct in 1987 for the Activity theory; there are various other structures that were developed to explain Activity Theory which will be discussed below.

Engestrom's Structure of Activity

According Yrjo Engestrom (1987) the activity theory is composed of 8 elements that interact with each other to achieve a specific goal.

Activity and Tasks: an activity is an action that performed on an object to achieve an outcome or a goal. This activity may contain numerous steps or task that may or may not lead to achievement of the ultimate goal (Barthelmess and Anderson, 2003).

Subject: subjects refer to the person that carries out the activity. The subject may play a specific role in completing a task, but is ultimately part of a group or team doing an activity.

Object: the object is that which becomes transformed in the process of the activity and is motivated by a goal (O'Leary, 2010).

Outcome: the outcome is what happens after a task or activity is completed, it may or not obtain the object or goal (O'Leary, 2010).

Community: the community is composed of all the people or subjects and objects involved in the activity being performed (O'Leary, 2010).

Tools: tolls refer to physical and mental tools. They determine the way people interact with reality. They may limit peoples' reactions or help them by enabling them to do things they previously could not (O'Leary, 2010).

Rules are guidelines, conventions, codes etc. that are usually set up by the organisation for a specific activity (O'Leary, 2010).

Division of labour: includes the hierarchical structure in the organisation and how activities are broken down into tasks and divided among members of the organisation (O'Leary, 2010).

The Activity Theory framework can be diagrammatically summarised as follows:

Figure 2: The structure of an activity. Source: Engestrom, 1987 p: 342.

Drawing conclusions form the above framework, it is evident that a pattern occurs in the analogy of the Activity Theory of most philosophers. The Activity Theory can thus be explained as an explanatory theory that enables us to understand, identify and acknowledge strengths and weaknesses in a system. With the use of Activity Theory, a subject performs an activity on an object to reach an outcome. The activity in influenced by a tool(s) and the outcome driven by a goal. However, there are rules that govern how these tasks and activities are performed, and how tasks are divided among participants. These participants for the community of the activity, it includes everyone that was directly involved in the activity.

Bendy et al. Units of Analysis

The activity theory is based on cognitive of perceptive actions and the analysis there of (Bendy et al 2000). In general, the activity theory is composed of 5 units of analysis:

Activity Task Action Operation Function Block

Activity and tasks are objects of study as they are composed of assorted units with complex internal structures that represent particular kinds of activities focused to achieve terminal goals. Actions, operations and functional blocks emerge as units of analysis. Activities have intermediate couscous goals.

Theories related to the activity theory

Two theories have shown to be prominent that relate to the activity theory, namely the Information Systems Development (ISD) model and the Activity Analysis and Development (ActAd) Model. The activity theory is an explanatory theory that gives us a clear indication of the current situation and its problems, whereas the ISD model and ActAd is designed to carry out solutions and bring about change in systems.

According to the paper written by Korpela et. al (Information Systems as an Activity), the ISD model and the ActAd model are interlinked where the ISD model is used as a universal work activity, with influence from ActAd as a theoretical framework. ActAD describes an activity as whole unit, comprised of networks and smaller activities or tasks, which is almost identical to the framework of the activity theory, Mursu et. al (2007).

Korpela et. al explains the ISD model as a method in which an activity is manipulated by tools such as analysis, design, implementation, introduction and sustained support, as well as process management. In theoretical terms, the ISD model can be easily analyzed by using the activity theory as a framework, as all elements of the activity theory are interlinked forming a network for the interaction of activities.

The use of activity theory and the diciplines in which it is used

Psychology was the first discipline to use the activity theory, specifically a Russian psychologist Leont'ev (1977). Leont'evs' initial concern was the nature of the human consciousness and understanding the fundamental psychological basis of human behaviour through the study of linguistics, mental disabilities and its phenomena.

In Engerstrorms' article, " Activity theory as framework for analysing and redesigning work" the activity theory is defined as a multi-disciplinary approach, as it cuts across disciplines ranging from economics, sociology, psychology, ergonomics and criminology. Engerstrom (2000) describes the theory as drawing on psychological notions of mental processes, and makes use of institutions and communities rather than individuals as their units of analysis. Activity theory is directly proportional to learning and doing, in the sense that one cannot exist without the other; they are driven or initiated by a goal (Rohrer-Murphy and Jonassen, 1999).

During the 19th century, social science was defined as the study of human behaviour within societies. An authentic definition of social science given by

Émile Durkheim, Karl Marx and Max Weber: “ A society is made up of individuals are a major unit of analysis within a society”, entitles them as primary architects of modern social science. With the use of the activity theory, we can predict the outcome based on background information and existing knowledge. This will enable us to gain a clear understanding of the varying behaviours and mental processes of people within a society.

In criminology, activity theory was proposed by Lawrence Cohen and Marcus Felson in 1979 (Miller, 2006: 81). It was a response to attempt to analyse the then increasing crime rate of the United States during 1947 to 1974 (Cohen, 1979: 588). during that period, the crime rate was increasing and economic conditions were deteriorating, the activity theory was thus popular at that time as it was the only theory that could explain the circumstances. Once the analysis was complete, Cohen and Felson created a theory that was based on the rational choice model, in which people make rational decisions in ways that increases their advantages, and decreases their disadvantages as much as possible (Akers, 2004: 26).

It is thus evident as stated above that the activity theory is versatile and can be used across multiple disciplines. It is an explanatory theory that enables the development of change and can be implemented in countless situations.

Philosophical perspective of Activity theory

According to Kutti (1991), activity theory is the “ Philosophical framework for studying different forms of human praxis as developmental processes both individual and social levels interlinked at the same time”

In other words the activity is not classified as a methodology but as a philosophy that looks at different forms of human natures acceptable practices, as developmental processes both on a social and individual level simultaneously. This philosophy is further described by Engestrom (1987) as a structural framework focused at surpassing all known dichotomies of micro-macro mental and material, observation and intervention in analysis and redesign of work.

“ The Philosophical views deals with problems connected with knowledge, values, reason, mind and language” (Teichmann and Evans 1999). Philosophical perceptions of activity theory found its origins in 1987, the birth of the society for research that was based on Activity Theory (ISCRAT) foundation. The Activity Theory was developed to solve problems for four main areas include Psychology of play, learning, cognition and child development (Becker and Niehaves 2007). Further more there where key outcomes or focus areas; language acquisitions and experimental development, these were also linked to educational institutes and schools.

The activity theory discovers deep underlying concepts; the study of these concepts takes us through a process of transcendence. Thus it is important to realise that individuals have a variety of societal circumstances, secondly it creates ways to understand change, and thirdly the concept of labour and the role it plays. Labour comprises of the use and making of tools and the conditions that affect the activity. These conditions can be broken down to the functions of the process, relationship with nature, other people and the different people in the society (Engestrom 1999).

Ontological perspective of Activity theory

The term “ ontology” comes from field of physiological concerned with study of being or existence. In computer science and information science ontology designed to enable the use of knowledge in a specific area whether physical or virtual. Ontology defines concepts, relationships and other distinctions that are relevant for development in a precise area (Liu and Tamer 2009).

Ontology and activity theory is useful for theoretical and methodical lengths characterising and analysing and designing for a particular unit. The transition to meditated activity, fundamentally changes all psychological operations. The use of tools limitless broadens the range of activity within which new psychological functions may operate (O’Leary 2010)

As shown in the above figure. Activity Theory ontological perspective branches off the core disciplines of activity theory and looks at the tools, rules, division of labour, community, subject, object and outcomes in depth. The Ontology view will result in areas of meditational tools and artefacts, norms, tasks and roles, groups, individual, goals and results. Ontology offers a deeper and descriptive understanding of collaborative learning. (Barros et. al 2002).

(Barros 2011 p: 2)

Epistemological perspective of Activity theory

Epistemology is a philosophical study of what is required in order to have rational benefits and knowledge. Both traditional methods of philosophy and

modern methods of cognitive science have broadened the understanding of epistemology (Cruz, 2011).

Epistemology is an attempt to make sense of the possibility, nature and limits of human intellectual achievement. A key focus is to try to understand what is really known or believe reasonable. Epistemology aims to understand general and ever-present elements of human enquiry such as perceptual knowledge or inductive inference. Epistemology aims to investigate specific areas of knowledge or rational beliefs. To understand the nature of explanation in cognitive science ultimately the use of epistemology is present (Thorne 2005).

When one relates the elements of Epistemology to the Activity Theory we can deduce that possibilities relate to the outcome of the activity and the limits referred to the rules that govern these activities. If we look at Activity Theory from an Epistemological perspective, its purpose is to describe a situation and how outcomes are achieved through the use of knowledge and resources, same as tools found in at. Activity theory thus realise what we know based on our knowledge and experiences, and gives us clear understanding thereof.

Part b

Activity Theory as an Analytical Tool: A Case Study of IS Development for an Anti-Retroviral Treatment Clinic in South Africa

‘ Does Activity Theory assist in highlighting challenges faced by the ART clinic with their current IS and assist in representing what users require from IS?’

The above the question is that which the case study seeks to answer. The ActAD model was used to highlight work and communication activities for which IS was needed. It was used to investigate the quality of data and illustrate importance of linking IS development and work practises.

Research methods used were observation, structured and semi-structured interviews. These were used to help with understanding on how IS are used and also to understand reasons why it is not used. Value and performance of current IS needed to be researched if a potential explanation could be found.

A number of techniques were used to collect data and to develop the process flow, these included the following:

Use of available info, common knowledge, published docs and literature study on health info.

Physical observations of the current process to watch and record the processes in the current systems

Structured, semi-structured, unstructured interviews with various stakeholders were held. Either face to face or by email.

After the collaborations with stakeholders and noting of concerns and viewpoints towards the current HIS, the ActAD model was used to represent the current IS and also the desired IS.

Activity Theory as an Analytical tool:

Actors and subjects: ART staff clinic that produce healthcare for HIV/AIDS patients requiring ART

Means of work, the instruments and the facilities: computer, excel spreadsheet, docs in patient files, statistical data and medical instruments

Object: unwieldy patients

Means of co-ordination and communication division of work, rules, etc.: communications via phones or verbally, the rules stipulated and applied and use of captured data.

Researcher’s role was to observe current situation by focusing on object, the means of work, instruments and facilities and how the actors and subjects made use of data collected. There are also exterior players illustrated by governmental and non-governmental organizations.

Usefulness of Activity Theory: Highlighting the challenges

The need for change: computer network and connectivity is lacking and thus a computer-based IS would be needed to aid the data incarceration, analysis and reporting. Current HIS does not support management functions or work processes of the clinic.

IS as part of the work activity: work processes need to be streamlined if a computerised IS can assist with improving data quality and help improve decision making. Some of the improvement would include:

Segregation of duties

Verification of data

Standardisation of ART clinic IS.

Role of different stakeholders: the greatest challenge is the need for all the stakeholders to agree on a flexible IS that meets the minimum data requirements of the parties involved.

Need for on-going support: funding for IT and training, ongoing upholding and support will be required once the system has been designed and implemented. This will lead to enhanced quality of healthcare services if it is part of proper admin and resource management.