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AODM as a framework and model for characterising learner experiences with technology

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The task of characterising learner experiences with technology is increasingly becoming complex due to continuous technological advancements that enable learners to connect, collaborate, generate educational resources and promptly share them in various settings. The challenge for the educator is to understand how to effectively capture and represent learners' current and future experiences with technology. This paper presents 'Activity-Oriented Design Method' (AODM) as a framework and model for characterising personalised and contextualised learner experiences with technology. The objective is to show how AODM can be used to understand learner experiences by examining learner practices with technology and interactions with each other. The aim is to assess the significance and adequacy of AODM as a framework and model that contributes to future understanding of learner experiences with technology. In order to support our arguments, we draw practical insights from two studies that applied AODM to e-learning

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investigations. The outcome of this analysis is an assessment of the capacity of AODM as a model and framework for characterising both current and future learner experiences with technology. Furthermore, the analysis illuminates the processes of change that inform the design and use of future technologies for learning.

1 Introduction

This article explores use of ‘Activity-Oriented Design Method’ as a model and framework for characterising learner experiences with technology. Discussions begin by reviewing literature around learner experiences with technology. Thereafter, a brief overview of Activity-Oriented Design Method (AODM) is presented. This is followed by a description of two studies that used AODM to investigate e-learning. Finally, we reflect on study findings and comment on the suitability of using AODM to characterise current and future learner experiences with technology.

Learner experiences with technology are shaped and influenced by various factors including: the nature of tools or technologies used to support learning; focused objectives or motives for engaging in learning activity; social and cultural aspects that exist in the context in which technology is used. Furthermore, new technologies such as mobile and ubiquitous technologies are increasingly transforming the way learners interact with each other and with educational resources, such that there is currently greater flexibility in the way learners experience learning with technology in various settings. For example, learner interactions with mobile and ubiquitous technology can be personally meaningful to the individual, and contextually sensitive to the social and cultural practices of the settings in which technology is used. Therefore, the design of future learning systems depends on a thorough understanding of the complexity of learner practices and interactions with technology. As Kukulska-Hulme (2008) points out:

“Learner experiences are clearly reinforced by a number of strong trends including the rapid spread of mobile devices which are largely personal and facilitate context specific interactions with technology and each other via social-networking tools such as facebook, twitter, etc.”

A challenge for researchers and developers of technology enhanced learning is to ensure that key elements of learner experiences with technology are made more visible in order to understand their respective contribution to enhancing current understanding of learning with technology. In this regard, models and frameworks play a very important role in making key elements of learners’ experiences with technology more visible by offering a way of conceptualizing

and characterising learner processes and elements that may assist in identifying meaningful forms of learning. Models and frameworks of learning can help us to understand attitudes towards learning and expectations from technology use by making processes that are meaningful to learning much more visible.

Meanwhile, constant changes in learner needs, contextual influences, personal expectations and attitudes towards technology use makes it difficult to effectively capture and represent learner experiences with technology, and, to predict future practices. Most models and frameworks of learning do not take into account transformations in learner practices or investigate learners' prior knowledge and experiences with technology (Engeström, 1999; Barab *et al.*, 2001). This situation has led to an increased interest in developing models and frameworks that help researchers to capture broad aspects of learners' experiences such as: paying attention to changes in learner practices, investigating learners' prior knowledge, and, considering both personal and contextual points of view (Luckin, 2010; Sharples *et al.*, 2002). Furthermore, the idea of characterising learner experiences with technology at a personal level and across contexts is inherently controversial, since models and frameworks cannot accurately be used to explain and predict the trajectory of developments in personal learning choices and contextual practices, since boundaries between personal and contextual factors are often blurred such that personal learning experience is considered to be part of the individual's identity and preferences (Pettit & Kukulska-Hulme, 2011). Consequently, characteristics of individual learner experiences such as preferences, control, choice, confidence in technology use and use of personal devices, also attitudes towards collaborative learning versus individual learning, affect the way learners experience learning with technology.

There are numerous studies of the use of technology in formal and informal settings (Scanlon *et al.*, 2005; Pettit & Kukulska-Hulme, *op. cit.*) but they vary significantly in research and methodological focus. More traditional approaches to investigating learner experiences with technology tend to rely on gathering learners' views or feedback about technology use, with data collected through use of questionnaires, surveys, interviews (Sharpe & Benfield, 2005). However, there is currently a growing recognition that efforts to engage learners in more meaningful studies about their e-learning experiences may require new methods, models and frameworks that are relevant to their personal and contextual settings (Luckin, *op. cit.*; Sharples *et al.*, *op. cit.*). Such conceptual frameworks provide rich data from which to interpret broader aspects of learners' current experiences and future expectations from e-learning. Rich data provides detailed insight into ways in which learners adapt and change their approaches to learning with technology.

In summary, current models and frameworks of learning with technology are

still evolving therefore little is known about their effectiveness in contributing to future understanding of learner experiences with technology. In order to address these issues, we reviewed key characteristics of AODM as a model and framework that renders itself useful for evaluating and characterising learning with technology. Thereafter, we draw some practical insights from two studies that used AODM to investigate e-learning.

2 Activity Oriented Design Method (AODM)

The Activity Oriented Design Method (AODM) (Mwanza, 2002; Mwanza-Simwami, 2009) is an activity theory (Leont'ev, 1978) based iterative approach to analysing and characterising learner practices with tools or technologies whilst paying attention to learner motives, and, social and cultural issues that exist in the context in which learning activities are carried out. AODM was originally designed to support Human Computer Interaction (HCI) research and design processes but is currently widely used to investigate technology enhanced learning and design (Greenhow & Belbas, 2007; Dolonen, 2009, Hauge & Dolonen, 2011; Mwanza-Simwami, *op. cit.*).

The conception and operational structure of AODM is based on the acceptance of Engeström's (1987) expanded model of human activity (Figure 1) as a representation that captures and unifies key fundamental principles of activity theory (Kaptelinin & Nardi, 2006) into a unified whole. Engeström (*op. cit.*) added the 'rules and regulations', 'community' and 'division of labour' components to Vygotsky's (1978) original model of human activity. The added components together with the 'tools' component that was originally introduced by Vygotsky (*Ibidem*) serve as mediators of a collective activity system. The various components of an activity system also known as an activity triangle model are shown in Figure 1.

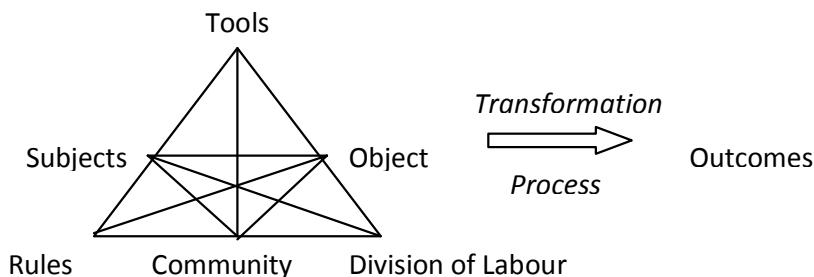


Fig. 1 - Activity triangle model also known as activity system (Engeström, 1987)

Components of an activity system includes: *subjects* representing those involved in activity e.g. learners and teachers; *tools* to represent artefacts such as technology used to carry out activities; *object* to represent objectives, motives and purposes for engaging in activity (objectives are transformed into *outcomes*); *rules* are mediating elements that represent regulations, cultural norms and practices of those involved in activity; *community* components represents both the physical and conceptual environment in which activity is carried out; finally, the *division of labour* component reflects variations in roles and responsibilities when carrying out human activities. The activity system is suitable for analysing both individual and collaborative practices. An important feature of this approach to modelling human activities is that it prompts the investigator to understand the:

- structure of an activity or activities being examined
- relationships that exist between and amongst various components of an activity system
- objectives or motives of those involved in activity
- history of the development and use of technologies in the activity being investigated
- role of tools, rules and regulations, also the division of labour as mediators of human activity.

2.1 The AODM toolkit

AODM presents (a) a method for applying fundamental principles of activity theory (Leont'ev, *op. cit.*; Kaptelinin & Nardi, *op. cit.*) to the phenomenon being investigated, (b) four methodological tools presented as an analytic scheme for identifying the essential elements of human activity and for examining inter-relationships, (c) guidelines to help identify contradictions that exist in the activity being investigated, all of which are essential to improving the overall activity. The four methodological tools incorporated in AODM include the:

1. *Eight-Step-Model* (Table 1) - helps to apply fundamental principles of activity theory by translating components of the activity system (Engeström, *op. cit.*) in terms of the activity being investigated.

TABLE 1
AODM's Eight-Step-Model (Mwanza, 2002)

The Eight-Step-Model		
Identify the: -		Question to Ask
Step 1	Activity of interest	What sort of activity am I interested in?
Step 2	Object-ive	Why is the activity taking place?
Step 3	Subjects	Who is involved in carrying out this activity?
Step 4	Tools	By what means are the subjects performing this activity?
Step 5	Rules & Regulations	Are there any cultural norms, rules or regulations governing the performance of this activity?
Step 6	Division of labour	Who is responsible for what, when carrying out this activity and how are the roles organised?
Step 7	Community	What is the environment in which activity is carried out?
Step 8	Outcome	What is the desired Outcome from carrying out this activity?

2. *Activity Notation* (Table 2) - used to reduce complexity in activity analysis by facilitating modelling and decomposition of activity systems in order to produce sub-activity systems.

TABLE 2
AODM's Activity Notation (Mwanza, 2002)

The Activity Notation				
Actors (Doers)	~	Mediator	~	Object-ive (Purpose)
Subjects	~	Tools	~	Object
Subjects	~	Rules	~	Object
Subjects	~	Division of Labour	~	Object
Community	~	Tools	~	Object
Community	~	Rules	~	Object
Community	~	Division of Labour	~	Object

3. *Technique of Generating Research Questions* (Table 3) – provides general and more focused research questions used to further examine learner interactions in sub-activity systems or learning episodes in order to conduct a detailed investigation and identify contradictions.

TABLE 3
AODM's Technique of Generating General Research Questions (Mwanza, 2002)

Technique of Generating General Research Questions
1) What Tools do the Subjects use to achieve their Objective and how?
2) What Rules affect the way the Subjects achieve the Objective and how?
3) How does the Division of Labour influence the way the Subjects satisfy their Objective?
4) How do the Tools in use affect the way the Community achieves the Objective?
5) What Rules affect the way the Community satisfies their Objective and how?
6) How does the Division of Labour affect the way the Community achieves the Objective?

4. Technique of Mapping Operational Processes - used to interpret and communicate research findings by presenting visual representations of the transition of activities, sub-activities, activity components and relations, also contradictions or problems identified in focused activities. Figure 2 shows an example implementation of AODM' technique of mapping operational processes in previous studies (Mwanza, *op. cit.*).

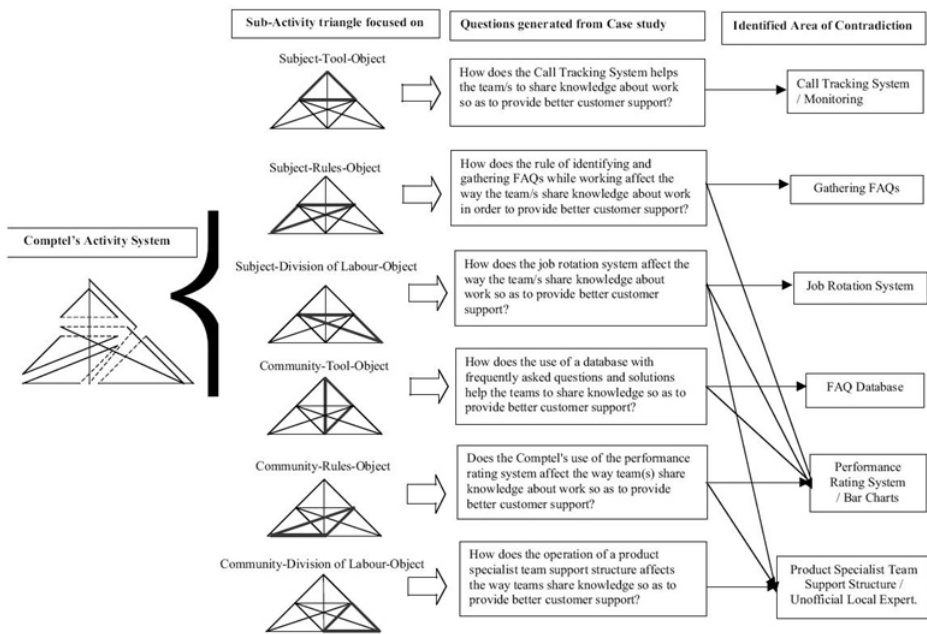


Fig. 2 - AODM's Technique of Mapping Operational Processes (Mwanza, *op. cit.*)

AODM based investigations enable a descriptive analysis of activities, following the ethno-methodological tradition that is key to activity theory. The outcome is context specific micro-analysis of activities, sub-activities, relationships between and within an activity, also brief episodes of the fo-

cused activity examined in great detail. AODM's support for analysing brief episodes makes it particularly suitable for investigating mobile learning events (Mwanza-Simwami, *op. cit.*). Furthermore, AODM is concerned with helping the researcher to identify contradictions within the activity system and generate design insights for further study and refinement.

In order to put foregoing discussions into perspective, a review of some of the studies that applied AODM to e-learning investigations and design is presented below.

Study 1: Using AODM to investigate knowledge building and sharing in higher education

Greenhow and Belbas (2007) used AODM to develop a comprehensive understanding of collaborative knowledge building and sharing practices among course design teams and their students within distance education programs. The aim of the study was to understand and characterize educational practices from the point of view of course design team members and their students. AODM was used to study and refine individual and group perspectives on the development and deployment of e-Learning courses at a large USA based university. Students were involved as participants in the design and critique of educational activities by closely examining practices in course design and development as they unfold in order to identify collaborative knowledge building practices, identifying where they occurred and where they broke down within an activity system. Study findings indicate that use of AODM analysis enabled researchers to effectively organise data gathered so as to facilitate ease of retrieval while preserving accuracy and context. This was important because the study was focused on understanding instructional practices as they occurred in situ, whilst information was collected from various sources and multiple media that included "audio recordings and transcripts of interviews, texts of threaded discussions, assignment submissions, screenshots of the WebCT/Vista interface, and course documents" (*Ibidem*). Results indicated that AODM model provided activity theory based categories that enabled investigators to identify key activities, actions, operations, etc., therefore, enabling investigators to determine whether or not "keywords derived from activity theory concepts were comprehensive enough to adequately represent the situation participants' described" (*Ibidem*). Results also show that working thorough the various stages of AODM's Eight-Step-Model enabled the course team to consider peer collaboration practices among students as essential to enacting course objectives by producing initial interpretation and modelling of the course design system (*Ibidem*). Furthermore, investigators were able to model the teaching and learning activity system in order to identify evidence of peer collabora-

tion in the course and identify features of the system design that support such practices. In conclusion, Greenhow and Belbas (*Ibidem*) observed that AODM based detailed descriptive analysis of educational practices facilitates limited generalisation to similar context but enables the researcher to accumulate evidence over a period of time.

Study 2: Using AODM to understand shared practices and future interactions in educational software design

Dolonen (2009) conducted a study of the role of teachers and students in the design of innovative educational software in which they used activity theory (Leontiev, 1978) as a general framework for investigating practices and used AODM amongst other methods and models to structure the design and evaluation of practices. The objective of this study was to establish a rich environment for conceptualising shared practices and future patterns of interactions and models of education. The immediate aim was to identify interesting everyday experiences with software so as to assess implications of teachers' and students' contributions to the design project (Dolonen, 2009). The study was carried out in the context of a large European Union (EU) funded project entitled: 'Science Created by You' (SCY, 2009 - <http://www.scy-net.eu/>). Whilst foundations of Dolonen's (*Ibidem*; Hauge & Dolonen, 2011) work were based on activity theory as a conceptual framework, AODM based methodological tools and models were used to put theory into practice during practical design activities. Dolonen (*Ibidem*) report that they found use of AODM's Activity Notation useful for reducing complexity in an activity system, however, they criticised the model for failing to give clear guidance on how to analyse inter-relationships between the various sub-activities of an activity system. In this regard, AODM introduces the technique of generating research questions in order to reveal relationships and contradictions that exist in an activity. In conclusion, Dolonen (*Ibidem*) observed that the strength of AODM lies in its approach to revealing structural tensions in human practices, however, they also noticed that AODM does not support the implementation of new practices, which would be helpful for conceptualising and representing innovative and new forms of learning which is vital for understanding learners' future practices with technology.

Reflections

This article has reviewed the suitability of AODM as a model and framework for capturing and representing learner experiences with technology by examining key characteristics of the AODM approach, which are: first,

that it focuses on understanding learner objectives or motives for engaging in activity; second, it focuses on examining social and cultural issues that exist in the context in which learning takes place in order to understand their influences on tool usage mechanisms; and third, that it offers a number of formal ways of investigating and representing what is happening in the learning process at a fine-grained level. Furthermore, AODM supports identification of contradictions in activities which can be used to improve the design of technologies, activities and interactions in future systems. This is useful for understanding both current and future experiences of learners' interactions with technology. Nevertheless, learner experiences like all human practices are inherently complex and subject to influences from various sources. AODM deals with the complexity of human practices by providing essential views of the structure of activity with very detailed context specific information showing relationships between one activity and another. Finally, even though AODM was not originally designed for characterising learner experiences with technology, the two studies presented in this article report successful and positive use of AODM to capture and model human practices and inter-relations, which is essential for characterising learner experiences with technology.

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