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Research Paper

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ABSTRACT

Due to the lack of guidelines on how to apply the activity hierarchy (AH) of activity theory (AT), many postgraduates including emerging researchers, continue to struggle in their attempts to apply the theory as a lens. Also, the difficulty limits options in selecting theories in information systems (IS) research. Thus, the study's objective was to propose a set of guidelines for applying AH in IS research. From a qualitative methods perspective, thirty-one articles were gathered. The interpretive approach was applied using the hermeneutic cycle to examine the articles. Based on the analysis, a model was developed. The model provides a set of sequential guidelines for applying AH as a lens in IS research. The study highlights the need for applying AH as a lens to guide postgraduates and emerging researchers including IS researchers who are unfamiliar with AT. The proposed approach has significant implications for improving the ease of use of the theory from a qualitative IS research standpoint.

Keywords

Activity theory, activity hierarchy, activity system, activity model, activity hierarchy model, information systems research.

INTRODUCTION

Activity theory (AT) focuses on actions in a socio-technical system through six connected components (Bryant et al., 2005; Engeström, 1987). The theory is founded on the concept of "activity", which has been justifiably portrayed as a purposeful and transformative tool for underpinning the relationships and interactions between actors and objects. According to Jonassen and Rohrer-Murphy (1999: 62), AT "provides us with an alternative way of viewing human thinking and activity". Hence, the theory helps social-technical systems mediate actions in a social structure (Engeström & Sannino, 2021; Nardi, 1996).

AT regards human activities as units for analysis, focusing on consciousness (McAvinia, 2016; Kaptelinin & Nardi, 2006). Based on the strengths and focus, the theory has been applied in more than three million information systems (IS) peer-reviewed articles (Iyamu, 2021). The application of AT has often focused on using the activity model consisting of six components: tools, subject, rules, community, division of labour, and object, in various areas of IS research. Despite its growing popularity, the activity's hierarchical structure by Leontiev (1978), seems muted. This paper does not pretend to present a case or argue on behalf of Aleksei Leontiev. This tries to contribute to advancing the work because of its necessity.

In areas where the activity model does not fit or cannot be used to underpin a study, there has been a consistent shift to other theories. The activity hierarchy does not seem to get consideration. This trend could be attributed to two main reasons. Firstly, it is difficult to get enough peer-reviewed articles to support and justify the research pursuit. Secondly, the reference points to guide the application of the concept are limited.

In AT, an activity is a collective phenomenon with a shared object and motive (Mursu et al., 2007). According to Leontiev (1978), human activity can be analysed into a three-level hierarchy of activity, action, and operation, each of which reflects the objective world. Human activity as the unit of analysis provides a useful hierarchical structure for examining behaviour relating to systems and technology, which affords insight into the sequential process. Karanasios (2018) explains how the hierarchical structure provides insights using a multi-layered lens for understanding activities.

Despite its significance and relevance in the context of IS research, the approach remains silent. This is attributable to a lack of a guide. Thus, the question posed by this study is: how can a guide be developed and proposed to interested researchers? By providing the guide, some challenges encountered in applying the activity hierarchy in IS research can be overcome. Importantly, it advances the development and evolution of AT from an IS research standpoint.

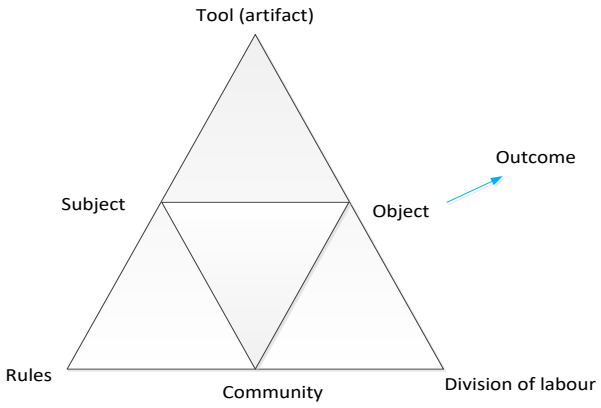
This paper is organised linearly into six main sections. Appropriately, the first section introduces the paper, followed by a comprehensive review of the literature. The approach employed in the research is discussed in the third section. A guide on how to apply the activity hierarchy as a lens is presented in the fourth section. In the fifth section, the implications of the study focusing on critical factors are discussed. A conclusion is drawn in the last section.

LITERATURE REVIEW

Activity Theory (AT) focuses broadly on human activity and encompasses behaviours and historical events that are culturally and socially constructed. As shown in Figure 1, the activity model consists of six components: tools, subject, rules, community, division of labour, and object (Engeström, 1999; Nardi, 1996). The subjects are relevant as they perform an activity (Feryok, 2012), using tools within rules and context where the division of work takes place (Mursu, 2007). An object is the basis for which an activity is initiated (Nehemia-Maletzky, 2018). The components are interrelated and help to formulate relationships and interactions in an activity.

Figure 1

Activity Model (Engeström, 1999)



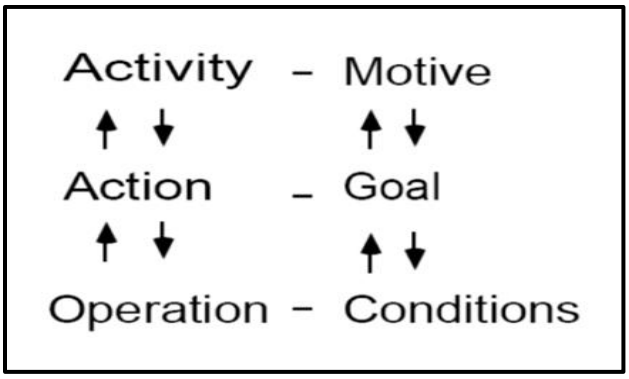
Human activities go beyond such. Propelled by activity hierarchy, therefore, in addition to the activity model (Figure 1), there is a need for a theoretical framework that addresses the significance of activities (Bertelsen & Bødker, 2003). Thus, Aleksei Nikolaevich Leontyev created a three-level hierarchical structure for a collective unit of analysis of activity (Engeström et al., 1990; Leontiev, 1978).

Activity hierarchy is a component of the AT that analyses an activity system using a three-layer hierarchical structure: (1) upper, (2) middle, and (3) lower layers, as shown in Figure 1 (Leontiev, 1978; Zheng et al., 2022). Figure 1 depicts bidirectional arrows indicating that activity can transform both downward and upward. When the activity transforms downward, it transforms into action, and action into an operation, while in the upward direction, the operation transforms into the action and the action into an activity (Blayone, 2019).

At the upper layer, the focus is on the activity and motive, whereby the activity comes into being because of the motive established by the subject. According to Li et al. (2022), the activity is seen as a collective effort conducted by the whole community at the upper layer of the hierarchy. Ang et al. (2011) explain that within an activity system, the collective activity is connected to the objective of the entire community. Thus, individual subjects are not often consciously aware of their roles. The middle layer appears beneath the upper layer and focuses on purposeful actions (Zheng et al., 2022). Blayone (2019) argues that at the middle layer, the primary focus is on subjects conducting their goal-driven actions that contribute to the object of activity. Engeström and Sannino (2021) explained how actions are discrete, short-lived, and consciously directed to goals.

Figure 2

Hierarchical levels of an activity (Leont'ev, 1981)



At the third layer of the hierarchy, there are routine operations. These routine operations are determined by the conditions under which the activity is conducted (Zheng et al., 2022). Li et al. (2022) asserted that operations are carried out unconsciously. However, Ang et al. (2011) argued that when a new condition is encountered, a routine operation is moved back to the action level (middle layer) at which it will be conducted consciously. Thus, at the lower level, the operations are directly influenced by the conditions in which the actions are carried out.

Activity hierarchy provides a multi-layered lens for understanding activities (Karanasios, 2018). Ang et al. (2011) asserted that activity hierarchy explains the process in an activity system, allowing for differentiation between a collective activity and individual action. Bertelsen and Bødker (2003) suggest that using the hierarchical structure enables a deeper understanding of events, behaviour, and situations concerning an activity and the motive, within context. Bertelsen and Bødker (2003). In Nardi's (1996) summation, AT offers a holistic and contextual discovery method relevant to conducting qualitative and interpretative research.

RESEARCH APPROACH

This study employed a hermeneutic interpretive approach to study peer-reviewed articles that have employed AT for analysis. The hermeneutic approach emphasises continuous engagement with and gradual development of a body of literature during which increased understanding and insights are developed (Boell & Cecez-Kecmanovic, 2014). According to Al-Raisi et al. (2020), hermeneutics is a qualitative approach that seeks knowledge and understanding from written texts. In this study, the researchers aim to seek knowledge from peer-reviewed articles to understand activity hierarchy and how it can be applied to guide data analysis. The peer-reviewed articles collection process was guided by the study aim, which was to develop a model to guide the application of the activity hierarchy sequence process in information systems studies. Thus, articles that have applied or mentioned the activity hierarchy were collected.

The articles were collected from various scholarly databases: Google Scholar, IEEE, Emerald, Scopus, Elsevier and, Tyler and Francis. To search through the academic databases, the following keywords were used: activity hierarchy, activity system, activity model, and activity theory. The collected peer-reviewed articles were from different years of range including past decades. The collected articles

needed to go beyond the recommended ten-year (Iyamu, Nehemia-Maletzky & Shaanika, 2016) publication range for two reasons. The first reason was to include the articles of the authors who pioneered the theory. This helps to gain insights into the historical perspective in terms of how the terms are perceived. Significantly, this was to gain a historical understanding of the activity hierarchy concept and how the concept has evolved. The second reason is that it was difficult to find articles that have applied the activity hierarchical concept to guide data analysis in IS research in the past five years. The limited literature is an indication that researchers are challenged with the application of activity hierarchy in IS studies.

In total, thirty-one (31) articles were collected and used as data for this study. This is attributed to the limited literature on the topic, the activity theory's hierarchical structure. The articles were analysed using the hermeneutic circle technique. The hermeneutic circle allows analysis of texts in an iterative process, reading each article a few times to gain a deeper understanding of the theme from various angles (Engler & Stausberg, 2021). Going back and forth during the analysis leads to new meanings to emerge. This was necessary to foster a deep understanding of the activity hierarchy and its application. In applying the hermeneutic circle, the researcher adopted the interpretive approach. Walsham (2006) suggests that the interpretive approach helps to gain knowledge of reality through social construction obtained from materials such as documents. This means that the approach can be used to gain a deeper understanding of insights from data sets (Nakasholo & Iyamu, 2019; Iyamu, 2018). The interpretive approach was therefore used to examine the narrative that the activity hierarchy is concerned with consciousness and the collectiveness of actors within a community. This includes the interrelationships between activities and actions including the emotions and conditions that are associated with the development, implementation, and management of systems.

ACTIVITY HIERARCHY STRUCTURE FOR INFORMATION SYSTEMS RESEARCH

Human activities are multilevel and developed through interaction between subjects and the objective world (McAvinia, 2016). As shown in the model (Table 1), the hierarchical structure allows multilevel analysis. The structure consists of three rows and two main columns, which we have classified into A (A1, A2, and A3) and B (B1, B2, and B3). Sequentially, human actions are purposeful, socially constructed, and mediated using relevant tools. Thus, an activity is congruently a unit of analysis. In such a circumstance where an activity is the unit of analysis, it provides a hierarchical structure for examining events and situations including interaction between individuals or groups of individuals within context. In doing so, the model employs an interrogative approach using the prefixes "What, Why, and How". The model should be read with the discussion that follows to gain a deeper comprehension.

The model marks the importance of sequence, mode, and agency by making them the trajectories, as shown in Table 1. In sequence, behavioural information can be gathered until it reaches a significant level (Hsu et al., 2023). The sequence can go through many split states (Polato et al., 2018). Mode is a collaborative way in which something occurs, is experienced, or is expressed. From the AT perspective, agency is the process that enacts this nexus of ongoing social constructs. Blunden (2022) conceptualises agency within a non-dichotomous, dialectical approach that gives credence to it being an achievement of togetherness. According to Stetsenko (2020), human agency is irrefutably, incontrovertibly, and thoroughly collective and collaborative using tools or things.

Table1

Hierarchical model for analysis

Sequence				Mode	Agency
Activity A1		Motive B1		Consciousness	Collective
What is the activity? Who problematised the activity? What is the purpose of the activity?	Who are the entities that perform the tasks? How does the performance satisfy a need through a material or ideal object?	What are the intrinsic and extrinsic rationale and factors behind a task? How was the intrinsic and extrinsic rationale defined?	Who defines a purpose? What influences a purpose?		
Action A2		Goal B2		Consciousness	Individual/ Group
What are the individual actions to be conducted? How was the act of doing specific things towards an outcome inscribed into an actor? Who inscribes such an act?	How was the process of doing things instilled by the objective? When was the process ascribed to the actors?	What are the specific goals being pursued? How is progress towards goals measured?	Who defines the specific aims/goals being pursued? What are the factors that can influence successful outcomes?		
Operation A3		Condition B3		Non-conscious	Things
How were the tasks executed? When did the transformation of the objective into reality happen?	How were the tasks achieved? When were the entities achieved?	What are the factors that lead to the change in events? How was the change executed?	How was the situation expressed? What are the limits of the situation?		

As shown in the Table, there is a connection between entities A and B. Each entity is split into subunits, downward and upward units, in a sequential order, 1, 2, and 3. In their explanation, Korpela et al. (2000) suggest that an activity is not intended for the same collective which produces it, but to be "consumed" by another collective. Thus, from an examining perspective, the analysis can be routinised. Also, routinization improves distinct constructs, conceptually and empirically (Hansson et al, 2023). The

routinisation allows the interpenetration of behaviour in events and situations concerning an activity. The agency, therefore, helps to summate how behaviour, rationalisation, and interpenetration are engineered to produce consequences.

Hierarchical model: Column A

Dynamically, the hierarchical structure enables analysis of activities, actions, and operations that change over time. This allows for the deconstruction of an activity in analysing qualitative data. Bertelsen and Bødker (2003) argued that the theory provides a hierarchical analysis of information behaviour through activity-action-operation and, by doing so, allows for the deconstruction of an activity. The deconstruction helps to unmask sedimented actions and operations of individuals and groups. It entails a dichotomic approach, a state of mutual exclusivity of actions and operations. This means that nothing can belong simultaneously to both action and operations in an activity. This leads to an exhaustive process through liminality and elimination of the composites and influencing factors.

Mind and body are catalysts of actions and operations, which are binaries. However, in analysing these binaries, deconstruction helps to gain a deeper comprehension of how the line separating these opposing entities (mind and body) connects them, making the entities interdependent. By connecting action and operation concerning an activity, a researcher can provide insights from hidden nuances in empirical evidence and reveal the implicit meaning of an assessment.

An activity constitutes a state of satisfying a need using an idea or tools. Giampietro (1994) explains how the hierarchical concept from an activity theory perspective provides a scientific tool to explore contrasting entities. The action involves being active on entities, routine or seldom. Karanasios (2018:136) asserts that “actions are accomplished because they realise a specific activity and can be described as subordinate to an activity”. Consequently, in the operation, entities are performable tasks, to satisfy a need through a material or ideal object. Blayone (2019) suggests that it is at the level of operations that individuals gain an understanding of the processes leading to the desired result, and the necessary capacity for automatising actions without sacrificing outcome quality. Additionally, it is about the act of doing specific things, focusing on an outcome and the desire geared towards satisfaction.

Hierarchical model: Column B

Motives are conscious, and individuals or groups usually consciously set and pursue goals. Conditions that Mursu et al. (2007) suggest are that the operation is non-conscious, and it results from routine actions. McAvinia (2016) explains that the analysis has a structure, undertaken under certain conditions, mediated by specific tools, and performed to achieve a purpose.

Activity is a behavioural system that does not happen in a vacuum but is evoked by events. The motive, goal and condition represent the triggers that evoke activity, goal, and condition, respectively. Importantly, without motive, goal and condition, the activity systems will cease to exist. Hence, motive, goal and action are the forces that give direction and shape to the activity system. It is worth noting that the activity system is never passive as its six components are collaboratively active towards the motive, goal, and condition. The activeness and interactions between the six components bring contradictions to the activity system, consequently modifying goals and conditions. Zheng et al. (2022) assert that contradictions are resolved continuously during the system’s life cycle and are considered a source of user needs evolution. The hierarchical structure enables the analysis of the factors that cause contradictions and how they are dealt with at each level of the activity.

There exists a hierarchical primacy of embodied behaviour which spreads across structures and activities, as a pattern (Stevanovic & Monzoni, 2016). For example, desire is geared towards

satisfaction, which instigates set plans for successful outcomes. Additionally, the desire defines purposefulness. Also, a likelihood that defines the result of certain events. Thus, actors pursue specific aims towards successful outcomes over time. However, often, there is an expression of a situation that limits or restricts an event.

IMPLICATIONS OF THE STUDY

From a data analysis perspective, there are implications for postgraduates focusing on qualitative methods and emerging researchers including researchers who intend to employ the hierarchical structure model proposed in this paper. As tabulated in Table 2, the implications of the study, more specifically, the model are behavioural, routinisation, and interpenetration.

Table 1

Implications of the model

Factor	Implication
Behavioural	There are three critical implications: (1) to learn how to gain a comprehension of non-dichotomous, dialectical that gives opportunities and challenges for the social construction of an activity; (2) an understanding of human behaviour affords researchers insight into the sequential process of an activity (Bertelsen & Bødker, 2003); and (3) the behaviour must be mapped and reasoned from both technical and non-technical perspectives, to gain a deeper understanding of the motive, action, and condition manifested.
Routinisation	Routinisation ensures predictability and repetitiveness of the processes in employing the activity hierarchy for data analysis. A high degree of routinisation enacts stability of the iterative process (Hansson et al., 2023). Document how it helps to reduce complexity and facilitates the analysis process. When that happens, the researcher can take control of navigating the data analysis using the activity hierarchy. Blayone (2019) explains how human actions are increasingly routinised through automation. Therefore, routinisation complements the iterative-ness of the model.
Interpenetration	The interpenetration of the individuals or a group and associated artefacts in an activity is a challenge that must be understood (Mursu et al., 2007). Interpenetration intersects the rows and columns in the model to draw deep and dependent details from the empirical evidence. This includes relationships and interactions that exist in the overlap within the structure of the hierarchy. Engeström et al. (2024) argued that interpenetration must be understood from a collective standpoint, in activity systems.

Activity theory differentiates between processes and activities at various levels. By implication, it requires learning how to apply the theory to gain a deeper understanding of nonverbal intention and communication. Thus, Stieglitz et al. (2014) assess the level of communication to elicit information within an activity. The implication includes the use of the AT to facilitate the relationships and connectedness of actors in carrying out an activity. Stieglitz et al. (2014) argued that the relationship between hierarchy and influence has not yet been forthcoming. Consequently, this helps to gain insights into explicit and implicit knowledge of human behaviourism that influences the operationalisation of IT solutions.

CONCLUSION

Applying the hierarchical structure model proposed in this paper, for analysis, enables researchers to liner equation–orderliness, deconstruction of an activity, and overcome many of the uncertainties in information behaviour research, which other theories have not covered extensively.

The use of socio-technical theories to underpin studies brings fresh perspectives into information systems and information technology studies. When it comes to Activity Theory (AT), its six components are mostly applied as a lens compared to its hierarchical structure. This is primarily because it is difficult to find studies that have applied the hierarchy structure mechanism of the AT guiding analysis. The AT hierarchy structure provides a sequential process for understanding activity systems. However, without a guide on how to apply the hierarchical structure, researchers will continue to be challenged, missing the wholeness that AT provides. This study developed a model on how to apply the activity hierarchy as a lens for data analysis. The model provides a step-by-step guide that can be employed by researchers to understand information systems activities. Fortunately, the model is not tested, thus it remains a theoretical contribution.

However, our analysis carries typical limitations of an exploratory study. The model has not been assessed using an empirical study in the IS field. The present study focuses only on how to employ the hierarchy structure for analysis in IS research. It excludes how to complementarily use the activity model and hierarchy structure. The limitations notwithstanding, the study is a huge step toward a theoretical and methodological approach for a systematic analysis using the hierarchy of activity theory. In the future, the proposed model needs to be tested and validated by researchers in IS and other fields of study.

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