

Toward a unified view of technology and activity

The contribution of activity theory to information systems research

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Abstract

Purpose – This theory development paper argues that activity theory, as a theory of practice, can help overcome long-standing challenges in the field of information systems (IS) by better accounting for the material in work and social activity. It also suggests ways in which IS research can inform the development of activity theory. The purpose of this paper is to be forward looking as much as reflective to advance an enlarged understanding of activity theory, and argue for its development in IS studies.

Design/methodology/approach – The paper is conceptual and draws upon existing literature and research to propose and cultivate an updated understanding of activity theory as a theoretical lens capable of accounting for social and technical aspects in IS.

Findings – The paper has three aims. First, to cultivate the use of activity theory in IS. It elaborates on the use and contribution of activity theory in IS, charts its use over the last 20 years and discusses how it brings together a range of ideas that have been neglected in other social theories. Second, to explore the challenges surrounding the use of activity theory in understanding interaction between actors and technology. Third, to set an agenda for its advancement in IS, to ruminate upon future research concerning the extension of activity theory and develop a “fourth-generation” activity theory.

Originality/value – The paper presents the first attempt to juxtapose activity theory with other theoretical philosophical perspectives; to chart the use of activity theory in IS over the last 20 years; and, to discuss how activity theory brings together a range of ideas that have hitherto been excluded from – or inadequately formulated in – other contemporary social theories.

Keywords Organizational change, Practice, Theory building, Activity theory

Paper type Conceptual paper

1. Introduction

It is well understood in the field of information systems (IS) that information and communications technology (ICT) acts as a driving force for organizations, in terms of efficiency in operations, processes, managing, and decision making – providing new ways to engage markets, and offering new products and services. More broadly, for individuals and society, ICT can amplify human intent, connecting individuals, opening new channels of information sharing, and creating new ways of mediating human activities and of engaging with organizations. While these themes are of key interest to the field of IS, it has been noted by several scholars that the manifestation of technology in this field – and, more broadly, in organization studies – tends to be limited (Orlikowski, 1992; Orlikowski and Iacono, 2001), and that studying the interaction between technology and actors remains a major challenge. Technology remains “missing in action” (Orlikowski and Scott, 2008, p. 434). The problem is twofold. On the one hand, recent research has noted that there is a trend in IS studies toward neglecting technology (Cecez-Kecmanovic *et al.*, 2014; Sarker *et al.*, 2013). On the other hand,

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it remains a challenge to account for technology without resorting to deterministic reasoning (Leonardi and Barley, 2008). Therefore, theory is needed that can bridge this gap and unify the social and material. A premise of this research paper is that cultural-historical activity theory, or simply activity theory, can overcome these long-standing issues by better accounting for the material in work and social activity – that is, the interaction between technology and actors/organizations. Activity theory makes arguments around “social” and “material” redundant as it provides a conceptual framework in which the social context and use of technology are one and the same, rejecting analytical dualism.

Over the last 20 years, there has been sustained interest in the use of activity theory among scholars in the field of organization studies (Engeström, 1999c; Jarzabkowski, 2003), information research (e.g. Spasser, 1999; Wilson, 2008), computing and human-computer interaction (HCI) (e.g. Kuutti, 1996; Kuutti and Bannon, 2014), and – to a lesser extent – the field of IS (e.g. Chen *et al.*, 2013; Ryu *et al.*, 2005). Each of these disciplines has drawn on specific elements of activity theory and identified contributions, which are drawn upon in this paper to emphasize aspects most relevant to IS.

Within IS research, the use of activity theory has split into two distinct but related streams. The first stream has used the concepts made available by activity theory to understand IS intervention and use, and change driven by IS (e.g. Kietzmann, 2008; Waycott *et al.*, 2014), leaning more toward management, computer-supported collaborative work, organization, and the social aspects of IS. The second stream has centered on using activity theory to inform IS design and to examine how humans interact with technology, leaning toward the fields of design and development, and the technical side of IS (e.g. Chen *et al.*, 2013; Karanasios *et al.*, 2013; Korpela *et al.*, 2000). The first stream remains more nascent. It is here that this paper argues that the use of activity theory can enhance understanding and offer significant insights into IS, offering an alternative (but not necessarily opposing or discordant) perspective to traditional positivistic, interpretive and critical approaches. This paper has several aims. The first is to cultivate the use of activity theory in IS. To do this the paper elaborates on the use and contribution of activity theory in IS, charts its use in IS over the last 20 years and discusses how activity theory brings together a range of ideas that have hitherto been excluded from – or inadequately formulated in – other contemporary social theories. By doing so, it is one of a few attempts to juxtapose activity theory with other theoretical perspectives. The second aim is to explore the challenges surrounding the use of activity theory in understanding interaction between actors and technology. The third aim is to set an agenda for its advancement in IS, to ruminate upon future research concerning the extension of activity theory in IS, and develop a “fourth-generation” activity theory. It also suggests ways in which IS can inform the development of activity theory. While there are guides explaining how activity theory can be applied in IS and related fields (Bodker, 1991; Ditsa, 2003; Kuutti, 1991a; Mursu *et al.*, 2007), this paper provides an update on these contributions and identifies new theoretical challenges, opportunities and directions.

The remainder of the paper is structured as follows. Section 2 discusses the evolution of activity theory and formulates the contribution of activity theory to IS. Sections 3-9 discuss the activity-theoretic perspective on technology and mediation, addresses longstanding issues with activity theory *vis-à-vis* other social theories and proposes development of activity theory for IS research. Section 10 presents arguments for greater use of activity theory in IS and argues for a fourth-generation activity theory. The paper concludes with a summary of the main arguments.

2. Evolution of activity theory

Activity theory is based on the concepts of the cultural-historical school of Russian psychology, which drew largely upon the works of Vygotsky (1978) between 1920 and 1930,

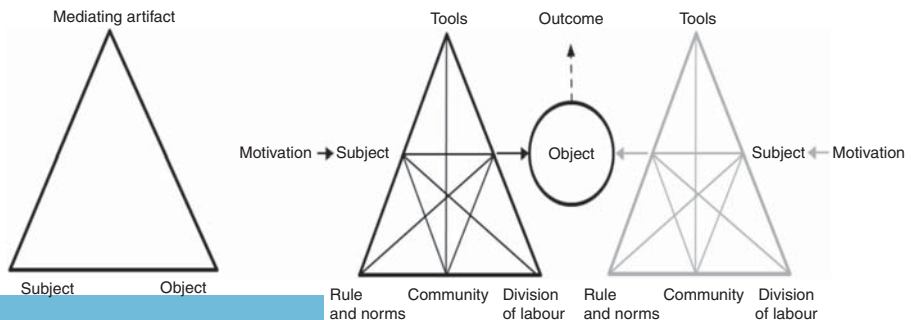
and later of others including Luria, Il'enkov and Leont'ev. Vygotsky's work, which has ostensible links to the ideas of the Bolshevik Revolution and Marxism (Gielen and Jeshmaridian, 1999), focused on learning and development (the zone of proximal development) and addressing profound philosophical questions about the possibility of mind. This paper, however, focuses on the concepts most useful to advance IS research rather than the broader activity-theoretic perspective. For a detailed introduction to the early development of activity theory, see Leont'ev (1978) and Engeström (1987).

Activity theory can be placed into three discernible (yet contested) generations (Engeström, 1987; Engeström, 2001). The first generation of activity theory centered on Vygotsky's early efforts. While Vygotsky's work was expansive, a key component that has endured is the notion of mediated action. According to Vygotsky, the interaction between the human agent (the subject) and the world (the object) is mediated by tools and signs (Miettinen *et al.*, 2009) (similar to Figure 1, left side). The second generation of activity theory is based largely on Leont'ev's contribution. Leont'ev advanced Vygotsky's work by proposing the notion of collective activity (rather than an individual focus) and making the distinction between activity, action and operation (see Section 4). However, Leont'ev never illustrated a model of collective activity. Rather, Engeström (2001) suggested the expanded triangle representation based on Leont'ev's ideas – which introduces the community, rules and norms and division of labor as key elements of an “activity system,” providing a root model of human activity (Engeström, 1987; Engeström, 2001). Figure 1, right side (in black), shows Engeström's (2001) depiction of a second generation activity theory. Engeström's third-generation activity theory expands this by focusing on connected activities and arguing that as a minimum two interacting activity systems should form the basis of a third-generation activity theory (Engeström, 2001). Figure 1, right side, represented by the combined black and gray activity systems shows two interacting activity systems connected by a shared object.

Engeström's (1999c) third-generation activity theory and its related conceptual tools for understanding social action, activity, change, and networks of interacting activity systems are the main focus of this paper.

As illustrated in Figure 1, activities are object-oriented, meaning that the most important element of the activity is the object upon which the subject acts to achieve a desired outcome. The object is the problem, situation or focus of the activity, and anchors the activity (Spinuzzi, 2011). A subject is an agent (a person or collective) that acts upon the object. The approach is considered to be interactionist, as the subject transforms the object in turn the object penetrates and influences the subject (Kuutti, 1996; Leont'ev, 1978). Similarly, Giddens (1984) posited that the subject and object are distinct, producing interacting enabling and restraining conditions; however, activity theory does not separate them from the activity context. A subject has a motivation(s) for working toward an object.

Figure 1.
Left: Common re-conceptualization of Vygotsky's (1978, p. 40) mediated activity. Right: Engeström's (1987, 2001, p. 94, p. 136) activity system and an example of connected activity systems



In work settings, the subject may change over time. For instance, in the context of the development of an IS solution (the object), a team of developers (the subject) may change over time, according to the cycle of research and development, while the object may remain the same (Crawford and Hasan, 2006).

An activity is governed by explicit and implicit rules and norms, which define what behaviors are appropriate. All activities take place within a broader community, through shared concepts (Engeström, 1987). The community is formed through individuals or groups, who have the same general object but are distinct, and with whom the subject interacts. By considering the community, activity theory provides a lens for understanding how actors with different perspectives can work together and develop new knowledge or tools, as well as the “multiple-voices” that appear through interactions between the community and the subject (Engeström, 2001). In addition, activities are considered outcomes of labor and labor organization, and therefore are divided by roles and hierarchies structured through a division of labor.

Importantly for IS scholars, mediation is an important element of the activity system. Tools are used by the subject (or community) to act upon the object. Tools mediate the subjects’ activity and actions. One of the major contributions of the activity-theoretic analysis to IS that it brings together technology (the tools) and the organizational/social context into the unit of analysis (the activity). Therefore, it does not privilege the social aspect over the technical, or overemphasize technology (Allen *et al.*, 2013), but rather offers a socio-technical perspective. That is, through the nature of its activity-based view of reality, it rejects analytical dualism. It follows that human activity is always situated in context, and often multiple contexts – and that the understanding of activity, and the use of IS, is inadequate outside this context (Spasser, 1999).

The following sections examine the primary contributions of activity theory to IS, the subsequent challenges and debates and ways that IS research can enrich activity theory.

3. Technology and mediation

For IS scholars, the fulcrum of interest is how IS change, disrupt and improve work and social activity and the use of ICT artifacts (Gregor, 2006). Leont’ev posited that while machines contribute to human activity through their work, they at the same time give rise to the emergence of new human abilities (Ruckriem, 2009). Similarly, ICT determines the nature and possibilities of human activity (Ruckriem, 2009) and the possibilities afforded by ICT make sense only in the context of object-oriented activity. This way of looking at tool use accommodates the idea that tools offer affordances (Gibson, 1977) – empowering or constricting. This is similar to the position of the structuration model of technology (Orlikowski, 1992) and the metaphor of “imbrication” (Leonardi, 2011), which builds on the works of management and sociology scholars (Ciborra, 2006). This view of ICT use stipulates that both actors and technologies have agency (although activity theory allocates limited agency to technology), but ultimately actors decide how they will respond to a technology (Leonardi, 2011). Activity theory is more in sync with science and technology studies, which reason that actors shape technologies while being continuously shaped by technologies (Hyysalo, 2010). For instance, where the object of an activity is a technology, the properties of the technology penetrate into – and may influence – the subject (Kuutti, 1996).

Tools are extensions of human agency, but at the same time affect other tools. For instance, an IS solution can be used to produce another IS, and tools used in one activity can also be used in different ways in associated and unrelated activities (Spinuzzi, 2011). Technologies such as sensors monitor and collect data, and IS solutions analyze data and can operate with some autonomy, but ultimately they have been programmed by humans

(Leonardi, 2011). Therefore, the production and use of tools are invariably social processes in which the tools act as both norms and means of labor, and embody cultural practice (Blunden, 2010). The creation of the tool (e.g. an IS) can also be viewed as an activity; similar to ANT (Miettinen, 1999).

The concept of mediation is not unique to activity theory; it also has a central role in ANT. In addition to offering humans and technology equal agency, ANT offers a different perspective on the human–technology relationship, which is examined with the following example. Latour (1994, 1999) stated that a “man” and a “gun” form a third entity when they merge: the “gunman.” For ANT, the focus is on how the person and the gun are brought together, thus creating a “gunman”; a third entity that is able to shoot someone “you are another subject because you hold the gun; the gun is another object because it has entered into a relationship with you” (Latour, 1999 p. 179). The ANT perspective adds that the subject becomes a different person with a tool in their hand (in the same way in activity theory an object can influence a subject). An activity-theoretic perspective offers a different conceptualization and narrative, although not one that is radically discordant with ANT. That is, there is no gunman. Rather, a subject (e.g. a person) uses a gun in order to act upon an object (e.g. an animal) to achieve some outcome (e.g. to satisfy hunger), driven by a motivation (hunger). The use of a gun (as opposed to, say, a bow and arrow) is influenced by cultural-historical rules and norms and connected tool producing activities. It is the conditions, motive and object-orientedness that lead to the tool-mediated (in this case, use of gun) activity.

3.1 *Digital technology as a central challenge for activity theory*

While activity theory is concerned with mediation, Vygotsky, Leont’ev and others could not have anticipated the rise of ICT and the dominant role it plays in modern social and work life (Ruckriem, 2009). ICT-mediated activities – such as using mobile technology on the move or developing a global IS solution – are radically different from the mediation in mind during the early development of activity theory (pre-ICT era). New ICT – such as social media – challenge activity theory in new ways. For instance, a hammer and a computer are both tools, whereas social media can be considered a hybrid between a tool and a community; that is, social media use may be used to act upon an object (e.g. a person or an event), but is by nature dependent on a community, whether in the form of contributors (as for a wiki) or followers (for a Twitter account). While activity theory can account for the interaction between community and tools within the activity system structure (Engeström, 2008b), few activity-theoretic studies have explored how social media is used as a tool–community hybrid to act upon an object. It also raises another emergent challenge, that technologies are increasingly taking hold of all the aspects of the activity system: technology can compose elements of the subject (e.g. humans working with robots; or possibly technology as the subject), the object, community and form hybrids of these. This is an opportunity for greater theorization of technologies and for the central notion of “tools” to be unpacked in IS studies (which are largely concerned with the interaction between technology and human activity). The contribution of this can be twofold. First it can demonstrate how activity theory is able to generate new knowledge on how new technology disrupts and transforms activities – a perennial challenge in IS research. Second, theoretically it can demonstrate how digital technologies fit within, challenge and reshape activity theory concepts.

4. Activity as practice

In IS research, individuals, groups, and organizations are typically the unit of analysis. Activity theory offers a different conceptualization, which focuses attention on activity, filling a gap in technology studies (Kuutti, 1991b). In the context of

organizational research rather than the organization being taken as the unit of analysis and organizational objectives prioritized, activity theory takes the activity system as the core unit and prioritizes “objects” of organizational activities (Blackler, 2009). This invites a situated analysis of the activity “which is often overlooked in more abstract studies of organizations” (Blackler, 2009, p. 27). However, while it provides an alternative unit of analysis, it is important to note that it accommodates practice, people, collectives (teams/groups), and structures, which is in line with the considerations of IS and organization research.

Typically, an activity analysis should fulfill four criteria: the activity must be the smallest unit, while preserving the complexity of the activity; the evolution and historical change of the activity must be analyzable; the activity should account for relations between individuals and the broader environment; and the activity should be studied as a mediated activity (Engeström, 1987). Therefore, the unit of analysis should be manageable and the choice of abstraction practicable within the boundaries of the research (Allen *et al.*, 2011; Engeström, 1999a). However, the guidelines surrounding the unit of analysis have been challenged in recent years (e.g. see Section 6 for discussion on object). Furthermore, while Engeström’s conceptualization of an activity system remains the most commonly used across IS and organization studies, in recent years there has been some re-conceptualizing of the activity system. For instance, Jarzabkowski’s (2003, 2015) re-conceptualization of the activity system to fit the theoretical field of strategy-as-practice has developed into a mainstay in organization studies.

4.1 Actions and operations

Beneath the level of activity are actions and operations; an activity is made up of actions, which are goal-oriented, and contribute to the achievement of the object. That is, actions are accomplished because they realize a specific activity, and can be described as subordinate to an activity. Operations are distinguished from actions as being undertaken without conscious deliberation. This model is fluid, as it seeks to portray a reality that is constructed both at and of a time and context (see Table I). A widely referenced example to illustrate the distinction between activity, action, and operation is the activity of building a house. This is made up of actions (such as laying the foundations) and operations (e.g. using a hammer to strike nails: an unconscious operation) (Kaptelinin, 1996). In the IS context, if the activity is mediated through an IS solution, interacting with it and adapting it to a task can then be viewed as the action, while the specific unconscious/automatic interactions (e.g. typing) and adaptation behaviors can be viewed as the operations (Barki *et al.*, 2007). In IS, this provides a multi-layered lens for understanding activities. For instance, the implementation of a mobile-technology solution in an organization can be considered the activity, while the development of a software application and testing are examples of actions, and programming and running micro-level tests of the software application are operations.

Activity level	Definition/example
Activity – not necessarily conscious, but may become conscious	Governed by motive(s) (collective) (e.g. building a house)
Actions – conscious	Governed by goals (individual or group) (e.g. laying the foundations)
Operations – conscious when learned, but can become unconscious or automatic in routine	Governed by conditions (non-conscious) (e.g. using a hammer)

Note: Adapted from Bertelsen and Bødker (2003, p. 301)

Table I.
Interrelationship between activity, actions, and operations

At the same time, the development of the software application can be considered the activity. That is, the level of abstraction is determined by the focus of the research.

As noted in Table I, activity theory differentiates between motives, goals, and conditions. In particular, people behave differently in different situations. When operations are frustrated people can seamlessly adapt to the new situation. When a goal is frustrated (e.g. an IS solution stops working), then it is necessary to make sense of what to do next and to set a new goal. This is performed without much conscious effort and emotion and therefore a new goal is predictable, provided that the motive remains the same (Nardi, 1996). But when a motive (e.g. to complete a work project) is unhinged, people are frustrated and their behavior becomes less predictable (Kaptelinin, 1996). Therefore, in order to understand people's behavior and predict changes, it is necessary to examine, if it is oriented toward a motive, a goal, or actual conditions (Nardi, 1996). This can shed light on how the use of IS in certain contexts is retarded. This framing provides a lens to view the actions that lead to the attainment of an object and, importantly, how ICT changes the actions, and the choice of available actions. However, while this distinction between activity, action and operation can be used to better understand IS use by providing more granularity, as it has in HCI (e.g. Kuutti, 1996), few studies go to this level. To help address the disconnect between activity and actions, the notion of "ensemble" was proposed between the two levels, as thematically grouped actions, oriented towards a particular purpose (e.g. design and implement a software component) (González *et al.*, 2009). However, this has not addressed the conceptual gulf between activity and actions in the literature. As a consequence activity theory studies have remained at the activity-level and neglected the opportunity to draw deeper insights into the use of IS. The level of operations is almost absent in IS. A possible reason for this is that IS researchers do not have the tools to examine unconscious operations. The emerging research methodology of NeuroIS, based on neurosciences (Dimoka *et al.*, 2012), opens up possibilities for addressing this shortcoming.

5. Contradictions: dialectical logic

A fundamental (and often understated) concept in activity theory is the notion of cultural-historical contradictions and tensions (both terms are used in the literature), which occur within and between activity systems (Engeström, 2001; Ilyenkov, 1974), and which promote dialectical transformation. As they arise or are revealed, they expose the dynamics, inefficiencies, disturbances, and – importantly – opportunities for change and action (Blackler, 2009; Helle, 2000), precipitating the development of an activity. While the term "contradiction" may be considered by some as a weakness within an activity, it is in fact a sign of richness and the capacity of an activity to develop, rather than to function in a fixed and static mode. Foot (2001, p. 63) refers to them as "growth buds." The process of using contradictions to promote learning and change is referred to as "expansive learning" (Engeström, Miettinen, & Punamäki, 1999). An activity without contradictions exists only in the form of an activity in an "ideal" form. This follows the dialectical logic of activity theory, which argues that it is inadequate to analyze static activities.

Importantly, for debates surrounding structure and agency (e.g. Giddens, 1984), contradictions provide a lens for understanding how deviation from established rules and norms occurs. As contradictions are aggravated within an activity, individuals begin to deviate from the activity's established norms, which in some cases may lead to a deliberate collective-change effort (Engeström, 2001). This process is cumulative, rather than final. In this view, contradictions are a "destabilizing" force, leading to constantly evolving and transforming activities, in which "equilibrium is an exception and tensions, disturbances and local innovations are the rule and the engine of change" (Cole and Engeström, 1993 p. 8). In other words, contradictions are imbued in social-cultural activity.

5.1 Manifestations of contradictions

Engeström (1987), working on concepts initially developed by Leont’ev, classified contradictions into four distinctive yet related forms of problematics, found either within or between activities, as illustrated in Figure 2 primary contradictions, located within each constituent component of the central activity (e.g. within a tool or motivation); secondary contradictions, occurring between constituents of the central activity (e.g. between the community and the division of labor); tertiary contradictions, occurring between an activity and a culturally more advanced form of the central activity (e.g. an activity before and after the introduction of a new IS solution); and quaternary contradictions, occurring between the central activity and other concurrent/co-existing neighboring activities (e.g. when the implementation of an e-health system for doctor–patient interaction initially disrupts the activity of health administration).

In the case of IS, examples of contradictions include technology creating maladaptive changes or aggravating contradictions that were not evident beforehand, implemented technology being incongruent with the rules and norms of the activity, or disrupting the actions that lead to the attainment of the object.

An enduring challenge is that few scholars articulate their analytical approach to identifying contradictions and because of a lack of depth and theorizing around contradictions it risks simply becoming a “fashionable catchword” (Engeström and Sannino, 2011). Most commonly, researchers examine misfits within and between elements of activity systems. To do this, it is necessary to follow a critical research philosophy, before and during data collection; to observe breakdowns and tensions between activities, people, collectives, technologies, practices and norms; and to be able to distinguish these from general assertions of asymmetric power relations (Engeström, 1999b). In their analysis, researchers should examine contrasts, denials, and oppositions between propositions, statements, observations, and other data (Murphy and Manzanara, 2008). Importantly, the identification of contradictions is linked to the epistemological commitments of activity theory – being

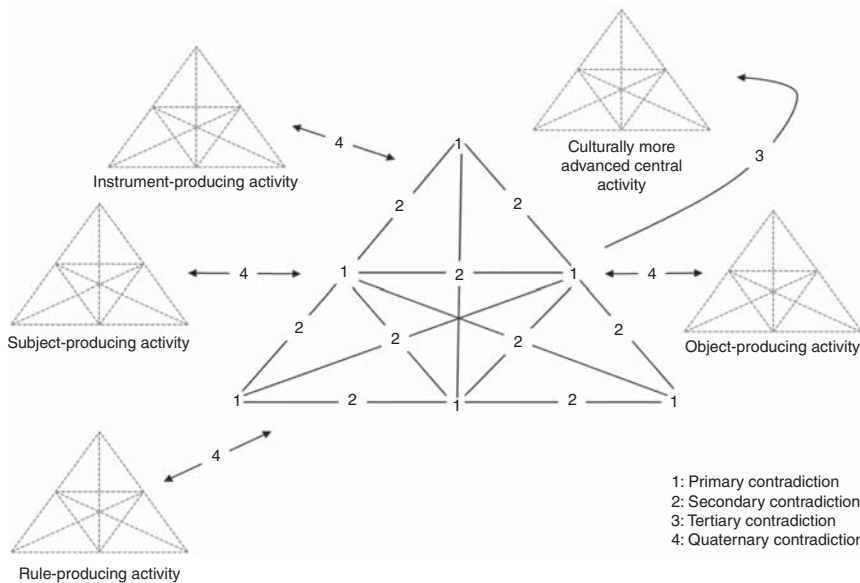


Figure 2. Levels of contradictions

Source: Adapted from CRADLE (2016)

ingrained within the study context (Moran and John-Steiner, 2003) – allowing for deep understanding of the activity. Data triangulation, understanding the multiple-voicedness of the activity (subject, community, neighboring activities, etc.), and observing some change within the activity over time (rather than for a limited static period) are important ways of identifying contradictions, and should be built into the study design.

While a powerful analytical tool, contradictions are not straightforward notions (Avis, 2009). Dialectical logic is concerned specifically with change and development, and the presence of contradictions typically necessitates action, however contradictions may at the same time exist but not act as a source for transformation. For instance, in complex organizational settings, contradictions are often not acknowledged or resolved (or simply normalized), meaning that transformation does not occur. Therefore, identification of the contradiction remains only one part. Equally important is the interpretation of the contradiction among the activity actors, the sense-making that occurs, and how the frame of reference of the rules and norms, related activities, and other forces influence or hinder meaningful action.

From an analytical and pragmatic perspective, a related problem is that contradictions may not be immediately obvious, openly discussed, visible, or amenable to being talked about and hence may grow in their influence and accumulate over time, and hence be more difficult to address. For instance, they may be culturally or politically difficult to confront, or problematic for the study subjects if published in academic forums. Political issues, corruption, gender relations, and other potentially sensitive matters are obvious cases. This limits the emancipatory power of the notion of contradictions, particularly in organizational settings, where there may be resistance to the investigation of deep and sensitive matters.

5.2 *Logic of resolution and congruency*

While contradictions provide a powerful analytical tool for change, within IS there is often a need to generate understanding on how activity is improved. Therefore, in addition to the traditional lens of contradictions, it is also useful to understand how IS can appease and resolve contradictions, and lead to new forms of temporary harmonization. This can be in areas where things immediately work better or potential longer-term “congruency” as the activity changes to adapt to the new tool and to the ways of working that it necessitates (Allen *et al.*, 2013), which may in fact be contradictions at a later stage, acting as a form of feedback. This is a contribution relevant to IS (see Allen *et al.*, 2013). Previous research suggested that actively resolving contradictions may lead to (short-term) congruency; however, often the IS becomes the source of tension over time, as technology and processes move on (Allen *et al.*, 2014).

Therefore, as contradictions (or “morphogenesis,” in Archer’s (1996) terms) are resolved, they may lead to temporary congruency (or “morphostasis”) and stabilization within an activity – and later to further contradictions. This overlaps with the notions of “logic of opposition” (Robey and Boudreau, 1999), consonance and dissonance, adaptation around practices, and re-establishing consonance (Vaast and Walsham, 2005) and feedback in systems theory (Mingers, 2011).

6. Activity objects: unpacking the black box

6.1 *Objects as the “sense-maker”*

For scholars interested in the interaction between technology and actors and organizations, the notion of an “object of activity” may be unfamiliar and difficult to grasp. The object of an activity is usually defined as the problem situation, focus or project, or thing or group that people are working to transform (Blackler, 2009; Engeström, Miettinen, & Punamäki, 1999),

and can distinguish one activity from another (Leont'ev, 1978). In IS studies, the object typically takes the form of a technology being developed or manipulated (e.g. Karanasios and Allen, 2013) or a work task that is being enhanced/disrupted through new tools (e.g. Wiredu and Sorensen, 2006). Therefore, the object provides some boundary and focus for the unit of analysis:

Objects are concerns, they are generators and foci of attention, motivation, effort and meaning. Through their activities people constantly change and create new objects. The new objects are often not intentional products of a single activity but unintended consequences of multiple activities (Engeström, 2008b, p. 3).

According to Leont'ev, there is no "objectless activity." As such, identifying the object is the first step in investigating an activity (Davydov, 1999). However, while an object provides focus, it can also be regarded as "a project under construction" (Engeström, 2005, p. 184). As soon as an immediate goal is attained, the object shifts and is reconstructed through new goals and actions (Engeström, 2005). This is referred to as "expansive visibilization," – a process driven by contradictions as actors seek to reconceptualize the object and motive of work (Engeström, 2001). For instance, it is common that an organization or group developing and implementing an IS (the object) may alter its perceptions toward the object as it begins to materialize (Karanasios and Allen, 2013). Tracing the development of an object over time can allow for deeper insights into activities (Kaptelinin and Nardi, 2006). Therefore, activity theory does not focus on static objects, but rather accommodates dynamic and active objects, reflecting the complexity and true nature of human activity. That is, objects of activity are socially constructed and emergent (Blackler, 2009).

As noted, activity theory is interactionist, as the subject transforms the object, and at the same time the object influences the subject (Kuutti, 1996). This is different from ANT, which imbues both subjects and (non-human) objects with equal agency (Latour, 2005) (at the same time both understand a recursive relationship between humans and objects). Activity theory, meanwhile, considers that objects do not have agency (although, as discussed advances in digital technologies may challenge this notion) but are inscribed with properties that may influence the subject. While this attributes agency only to the subject, there are instances where the object may have agency, for instance where it is a person.

6.2 *Problematizing the object*

The notion of object-orientedness remains one of the most contested aspects of activity theory according to Kaptelinin (2005). This argument arose from the difficulty in distinguishing an activity's "motivation" from the "object." To overcome this Kaptelinin (2005) argues that the object of activity should be defined as "the sense-maker" and offers three criteria for re-evaluating the term "object": There is only one object of activity (the "ultimate reason"), despite the poly-motivational nature of activities; the object of activity is cooperatively determined by all effective motives; and, the object of activity is both motivating and guiding the poly-motivational activity.

There are several other issues around the concept of the object. Initial motivations and perceptions toward the object change as the object develops and becomes a reality. Therefore, as motivations change over time, however subtly, so may the object. For instance, contradictory motivations were found to play a critical role in the development of handheld devices (Kietzmann, 2008). For IS studies, this suggests a recursive relationship between motivations and the object, whereby the motivations are manifest in the object, but as the object develops (i.e. an IS solution becoming realised) the motivations may shift. This is a process of negotiation and sense-making by the subject and by the community, as the object is formed and the dynamics of the activity change (Karanasios and Allen, 2013). An untheorized notion surrounding object is that in line with the ambiguous, personal,

contested nature of organizational work and social activity, an activity may in fact have multiple objects, whereby there is a decoupling of an “ideal” and “real” object. For instance, an ideal organizational activity object may be to introduce “energy efficient IT practices”; however this object may be purely ceremonial – suggestive of contradictions between the projected and actual activity object. ICTs also problematize the notion of an object as they allow subjects to work on objects remotely (e.g. a project, system, person etc.), without any seeming direct interaction. This raises questions around whether such technology mediated shifts in human activity, and the distributed nature of modern human activity, challenge the boundedness of the activity system.

6.3 Runaway objects

The above point leads to recent calls to open up the notion of the object to the possibility of addressing larger-scale activities such as climate change, social innovations (e.g. crowdsourcing), poverty alleviation, and development (Engeström, 2008b; Karanasios, 2014); in other words, away from bounded and well-defined activity objects. Such objects are referred to as “runaway objects” and are related to the notion of the “runaway world” (Giddens, 2000); such objects are often disastrous (e.g. climate change) according to ANT theorists (Law, 1991). Figure 3 illustrates the multiple activities related to the runaway object and the multiple relationships that exist among them.

As Figure 3 suggests, these are objects that have rapidly growing boundaries, that are difficult to control, involve multiple and complex links between activities, and have broad and unintended impacts. Examples include the Linux operating system, Wikipedia, crowdsourced projects, and open models of scientific research and publishing (Engeström, 2007).

In an open-source software community such as Linux, the object is an operating system that evolves as the developers and users refine it (Engeström, 2007). This example is emblematic of the challenge of digital technologies. In this case, the object is at the same time dispersed and focused. That is, users and developers are free to “tinker” with it, and yet, it remains the same object for all. While being the object, it is at the same time a tool: “it does useful work for users, yet it is unfinished, full of challenges, and continuously developed further” (Engeström, 2007).

The IS field presents opportunities for developing and advancing the notion of runaway objects. However, the expanded frame of reference of the object threatens the principled

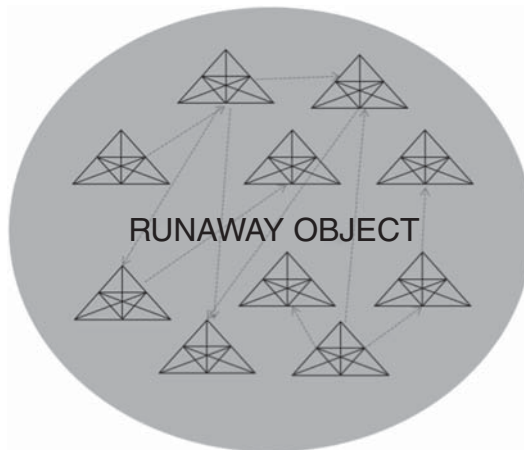


Figure 3.
Runaway objects

Source: Adapted from Engeström (2008b, p. 5)

boundedness of the activity system (Spinuzzi, 2011). It also represents a conundrum of how to bound the unit of analysis when accounting for multiple and emergent activities, and the multidimensionality of connections centered around an expansive object (Spinuzzi, 2011).

A further challenge is that transformations of these expansive objects are often beyond research efforts. To counter these challenges in IS, “less-spectacular” objects may be needed, which are more manageable, so as to expand the activity-level vision without losing grasp of the premise of object-oriented activity (Engeström, 2008b).

7. Interacting activity systems

In addition to examining the activity as a unit of analysis, the activity-theoretic perspective allows researchers to connect an activity with the multivariate and tension-laden nature of human activity by examining connected activities (Spinuzzi, 2008). This acknowledges that activities have “baggage,” do not commence *tabula rasa*, and are historical activities that form over periods of time (Engeström, 2001). It is a way of examining how activities develop and change over time; it follows that activities are woven – combining, merging, interpenetrating, and dividing – and become more complex over time (Spinuzzi, 2008), allowing for broader contextual understanding. Most activity theory studies traditionally examined single activity systems. However scholars have noted that new forms of work (e.g. knowledge work) (Spinuzzi, 2012), inter-organizational fields (Daniels *et al.*, 2010) and the networked society (Yamazumi, 2009) means that it is increasingly necessary to examine inter-connected activity systems to answer relevant research questions. This is particularly true in the context of IS studies.

Connections can be temporary, as in the case of organizations coming together to work toward a common object – for instance, police, fire, and paramedic services sharing information in order to respond to a natural disaster – in which case issues of IS inter-operability and information sharing are paramount (Allen *et al.*, 2014). This is referred to as “knot-working” (Engeström, Engeström, & Vähäaho, 1999); here, organizational activities come together to form a “knot” and, after working on a shared object, disentangle themselves. Connections can also be stable and long-lasting. Connections show action, movement, and development and the different ways in which activity is connected and interwoven by IS, and the effects of this process. In addition, the notion of connected activities is particularly useful for observing connections and contradictions between activities, and for generating insights into how ICT tools developed in one activity are absorbed as tools in other activities (Karanasios and Allen, 2013). That is, it provides a lens to understanding the life of the technology beyond its development – and how it shapes, and is shaped within, other activities.

While most theoretical approaches are not concerned with connections across activities, ANT and activity theory simultaneously attempt to attend to multiple-activity systems.

Networks of activity systems have been used to demonstrate how each element of an activity (e.g. rules/norms and tools) is connected by separate but inter-connected activities in order to inform the development of an IS solution (Korpela *et al.*, 2000), for studying innovation as a network of activity systems (Miettinen, 1999) and for understanding collaborative work (Spinuzzi, 2012). As the use of IS often results in impacts beyond the central activity in which they are used, a minimal network of activities should include the primary activity system of the main actors and related activities (Engeström, 2001).

8. Emancipatory agenda

An often-stated power of activity theory is its ability to “emancipate” subjects, prompting change and development, and offering a form of emancipatory science “whose effect is to emancipate its subjects, rather than predict or control them” (Blunden, 2010 p. 5). In this way, activity theory is distinct from most contemporary social theories employed in IS

(linking with axiology of research). It therefore, provides an appealing lens for IS research, as the main concern of many studies is to improve organizational work or to address social issues through ICT. This acknowledges the privileged position of the researcher. However, while activity theory offers analytic tools providing a more-nuanced analysis of change, tool use, division of labor within activities, and underlying norms, the emancipatory agenda has not materialized in activity-theory studies to any large extent. Likewise, Engeström (2008a p. 258) noted that “[i]f activity theory is stripped of its historical analysis of contradictions of capitalism, the theory becomes either another management toolkit or another psychological approach without potential for radical transformations.”

Most research conducted using activity theory in IS has kept the notion of emancipation distant, without drawing upon economic or deeper societal analysis (Avis, 2009). A particular challenge is that the emancipatory agenda is problematic to address, particularly in commercial organizational settings.

Activity theory is useful for understanding the role of ICTs in overcoming extant contradictions and improving conditions for actors or beneficiaries being acted upon. For instance, a patient benefiting from an e-health system; new efficiencies in working through mobile systems; or, an older adult being better connected through ICT. In this way activity theory provides a strong theoretical lens to form arguments on the underlying socio-economic mechanics of society, organization, and the role of IS in human-mediated activity, change, and development. Here there is a match between activity theory and IS; the IS field remains an opportunity for expansion and advancement of activity theory, particularly as there has been recent interest among IS scholars in addressing societal challenges (Majchrzak *et al.*, 2016). An important criterion here is that it is applied in a way to deliver action. This stresses the importance of the research questions used to frame a study. To overcome the practical matter of addressing “how to do emancipatory research?” the Change Laboratory (“ChangeLabs”) approach (Engeström *et al.*, 1996) has been proposed as an activity theory driven methodology to intervene in and redesign organizational work. In recent years, it has developed (Virkkunen and Newnham, 2013) and galvanized a body of intervention style research in contexts such as agriculture, health and education.

9. Activity theory and the nature of reality and knowledge

A challenge surrounding activity theory has been classifying it within the typical frames of positivism, interpretivism, and critical approaches (Orlikowski and Baroudi, 1991), amid enduring philosophical debates on the nature of reality. Part of the reason for this can be explained by the origins of activity theory in the 1930s’ Soviet Union – and links with Soviet philosophy and psychological theories (Davydov, 1999) – which has meant that it did not engage with Western philosophy until the 1970s. A further difference from other contemporary social theories is that activity theory has a distinct axiology (a priori to ontology and epistemology), which is concerned with emancipation and positive change. However, some connection with Western philosophy has been made. Deweyan pragmatism, in particular, can be regarded as a “theory of activity”:

[...] pragmatism regards the concept of transformative practical activity as a theoretical category that makes it possible to solve philosophical dilemmas that emerged from Cartesian subject-object (and mind-body) dualism. For both of the theories, the concept of activity, the prototype of which is work, constitutes a basis for understanding the nature of knowledge and reality. (Miettinen, 2006, p. 389).

Despite its disassociation from contemporary categorizations and debates and difficulty of classifying within the strict criteria of theory (Doty and Glick, 1994), activity theory deals with contested areas of contemporary social theories, most notably the notion of agency (Archer, 1996; Giddens, 1984). Commonly adopted theories (such as structuration theory) attempt to reconcile structure and action through an iterative process; institutional theories

clearly privilege structure, while ANT rejects difference between human and non-human entities, locating agency in the heterogeneous relations between the two groups. Orlikowski and Barley (2001, p. 158), advocated for understanding the role of “human agency as embedded in the institutional contexts, as well as the constraints and affordances of technologies as material systems.” Activity theory views agency as voluntary action or intentionality; subjects are seen as change agents who define and transform culture through their actions, and “are endowed with the capacity to generate new activity cycles” (Stetsenko, 2005, p. 70). Within this framing, technology plays a role, as action is described as artifact-mediated (as discussed in this paper). These powerful tools influence human behavior, but at the same time humans make them serve their own purpose to alter their environment through their mediated behavior (Vygotsky, 1997).

Much of the research has followed a critical philosophical or interpretive perspective and has treated activity theory as a practice theory (Miettinen *et al.*, 2012) – where it neatly fits within the practice turn in IS and social sciences (Levina & Vaast, 2005; Miettinen *et al.*, 2009). It is best labeled as a “classical” practice theory, which is concerned with understanding the change and development of human practice (Miettinen *et al.*, 2012) when emerging problems or practices are faced (Miettinen, 2006). In contrast, more-contemporary social-practice theories (e.g. ANT and structuration theory) focus on the “habituality of practice,” which makes it difficult for them to make sense of changes in human practices (Miettinen *et al.*, 2012).

Following Gregor’s (2006) distinction of IS theories, activity theory fits best within the category of a theory for “analysis,” “explanation,” and “study design,” rather than a theory of “prediction.” (Vygotsky developed activity theory for explanatory rather than descriptive analysis.) That is, it is best described as a theory “for providing a lens for viewing or explaining the world” (Gregor, 2006, p. 613). Importantly, it also can be defined as a theory of “action” – marrying intervention research with theory. A key theme in activity-theory studies is the reciprocal interaction between theory and practice, where research is often embedded in the study context, and used as a mechanism to influence and intervene (e.g. the “ChangeLabs” approach).

It has been argued that, while activity theory can be used in the interpretation and explanation of data, it is useful and often necessary to turn to other theories for deeper explanation. For instance, it has been combined with structuration theory (Canary and McPhee, 2009) and institutional theory (Ogawa *et al.*, 2008); in the case of the latter, activity theory provides the micro-level perspective, while institutional theory provides the macro-level perspective.

Vygotsky, it was argued, was an interpretivist (Moran and John-Steiner, 2003). This is in line with his view that the study of a phenomenon involves the collection of rich data over a sufficient period of time in naturalistic settings (Vygotsky 1978) and must then be interpreted in terms of theory. Indeed, activity theorists see workplaces as laboratories for understanding activity “in the wild” (Engeström and Sannino, 2012), combining active participation and action research (Malaurent & Avison, 2015), and primarily qualitative data collection, often involving tracking the history and development of a practice. This is in line with the interpretive tradition, which is concerned with understanding complex lived experience through the perspective of those living it (Schwandt, 1994). It is the embedded nature of the research that provides critical insights and reveals the social reality. Typically, the activity is constructed through the researcher’s analysis (emic perspective), but the activity is developed from the perspective of the subject (etic perspective). In line with qualitative approaches, the explanatory and analytical findings that emerge from the use of activity theory allow for “naturalistic or qualitative generalization” (Stake, 1995) rather than statistical/quantitative inferences. Over time, there has been a growth in methods employed and a leaning toward methodological pluralism. The mixture of methods used helps avoid the urge to plant a view

of the world based on limited data. Perhaps because of methodological pluralism, one critique of activity theory has been its lack of methodological prescription; however, a benefit is that it is not overly prescriptive but rather can be integrated within/with other theoretical approaches, and other more explicit theories can be drawn upon to describe and explain data (Nardi and O'Day, 1999). While it would be expected that activity theory would be more appealing to qualitative researchers, in IS there has been some mixing of activity-theory concepts within quantitative studies. For instance, these concepts have been blended with the task-technology fit model to conceptualize activity related to IS use (Barki *et al.*, 2007); combined with quantitative techniques to model knowledge acquisition (Ryu *et al.*, 2005); and, blended with traditional IS acceptance and success models (Junglas *et al.*, 2013). Although caution is needed not to dilute theoretical concepts, this bricolage enables a researcher to adapt activity theory to study different contexts and research questions, overcoming much of the paradigm conflict noted in the IS field (Mingers, 2003).

10. Discussion: developing activity theory in IS

This paper commenced by arguing that activity theory can overcome one of the enduring challenges in IS research by unifying the social and material. It outlined how activity theory, like all theories, brings us to a particular understanding. It has laid out the assumptions of the theory and shown how it privileges a certain way of looking at the world; by so doing, it suggests that activity theory is best suited to certain types of inquiry and research questions in IS – focusing on technology use in context. While it has built on extant arguments, it has also proposed new ones relevant to IS scholars and provided some juxtaposition with other theoretical approaches. This is the first paper to provide such a comprehensive reflection on the use of activity theory in IS.

The paper has attempted to show that alongside its internationalization, activity theory has principally become an empirical method of understanding complex activities through the lens of activity systems. This is distinct from its initiation as a way to address profound philosophical questions about the possibility of mind, as per Vygotsky's contribution (Bakhurst, 2009). Since Vygotsky's work, the activity system (as a unit of analysis) has moved activity theory away from his legacy of psychology, and a revised activity theory has shifted the focus toward a more pragmatic view of the interaction between a subject, technological mediation, objects and the cultural-historical context. At the same time, this paper also cautions that during its evolution, important legacies (such as emancipation, actions and operations) have become in danger of being abandoned, which are critical to many areas of the IS field.

Building on this, a major contribution of this paper is the argument for continued enrichment and development of activity theory and the need to cultivate a fourth-generation activity theory. This paper has identified several challenges and subsequent areas of development related to IS:

- (1) How can the concept of “tools” be further unpacked by IS studies to answer questions around how modern technologies fit within the traditional understanding of tools in activity theory? The social and distributed nature of digital technologies is a particular area for exploration and theorization. This is deeply relevant to IS, but also adjacent fields such as education and HCI.
- (2) Re-conceptualizing the activity system to generate new activity-based theoretical understandings and perspectives – such as Jarzabkowski and Wolf's (2015) work on an activity-based approach to framing organization strategy practice.
- (3) Re-framing the notion of objects to account for more expansive objects which are often the focus of IS studies.

- (4) Understanding how IS creates new networks of connecting activity systems (e.g. inter-organizational work) and how activity theory accommodates this.
- (5) Examining congruencies within, and across, activity systems because of the introduction of IS (in addition to contradictions and tensions).
- (6) Using the conceptual and analytical tools activity theory offers to examine how IS can emancipate subjects.

Others have noted that advancements in technology, and hence changes in mediated activity, the changing nature of human activity (e.g. distributed, inter-organizational, collaborative knowledge work), and the emergence of the networked society (Daniels *et al.*, 2010; Ruckriem, 2009; Spinuzzi, 2014; Yamazumi, 2009) implies a need for a fourth-generation activity theory (Engeström, 2008b; Spinuzzi, 2014). Spinuzzi (2012, 2014) has commenced work in this direction in terms of building networks of activity systems particularly for co-working and collaborative objects. However, as this paper as identified, there is further room for development, particularly within the field of IS. In addressing these issues it is worth considering the epistemological commitments of activity – studying a phenomenon in naturalistic settings (Vygotsky 1978) – which become problematic in the context of expansive and distributed activity networks. However, this also opens the door to methodological advances adopted in IS (e.g. netnography).

Rather than adding to debates around paradigmatic incommensurability, this paper has taken an open approach, arguing for dialog and integration, both conceptually and practically, with other theories. As observed, there are complementarities and ontological relations with other contemporary social theories. For instance, ANT and activity theory share many similarities even though they offer different narratives and conceptualizations and stem from different philosophical backgrounds (Miettinen, 1999). The harmonious and conflicting aspects between theories opens up possibilities for developing better theory (Poole and Ven, 1989).

The extant literature has provided notes of caution and critiques on activity theory, largely derived from the schools and literature of cultural psychology (Blunden, 2010; Kaptelinin, 2005), education (Avis, 2009; Bakhurst, 2009), and (to a lesser extent) organization and IS. While some of these arguments have been expanded upon in other fields (e.g. Bakhurst, 2009; Ratner, 1997), this paper has attempted to address these critiques in the context of IS research. Other areas of debate remain, particularly concerning underlying philosophical issues relating to the translation of the terms from Russian to English (Bakhurst, 2009; Kaptelinin, 2005), which are beyond the exposition of this paper. Likewise, areas of development in activity theory around the sensuous, emotional and dialogical aspects (e.g. Roth, 2007; Sannino, 2008), and labor, identity and power (e.g. Daniels *et al.*, 2010; Simeonova, 2015) were not discussed, but present other areas for development.

11. Conclusion

This paper started by arguing that activity theory, as a theory of practice, is able to account for the material in work and social activity. Activity theory is not proposed as a theory of everything; rather, this paper aims to cultivate it as a theoretical lens capable of accounting for social and technical aspects in IS. In so doing, it has laid out the principal contributions, mapped out the existing research, and developed future perspectives of activity theory in IS research. It has also demonstrated that activity theory brings together a range of ideas that were hitherto excluded from (or inadequately formulated in) more traditional theories adopted in IS research. This paper has also identified the challenges in the application of activity theory, outlined areas where the field of IS provides fertile ground for the expansion of a

fourth-generation activity theory, and ruminated upon future research concerning the extension of activity theory in IS research. Therefore, it is forward looking as much as reflective, and advanced an enlarged understanding of activity theory for IS. While this paper charted the extant use of activity theory in IS, the contributions to this paper come from different studies and contexts. This suggests that there is the possibility of cross-pollinating ideas from IS on the use of activity theory into other fields, and vice versa.

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