Activity theory

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Introduction
One needs a fairly wide definition of ‘information science’ in order to consider applications of activity theory in the field and, fortunately, as evidenced by the range of topics that ARIST has covered over the years, the editors have encouraged a wide definition. As we shall see, to restrict the definition in any way would result in a very short chapter indeed.

Consequently, this review ranges widely, from aspects of psychology (where the theory was first formulated) through education, to information systems and human-computer interaction, digital library development and information seeking behaviour. The paucity of contributions in what might be labelled ‘library and information science’ is curious. It is common in this broad field to identify ‘activities’ of numerous kinds, in academic and practitioner writing. Reference service, information seeking, cataloguing, children’s services, online searching, etc., are all described as activities, and yet ‘activity theory’ has made very little impact.

Why would activity theory be needed in library and information science? At present, research in this area is conducted within separate ‘silos’, sometimes defined by problem areas, such as information retrieval and information seeking behaviour, sometimes defined by institutional type, such as research libraries, college and university libraries, school libraries and so on. There is no over-arching paradigm for research in these sub-fields and the divisions are perpetuated in different sets of journals related to the different fields. The consequence is that researchers in one area may not understand the problem areas defined by another, may have no awareness in differences in research methodologies and have no common language within which to interchange ideas and results. Activity theory could provide that over-arching paradigm.

The aim of this chapter, therefore, is to review the development of the concept and its application in related fields and to suggest how those applications might find their way into ‘library and information science’.

The chapter is structured as follows: first, the historical background and nature of activity theory are presented; this is followed by an analysis of its use in some fields of interest to information science and then the implications of these developments for information science are presented. In this section, ‘information literacy’ is used as an example of how activity theory can help to develop a research agenda. Finally, brief conclusions on the significance of activity theory for information science are presented, together with an activity-theoretical expansion of ‘information science’ to include related disciplines.

Although activity theory has not been dealt with previously as a topic in its own right in ARIST, some authors have drawn attention to its value in other fields: Van House (2004), reviewing the field of science and technology studies, commented on the significance of activity theory workplace studies; in the same volume, Rogers (2004) explored activity theory as one of the new approaches to human-computer interaction research.

The origins of activity theory.
Activity theory had its origins in psychology in the Soviet Union as a Marxist alternative to the prevailing, Western, psychological orthodoxy of behaviourism. Originally, it was
proposed as a theory of human consciousness and as an explanation of the nature of human behaviour. Human behaviour consists of activities of one kind or another and, at the root of activity theory is the proposition that consciousness is formed through activity. In fact, as Bedny, Seglin & Meister (2000) point out, because of the cultural impacts on consciousness, human behaviour is not reducible to a variety of animal behaviour and the term chosen to describe human behaviour in Russian, therefore, was *deyatel’nost*, which is translated as ‘activity’; however, as Kuutti (1996, p. 41) points out, the Russian term has connotations of acting to transform something, which the English word does not convey. In essence, therefore, ‘activity theory’ connotes the study of the mode of human behaviour that acts upon objects to transform them.²

The key names in the early stage of the development of activity theory were those of Lev Semyonovich Vygotsky (1996-1934), whose ideas are still widely applied in developmental psychology and educational research (see, e.g., Kozulin, Gindis, Ageyev & Miller, 2003) and Sergei Leonidovich Rubinshtein (1889-1960). Rubinshtein tends to be rather ignored in the history of the theory in the West although Zinchenko (1995, p. 42) notes (without providing a citation) that: “In 1922 Sergei Rubinshtein transplanted the philosophical category of ‘activity’ into psychological soil.” However, the research most closely associated with the development of the theory beyond Vygotsky was that of one of his students and subsequently fellow researcher, Alexei Nikolaevich Leont’ev (1903–79). Based on Vygotsky’s early work, there emerged the diagrammatic representation of activity theory shown in Figure 1.

It should be noted that, in Vygotsky’s original formulation, ‘mediating artefacts’ are replaced by ‘psychological tools’, by which he meant language, writing, mathematics, maps and other symbol structures, although his later work was concerned mainly with signs and words and other symbolic structures received less attention (Zinchenko, 1995, p. 38). Consequently, ‘artefacts’ should be understood as including these tools as well as the physical tools that figure more commonly in current, Western research employing activity theory.

Because so many of the early researchers on activity theory were students and subsequently co-workers of Vygotsky, developments in the field were, to a significant degree, the result of collective endeavour. However, we can attribute many of the key ideas of the theory to Leont’ev (1977, 1978), who developed the cultural-historical dimension, notions of division of labour in the performance of activity and, importantly, the hierarchical relationships of activity, actions and operations. As Zinchenko has pointed out, Vygotsky was concerned with “the problem of ideal mediators that exist between humans and between humans and the world”, that is, the abstract tools of language, etc., while, “The psychological theory of activity was concerned with the problem of real (i.e., concrete) tools and objects that humans… place between themselves and nature” (Zinchenko, 1995, p. 44). In essence, it is Leont’ev’s activity theory that is represented in Engeström’s diagrammatic representation, shown in Figure 2.

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In Figure 2, Engeström adds to Vygotsky’s formulation the concepts of *rules and norms*, *community* and *division of labour*. The *rules and norms* constitute the formal and informal, legal and traditional limits on and specification of the activity being undertaken. For example, a social worker will undertake an activity of, say, evaluating a potential foster parent, under the organization’s procedures and guidelines for fostering, which may themselves be derived from statute law. The *community* can be elaborated at different levels: it may be the immediate work group or team of which the *subject* is part, or the wider organizational community, or the society at large. The *division of labour* simply relates to the extent to which the performance of the activity involves collaboration and the sharing of tasks with others. These extensions, in effect, move the focus of activity theory from the individual and consciousness, to activities within a community and a concern for development.

Alexandria Luria, the other former student and co-worker of Vygotsky was predominantly interested in the cultural-historical dimension of human behaviour and ‘psychological activity’ and subsequently went on to, in effect, found the study of neuropsychology.

Since the collapse of communism and the dissolution of the Soviet Union, activity theory (or ‘the activity approach’ as it tended to be called in Russia) has lost some of its appeal as philosophers and social scientists have been exposed to ideas on phenomenology, hermeneutics and post-modernism and as the name of Marx has become negatively associated (Lektorskii, 2004, p. 13-14) and it is rather ironic that, as this has happened, interest in activity theory in the West has increased.

**The nature of activity theory**

For a proper understanding of activity theory it is necessary to look a little further into its origins: first, the connection to cultural-historical psychology is important. The goal of cultural-historical psychology, more recently termed “sociocultural” psychology is defined by Wertsch, del Rio and Alvarez as being:

“...to explicate the relationships between human mental functioning, on the one hand, and the cultural, institutional, and historical situations in which this functioning occurs, on the other.” (Wertsch, del Rio & Alvarez, 1995, p. 3).

The idea of the cultural-historical context has its origins, as we might suspect, in the Marxist view of society, although connections to Fichte and Hegel are also evident (Lektorskii, 2004, p. 15), and Leont’ev, driven by the fact that Vygotsky’s writings were declared ideologically unsound and proscribed under Stalin, used the term *societal-historical* instead (Veer & Valsiner, 1991).
Zinchenko (1995, p. 41) notes that Leont’ev, in developing activity theory (following his move, along with Luria and Zaporozhets, from Moscow to Khar’kov), moved away from the study of consciousness to the study of object-oriented activity. The connection is derived through the Marxist position that consciousness is formed through human engagement in activities. Nardi (1996) expresses this very well, when she writes:

“Activity theorists argue that consciousness is not a set of discrete disembodied cognitive acts…and certainly it is not the brain; rather, consciousness is located in everyday practice: you are what you do. And what you do is firmly and inextricably embedded in the social matrix of which every person is an organic part” (Nardi, 1996, p. 7).

Although Leont’ev changed the focus of his work from consciousness to activity, the connection remained: Zinchenko notes that:

“…while for Vygotsky consciousness was mediated by culture, for Leont’ev mind and consciousness were mediated by tools and objects.” (Zinchenko, 1995, p. 41).

Reviewing a biography of Luria, Stetsenko notes that the cultural-historical context of the work of Vygotsky and his colleagues was central to the production of their cultural-historical theory:

“[A] history of the Vygotsky-Leont’ev-Luria school would have to reveal how the cultural-historical context of their work, specifically the revolutionary project of changing society based on ideals of equality and social justice that these scholars clearly espoused (all the subsequent dramatic failings of this project notwithstanding), instead of being an outside source of influence, became integrated right into the body of their work, into its methodology, and the very knowledge it produced.” (Stetsenko, 2003, p. 96)

It would be difficult to find a more telling example of the influence of the cultural-historical context on a human activity.

From this consideration of cultural-historical psychology as the foundation of activity theory, we can move on to examine its general principles, of which six are customarily described: the unity of consciousness and activity, object-orientation, internalisation/externalisation, mediation, the hierarchical structure of activity and development. (Kaptelinin and Nardi, 1997).

The principle of the unity of consciousness and activity stems directly from the early work on consciousness by Vygotsky’s group in Moscow. The key notion is that consciousness, or ‘mind’ in a more generic sense, emerges in evolution through human activity in relation to the external world, or, as Kaptelinin puts it:

“The most fundamental principle of activity theory is that of the unity of consciousness and activity. ‘Consciousness’ in this expression means the human mind as a whole, and ‘activity’ means human interaction with the objective reality. This principle, therefore, states that the human mind emerges and exists as a special component of human interaction with the environment. Mind is a special ‘organ’ that appears in the process of evolution to help organisms to survive. Thus, it can be analyzed and understood only within the context of activity.” (Kaptelinin, 1995, p. 107)

The principle of object-orientation is simply that human activity is directed towards objects that have a scientifically determinable ‘reality’ and/or a socio-culturally determined reality. Thus, we have ‘real world’ objects such as the raw material of, say, the wood-carver, whose activity is to act upon the block of wood to transform it into a carving and we have the
socially-constructed objects of, for example, the peer group, which individual members may seek to transform be introducing new potential members.

The third principle, that of internalisation/externalisation, derives directly from the first two: given the unity of consciousness and activity, and object-orientation, then our mental processes must be created as a consequence of our external activities being internalised. Our consciousness of the world around us is formed by our acting upon it and, reciprocally, our internal conception of the world is fixed through our activity in the world. According to Vygotsky (1978), language is the means we employ to internalise our externally-derived experience.

The principle of mediation is, initially at least, straightforward: it is that activity is mediated by tools. However, ‘tools’, as already noted is a complex concept, involving not simply, for example, chisels and planes to work on wood, but also our mental tools of language and symbol. Furthermore, the kinds of socio-cultural phenomena such as rules, norms and the division of labour, identified in Engeström’s version of activity theory (and earlier by Leont’ev), can also be viewed as ‘tools’ in the sense that they are constructs through which our interaction with the object may be constrained or assisted (Wilson, 2006).

The principle of the hierarchical structure of activity is a major contribution of Leont’ev, who defined activity, actions and operations and related them to motives, goals and conditions as shown in Figure 3.

Leont’ev sets out the relationships as follows:

“…the concept activity is necessarily connected with the concept of motive. Activity does not exist without a motive; ‘non motivated’ activity is not activity without a motive but activity with a subjectively and objectively hidden motive. Basic and ‘formulating’ appear to be the actions that realize separate human activities. We call a process an action if it is subordinated to the representation of the result that must be attained, that is, if it is subordinated to a conscious purpose. Similarly, just as the concept of motive is related to the concept of activity, the concept of purpose is related to the concept of action”.

and:

“…actions are not special ‘units’ that are included in the structure of activity. Human activity does not exist except in the form of action or a chain of actions. For example, work activity exists in work actions, school activity in school actions, social activity in actions (acts) of society, etc. If the actions that constitute activity are mentally subtracted from it, then absolutely nothing will be left of activity.”

and, finally,

“…the action also has its operational aspect (how, by what means this can be achieved), which is determined not by the goal in itself but by the objective-object conditions of its achievement” (Leont’ev 1978: section 3.5).

It should be noted that these hierarchical levels are not immutable: Leont’ev notes:

“Activity may lose the motive that elicited it, whereupon it is converted into an action realizing perhaps an entirely different relation to the world, a different activity; conversely, an action may turn into an independent stimulating force and may become a separate
activity; finally, an action may be transformed into a means of achieving a goal, into an operation capable of realizing various actions.” (Leont’ev, 1978: section 3.5)

The idea of the hierarchy, activity–actions–operations, does not find universal approval: for example, Chaiklin (forthcoming) suggests that ‘...decomposing activity (or practices) into different levels destroys important conceptual advantages that a systemic activity perspective offers to the analysis of computer-based systems in a practice.’ He supports this view by a quotation from Leont’ev: ‘No type of transformation of separate “splinters” of activity is possible in general since this would mean not a transformation of activity but its destruction’. (Leont’ev, 1978, p. 68)

Finally, the principle of development, implies the need to understand how an activity has developed over time in its cultural-historical context, as well as how the actions taken on the object affect that development. This principle is sometimes referred to as ‘Vygotsky’s principle of development’, since it arose out of his work on the educational development of the child. However, in current research in many sectors, the development of activity systems other than the child’s mind are at the centre.

At the operational level the nature of activity theory is neatly encapsulated by Barthelmess and Anderson, in a statement that might be taken as a gloss on Figure 2:

“...activities are undertaken by subjects, motivated by a purpose, transforming an object into an outcome. The object may be shared by a community of actors, that work together to reach a desired outcome. Tools, rules and division of labor mediate the relationship between subjects, community and object” (Barthelmess & Anderson, 2002, p. 34).

Engeström (1999) writes of “three generations of activity theory”: the first, centred upon Vygotsky, “created the idea of mediation” but was limited by its focus upon the individual, a limitation removed by Leont’ev in the second generation in showing “how historically evolving division of labor has brought about the crucial differentiation between an individual action and collective activity”. The third generation, i.e., the present, “needs to develop conceptual tools to understand dialogue, multiple perspectives and voices, and networks of interacting activity systems”. In the fields of application under review, we may see some of these conceptual tools in process of development.

Engeström has also been responsible for drawing attention to the contradictions that exist in and between activity systems, building upon Leont’ev and, ultimately, Marx. In Learning by expanding (1987) he sets out four levels of contradictions: 1. primary contradictions within each component of an activity, which is seen as a clash between the individual action and the overall activity; 2. secondary contradictions between the elements of the activity – Engeström notes that,

“The stiff hierarchical division of labor lagging behind and preventing the possibilities opened by advanced instruments is a typical example” (Engeström, 1987, Ch.1);

3. tertiary contradiction between the dominant form of an activity and a culturally more advanced form. For example,

“A tertiary contradiction arises when, say, the administrators of the medical care system order the practitioners to employ certain new procedures corresponding to the ideals of a more wholistic and integrated medicine. The new procedures may be formally implemented, but probably still subordinated to and resisted by the old general form of the activity” (Engeström, 1987, Ch. 1);

4. Quaternary contradictions between the elements of an activity and what Engeström calls its “neighbour activities”; thus, the rules and norms according to which an activity is carried out are produced by the neighbouring ‘rule-producing activity’, which the
instruments or tools employed are produced by the neighbouring ‘instrument-producing activity’. Engeström notes that it is the contradictions in activity systems that bring about their development: “…new qualitative stages and forms of activity emerge as solutions to the contradictions of the preceding stage or form” (Engeström, 1987, Ch. 2) and Barab, et al. comment:

“contradictions are best understood as tensions among the components of the activity system… Tensions are critical to understanding what motivates particular actions and in understanding the evolution of a system more generally. These tensions can be thought of as system dualities, and it is through understanding the interplay within and among these dualities that one can best understand and support the continued innovation of the system.” (Barab, Barnett, Yamagata-Lynch, Squire and Keating, 2002, p. 80)

Fields of application

The fields of application discussed here are all inter-related: psychology shades into the psychology of education and educational development generally; information systems development and human-computer interaction shade into online learning and information literacy, as well as into the design of library systems and online information services, and all of these are related to aspects of information science such as interactive information retrieval and human information behaviour research. Consequently, the disciplinary divisions used are somewhat artificial and the interactions among the fields are of more significance than the disciplinary differences.

Clearly, additional fields could also have been chosen; for example, work studies (see Engeström, 2000 and Bedny and Karwowski, 2004) and organization studies (see Blackler, Crump and McDonald, 2000) are areas in which activity theory is used. However, these subject fields, although important for a consideration of the context of information activities, do not bear, to my mind, quite as close a relationship to information science as the topics discussed below. In addition, this is a selective review, rather than an exhaustive text.

Psychology

Given the origins of activity theory, psychology is the appropriate field in which to begin a consideration of the application areas, however, the field is so diverse that a thorough review would be virtually impossible. Currently, most work appears to be in applied areas of psychology such as ergonomics, work studies, computer-supported cooperative work and educational psychology. In any event, such a review is not the aim in this chapter: the aim is to explore those aspects of the application areas of activity theory that may have some implication for information science. From this perspective, most of the psychological work of relevance actually falls within educational psychology and in the information systems aspects of collaborative learning. Consequently, attention is given to these matters in the appropriate sections below.

Psychology makes its appearance in information science in the guise of cognitive science, employed, for example, by Ingwersen (1996) in the area of interactive information retrieval; in the study of personality, for example, in Heinström’s (2003) research on personality dimensions in relation to information seeking behaviour; and in a number of papers (and one book) by Hjørland alone and with co-workers (Hjørland, 1997, 2002, 2004; Hjørland and Albrechtson, 1995; Hjørland and Christensen, 2002). Of these authors, only Hjørland makes any reference to activity theory (in papers relating to classification, domain analysis and the socio-cognitive approach to information science), although when its concepts are used, it is often without explicit reference to the theory. Hjørland’s academic background is in
psychology and his aim is to draw attention to psychological and social psychological theories and epistemological positions that may have value in information science. Hence, the promotion of the idea of domain analysis as a new paradigm in information science:

“The domain-analytic paradigm in information science (IS) states that the best way to understand information in IS is to study the knowledge-domains as thought or discourse communities, which are parts of society’s division of labor. Knowledge organization, structure, cooperation patterns, language and communication forms, information systems, and relevance criteria are reflections of the objects of the work of these communities and of their role in society. The individual person’s psychology, knowledge, information needs, and subjective relevance criteria should be seen in this perspective.” (Hjørland and Albrechtson, 1995, p. 400)

and the advocacy of philosophical realism:

“A realist conception of relevance, information seeking, information retrieval, and knowledge organization is outlined. Information systems of all kinds, including research libraries and public libraries, should be informed by a realist philosophy and a realist information science.” (Hjørland, 2004, p. 488)

In all of Hjørland’s work, activity theory is seen as one of the underpinning ideas that can provide information science with models of reality that will lead to fruitful investigation.

**Education**

From psychology, the move to education is a natural one, since Vygotsky’s work on the development of consciousness and learning was central to much of modern educational psychology. A key concept in Vygotsky’s work is the ‘Zone of Proximal Development’ (e.g., Vygotsky, 1978) or ZPD, which is the ‘zone’ in the learning process where the help of an adult (or a more advanced peer) can move a child from their existing level of understanding to a more advanced level. However, Tolman points out that:

“Too often… it has been interpreted simply as a way in which the teacher can aid the learning of a pupil. This completely misses its theoretical intent, which is to reveal the essentially mediated nature of human learning.” (Tolman, 1999, p. 75)

Tolman quotes Engeström (1987) as “coming closer to the mark” when he describes the ZPD as the difference between what individuals may achieve in an existing state of everyday life and what can be achieved as a result of collective action. This original and wider intention of Vygotsky clearly has potential in many areas of life, including, for example, decision making in organizations. It is well known that collective problem solving can generate many more answers to a problem than any one individual alone is capable of achieving (a phenomenon known in education from Piaget (1959) onwards; see also Surowiecki, 2004) and this can be seen as working within the ZPD to establish a new state of organizational ‘everyday life’. A formal understanding of the ZPD could enable organizations to determine when collaborative action is needed.

The area within information science to which the ZPD is most obviously applicable is the study of ‘information literacy’ and it was rather surprising to find that a search on all of the ISI databases for “zone of proximal development AND information literacy” produced no results; nor did “activity theory AND information literacy”. However, a search on Google Scholar proved more successful, although most of the references found do not put the ZPD in the context of activity theory or cultural-historical psychology. One of few studies that does embrace activity theory in its totality is a doctoral dissertation (Peach, 2003), which examines learning assistance programmes and, through the activity theory approach,
demonstrates the contradictions and tensions that exist among the different groups and university units involved in this process. Typically, for work involving activity theory in this area, the work was done in the field of education, not library and information science.

As noted above, there is more work using the ZPD concept, without reference to activity theory: Haltunen (2003) is typical of this approach, where Vygotsky and the concept receive a token citation, while the paper itself deals with other issues – in this case, a constructivist learning framework.

More generally, in education, the work of Engeström has been of major significance. From his base as Professor of Adult Education and Director of the Centre for Activity Theory and Developmental Work Research at University of Helsinki, Engeström has developed theories of learning, in both the school and the workplace, based on activity theory and the concept of expansive learning. He draws upon the work of Bateson (1972), who set out four levels of learning, in which Learning 3 equates to expansive learning. In an interview at the University of Lancaster (UK), Engeström commented:

“Learning by expanding, or Learning 3, is very much going beyond the information given to construct a new set of criteria, a broader picture, a broader object for your activity, in which… it liberates you from the constraints of the particular setting in which you are functioning and enables [you] to create new settings. So, Learning 3, or expansive learning, is very much about learning something which is not yet there, by constructing a new activity.” (Engeström, 2002).

Almost all of Engeström’s early work in education, from 1967 to the early 1980s was in Finnish and was concerned with the development of the Finnish educational system, motivation to learn, and other aspects of learning in the school context. From about 1987, however, when Learning by expanding was published, he has also given attention to other forms of activity, specifically work activity, and the nature of learning in work activity systems and other organizational activity systems. In the introduction to the German edition of his book (published as part of the online version of his book) he noted his construction of “developmental work research as a methodology for applying activity theory, specifically the theory of expansive learning, in the world of work, technology and organizations” (Engeström, 1987).

**Computer-mediated learning**

Other major areas of education in which activity theory has had an impact are collaborative learning and online learning. For example, Baker, Hansen, Joiner and Traum (1999) explored the concept of grounding, or the development of mutual understanding among learners, within an activity theory framework. They conclude that students experience difficulties in appropriating the learning tools (both the tools of the scientific discourse and the tools of collaborative learning) and conclude:

“…collaborative learning is associated with the increased cognitive-interactional effort involved in the transition from learning to understand each other to learning to understand the meanings of the semiotic tools that constitute the mediators of interpersonal interaction. Understanding how and when grounding leads to collaborative learning therefore requires detailed analysis of learners’ goals in specific situations that motivate them to go further in their attempt to gain mutual understanding, of the extent to which the material and semiotic tools that they use can be appropriated, and, especially, the different forms of mutual understanding that will need to be achieved by the learners with respect to these ‘objects’. It is precisely these aspects of collaborative learning situations that our analytical framework is designed to highlight.” (Baker, Hansen, Joiner and Traum, 1999, p. 55).
Related research by Fjuk and Ludvigsen (2001) explores Engeström’s (1987) concept of 
*contradictions*, the historically evolving problems, break-downs and tensions that occur in an 
activity system. They show that, as a result of the different perceptions of collaborative 
systems held by those who design and use them, contradictions occur, which must be 
resolved through the development of the system, if *collaborative* learning is to take place. 
The authors conclude:

“…past designs concerning distributed collaborative learning seems to have been marked by 
an approach of using networked computers as add-ons to existing pedagogical and 
organisational practice. However, we need to know the principles of educational traditions in 
order to change them with respect to new technologies and concepts. Creative and new ways 
of thinking that will work in practice are dependent on prior understanding of the 
knowledge, experience and principles that underpin that tradition of praxis. This reality of 
new distributed learning situations clearly indicates that the learners’ social interactions 
towards a shared learning environment must be viewed in terms of interconnected activity 
systems. It is therefore crucial to explore which conditions the distributed environment 
 imposes on the social interactions that are found crucial for developing a common learning 
environment.” (Fjuk and Ludvigsen, 2001, p. [5]).

Berge and Fjuk (2006) used activity theory in seeking an understanding of the role of online 
meetings in a distance-learning Web-based course on object oriented programming. They 
note that the meetings, which involved instant messaging and streamed video recordings of 
the lessons, did not ‘play out’ as intended, i.e., did not appear to contribute significantly to 
the students’ learning, but, nevertheless, were viewed as useful by the students. The 
authors suggest that the meetings facilitated the development of a ‘community of practice’ 
among the students and that this function should be noted in the future design of 
computer-assisted learning.

In another study by Mørch and Wasson (1999), activity theory was used (as one element in 
a multi-modal study) to guide the research process in understanding how students and 
instructors organized their work in using and providing material for telelearning, using the 
TeamWave Workplace groupware system.

The authors noted that:

“Our experience with Activity Theory is that it provides a lens through which we can see the 
world. It is useful to orient thoughts and research questions. It provides a number of 
methods/tools shaped by a general theoretical approach. It can be used to guide 
methodological decisions regarding evaluation (how technology is used) and to a lesser 
extent regarding design (how technology will be used)” (Mørch and Wasson, 1999, p. [4]).

In a study of Australian distance learning students Fåhræus (2004) employed activity 
theory to analyse interviews with teachers and students regarding an online learning 
capability that was just emerging from what had previously been paper correspondence 
courses. The study revealed the inner contradictions in the situation, caused by both 
teachers’ and students’ perception of learning as individual and formed by the pre-existing 
situation, resulting in a failure to take advantage of the potential of the new technologies to 
enable collaborative learning.

In these different studies authors point to some common advantages of activity theory: it is 
used in guiding the development of research instruments, in providing a framework for the 
analysis of data (whether the data were gathered on an activity theory basis or not), in 
providing an understanding of user behaviour that can help in the design of systems, and 
in providing understanding of the wider contextual issues that affect system use and 
usability.
It may appear obvious, but there are lessons in this kind of research for those involved in information literacy programmes that involve computer-based learning: the students must be suitably motivated to engage in the activity, they must see the programme as helping them to satisfy a personal goal, and attention must be given to ensuring that the abstract concepts associated with information searching and other information skills are appropriated and internalised, as well as the practical skills of actually using the computer-based learning package and any subsidiary systems with which that package interfaces (e.g., search engines and databases). There are many areas of potential contradiction in such systems: the nature of the information to be acquired by students, the extent to which that information must be implemented in practice for internalization to take place, the suitability of the pedagogical model and its harmony with the pedagogy that prevails in the students’ disciplines, the effectiveness of the system’s design and its integration with other systems, and so on. Resolving these contradictions through continuous development of the activity system of computer-based information literacy instruction, will not be an insignificant task.

**Information systems**

Defining information systems rather widely, but to maintain the distinction from computer science more generally, we can take it to include all subsidiary studies that have to do with the development of information processing systems within the organizational, work domain or human context. Under this definition, the main areas for the application of activity theory within the information systems field have been computer-supported cooperative work (CSCW), human-computer interaction and information systems development.

**Computer-supported co-operative work**

With the spread of computing in organizations of all kinds much more work is now computer-supported and, because of widespread global distribution and the necessity for team-work in knowledge-intensive enterprises, much work is both cooperative and computer-supported. CSCW is dealt with first in this subsection because, like human-computer interaction, it has significant relationships to activity theory in education and learning theory. To make effective use of cooperative computer systems, the users and teams must develop common understanding not only of the nature of the tasks they share, but of the artefacts made available to them to assist and support their work on those tasks. By artefacts we mean not simply the networked computers they employ, but also the communication tools associated with those computers, for example Voice over Internet Protocol (VoIP) telephony and video-telephony as well as the more usual e-mail and chat services, and the group-work software they may employ. In addition there are those ‘psychological tools’ of language and symbolism that must also be shared and, in multi-disciplinary (and often multi-cultural) teams, problems relating to these tools are not uncommon. In other words, they have to learn how to use the system and, crucially, to share that learning and the languages of learning. With intensively interacting teams one may get Engeström’s expansive learning taking place, with new uses being developed for established systems and new ways of working evolving.

There is clearly a close connection between computer-mediated learning and computer-supported co-operative work (CSCW): learning activity may be considered a rather specialised mode of work and work activity involves learning. Consequently, we find that the technologies employed in CSCW have much in common with those involved in collaborative learning and computer-mediated learning generally. The close connection is investigated by Collis and Margaryan (2004) in a study of work-based learning in Shell International Exploration and Production. Activity theory was used as the basis for the
design of online courses (following suggestions made by Jonassen and Rohrer-Murphy, 1999) and the delivery of the course was within a framework developed by the authors, which they call WBA-CSCL or Work Based Activity-Computer-Supported Collaborative Learning, which, itself, was analysed as an activity system. In other words, the learning was work-related. The authors conclude that activity theory served the purpose of course development well, and that its analytical use revealed contradictions in the organization that prevented the full benefits that could be derived from the course. Specifically, ‘learning on the job’ was not perceived as true learning by the participants in the course, who saw education as ‘going on a course’. Also, although company policy favoured skills development, the policy had not been translated into action regarding making time available for learning or changing the reward and promotion systems. The authors conclude:

“...Thus, the WBA-CSCL Framework based on activity theory and the associated course-design approach appear to help in structuring the introduction of new forms of learning for professionals in corporate settings. However, much stills [sic] needs to change in the social climate of the workplace (the community, the rules, and the division of labor) before the potential of the approach will be realized in widespread practice in corporate settings.” (Collis and Margaryan, 2004, p. 50).

Another study that connects work and learning is that by Heeren and Lewis (1997) in which the communication media employed by three different distributed research communities were studied using a combination of activity theory and media richness theory (Daft and Lengel, 1984). They note that collaborative activities evolve in such settings and, although the study concerned collaborative research groups, draw conclusions for computer aided collaborative learning. They note that:

“...communications technology can provide support at certain phases of activity in the context of work. However, there is little evidence that this support assists learning communities except where those activities are structured so as to reflect working practices.” (Heeren and Lewis, 1997, p. 96).

and specifically draw attention to the need to establish a common understanding of the motive for learning, to provide opportunities for face-to-face interaction, and to understand the need for group leadership, if the learning objectives are to be attained.

The process of establishing shared understanding is explored in an interesting fashion by Fjeld, Lauche, Bichsel, Voorhorst, Krueger and Rauterberge (2002). They point out that groupware systems are often developed from single-user systems and that effective development of software that is to be used in virtual circumstances needs to be developed in a common physical space, or, as they put it, the developers must be co-located. To this end, they employed an ‘augmented reality’ system, called BUILD-IT, which involved the developers in manipulating physical objects to develop virtual tools for physical planning. Activity theory was employed as the framework for the study, with an emphasis on the objectification of virtual tools. The notion of co-located development of virtual systems would appear to have much to offer, especially if, as appears the case in this example, the system is to be used by a limited number of individuals working as a team.

In a study of process-centred software development environments, Barthelmess & Anderson (2002) study software development as a collaborative activity from an activity theory perspective. One of the key points they note is that such environments often do not incorporate the means of communication among the collaborating system designers. This draws attention to the fact that the interaction within an activity system is essentially communicative.
Inevitably, given the character of CSCW, the notion of communities of practice is going to appear in conjunction with other concepts and Cluts (2003) used this idea in association with activity theory to examine how shared understanding of a groupware system for sales and customer contact management was established in an organization. Using the activity theory checklist developed by Kaptelinin, Nardi and Macauley (1999) to guide interviews and observation, the study concerned,

“…the installation of a major CSCW software package… [which] was implemented to facilitate sharing of information and customer contacts among the customer service team. The software included central information file and contact management, sales management, and profitability analysis capabilities, all of which were new functions for the organization”.

This was a major technological innovation for the bank and the author concludes that:

“This information [i.e., the findings of the study] and the language of activity theory and communities of practice can then be used to describe implications for developers and implementation managers. The implications themselves are not new, but the language of activity theory and communities of practice provide a richer context for understanding and making sense of development principles” (Cluts, 2003, p. 150).

Paradoxically, cooperative work requires not simply collaboration among individuals, but also considerable individual dedication to the success of the collaborative enterprise. For example, Cluts noted the extent to which intended users of the system watched to discover the extent to which others were using in deciding their own participation (Cluts, 2003, p. 151). This paradox was also explored within an activity theory framework by Nardi, Whittaker and Schwarz (2002) who define the social networks formed, as conditions and tasks require, by people working within and across organizations as intensional networks. The implication for activity theory of the rise of such networks is the need to consider the ‘subject’ not as an individual but as a collective. (This suggestion is not new, e.g., in his famous discussion of the pre-historic hunting party, Leont’ev clearly envisages the ‘subject’ as the group.) The idea of the intensional network also has implications for the kinds of systems needed to support work of this kind.

**Human-computer interaction (HCI)**

As noted earlier, Rogers (2004) has surveyed activity theory as a new theoretical direction in HCI research sufficiently recently (her references take us up to 2002) for her analysis to act as a starting point. In reviewing work, she concludes that, “…to achieve a level of competence in understanding and applying activity theory requires considerable learning and experience” and “When given to others not familiar with the original theory, the model’s utility is limited”. This problem, however, would be common to any community of researchers who have been trained in other sets of methodological approaches and does not appear to have inhibited interest in applying activity theory in relation to HCI.

In an earlier review, Kuutti painted a picture of HCI as a field in which the dominant paradigm of cognitive psychology was failing to deliver results that benefited information system design. He suggest activity theory as a means of remedying the situation, suggesting that its main strengths were its attention to multiple levels of interaction, the social context of interaction and its concepts of development and the ‘dynamic features of human practices’ (Kuutti, 1996, p. 38).

In HCI, the dominant model of activity theory is that of Engeström, introduced to the field by the Danish researcher Bødker (1989): however, an alternative, promoted by Bedny (e.g., Bedny, Segler and Meister, 2000), and known as systemic-structural activity theory, has also been applied. Bedny emphasises the importance of Rubinshtein (e.g., 1957) in the development of this variant of activity theory; specifically noting the distinction between
Vygotsky’s perception of the formation of intellect through social interaction and the ‘psychological’ tools of language, gesture, sign, etc. and that of Rubinshtein (and the later writings of Leont’ev) in which the formation of intellect through work activity is also emphasised (Bedny, Karwowski and Bedny, 2001).

The ability to relate the general conceptual framework of activity theory to other theories is evident in HCI as elsewhere, for example, Widjaja and Balbo (2005) marry activity theory with structuration theory (Giddens, 1984) to propose structuration of activity as an alternative to both in explaining human work activity in general and HCI in particular. The connections between activity theory and structuration theory are readily apparent; however, whether combining the two frameworks provides much improvement over activity theory alone is not so apparent.

Activity theory has also been combined with genre theory, most notably by Spinuzzi (1999, 2002a, b): in this work, the notion of genres, familiar to us from literary studies, is extended to include screen genres (i.e., such features as dialogue boxes, drop-down menus, etc.) and associated documentation genres, which could include, for example, the formal documentation associated with a system, as well as the informal genres developed by the user in interaction with, or in preparing to use the system. The latter might include, for example, hand-written notes of data to be entered into the system, or data cut from the screen record and pasted into an electronic document. Usability then becomes a matter not simply of screen design of an application but one of ensuring the usability of the system in the wider context of interacting screen and non-screen genres.

A related piece of work, which does not use genre theory (although it would have been appropriate to do so) and which is concerned not simply with human-computer interaction, but with the more general human-ICT interaction, explored the nature of command and control in two ambulance services in the UK. Activity theory was used as a framework and the exploration of factors such as the differences in division of labour in the two services, together with differences in artefacts (computer-based in one and manual in the other) led to the conclusion that: “…software support for ambulance control should take the form of a set of tools (e.g. gazetteer, electronic map, notepad) to be used differently by different users for different purposes. Such a configuration would support the emergence of situated, well adapted, collaborative practices over time” (McCarthy, Wright, Healey, Dearden and Harrison, 1997, p. 110).

Similarly, work by Hart-Davidson (2002), dealing with document-mediated interaction, mentions genres without using genre analysis and adopts an activity theory perspective in examining how a specific type of document, engineering students’ design reports, might be best designed for on-screen interaction by a teacher assigning a grade. The analysis leads to a design that calls up specific parts of the document for review, with a panel showing the grade possibilities and their criteria. A document design of this kind, tailored to a particular use, is more appropriate in the specialised circumstances than would be a normal word-processed document. In other words, exploration of the activity leads to changes in design structure.

Recently human-computer interaction researchers have been using the term ‘interaction design’ as an alternative, perhaps as a consequence of understanding that interacting with computers does not define the whole of a work task, even though that task is completed largely through the help of computers. An excellent introductory text on activity theory and ‘interaction design’, which could become the standard work in the field, was published by Kaptelinin and Nardi in 2006.
Information systems development

Several researchers have been responsible for introducing activity theory into information systems development or systems design generally: e.g., the Danish researcher Susanne Bødker argues that:

“...present systems design is really in a conflict situation for a number of reasons including that
• the material that is worked with (computers) become more and more flexible, and that the tools and techniques used in systems design today are insufficient for that kind of material and for the challenges posed by ready-made software,
• and, that real user influence is necessary in more and more cases.” (Bødker, 1991, p.551)

and urges the adoption of activity theory as a conceptual framework for a variety of reasons, including:

“An analysis of systems design as an activity system allows for a focus on many different levels of the total activity. We can look at the materials and tools used by a couple of programmers, or we can look at the total project group in relation to the surrounding organizational units. What is the purpose of their activity, what do they do to fulfill this purpose, and how do they do it? What are the actual social and physical conditions for their work? In particular this analysis points at the many different levels where systems design tools and techniques comes in. And it points at the many parts played by computer technology in the design process.” (Bødker, 1991, p. 559)

Bødker’s paper would be essential reading for anyone in the information science world who wishes to understand why activity theory might be appropriate for our field.

Quek and Shah (2004) compared five activity-theory-based methods of systems design: Activity Analysis and Development (ActAD) (Korpela, 1997); the Activity Checklist (Kaptelinin, Nardi and Macaulay, 1999); the Activity-oriented Design Method (AODM) (Mwanza, 2002); the Jonassen & Rohrer-Murphy (1999) framework; and the Martins & Daltrini (1999) framework. Quek and Shah conclude:

“It is found that within the AT-based methods that have emerged from the survey, there is a lack of comprehensive treatment, regarding coverage of development phases as well as coverage of AT concepts. It is also found that only one of the methods [note: i.e., Mwanza’s AODM] has been validated in a real life systems development.” (Quek and Shah, 2004, p. 232).

Korpela, Mursu, and Soriyan (2002) develop the ActAD framework referred to above, defining information system development as:

“the process by which some collective work activity is facilitated by new information-technological means through analysis, design, implementation, introduction and sustained support, as well as process management.” (Korpela, Mursu and Soriyan, 2002, p. 115)

The authors illustrate the application of the framework by reference to a number of studies and one important issue they raise is that of the network of activities into which the information systems development activity must fit. Thus, even within a single organization, the activity addressed by the development process will be related more or less intimately to other activities that are not the subject of systems development but which may affect or be affected by that development. They conclude, “the concept of activity network is useful in analyzing work practice in context, but network analysis has not received sufficient attention in previous activity-theoretical studies”. (Korpela, Mursu and Soriyan, 2002, p. 125)

In an interesting study, Irestig, Eriksson and Timpka (2004) compared two methods of contextual design, by examining the prototypes resulting from participatory design and
user-centred design. Case studies of the two systems were analysed using an activity theory framework. Significant differences were found to result from the two methods, with user-centred design focusing more upon the individual user interface and the computer systems generally, while the participatory design process produced a system that was focused to a greater extent on organizational tasks and the political reality of the system, which was pragmatic, easy to install and maintain.

There could be lessons from work of this kind for the design of, for example, digital library systems and organizational intranets. The idea of user-centred systems is strongly rooted in information science in areas such as interactive information retrieval and in the field of information seeking behaviour research. However, the shortcomings of the prototype resulting from the application of user-centred design suggest that, if the system (digital library or whatever) is to respond pragmatically to organizational issues, a participatory design process is likely to be more effective.

More generally, and linking information systems development and education, a study from Singapore (Lim and Hang, 2003) used activity theory to explore the integration of information and communication technologies (ICT) in schools. Specifically, the authors sought to answer the question, ‘How has ICT been integrated in Singapore schools such that students engage in higher order thinking?’ – akin to asking whether ‘expansive learning’ takes place. The activity theory approach provided a broad contextual framework that enabled the researchers to explore the contradictions in the system that inhibited the effective use of ICT. They noted, for example, that teachers continued to teach as previously and did not use the technology to stimulate student self-learning; also, the lessons on the use of ICT did not extend to the use of ICT for learning, but, rather, were an end in themselves. Once these contradictions were recognized by the research, the school was able to take action to overcome them. The authors conclude:

“By adopting an activity–theoretical approach to the study, we will be able to document and describe the activity systems across schools and classrooms with the integral contextual understanding of how larger entities such as policymakers have on them. Not only can we understand the various processes within and between activity systems, we can construct pedagogical models and approaches of ICT integration for schools based on that understanding” (Lim and Hang, 2003, p. 62).

One area of information systems design that is rather close to information behaviour research is the study of information requirements and here, Turner, Turner and Horton (1999) have applied activity theory as a framework for organizing ethnographic data and thereby arriving at fresh insights into the context of requirements. The authors employ the activity theory concept of contradictions to show how these reveal requirements for systems design. An example of a contradiction occurred in the updating activity of the observed research project: the authors comment that updating required the transcription of information from team-members’ notebooks to the whiteboard used in the updating session. An artefact designed to present notebook pages would have resolved this contradiction.

**Information science**

As noted earlier, activity theory appears not to have had a significant influence in information science, at least in the West. It would be surprising, however, if such a significant development in the Soviet Union had not had its effect on research in library and information science in that country. Indeed, such was the case, as the following sub-section shows.

**The activity approach in Soviet library and information science research**
Although, from the 1950s onwards, there was an attempt by publishers to reveal the nature of Soviet Union’s research activities in a number of fields through the production of translations of Russian journals, librarianship and information science were not beneficiaries of this effort, except for some occasional studies included in ARIST reviews. Added to this, Western researchers’ language skills rarely extended to a knowledge of Russian.

Consequently, in the West, an understanding of what was going on in this area has been lacking. Not surprisingly, however, activity theory or the ‘activity approach’ was widely applied in the Soviet Union and East European countries. In Marxist terminology the term ‘activity’ is closely associated with the terms of ‘labour’ and ‘practice’. ‘Practical activity’ is supposed to be the main criterion of scientific truth in Marxist methodology and was treated as one of generic cognitive means in science, including the social sciences. Therefore, ‘practical activity’ was a widely used category and research instrument in different sciences and disciplines.

Activity in general is understood as the main means of human existence and is divided into several major areas (practical, cognitive and educational, and organizational) according to its goals and results. All these activity areas are closely interrelated. As such, the activity approach was always more or less explicitly or implicitly present in Soviet library and information science research. A rather exhaustive review of the development of the activity approach in bibliography from the 1920s until the beginning of the 1970s was provided by Korshunov (1975, p. 5-33). However, the conscious and qualitatively different application of the activity approach as a research tool in the information disciplines (bibliography, information science and librarianship) is related to the development of the theory of bibliography and mainly to the concept of bibliography as a special activity (or a system of related activities) developed during the 1970s. This concept was extended to information activities and librarianship.\(^3\)

In bibliography research the activity approach was treated as a means for the holistic integration of the data produced by different methods and means of research. Its advantage is that investigation is not limited to the relations between a subject and an object. On the contrary, this approach demands that other components of an activity (needs, goals, means, tools, etc.) should be taken into account. Therefore, the activity approach enables a deeper, multi-aspect and more systemic research into bibliography as a complex social phenomenon. A combination of the activity and system approaches was used and bibliography was treated as a system of practical, managerial and cognitive (scientific and educational) activities. This system guarantees the production, dissemination, preservation, and use of bibliographic information in society.

Russian bibliographers have created a definition of bibliography through the category of activity. In addition to the traditional (ontological) approach this new activity approach was used in Russia from the 1970s onwards. The conception of bibliography as a system of activity (or activities) was created by Barsuk (1975), Korshunov (1975), Tugov (1977), Fomina (1976), Bespalova (1980, 1982), Vochrysheva (1989), and others. An account of the Russian concept of bibliographic activity is presented in Maceviciute and Janonis (2004). The activity approach was also incorporated into the State standard of bibliographic terms (Gosstandart 1985). The definition of bibliography as an activity system was a significant step forward in the understanding of bibliography as a coherent social phenomenon.

One of the most important issues within this approach was an attempt to follow the requirement of the activity approach and to distinguish two main structural levels of
bibliography: the essential internal and the empirical external (see the earlier discussion on externalisation/internalisation). The structure of an activity consists of needs, motives, interests, goals, subject, object, processes, means and methods, conditions, and results. The essential internal structures of bibliography are constructed from the first three motivational components. The essential initial element of the activity and the driver or source of all kinds and forms of activity are a need and a motive. An interest is a concrete form in which the need is expressed; it is a measure of perception of the need. Needs and interests are transformed into a goal (an ideal model of expected result). This is a cause and a regulator of a conscious activity. The goal has to be adequate to the possibilities and demands the selection of effective means and methods. Each kind of activity is determined by objective and subjective conditions (material, human resources, etc.). A conscious application of the activity approach requires that a scholar investigates all components of the activity in interdependent mutual relation to one another.

The essential internal structure of bibliographic activity determines the coherence and continuity of it in time (history) and space. It is expressed in the deep functions of bibliography as they relate to societal needs and the motives of the activity. The empirical external level is expressed in the variety that bibliographic phenomena, tools, methods, processes, results, goals, etc. can take in concrete socio-cultural-historical contexts. (Korshunov, 1975, p. 119, Bespalova 1982, p. 21). This position provided the possibility of revealing the historical development of bibliography, bringing together various forms of bibliographic information from early bibliographic lists and library catalogues to the complex social and technological phenomenon that bibliography has become.

The concept of activity is also applied to information activity. It is centred upon the category of information need and human information activity is treated as an integrative part of any activity (Kogan 1981; Kogan and Ukhanov 1991; Ukhanov 1998). This concept of scientific information activity was also used by the authors working in information science in Russia (e.g., Michailov, Chernyj, and Giliarevskij, 1968; 1976). The authors often make a difference between the information activity as a part of everyday work or life and a professional information activity system that is distinguished by consciously formulated goals and results (information products or services) (Macevičiūtė, 2004).

The search for the essential functions of library work that would bring together a variety of libraries and other related institutions stimulated the use of the combination of the activity and system approaches in library science. This approach was used by Stoliarov (1981), Vaneev (2004), Cherniak (1981), Sokolov (1984) and others.

The activity approach in the library and information disciplines in Russia and in other East European countries at present is regarded as self-evident. The definitions of librarianship, bibliography and information work in encyclopedias (e.g., Glosienė, 1997), intergovernmental terminological standards in the region (e.g., Intergovernmental Council… 1999), and special dictionaries are based on the concept of activity. On the other hand, it is obvious that empirical research has not used the full potential of activity theory and, perhaps as a consequence, within the fields of practice, the theories are often regarded as inconsequential and removed from practical concerns.

Why was activity theory ignored in Western information science research when educational and other researchers took it into their fields? We can only speculate about this, but the migration of ideas seems to happened in two ways: first, Engeström is Finnish and (for geopolitical reasons) Russian has long been more widely taught in Finland than in other Western European countries; consequently, it is likely that in pursuing his initial research in education, his attention would be drawn to Russian sources that would be accessible to him. Secondly, expatriate Soviet researchers, such as Bedny, took their activity theory
background with them when they moved West and the ideas spread out from them as they gained academic positions and began publishing in English. We know of no such scholars in the library and information science field.

It can be seen that the ‘activity approach’ in Soviet library and information science serves as a conceptual framework that brings together virtually all research in the field. There is no such conceptual framework in the West; however, a few writers have explored the relevance of activity theory in a variety of areas and Spasser (1999), in a short paper, concludes that it:

“...can provide information science with a rich, unifying, and heuristically valuable vocabulary and conceptual framework that will facilitate both the continual betterment of practice and the secure transferability and cumulation of knowledge.”

The limited application of activity theory in a number of areas of information science is explored in the following sub-sections.

**Digital library development**

The research literature on digital libraries is largely concerned with technological issues and with the nature of the information resources included in such libraries (the European DigiCULT project (European Commission, 2002) may be taken as an example of the latter).

Elliot and Kling’s definition of ‘digital library’ is very wide, and perhaps usefully so, since attempts to restrict the definition do not appear to serve any particularly useful purpose: “information systems (IS) and services that provide electronic documents – text files, digital sound, digital video – available in dynamic or archival repositories” (Elliot and Kling, 1997, p. 1023). Examples range from the ACM Digital Library, an electronic store of ACM publications including journals and conference proceedings to individual organizational intranets, which are sometimes described as ‘digital libraries’, and to more restricted collections, such as that explored by Spasser (2002).

Spasser’s work is one of very few in information science that fully employs an activity theory perspective (and published in *Computer Supported Cooperative Work*, rather than one of the information science journals). The study concerns the Flora of North America digital library, an enormously ambitious project to describe the more than 27,000 species in America north of Mexico. It is, at one and the same time, a paper publishing project, with thirty volumes planned by Oxford University Press, a collaborative work effort on the part of more than 800 participants, a collaborative research project, and a digital library under development. The focus of Spasser’s paper is on the re-organization of the project from one based on traditional publishing methods, which proved inadequate:

“While the Project has moved forward (the first three volumes have been published, and intensive work is well under way on volumes 22–24 and volume 4), with its 800+ participants scattered across North America involved in a decades-long effort and with hundreds of manuscripts in various stages of review by different sets of participants at any one time, traditional publishing methods have proved inadequate and inefficient.” (Spasser, 2002, p. 88)

Accordingly, a move was made from traditional publishing methods to the use of a computer-based system, Collaborative Publishing Services (see Spasser, 2000) which:

“...attempts to integrate communication, information sharing (through creation of a common information object repository), and coordination support features and is accessible by unmodified web browsers across heterogeneous, autonomous, and distributed information technology infrastructures” (Spasser, 2002, p. 88)
Interactive information retrieval

On the face of things, one would expect that, if any area within information science would be an ‘early adopter’ of activity theory, it would be the field of interactive information retrieval. The subject overlaps with other areas, such as human-computer interaction (indeed it might be described as a sub-field of HCI) and information systems development. However, although there are still some key researchers in the interactive IR field (in spite of much of the work having migrated to computer science), such as Ingwersen at the Royal School of Library and Information Science in Copenhagen, Järvelin at the University of Tampere, and Belkin and Saracevic at Rutgers University, activity theory appears to have made little, if any, impact.

A search on Scholar Google (with the equivalent of the Boolean construction (“interactive information retrieval” OR “interactive IR”) AND “activity theory”) revealed nothing of interest, nor did the same search on the Web of Knowledge. The same search on Google revealed only one project at Rutgers (under the direction of Belkin): doctoral candidate Tang is employing activity theory in a study of user reaction to a novel ‘faceted information space’. In a dissertation proposal, Tang notes:

“The first group of research questions involves users’ perception and acceptance of the display tool, as compared with the tool they have been accustomed to. This will entail the investigation of users’ assimilation of the display tool over time. This part of the inquiry will be directed by activity theory where the internalization of the external tool is highlighted…” (Tang, n.d., p. 4)

Overall, therefore, it appears that interactive information retrieval researchers have not yet engaged with activity theory to any significant extent and perhaps they and those in human-computer interaction have not yet engaged with one another.

Information seeking behaviour

Although Kuhlthau (2004) does not make reference to activity theory in her work, it is worth drawing attention to her conception of the Zone of Intervention, which is “modeled on Vygotsky’s… zone of proximal development” (Kuhlthau, 2004, p. 128):

“The zone of intervention is that area in which an information user can do with advice and assistance what he or she cannot do alone or can do only with difficulty… Intervention within this zone enables users to progress in the accomplishment of their task.” (Kuhlthau, 2004, p. 129).

It would be a relatively straightforward matter to incorporate this idea of the zone of intervention into a study of, for example, information seekers’ use of various technological tools. Kuhlthau uses the idea in the development of school librarians’ skills in dealing with information users, but its use in information literacy programmes generally would also be feasible.

Jin (2004) in presenting a poster at the ASIST Annual Meeting, sets out a programme of research to explore the information behaviour of competitive intelligence practitioners. This is evidently a PhD project and appears not yet to have been fully reported. However, the activity theory framework is clearly presented and adapted to a consideration of the competitive intelligence activity and the author notes: “…within the framework, [the] overall activity system, rather than individual CI practitioners, becomes the unit of analysis for research on information behavior”. It is not clear, however, how the activity theory framework will help to provide answers to the research questions, which appear to be rather ‘traditional’ in character and not influenced by activity theory.
Recently, Wilson (2006) has explored the relevance of activity theory for research in information seeking behaviour by revisiting previous research and retrospectively applying the framework. He shows, for example, how information flows in the social welfare activity of taking a child into protective care involve multiple activity systems in different agencies and how information seeking can be a collaborative activity, involving division of labour. It may be that information exchange among interacting agencies may be one of the conceptual tools that Engeström (1999) has pointed to being needed in the third generation of activity theory. Wilson also shows how the rather static diagrammatic models of activity theory might be converted to a ‘process model’, which also embodies rules, norms and the division of labour as tools in activity.

Other researchers in this field have occasionally mentioned activity theory in their work, without, however, taking the analysis very far. For example, Atwell and Dowell (2003) briefly mention activity theory in their study of the information seeking behaviour of journalists, drawing attention to the fact that search behaviour often related not to a single goal, but to multiple goals. However, as a whole, their paper does not employ activity theory as an analytical framework.

Lessons for information science?

What do we learn from this review of the applicability of activity theory to research in librarianship and information science? As shown, to date there has been relatively little research in these fields performed within an activity theory framework – the fingers of both hands would not been needed to count the number of papers. True, Hjørland has written quite extensively on realism in information science and on domain analysis and usually mentions activity theory as one of his sources of influence, but research within a specifically activity theory framework is rare: we can cite Spasser (1999, 2000, 2002) as one of the main researchers within the tradition and, in addition to the work by Jin (2004) and Wilson (2006), also noted above, Talja, Tuominen and Savolainen (2005) draw attention to activity theory in their consideration of the ‘isms’ of information science, as part of ‘collectivism’ and mainly through reference to the work of Hjørland and Albrechtson. Over all, however, we have to conclude that information science research, at least as traditionally defined in the library and information science community, has been little affected by the burgeoning interest in activity theory in other information disciplines.

This leads to the question, What influence ought activity theory to have in information science?

The field of education, having had what is probably most experience of activity theory-based research is a fruitful area for synergy: here two sub-disciplines can build upon the discoveries and models in education; they are, information literacy and computer-based collaborative learning. As noted above, information literacy is already a topic of research in education and the key recommendation would be for researchers in the information science area to form strategic alliances with colleagues in educational research, who are likely to have a greater awareness of activity theory. Considering research itself as an activity, there are likely to be considerable benefits from collaboration, not least because a division of labour would be possible—the information scientist being concerned with the development of skills in searching for and accessing information resources, while the educationalist would be interested in the pedagogical issues relating to the teaching of these skills. Both would be interested in how information on information skills is best presented to naive information searchers, and how the student’s activity could benefit from the wider contextual framework of pedagogical development that activity theory can provide. Also, Engeström’s concept (1987) of expansive learning could lift information literacy research out
of a relatively mundane concern with skills development to deal with how the acquisition of those skills help the student (and which students and how) to ‘go beyond the information given’ to the creative use of that information.

As noted earlier, a search for research on information literacy within an activity theory had only very limited success and, in general, the field does not yet appear to have engaged with activity theory. In this section, to exemplify the potential of activity theory for information-related research, we explore what benefits there might be in adopting an activity theory framework for information literacy research. Using Engeström’s triangle (figure 2 above), we can consider each of the nodes in turn to discover the research questions to which activity theory gives rise, thereby illustrating the value of AT as a conceptual framework for the development of research.

To begin with the ‘subject’, most information literacy research is concerned with programmes developed for students, to equip them with skills of information searching and information use that will serve them well not only in their current roles but in relation to life-long learning. But what of the teachers of those students? Is it assumed that they have all the necessary skills and do not require further development? And what of the librarians who serve those students and teachers? They may be involved in information literacy programmes themselves, but, often, the persons involved are not necessarily those who serve the students and teachers daily. Should information literacy programmes, then, be developed and taught collaboratively? Should there be collaboration in learning, so that fast-learning students can help teachers gain a better understanding of the complexities of search engines? Should librarians be involved as learners so that they discover what resources are thought to be most useful by both teachers and students? In other words, simply asking, ‘Who is the subject of this activity?’ gives rise to these questions and probably many more. And these questions only relate to the world of education: what of the world of work? What questions arise when we consider that context?

Turning to the ‘object’, the core question is, ‘What is the object of information literacy development?’ Is it to provide the individual student with a specific range of information discovery and information use skills? Or is it to develop the competencies of the target group (students, teachers, librarians or whatever) collectively? If the latter, the implications would be very different. When we turn to work organizations, information literacy development might focus on teams or ‘communities of practice’, where a decision might be taken that a division of labour might be most effective and only one member of the team or community should become expert in information searching, analysis and delivery to colleagues. Interestingly, this was Farradane’s original definition of the ‘information scientist’; is the world of connected, distributed information resources driving us back to that original concept?

‘Tools’ are generally considered to be computers and the associated software systems, but the work on genre theory, cited earlier, as well as activity theory itself, suggests that ‘tools’ can be interpreted as a much more diverse set of phenomena. There is considerable attention in information literacy research and programmes to the physical tools of computing and to the software, but people use a variety of additional tools, from other programs such as word-processors to PDAs and paper resources, such as files and notebooks. How these various tools, and others such as thesauri and classification systems (including those devised by individuals for their own purposes), are integrated by the learner is an interesting subject for research.

Considering the ‘rules and norms’, there is a clear link between information seeking, information use and information ethics that needs exploration in the context of information literacy. Students, in particular, need to be aware of the conventions of citation and
quotation, in order to avoid charges of plagiarism, for example. At the collective level, there may also be informal rules and norms of behaviour with respect to information use: for example, in a student project team, the necessity to share information freely may need to be reinforced.

How the nature of the ‘community’ influences information literacy has not been explored, to my knowledge at least, and, in the education sector, a particular peer group of students may hold that information literacy is ‘geeky’ and not to be pursued, while another group, bound together by the need to finish a joint project, may have a completely different perspective. In work organizations, similar divergences of view may prevail and different levels within the community may give more or less support to the development of information literacy in the organization. If, for example, senior management hold that ‘time should not be wasted’ on information searching and Internet use, those who actually need the training and development may be forced into self-learning. This may be an example of the contradictions in activity systems, with the goals of one group, the senior managers, being in conflict with the goals of the team or the work group.

‘Division of labour’ has already been mentioned as a factor in teamwork and, in certain situations, training individuals rather than groups may be an appropriate strategy. The trained individuals might then operate as trainers themselves for other members of the work group or community of practice. In the educational environment one would expect information literacy programmes to apply to everyone, however, and the division of labour may refer to the distribution of teaching and mentoring roles over the different parties involved in the process – teachers, students and librarians.

Finally, the ‘outcomes’: this implies evaluation research on the ‘success’ or otherwise of information literacy programmes: longitudinal research on the efficacy of information literacy programmes is often called for, but rarely accomplished, and the long-term effects may be their most useful feature. The acquisition of certain personal information management competencies may well serve a useful purpose in relation to, for example, the conduct of project work in an educational institution, but, if thoroughly learnt and internalised into everyday performance, they may have a lasting benefit on an individual’s career outside of education.

It is also recognised that actions have intended and unintended consequences: what are the unintended consequences of information literacy development?

This brief, and very incomplete review of activity theory as a conceptual framework for a sub-field of information science reveals its power as a tool for developing a research programme in the field. When applied to a specific project, there is at least equal potential.

There are also synergies between education and information seeking behaviour, as the earlier reference to the work of Kuhlthau demonstrates. Many researchers, however, use the educational sector simply as an arena in which to carry out their research and do not develop the connections in ways that would be fruitful for education: an exception to this is the work of Limberg and her colleagues at the Swedish School of Library and Information Science. Beginning with her doctoral study (outlined in Limberg, 1999) and subsequently moving into project-based research with a strong educational component (e.g., Limberg and Alexandersson, 2003; Hultgren and Limberg, 2003). Limberg (like Kuhlthau) has demonstrated the value that information seeking behaviour research can have for education.

Limberg has adopted a socio-cultural approach (Alexandersson and Limberg, 2004) (which is closely related to the activity theory perspective) and, as with Kuhlthau, it would be interesting to map her work directly into such a perspective and discover what additional insights might be obtained.
The area of online learning and online information use is closely related and depends upon developments in information skills development and information literacy. At root, the systems employed are distributed information systems and activity theory has contributed to this area. The role of library and information services in such learning systems is often limited to ensuring the availability of resources and the wide variety of interfaces available and the wide variation in the design of library intranets is sufficient evidence that little work has been done on these interfaces to ensure that the networked learner (who may actually be on the same university campus as the library) understands the role of the intranet and the significance of different kinds of information resources. That requires, again, a synergy with research in education and human computer interaction. The need for research is attested to by George, Bright, Hurlbert, Linke, St. Clair and Stein (2006) on the information behaviour of masters’ and doctoral students engaged in research. It was found that, even although such students were not new to library and information use, few were fully aware of the range of resources available through the library intranet and the means available to discover those resources.

Information literacy has been the focus of this discussion because of its strong interdisciplinary character, but other areas of information research might also benefit from the application of an activity theory perspective. For example, in relation to the management and use of information in organizations, there is a great deal of research from a variety of directions. The ‘Tampere School’ of studies on task analysis (for example, Byström and Järvelin, 1995; Byström, 2002, Byström and Hansen, 2005; Vakkari, 2001, 2003) has shown that the nature of individual tasks and their performance is significant for various aspects of information science, from information searching to information retrieval, and the incorporation of these studies into an activity theory perspective might lead to the investigation of interesting relationships between tasks and the wider activities of which they are a part. Also, it would direct attention to the contextual aspects through a consideration of the rules and norms of the organization in which the tasks are performed, the community affected by, or engaged in, the performance of those tasks and the extent of the division of labour in activities, which raises issues of the coordination of tasks for the accomplishment of the wider activity. Very interesting research in the area of work task analysis is being carried out at the VTT Technical Research Centre in Finland by Norros and her colleagues (see, for example, Norros, 2004).

Earlier, it was noted that Davenport and Hall (2002) had drawn attention to the use of activity theory in research on communities of practice and organizational learning. However, there appears to be very little in the organizational studies journals that adopts such a perspective. In fact a search on Web of Knowledge for “activity theory AND (communities of practice OR organizational learning)” across the six major organization theory journals resulted in only three items, only one of which, Blackler (1995), was actually concerned with this specific subject. This is a little odd, since there are certainly two other papers in the journal Organization, on the topic (Blackler, Crump and McDonald, 2000; and Engeström, 2000). There is also a very interesting third paper (Thompson, 2004), which suggests that, in applying activity theory to organizational life, researchers have moved away from Vygotsky’s original concept. Thompson argues that:

“…this original formulation, which emphasized the mediation of human consciousness by tools and signs… has been replaced by a concern with the interrelationships between social groupings, which, not being conscious, are incapable of mediated experience in the manner Vygotsky proposes.” (Thompson, 2004, p. 580)

Although critical of work by Blacker and Engeström, Thompson does not wish to dispose of activity theory altogether: rather, he seeks, as his title states, to strengthen organizational activity theory by drawing in ideas from the Russian philosopher and literary theorist,
Mikhail Bakhtin, to ground activity theory more securely in its Vygotskian origins. Interestingly, in his comments on Blacker, Engeström (2000b) also draws attention to the value of Bakhtin’s work.

Activity theory may not be an appropriate research framework for every area within library and information science, but on the basis of this analysis, it would be appropriate for any investigation of library and information practice and the greater part of research is concerned with practice: how things are done, how to do them more effectively or efficiently and how to develop systems that support the doing.

Conclusion

While this review of possible influences might be satisfactory from the perspective of a narrow definition of ‘information science’, it might actually be more interesting to re-define the field to cover the totality of the disciplines covered by this review. The latter would be a more radical approach and one that is justified, in this author’s mind by two factors: first, the extent to which the original idea of ‘information science’ has been eroded by the acceptance by other disciplines of many of the key concerns of information science. We can point, for example, to information retrieval, research on which has migrated almost entirely to computer science, to the obvious relationships between ‘information requirements’ in information systems and ‘information behaviour’ in information science, to the fact that studies in information literacy, which began as ‘user education’ in librarianship, are now part of the research agenda in education, and to the increasing tendency for ‘information services’ to be computer-based and, hence, to require the disciplines of information systems development. Apart from the continuing concern with the management of the physical record in the form of books and archive materials, information delivery has become more and more a matter of electronic information delivery and the tendency for ‘information science’ to merge into the wider world of information disciplines generally shows no sign of reversal or containment.

The second factor is that by reviewing activity theory as a common conceptual framework for the range of information-related disciplines reviewed here, one’s attention is drawn to the artificiality of the distinctions. Very often, common phenomena are being explored through activity theory but in different academic sub-cultures, in different journals and not always with the degree of inter-disciplinarity that might be appropriate.

It appears, in fact, that ‘information science’ would be a useful term under which to subordinate all of the information research areas reviewed here (i.e., excluding psychology and education), leading to what Engeström (1987) calls the expansive transformation of the field. We can use Engeström’s model of the activity system to suggest the kind of transformation that could take place through an integration of the information disciplines: figure 4 owes something to figures 2.10 and 2.12 in Engeström (1987). The figure is fairly readily readable and the explanation is straightforward: the arrows show the ‘expansive’ character of the changes, while the small activity theory diagram shows the new information science research system as the outcome of the transformation. At all points in the figure we suggest an expansion of concerns and motives that shift the model from one related to individual ‘information science’ disciplines or sub-disciplines (HCI, information systems development, collaborative learning systems, etc.) to one based on the implications of adopting activity theory as a common conceptual framework for research across the disciplines, providing a common language and enabling a common understanding of research issues.

Such a solution to the fragmentation of research across disciplines will not be easy to accomplish but, the more the inter-related concerns are shown in ARIST, the more likely it
is that a solution of this kind will ultimately enable us to define ‘information science’ as a coherent and useful research area.

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Notes
1 The problems of translating Russian terms used in activity theory is also dealt with by Kaptelinin and Nardi, 2006, Chapter 6.
2 Although Zinchenko provides no citation, he may have in mind Rubinshtein’s ‘Principle of creative personal-activity’ (1922). Intriguingly, Rubinshtein worked as Director of the Research Library of Odessa from 1922 to 1930 (see http://www.ido.edu.ru/psychology/psychophysiology/biograf27.html) and then as Assistant Director of the City Libraries of St. Petersburg before returning to academic psychology in the same city (Don, 2004).
3 The term ‘bibliography’ or ‘bibliographic science’ has a much broader connotation in Soviet literature than in the West: Macevičiūtė and Janonis note:

   “Bibliographic practice is the practical creation of bibliographic information and bibliographic services in society, supporting practically every other human activity through a wide range of institutions (libraries, archives, museums, information services, indexing and abstracting centres, publishing, science communication, etc…) or beyond them.” (Macevičiūtė and Janonis, 2004, p. 32)

In other words, it embraces the whole of library and information science, and more.

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