Distributed Cognition

In subject area: Social Sciences

Distributed Cognition refers to the perspective that cognition is not confined to individuals' minds but is distributed across people, physical surroundings, and symbolic environments. It emphasizes that reasoning extends into the immediate environment, where external elements become resources for cognitive processes.

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International Encyclopedia of the Social & Behavioral Sciences, 2001

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2 Distributed Cognition

Whereas CHAT research often involves comparisons of groups of people's reasoning, work conducted within the distributed cognition tradition typically focuses on the reasoning of individuals or small groups of people as they solve specific problems or complete specific tasks. Empirical studies conducted within this tradition therefore tend to involve detailed microanalysis of either an individual's or a small group's activity. Further, whereas CHAT researchers often frame people's reasoning as acts of participation in relatively broad systems of cultural practices, distributed cognition theorists typically restrict their focus to the immediate physical, social, and symbolic environment. This circumscription of analyses to people's reasoning in their immediate environments is one indication that this tradition has evolved from mainstream cognitive science. Several of the leading scholars in this tradition, such as John Seeley Brown, Alan Collins, and James Greeno, initially achieved prominence within the cognitive science community before substantially modifying their theoretical commitments, in the process contributing to the emergence of a distributed perspective on cognition.

The term 'distributed intelligence' or 'distributed cognition' is most closely associated with Roy Pea (1993). Pea coined this term to emphasize that, in his view, cognition is distributed across minds, persons, and symbolic and physical environments. As he and other distributed cognition theorists make clear in their writings, this perspective directly challenges a foundational assumption of mainstream cognitive science. This is the assumption that cognition is bounded by the skin or by the skull and can be adequately accounted for solely in terms of people's construction of internal mental models of an external world. Distributed cognition theorists instead see cognition as extending out into the immediate

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Cognition, Distributed

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Distributed cognition is a framework for thinking about cognition which seeks to understand how the cognitive properties of aggregates emerge from the interactions of component parts. It can be applied to cognitive systems at many levels of complexity, from areas of an individual brain to communities of interacting persons. Distributed cognition is sometimes construed as a special kind of cognition that occurs when people are in interaction with one another or with material artifacts. This is only partly correct. Rather than being a kind of cognition, distributed cognition is a manner of thinking about cognition that permits one to examine the relationships between what is in the mind and the world the mind is in. When applied to groups of persons, distributed cognition provides a language for cognitive processes that are distributed across the members of a social group, between people and their material environments, and through time. It attempts to use an understanding of the social, cultural, and material context of cognitive practices to constrain models of cognitive processes within and among individual minds.

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Distributed cognition is a theoretical approach that is concerned with the interactions among people, artifacts, and both internal and external representations. Rather than focusing exclusively on an individual's internal cognitive processes, that traditional cognitive approaches do, it focuses on the processes that take place in an extended 'cognitive system'. These include verbal and non-verbal behavior, the coordinating mechanisms used by social actors, the forms of communication that take place, and the way tacit and explicit knowledge is shared and accessed. One major benefit is the explication of the complex interdependencies among people, artifacts, and technological systems that often can be overlooked when using traditional theories of cognition.

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In addition to this level of analysis, the distributed cognition approach involves explicating:

- the distributed problem solving that takes place (including the way people work together to solve a problem)
- the role of verbal and non-verbal behavior (including what is said, what is implied by glances, winks, etc., and what is not said)
- the various coordinating mechanisms that are used (e.g., rules, procedures)
- the various ways communication takes place as the collaborative activity progresses
- how knowledge is shared and accessed

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1 Mind in Society

For many people, distributed cognition means cognitive processes that are distributed across the members of a social group (Salomon 1993). The fundamental question here is how the cognitive processes we normally associate with an individual mind can be implemented in a group of individuals? A wide range of disciplines in the social sciences has explored this question.

Treating memory as a socially distributed cognitive function has a long history in sociology and anthropology. Durkheim, and his students, especially Halbwachs (1925), maintained that memory could not even be coherently discussed as a property of an isolated individual. Roberts (1964) proposed that social organization could be read as a sort of architecture of cognition at the community level. He characterized the cognitive properties of a society (its memory capacity and ability to manage and retrieve information) by looking at what information there is, where it is located, and how it can move in a society. Schwartz (1978) proposed a distributional model of culture that emphasized the distribution of beliefs across the members of a society. Romney et al. (1986) created quantitative models of the patterns of cultural consensus. The identification of patterns raised the question of why such patterns form. Sperber (1985) introduced the idea of an epidemiology of representations. He suggested an analogy in which anthropology is to psychology as epidemiology is to pathology. In the same way that epidemiology addresses the distribution of pathogens in a population, anthropology should treat questions about the distribution of representations in a community. A similar set of developments followed from Dawkins' (1976) discussion of 'memes' as the cultural analog of genes. These ideas have now coalesced in the field of memetics (Blackmore 1999). March and Simon (1958) argued that organizations can be

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International Journal of Nursing Studies

Journal
2004, International Journal of Nursing Studies
John Paley

It is worth emphasising, then, that 'distributed cognition' is not simply a fancy name for the pooling of knowledge and expertise. What the concept of 'pooling' misses is that the knowledge and the expertise are *themselves* distributed in a cognitive system. To take the simplest example again: if I have crimped the page of my book, I may not know what page number I have reached. Yet I can retrieve the number merely by opening the book at the crimp. The knowledge of what page I have reached can be ascribed neither to me nor (obviously) to the book. Rather, it is a function of the cognitive system in which both the book and I participate. Ascribing knowledge to a system, rather than to a human being, may look metaphorical. But Hutchins (1995) argues that the language of cognition was originally transferred *to* the domain of mental activity *from* the domain of formal symbol systems (p. 364). The metaphorical extension, in other words, goes in the opposite direction.

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The distributed systems approach

Currently, the dominant approach in studies of augmentation seems to be associated with an attempt to understand how cognition is distributed between human minds and artefacts (Cosmo, 1992; Norman, 1991, 1993; Pea, 1993; Perkins, 1993; Salomon, 1993a, 1993b). Most approaches to distributed cognition follow generally the same sequence of steps. Typically, they start with differentiating between two entities: (a) a person whose cognition is not supported by any artefacts, and (b) the same person taken together with objects, usually tools, which support or perform some cognitive functions. In other words, the distribution of cognition between individuals and artefacts is viewed as creating a larger scale cognitive system by complementing "native" human cognition with external resources.

The next step of the analysis is to identify the limitations of native human cognitive capability and, then, to define the external components of "cognition at large". Finally, the analysis is focused on how the two cognitive systems -- one of the unaided individual and one of the individual augmented by artefacts -- affect each other. There are three questions addressed by most studies of distributed cognition:

a) Does the fact that cognition is distributed mean that the border between the individual and the world should be reconsidered?
b) What are the specific kinds of artefacts which actually or potentially augment human cognition?
c) What is the impact of the distribution of cognition on the human mind?

Following the same sequence of analytical steps does not mean, however, coming to the same conclusions. In fact, the whole spectrum of possible answers to the above questions is

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Distributed creativity theory

Distributed creativity theory (Sawyer & DeZutter, 2009) describes how creative cognitive processes are distributed across groups. The focus of this research approach is not to examine the results of groups engaging in activities such as during brainstorming activities, but rather what is the interaction between individuals within a group who are creating the new work. Cognitive scientists have studied distributed cognition by conducting interactional analyses that are qualitative and observational. This same approach has been applied in studies investigating distributed creativity. Examining videotaped collaborations over time reveals emergent patterns of distributed creativity (Sawyer & DeZutter, 2009). This form of analysis is ideal when a new performance work is created through a series of improvisations. Improvisational theater companies create exclusively with this approach; however, improvisational explorations are common practices when constructing theater of witness performances or devised theater productions. Jazz musicians actively explore new musical interactions among each other when performing together, and musical bands incorporate improvisation when creating new songs. Pure collaborative emergence of creative performances transpires when there is no set endpoint, each performer's actions are contingent on other group member's actions, and these actions take place in the present moment; however, there are always underlying structures that guide purely improvisational works. For example, jazz performers may rely on familiar musical "licks" or actors may lean on loose everyday plot development. These provide a safety net when performing. Distributed creativity among performers is also contingent on group safety. To some degree individualism needs to be suppressed in order to sensitively respond to group needs, and through this effort the group establishes its own unique identity (MacDonald & Wilson,

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A Distributed Perspective on School Leadership and Management

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A Distributed Perspective: Conceptual and Empirical Work

Over the past decade, scholars have worked at fleshing out a framework utilizing a distributed perspective for examining school leadership and management (Gronn, 2000, 2003; Spillane *et al.*, 2001, 2004; Spillane, 2006). A distributed perspective is a conceptual or analytical framework for researchers involved in investigating school leadership and management. Of course, it can just as easily be used as a diagnostic instrument for practitioners and interventionists working to improve practice, drawing their attention to particular dimensions of school leadership and management (Spillane, 2006). Scanning the theoretical literature, at least two aspects of a distributed perspective, are evident – the leader plus aspect and the practice aspect.

Leader Plus Aspect

Conceptual

A distributed perspective acknowledges that the work of leading and managing schools involves multiple individuals, not just those with formally designated leadership and management positions but also individuals without such designations. A distributed perspective then presses us to take into account the work of all the individuals who may have a hand in leadership and management work. Acknowledging that anyone in the school organization might have a hand in the working of leading and managing the organization is not to argue that everyone does or even should be leaders or managers. Taking a distributed perspective cautions us against investigating school leadership and management by focusing chiefly on the work of formally designated leaders.

While allowing for heroes and heroines, a distributed perspective presses us beyond the heroics of leadership paradigm (Yukl, 1999: 292; also Heller and Firestone, 1995; MacBeath

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Critiques of distributed leadership

Distributing what?

It is not surprising that there is no agreement on a definition of distributed leadership, as it adds one opaque idea, distribution, to that of another, leadership, which itself is a highly ambiguous and contested concept. Some, such as Lakomski (2008), go so far as to consider the concept of leadership "a folk theory" and "therefore a contender for outright elimination" (p. 161). Historically, the extensive literature on theories of leadership has focused on who and what leaders are, their values, ethics, personality traits and so on, and their actions—that is, what they do, the two being interrelated. Distributed leadership has introduced into this scenario greater emphasis on leadership outcomes as unintended, emerging from the concatenation of intention and the material and social context: "leadership is the outcome both of people's intentions (intentionality) and the complex flow of interactions in the daily life of schools (emergence)" (Woods and Roberts, 2019: 665). Though distributed leadership reaches back at least as far as the 1950s as a concept that has much in common with shared leadership, systems leadership and other generic leadership theory, there is a more recent insistence on a theoretical distinctiveness, drawing on the developing science of cognition as a socially distributed process. Halverson (2002) uses Hutchins (1995) as a source of distributed cognition theory: "*a model of the operation of a sociocultural system from which the human actor has been removed*" (p. 363, original emphasis), in contrast to an earlier person-centered "model of an individual's internal cognitive processes" (p. 249). Lakomski and Evers (2016) describe the process of socially distributed cognition as recognizing that individual intentional agency cannot account for how humans function and that "cognition, in this view, 'leaks' into the world, therefore is no

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