IDEA GROUP PUBLISHING

701 E. Chocolate Avenue, Suite 200, Hershey PA 17033, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com

ITP4487

Activity Theory as a Theoretical Foundation for Information Systems Research

George E.M. Ditsa and Joseph Davis
Department of Information Systems, University of Wollongong, Wollongong, NSW 2522, Australia, Ph: +61 2 4221 4034, Fax: +61 2 4221 4474, george_ditsa@uow.edu.au

ABSTRACT

Theoretical models from social psychology have been widely used by information systems researchers as theoretical foundations to explain and predict information systems use. Unfortunately, most of these models used ignore the social context in which IS is used, but rather focus mainly on the individual and the technology. History and time are as well ignored in most cases. Activity theory (AT) offers a set of philosophical concepts that can be used to integrate the human and the technological dimensions into a holistic research approach. This paper presents the basic concepts of Activity Theory and its potential as a theoretical foundation for information systems use research.

INTRODUCTION

Recently, existing approaches to information systems (IS) research have been the subject of much discussion as the field searches for ways to combine the technological and the social aspects of IS. There has been that "war" between the quantitative and qualitative research camps, which, fortunately, was just recently declared to be over. Qualitative research is said to be now welcomed in almost all IS journals (Myers, 1999). However, the search for a unifying theoretical foundation for IS research seems to be far from over. As the information technology advances so rapidly and the use of IS increases by the day, cracks in some earlier IS researches are beginning to appear. History, time, the socio-technical nature of IS and, perhaps most importantly, the absence of a strong and unifying theoretical foundations may have contributed to these cracks (Markus, 1999).

There has been much debate about whether IS is, in fact, a discipline, what the nature of the field of IS might be, and what types of research should be conducted in such a field (for example see Applegate & King, 1999; Benbasat & Zmud, 1999; Davenport & Markus, 1999; Lee, 1999; Lyytinen, 1999). IS investigators have suggested the use of social psychology models as potential theoretical foundations for research on the determinants of user behaviour and system use (e.g., Christie 1981, Burton, et al., 1993; Szajna and Scamell 1993; Davis, Bagozzi and Warshaw, 1989; Netemeyer and Bearden, 1992, Bagozzi et al., 1992; Martocchio, 1992 Nataraajan, 1993; Kelloway and Barling, 1993; Mykytyn and Harrison, 1993; Wishnick and Wishnick, 1993; Saga and Zmud, 1994). Among the most commonly used theories for research in this area are the Theory of Reason Action (TRA), the Technology Acceptance Model (TAM), the Expectancy Theory, the Theory of Planned Behaviour (TPB), and the Social Cognitive Theory (SCT).

Despite the large amount of research surrounding the area of information systems use, studies (Franklin et al., 1992; Hornby et al., 1992; Hovmark and Norel, 1993; Williams, 1994; Markus and Keil, 1994) suggest that most systems fail to meet the objectives and aspirations held for them**,** not because they are not technically sound, but because psychological and organisational issues were not well addressed during the development, implementation and use of the systems.

This paper aims at presenting Activity Theory as an alternative theoretical foundation for IS research to address some of the shortcomings of the current theoretical approaches. The paper first takes a brief look at some commonly used social psychology theories in IS research. The paper then presents an overview of the concept of AT, followed by a discussion of AT as a theoretical framework for information systems research supported by examples of two practical work activities. The paper continues by pointing out some problems and limitations in applying AT in IS research before concluding.

SOME COMMONLY USED THEORIES IN INFORMATION SYSTEMS RESEARCH

Many authors have studied different aspects of the phenomenon of individual reactions to computing technology from a variety of theoretical perspectives, including Diffusion of Innovations (e.g., Compeau & Meister, 1997; Moore & Benbasat, 1991); the Technology Acceptance Model (TAM) which is an adaptation of the Theory of Reason Action (TRA) (e.g., Davis, 1989; Davis, Bagozzi & Warshaw, 1989; Venkatesh & Davis, 1996); the Theory of Planned Behaviour (TPB) (e.g., Mathieson, 1991; Taylor & Todd, 1995); and Social Cognitive Theory (SCT) (e.g., Compeau & Higgins, 1995a, 1995b; Hill et al, 1986, 1987). This research has produced useful insights into the cognitive, affective and behavioural reactions of individuals to technology, and into the factors which influence these reactions.

In each of the theories noted above, behaviour (e.g., the use of computers) is viewed as the result of a set of beliefs about technology and a set of affective responses to the behaviour. The beliefs are represented by the perceived characteristics of innovating in Innovation Diffusion research, by perceived usefulness and perceived ease of use in TAM, by behavioural beliefs and outcome evaluations in TPB, and by outcome expectations in SCT. Seddon (1997) refers to these as the net benefits (realised or expected) accruing from use of the system. Affective responses are typically measured by attitudes towards use, an individual's evaluation of the behaviour as either positive or negative. These commonalities in the models reflect a belief in the cognitive basis of behaviour.

While TAM and the Diffusion of Innovations perspectives focus almost exclusively on beliefs about the technology and the outcomes of using it, SCT and the TPB include other beliefs that might influence behaviour, independent of perceived outcomes. The TPB model incorporates the notion of Perceived Behavioural Control as an independent influence on behaviour, recognising that there are circumstances in which a behaviour might be expected to result in positive consequences (or net benefits), yet not be undertaken due to a perceived lack of ability to control the execution of the behaviour. Perceived Behavioural Control encompasses perceptions of resource and technology facilitating conditions, similar to those measured by Thompson, et al. (1991), as well as perceptions of ability, or self-efficacy (Taylor and Todd, 1995). However, none of the above theoretical frameworks addresses explicitly the interpersonal, social and situational factors that may influence the user's behaviour and use as does Activity Theory.

THE EVOLUTION OF THE CONCEPTS OF ACTIVITY THEORY

Activity Theory originates from the former Soviet Union, and has its root in the German philosophy of Kant and Hegel. It is a theory which treats the individual's personality as an outgrowth of social forces rather than the autonomous being of the Western rationalist Cartesian model (Bødker, 1991). The approach was introduced to the West by the notable contributions of Wertsch (1981, 1985, 1987, 1994) but the relative abstractness, and the unfamiliarity of the concepts in the Anglo-American context made theory not to receive the attention it deserves in the West. Scandinavian researchers, such as Engeström (1987, 1990), Bødker (1991), Kuutti (1992**,** 1996), and Karpatschof (1992) gave the theory the attention it deserves and extend the concepts of the theory. Other western psychologist to study the theory in detail include Draper (1993), Raeithel (1992) Cole and Maltzman (1969) and Cole (1988), as well as Tolman (1988), who has produced a useful dictionary of English terms used in describing the theory, as well as the origin of words in both Russian and German. Currently the Scandinavian version of the theory appears to be gaining grounds, especially in the West.

This paper appears in *Challenges of Information Technology Management in the 21st Century,* the proceedings of the Information Resources Management Association International Conference.

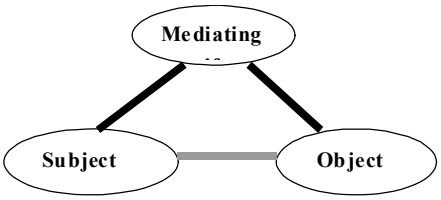


Figure 1: Common formulation of Vygotsky's model of mediated action

In the Beginning

Activity theory is a cultural-historical theory of activity which was initiated by a group of revolutionary Russian psychologists in the 1920s and 1930s, who were determined to turn the spirit of Karl Marx's (1845) Feuerbach theses into a new approach of understanding and transforming human life. The basic concepts of the approach were formulated by Lev Vygotsky (1896-1934). According to Vygotsky, psychology in the 1920s was dominated by two unsatisfactory orientations: psychoanalysis and behaviourism. Vygotsky and his colleagues A. R. Luria and A. N. Leont'ev, formulated a completely new theoretical concept to transcend the concept of *artifact-mediated* and *object-oriented action* (Vygotsky, 1978). They contend that a human individual never reacts directly (or merely with inborn reflexes) to the environment. The relationship between *human* agent and *objects* of the environment is *mediated* by *cultural means, tools and signs*. Thus, human action is viewed as having a tripartite structure and was depicted pictorially by Vygotsky as a triangle that had a sign mediating between a stimulus and response which has since been reinterpreted by Engeström (1987) into the form shown in Figure 1.

As shown in Figure 2, Vygotsky and his colleagues propounded the basic structure of an individual activity where the *tool* mediates between the *subject* and the *object* in achieving the object and in the transformation process of the object to an *outcome* (desirable or undesirable result). The subject is the human actor who has a problem space (the object) and does something directed to the object (the activity) with the help of tool(s) and transforms the object to an outcome. When considering the term *activity*, the underlying concept on which AT is based, it is important to realise that in English the term activity does not carry the essential connotation "*doing in order to transform something*," as do the corresponding German or Russian terms *(tätigheit* and *dejatel'nost)* from which the theory has evolved.

> "An activity is a form of doing directed to an object, and activities are distinguished from each other according to their objects. Transforming the object into an outcome motivates the existence of an activity. An object can be a material thing, but it can also be less tangible (such as a plan) or totally intangible (such as a common idea) as long as it can be shared for manipulation and transformation by the participants of the activity" Kuutti (1996, p. 27).

In human activity theory, the basic unit of analysis is human (work) activity. Human activities are driven by certain needs where people wish to achieve a certain purpose. An activity is usually mediated by one or more instruments or tools (the concept of mediation is central to the whole theory). According to Kozulin (1986): "the main thing which distinguishes one activity from another, however, is the difference in their objects".

Leont'ev later introduced the concept of *division of labour* into Activity Theory. Marx's concept of labour, or production of use values, was the paradigmatic model of human object-oriented activity for Leont'ev.

> According to Leont'ev, apart from work being mediated by tools, work is also "performed in conditions of joint, collective activity (...). Only through a relation with other people does man relate to nature itself, which means that labour appears from the very beginning as a process mediated by tools (in the broad sense) and at the same time mediated socially" (Leont'ev, 1981, p. 208).

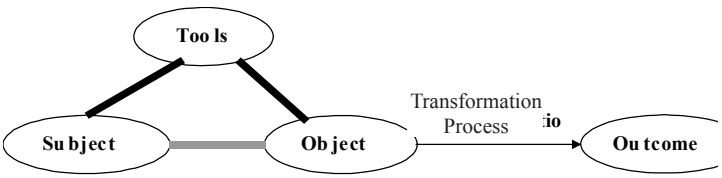


Figure 2: Structure of an Individual

This notion of Activity Theory is shared by the Situative Perspective. Proponents of the Situative Perspective take the view that "it is erroneous to consider the mind as something divorced from the individual's surroundings. This is not an attempt to deny the existence of in-the-head operations, or to suggest that artifacts in the environment are capable of "thinking" in some fashion. Rather, it is an argument that the relationship between mind and environment is so complex, and so interdependent, that it is an oversimplification to consider them separately" (Greeno, 1997).

The Second Generation of Activity Theory

The second generation of Activity Theory derived its inspiration largely from Leont'ev's work. His famous example of "*primeval collective hunt*" (Leont'ev 1981, p. 210-213) explicated the crucial difference between an individual action and a collective activity. The distinction between *activity, action* and *operation* became the basis of Leont'ev's *three-level model of activity* (as shown in Figure 4). The uppermost level of collective activity is driven by an object-related motive(s); the middle level of individual (or group) action is driven by a conscious goal; and the bottom level of operations is driven by the conditions or tasks. Leont'ev however never graphically represented Vygotsky's original model into a model of a collective activity system. Engeström, (1987) depicted the model as shown in Figure 3.

Classification of Tools in Activity Theory

Activity theory classifies tools into three main categories:

- **Primary tools** (artifacts, instruments, machines etc.)
- **Secondary tools** (language, signs, ideas, models of acting etc.)
- **Tertiary tools** (cultural systems, virtual realities)

Primary tools are considered as physical, material tools (e.g., hammer, pen and paper) while secondary and tertiary tools are termed psychological tools (e.g., language, signs, models and cultural systems).

It will be seen in this classification and definition of tools in Activity Theory that an information system can be viewed as an embodiment of all three categories of tools and may be seen as a complex tool.

ACTIVITY THEORY AND INFORMATION SYSTEMS RESEARCH

AT is a research approach in the interpretive mould that presents a framework within which to analyse the actions of people as they interact with each other in attempts to achieve a desired outcome. The activity system allows the actions of people and the mediating influences on their productive activity to be openly examined and understandings arrived at that aren't based on hidden 'interpretive' or 'subjective' analysis. AT has been advocated and used for research which combines the social and technological aspects of human life in such fields as psychology, sociology, education, human computer interaction and organizational theory. Some recent examples include (Blackler, 1995; Blackler et al., 1999; Bødker, 1996; Christiansen, 1996; Engeström, 1990, 1996a, 1996b; Engeström & Escalante, 1996; Jonassen & Rohrer-Murphy, 1999; Martin et al., 1995; Nardi, 1996a; Kuutti, 1991, 1999).

Engeström (1990) views human activity as an interdependent system involving the individual (*subject*), *tools*, a problem space (*object*), the *community* of people who are similarly concerned with the problem, the *division of labour* between community members aimed at the object and the outcome, and the conventions (*rules*) regarding actions. The activity of the individual (top three components of Fig. 3) is not viewed in isolation, but is tied to the larger cultural context. Human activity is seen as socially bound and not simply the sum of individual actions (Engeström, 1990).

> Furthermore, the system as a whole is dynamic and continually evolves. For example, changes in the design of a tool may influence a subject's orientation toward an object, which in turn may influence the cultural practices of the community. Or, changes to cultural practice may inspire the creation or reworking of a tool.

Perturbations at any one point in the activity system (see Fig. 3) produce ripples and, occasionally, can cause major transformations across the system. Thus the model provides a "composite" view that recognises both the socially distributed nature of human activity and the transformative nature of activity sys-

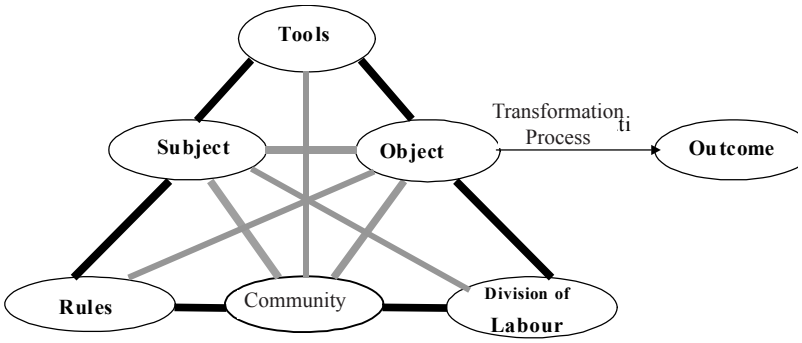


Figure 3: Basic Structure of a Collective Activity (Engeström, 1987)

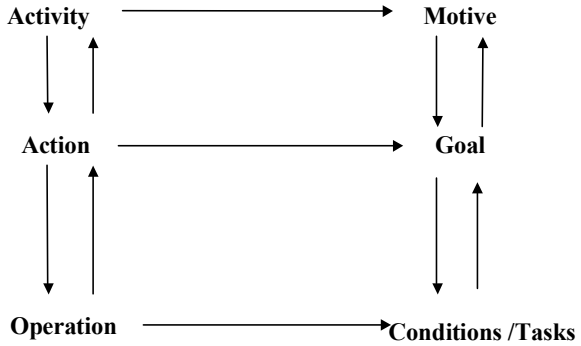


Figure 4: Hierarchical Levels of Activity

tems in general. Engeström's model suggests ways of inducing cultural change and also draws attention to possible points of leverage in the attempt to overcome the sequestered nature of IS use. For example, changing the nature of the rules of IS use and the expected outcomes, and modifying the division of labour, or valuing tools, including IS, may create a different user behaviour towards the use of the IS.

Viewed from this perspective, researching into IS use can be conceptualised as a process of manipulating the "points of leverage" in Engeström's model, where IS is the tool. IS researchers, therefore, should not aim at isolating individual cognitive processes through controlled experimentation and survey methods, but should instead work toward understanding the organisational context in which the IS is used. This notion of Activity Theory is supported by theories of situated cognition. As Salomon (1995) points out:

> "Even if we accept only the idea that some cognitions are socially distributed under some conditions (Perkins, 1993), or that distributed and "solo" cognitions mutually affect each other in an ongoing spiral of development (Salomon, 1993), then research that excludes interpersonal, social, technological, and situational factors becomes badly one-sided and constrained" (p. 14).

He continues by adding that this raises doubts about the validity of traditional experimental methodologies and argue for new forms of educational research in which individuals, and groups of individuals, are studied "in situ" (Salomon, 1995). This argument holds for research in IS use as well. Victor Kaptelinin summarises the appropriateness of AT in the study of information systems in these words:

> "One of the most important claims of activity theory is that the nature of any artifact can be understood only within the context of human activity – by identifying the ways people use this artifact, the needs it serves, and the history of its development" Kaptelinin (1996, p.46).

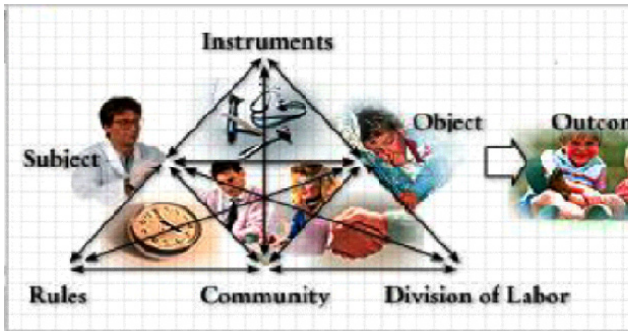


Figure 5: The Work Activity of a Primary Care Physician
Source: http://www.helsinki.fi/~jengestr/activity/6a.htm

Examples of Work Activity

Perhaps some examples of a work activity may concretise the model. Consider the work *activity* of a physician working at a primary care clinic (Figure 5). The *object* of his work is the patients with their health problems and illnesses. The *outcomes* include intended recoveries and improvements in health, as well as unintended outcomes such as possible dissatisfaction, non-compliance and low continuity of care. The instruments include such powerful *tools* as X-rays, laboratory, and medical records - as well as partially internalised diagnostic and treatment-related concepts and methods. The *community* consists of the staff of the clinic, distinguished from other competing or collaborating clinics and hospitals. The *division of labour* determines the tasks and decision-making powers of the physician, the nurses, the nurses' aides, and other employee categories. Finally, the rules regulate the use of time, the measurement of outcomes, and the criteria for rewards.

The same primary health care activity will look quite different if we take the point of view of another subject in the community, for instance a nurse. Yet both subjects share the overall object - the patients and their health problems. An activity system is always heterogeneous and multi-voiced. Different subjects, due to their different histories and positions in the division of labour, construct the object and the other components of the activity in different, partially overlapping and partially conflicting ways. There is constant construction and re-negotiation within the activity system. Co-ordination between different versions of the object must be achieved to ensure continuous operation. Tasks are reassigned and re-divided, rules are bent and reinterpreted. And the use of a tool(s) will be influenced by all the components of the activity system.

Let us consider another example of an executive of an organisation who is to make a decision (the object) and makes the decision (outcome) by using an executive information system (EIS) as a tool (Figure 6). The executive's individual attributes such as computer literacy, age, education, skill, ability, knowledge, attitude, values, beliefs, and motivation to use the EIS will influence the use. However, like the primary care physician, the executive's use of the EIS may also be influenced by the laws, policies, regulations, standards, norms ethical issues, and other workplace practices (rules); the staff and stakeholders (the community) of the organisation; the division of labour that goes with the decision-making (the object) and the decision made. A research framework as in Figure 6 below is being used by the authors to research into executive's use of EIS.

PROBLEMS AND LIMITATIONS IN APPLYING ACTIVITY THEORY IN IS RESEARCH

Like all other research approaches, AT has also its problems and limitations. First of all a researcher must develop a complete understanding of the activity system under observation. Akin to ethnographic research, the researcher must have an intricate understanding of all forces impacting the system and the changes in activity systems over time. This can only be gained by completely immersing oneself in the system under observation (becoming a native) for the entirety of the process. Kuutti, (1996) recognised that activities are long-term formations and their objects cannot be transformed into outcomes at once, but go through a process often consisting of several steps or phases. The researcher must see out all of these steps or phases and may need to use a varied set of data collection techniques without undue reliance on a single method to elicit a complete picture of the activity system. This will entail great cost to the researcher.

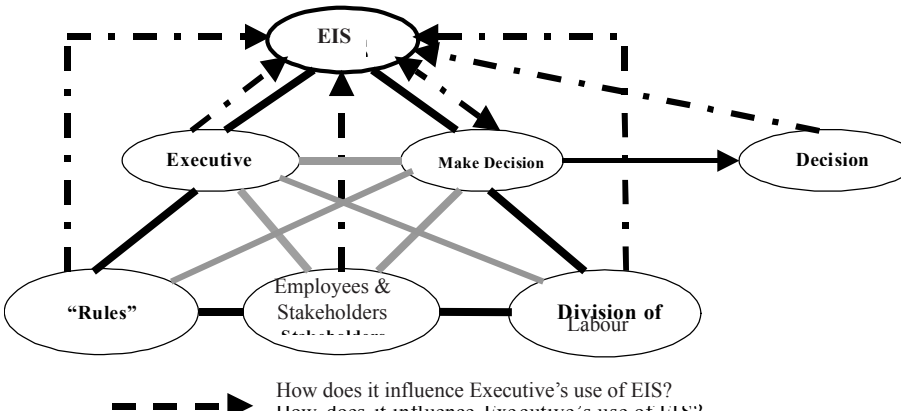
Using AT the researcher must understand and account for all history, actions, rules (both stated and unstated), tools, communal norms and divisions of labour that are at play in the activity system. These obviously cannot be assumed to exist in all activity systems. This will always leave the researcher open to the criticism and challenge of being simply in a

description of interactions that lacks an analysis that can be applied generally. One solution to this problem as advocated by Engeström is to use AT as an approach where researchers enter actual activity systems allowing the general ideas of AT to be put to the "acid test of practical validity and relevance" (Engeström, 1999:35).

Nardi (1996c) also points out four methodological implications AT as:

1. The research time frame must be long enough to understand users' objects, including, where appropriate, changes in objects over time and their relation to the objects of others in the setting being studies.
2. Attention must be paid to broad patterns of activity rather than narrow episodic fragments that fail to reveal the overall direction and import of an activity.
3. The use of a varied set of data collection techniques, including interviews, observations, video, and historical materials, without undue reliance on any one method.
4. There must be the commitment to understand things from the users' point of view.

Figure 6: Executive use of EIS



CONCLUSION

This paper outlined some of the strengths and weakness of Activity Theory and advocate its use as an alternative theoretical foundation for IS research to address some of the shortcomings of the current theoretical approaches. The strength of AT is the importance of its integrating framework linking a set of theoretical principles. It is a powerful and clarifying descriptive tool rather than a strongly predictive theory. The object of AT is to understand the unity of consciousness. AT incorporates strong notions of intentionality, history, mediation, collaboration and development in constructing consciousness (Kaptelinin, 1996). Despite some of the weakness outlined above, AT has a unique way of considering IS as a tool and the advantage of a methodology which considers history, time, the individual, the group of individuals, the organisation, as well as IS in a research setting.

REFERENCES

Applegate, L.M., and King, J.L. (1999). Rigor and relevance: Careers on the line, *MIS Quarterly,* 23, 1, 17-18.

Bagozzi, R.P., Baumgartner, H. & Yi, Y. (1992). State Versus Action Orientation and the Theory of Reasoned Action: An Application to Coupon Usage. *Journal of Consumer Research*, 18(4), 505-518.

Benbasat, I., and Zmud, R.W. (1999). Empirical research in information systems: The practice of relevance, *MIS Quarterly,* 23, 1, 3-16.

Blackler, F. (1995) Knowledge knowledge-work and organizations: an overview and interpretation, *Organization Studies,* 16(6), 1021 - 1046.

Blackler, F., Crump, N., and McDonald, S. (1999) Managing experts and competing through innovation: an activity theoretical analysis, *Organization,* 6, 1, 5-31.

Bødker, S. (1991). Through the Interface: A Human Activity Approach to User Interface Design. Lawrence Erlbaum, Hillsdale, NJ.

Bødker, S. (1996). "Applying Activity Theory to Video Analysis: How to Make Sense of Video Data in HCI", in Bonnie Nardi (ed) *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 147-174.

Burton, F., Chen, Y. & Grover, V. (1992-93). An Application of Expectancy Theory for Assessing User Motivation to Utilise an Expert System. *Journal of Management Information Systems*, 9 (3), 183-198.

Chritiansen, E. (1996). "Tamed by a Rose: Computers as Tools in Human Activity", in Bonnie Nardi (ed) *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 175-198.

Christie, B. (1981). *Face to File Communication: A Psychological Approach to Information Systems*, Wiley.

Cole, M. (1988). Cross-cultural Research in the Sociohistorical Tradition. *Human Development,* Vol. 31.

Cole, M. and Maltzman, I. (eds.), 1969. *A Handbook of Contemporary Soviet Psychology*. Basic NY.

Compeau, D.R. & Higgins, C.A. (1995a). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2), 189-211.

Compeau, D.R. & Higgins, C.A. (1995b). Application of social cognitive theory to training for computer skills. *Information Systems Research*, 6(2), 118-143.

Compeau, D.R. & Meister, D.B. (1997) Measurement of perceived characteristics of innovating: A reconsideration based on three empirical studies. Presented at a workshop of the *Diffusion Interest Group on Information Technology,* Atlanta, GA, December 13, 1997.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User acceptance of Computer Technology: A Comparison of two theoretical models. *Management Science*, 35(8), 982-1003.

Davenport, T.H., and Markus, M.L. (1999) Rigor vs. relevance revisited: Response to Benbasat and Zmud, *MIS Quarterly,* 23(1), 19-23.

Draper, S. (1993). Activity Theory: The New Direction for HCI?, *Intl. Journal of Man Machine Studies,* Vol. 38.

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.

Engeström, Y. (1990). *Learning, working and imagining: Twelve studies in activity theory*. Helsinki: Orienta-Konsultit Oy.

Engeström, Y. (1996a) Non scolae sed vitae discimus: toward overcoming the encapsulation of school learning, in H. Daniels (ed.), *An introduction to Vygotsky,* Routledge, London, 151-170.

Engeström, Y. (1996b) The tensions of judging: handling cases of driving under the influence of alcohol in Finland and California, in Y. Engeström and D. Middleton (eds.), *Cognition and communication at work* Cambridge University Press, Cambridge.

Engeström, Y., and Escalante, V. (1996) Mundane tool or object of affection? The Rise and Fall of the Postal Buddy, in B.A. Nardi (ed.), *Context and consciousness: activity theory and human-computer interaction,* The MIT Press, Cambridge, MA, 325-374.

Engeström, Y. (1999) Activity theory and individual and social transformation, in Y. Engeström, R. Miettinen, and R.-L. Punamaki-Gitai (eds.), *Perspectives on activity theory,* Cambridge University Press, New York, 19-38.

Engeström, Y., Miettinen, R., and Punamaki-Gitai, R.L. (eds.) (1999) *Perspectives on activity theory,* Cambridge University Press, New York.

Franklin, I., Pain, D., Green, E., and Owen, J. (1992). Job Design Within a Human Centred (system) Design Framework. *Behaviour and Information Technology*, 1992, 11(3), 141-150.

Greeno, J. G. (1997). On claims that answer the wrong questions. *Educational Researcher*, 26(1), 5-17.

Hill, T., Smith, N.D., & Mann, M.F. (1986). Communicating innovations: Convincing computer phobics to adopt innovative technologies, in R.J. Lutz (Ed.), *Advances in Consumer Research*, 13, 419-422. Provo, UT: Association for Consumer Research.

Hill, T., Smith, N.D., & Mann, M.F. (1987). Role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers. *Journal of Applied Psychology*, 72(2) 307-313.

Hornby, P., Clegg, C.W., Robson, J.I., MacLaren, C.R.R., Richardson, S.C.S. and O'Brien P. (1992). Human and Organizational Issues in Information Systems Development. *Behaviour and Information Technology*, 11(3), 160-174.

Hovmark, S. and Norell, M. (1993). Social and Psychological Aspects of Computer-aided Design Systems. *Behaviour and Information Technology*, 12(5), 267-275.

Jonassen, D.H. and Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments, *Educational Technology, Research and Development,* 47(1), 61-79.

Kaptelinin, V. (1996) Computer-Mediated Activity: Functional Organs in Social and Developmental Context, in B.A. Nardi (ed.), *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 235-245.

Karpatschof, B. (1992). The Control of Technology and the Technology Control, *Multidisciplinary Newsletter for Activity Theory, Intl. Standing Conference for Research on Activity Theory (ISCRAT)* Berlin.

Kelloway, E.K., & Barling, J. (1993). Members' participation in local union activities: Measurement, prediction, and replication. *Journal of Applied Psychology*, 78(2), 262-279.

Kozulin, A. (1986). The concept of activity in Soviet psychology. *American Psychologist*, 41(3), 264-274.

Kuutti, K. (1991) Activity theory and its applications to information systems research and development, in H.E. Nissen, H.K. Klein, and R.A. Hirschheim (eds.), *Information systems research: contemporary approaches & emergent traditions,* North-Holland, Amsterdam, 529-549.

Kuutti, K. (1992). HCI Research and Activity Theory Position, *Proceedings East-West Intl. Conference on Human-Computer Interaction,* ICSTI, St Petersburg, Russia, 13-22.

Kuutti, K. (1996). "Activity Theory as a Potential Framework for Human-Computer Interaction Research" in Bonnie Nardi (ed) *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 17-44.

Kuutti, K. (1999) Activity theory, transformation of work, and information systems design in Y. Engeström, R. Miettinen, and R. Miettinen and R.L. Punamäki-Gitai (eds.), *Perspectives on activity theory,* Cambridge University Press, 360-376.

Lee, A.S. (1999). Rigor and relevance in MIS research: beyond the approach of positivism alone, *MIS Quarterly,* 23, 1, 29-34.

Leont'ev A. N. (1981). *Problems of the development of the mind*. Moscow: Progress Publishers. Luria, A. R. (1976). Cognitive development. Cambridge: Harvard University Press.

Leont'ev, A. N. (1978). Activity, consciousness, and personality. Englewood Cliffs: Prentice Hall.

Lyytinen, K. (1999). Empirical research in information systems: on the relevance of practice in thinking of IS research, *MIS Quarterly,* 23, 1, 25-28.

Markus, M.L. and Keil, M. (1994). If We Built It, They Will Come: Designing Information Systems That People Want to Use. *Sloan Management Review*, 35(4) 11-25.

Markus, M. L. (1999). *Conceptual Challenges In Contemporary IS Research.* Keynote Address at the 10th Australasian Conference on Information Systems (ACIS), Wellington, New Zealand, 1-3 December 1999.

Martin, L.M.W., Nelson, K., and Tobach, E. (eds.) (1995). *Sociocultural psychology: theory and practice of doing and knowing,* Cambridge University Press, Cambridge.

Martocchio, J.J. (1992). The Financial Cost of Absence Decisions. *Journal of Management*, 18(1), 133-152.

Marx, K. (1845/1967). Theses on Feuerbach. In E. Kamenka (Ed.), *The Portable Marx*. Penguin Books.

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behaviour. *Information Systems Research,* 2(3), 173-191.

Moore, G.C. & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research,* 2(3), 192-222.

Myers, M.D. (1999). *Getting Qualitative Research Published.* The 10th Australasian Conference on Information Systems (ACIS) Panels, Wellington, New Zealand, 1-3 December 1999.

Mykytyn, P.P. Jr. & Harrison, D.A. (1993). The application of the Theory of Reasoned Action to senior management and strategic information systems. *Project Management Journal*, 6(2), 15-26.

Nandhakumar, J. and Jones, M. (1997). Designing in the Dark: The Changing User-Developer Relationship in Information Systems Development. *Proceedings of the Eighteenth International Conference on Information Systems,* Dec. 15-17, 1997, Atlanta, Georgia.

Nardi, B.A. (ed.) (1996a) *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press.

Nardi, B.A. (1996b) Some reflections on the application of activity theory, in B.A. Nardi (ed.), *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 235-245.

Nardi, B.A. (1996c) Studying Context: A Comparison of Activity Theory, Situated Action Models, and Distributed Cognition, in B.A. Nardi (ed.), *Context and Consciousness: Activity Theory and Human-Computer Interaction,* The MIT Press, 69-102.

Nataraajan, Rajan (1993). Prediction of choice in a technically complex, essentially intangible, highly experiential, and rapidly evolving customer product. *Psychology & Marketing*, 10(5), 367-379.

Netemeyer, R.G. & Bearden, W.O. (1992). A Comparative Analysis of Two Models of Behavioral Intention. *Journal of the Academy of Marketing Science*, 20(1), 49-59.

Perkins, D.N. (1993). Person-plus: A distributed view of thinking and learning. In G. Salomon (Ed.), *Distributed cognitions*. (pp 88-110). New York: Cambridge University Press.

Raeithel, A. (1992) Activity theory as a foundation for design, in C. Floyd, H. Zullighoven, R. Budde, and R. Keil-Slawik (eds.), *Software development and reality construction,* Springer-Verlag, Berlin, 391-415.

Saga, V.L. & Zmud, R.W. (1994). The Nature and Determinants of IT Acceptance, Routinization, and Infusion. *Diffusion, Transfer and Implementation of Information Technology (A-45),* Elsevier Science, 67-85.

Salomon, G. (1993). No distribution without individuals' cognition: A dynamic interactional view. In G. Salomon (Ed.), *Distributed cognitions*. (pp 111-138). New York: Cambridge University Press.

Salomon, G. (1995). Real Individuals in Complex Environments: A New Conception of Educational Psychology. Draft Document.

Seddon, P.B. (1997). A respecification and extension of the Delone and McLean model of IS success. *Information Systems Research,* 8(3), 240-253.

Szajna, B. & Scamell, R. (Dec 1993). The Effects of Info Systems User Expectations on Their Performance and Perceptions. *MIS Quarterly*.

Taylor, S. & Todd, P.A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research,* 6(2), 144-176.

Thompson, R.L., Higgins, C.A., & Howell, J.M. (199). Personal computing: Towards a conceptual model of utilisation. *MIS Quarterly* 14, 125-143.

Tolman, C.W. (1988). The Basic Vocabulary of Activity Theory in *Activity Theory*, No.1, ISCRAT, Berlin.

Venkastesh, V. & Davis, F.D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, 27(3). 451-482.

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes*. Cambridge: Harvard University Press.

Vygotsky, L. S. (1981). The genesis of higher mental functions, in J. V. Wertsch (Ed.), *The concept of activity in Soviet psychology*. Armonk: Sharpe.

Wertsch, J.V. (ed.) (1981). *The concept of activity in Soviet psychology,* M.E. Sharp Inc., Armonk, NY.

Wertsch, J.V. (1985). *Vygotsky and the Social Formation of Mind,* Harvard University Press.

Wertsch, J.V. (ed.) (1987) *Culture Communication and Cognition: Vygotskian Perspective,* Cambridge University Press.

Wertsch, J.V. (1991). *Voices of the Mind,* Harvard University Press.

Wertsch, J.V. (1994). The Primacy of Mediated Action in Sociocultural Studies, *Mind, Culture and Activity: An International Journal*, Vol. 1 No. 1, Fall, Laboratory of Comparative Human Cognition, UCSD, CA.

Williams, T.A. (1994). Information Technology and Self-managing Work Groups. *Behaviour and Information Technology*, 13(4), 268-276.

Wishnick, Y.S. & Wishnick, T.K. (1993). Relationships between school labour relations practitioners' personal and social beliefs and their propensity toward using an interest-based negotiations model in the public schools. *Journal of Collective Negotiations in the Public Sector*, 22(3), 215-231.