This paper discusses the use of organizational activity theory to address concerns on the best way to digitized human work that can lead to the creation of a harmony between the human, technical and the social system, towards increased productivity in the deep mine industry. The aim is to develop the requisite knowledge on the use of social networking technologies (new communication models) to design highly digitised work activity in which open collaboration can be enhanced between the human and the technological functions of the work that will make cross value chain optimisation a reality. This is because, world’s metal mining industry faces a number of challenges covering the whole mining and minerals which must be addressed with using both the socio-technical approach (Abrahamsson and Johansson, 2008) and organizational activity approach (Sanda, Fältholm and Abrahamsson, 2010). As such, mining industries need new mental images of themselves based on new technologies with a modern work organization that supports high productivity as well as good working and social conditions (Abrahamsson, Johansson and Johansson, 2009).

Thus in the digitized mining activity, the human is simultaneously engaged in physical activity (through the manipulation of digitised computer technology to programme robotic work tasks) as well as in mental activity (through digitized communication models, by listening to background music during work, information transmission from the mines control centres, and/or from colleagues approaching or leaving the individuals activity location inside the deep mine). This therefore gives rise to the question of the kind of learning that can be made by studying and understanding the human activity component of the digitized mining activity, and how such learning can be used to improve future work design of mine activity that can result in increased productivity, improved quality of work life, positive negotiation of tasks, and the evolution of tacit knowledge.

Data is collected using observation and video-recording of miners’ activities, as well as recorded interviews with the miners during four separate visits (shifts) in the company of mineworkers to the mine work environment 1.3 kilometers below the earth surface. Each study visit lasted seven hours which is the work duration for each shift.

The Systemic-structural activity theory (Bedny and Karwowski, 2007), a modern synthesis within activity theory which brings together the cultural-historical and systems-structural strands of the
tradition with findings and methods from Western human factors/ergonomics and cognitive psychology (Bedny and Karwoski, 2007) is used. The SSAT entails the conceptual application of both organizational activity and macroergonomics. The rationale for using these theoretical approaches is that these theories, in their own approaches, provide dynamic views of strategic practices in organizations, and also help explain the role of such practices in organizational change (Sanda, 2006; Jazarbskowski, 2003). This theory avoids the current trend whereby most of the works within activity theory are restricted to the sociocultural approach to activity study, with the individual-psychological approaches to activity study, which are basic to the study of human work, usually not discussed (Bedny and Karwoski, 2007). The individual-psychological analysis of activity includes the informational (cognitive), the morphological, the functional, and the parametrical methods of activity analyses (Bedny, Karwowski and Bedny, 2001). All of these methods are considered to be interdependent and are logically organized according to stages and levels of the activity analysis. This allowed for the obtained data to be tied together into a holistic system (Bedny and Karwoski, 2007). Therefore in the analysis of deep mining activity, both the sociocultural and the individual-psychological analyses are conducted.

In the activity analysis, the persons engaged in the mine activity, what their intentions, goals and motives are, and what type of activity they are involved are considered important. The main unit of analysis is the mine production activity. The sub-unit of analysis is carried out at two levels. These are the “object oriented” activity level, and the “subject-oriented” activity level. The object-oriented activity is analyzed from the perspectives of individual miners using technological tools (highly mechanized equipments) in breaking the rocks (material objects). The subject-oriented activity is also analyzed from the perspectives of the individual miner and his subjective interaction with the communication models and the technological tools as social objects.

Based on the analysis, it is argued that since organizations possess technologies (i.e. techniques for processing raw materials and/or people) for accomplishing work, organizational activity then emphasizes a work system design in which technology affects social relations in organizations by structuring transactions between roles that are building blocks of an organization. In this respect, it is argued that application of systemic-structural activity theory stands to provide an understanding of the various processes that is entailed in digitized human work which can be used to design a harmonious work environment integrating the human, technical and the social system, towards increased productivity in the deep mine industry. The significance of such harmony creation is defined by the realization that in order to enhance the development of intelligent automation systems for industrial firms, there is a need for the creation of knowledge on the harmonious integration of technological, organizational and human systems. This is because such integration
will stand to provide the basis for the evolution of a community of practice at the workplace. It is concluded that the systemic-structural activity theory can help understand how to optimize a work system’s design, such as the digitized mine activity, in terms of its sociotechnical system characteristics. Based on this understanding, the characteristics of the overall work system design can be carried down to the design of individual jobs, as well as human-machine and human-software interfaces in order to ensure a fully harmonized work system. When this goal is achieved, the results should be dramatic improvements in various aspects of organizational performance and effectiveness (Hendrick and Kleiner, 2002).

References


