

Distributed Cognition in the Workplace

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Introduction

Distributed cognition grew out of a need to understand how problem solving and information processing may be understood across units of analysis by incorporating tool use and involvement of other people (Perry, 2003). This assumes that cognition is not something exclusive to one's head but can be realized in the environment and in others. This concept is also found in philosophy in the work of Clark and Chalmers and their theory of the Extended Mind (EMT). Central to the idea of the EMT, is the parity principle. The parity principle claims if there is a cognitive function, or part thereof, in the head then it must be part of a cognitive process. If this function can be realized outside the body, then it must also be part of cognition. Suppose we recognize function A as being part of cognitive process B and function A exists in the brain. If somehow function A can exist outside the brain, it is still part of B and therefore part of cognition. So, cognition can exist independent of a biological body. This follows from multiple realizability from functionalism. The idea of cognition being independent from biological systems is central in the current pursuit of artificial intelligence. Distributed cognition is not only found in philosophy but in psychology as well. Consider the Wason Selection Task. In Wason's test, four "facts" are presented in the form of cards. Each card has one piece of information on one side, and another piece of information on the other side. The "conditional hypothesis" to be evaluated has to do with the relationship between the information on the two sides of the cards. The subject is shown four cards with one side up and the other side down; the task is to decide which cards should be turned over to evaluate the hypothesis. When solving this problem alone, the success rate is roughly 10%. When participants were allowed to work in teams, the success rate jumped to 80%. Most importantly, distributed cognition is realized in the real world.

Hutkins, 1995 did an ethnography of a crew navigating a ship. He proposed no one person carries the knowledge of navigating a ship, rather you have a series of interlocking skills that make the ship able to sail. For instance, one person knows how to steer while another is able to fix the engines etc. There is an entire system that navigates the ship which includes both people and equipment. In this case, both extended mind and distributed cognition is present. People extend their mind into the computers etc., and work together collaboratively to make the system work. There is a dynamical system of both people and machine. We can see how distributed cognition is relevant to life therefore it may be of benefit to understanding this comprehensively. If used wisely, it can be used to one's advantage for advancements in their life. This paper seeks to analyze this concept.

Distributed Cognition

Collaborative groups have opponent processing in a non-antagonistic manner (Mercier & Sperber, 2017). In fact, the only thing that makes humans distinct from animals is our ability to interface with distributed cognition. This allowed us the ability to use tools and for the creation of culture, traditions etc. Therefore, it is then in the nature of humans to be social creatures. The key to understanding the application of Distributed Cognition is in its use in uncovering how systems *coordinate* transformations on representations in *goal-seeking* behavior (Perry, 2003). It is the aim to determine how intelligence manifests at a systems level, not an individual level. In our ship example, it is understanding how the entire ship functions, not just one aspect of it. This is known as cognitive ethnography, and it entails observation of cognition on a systems level. Using this, people can analyze organizational structures to make processes more efficient. The breakdown of cognition at a systems level gives a different perspective on information flow etc., which in turn can offer more informed decisions. The unit of analysis in distributive cognition is an activity system. An activity system comprises of a group of human actors, their tools and environment, and is organized by a particular history of goal-directed action and interaction (Hazelhurst et. al., 2008).

Recent developments in distributed cognition involves the discussion of distributed cognition in medical informatics. This was done to understand human performance in healthcare and for design of technology to facilitate these performances. Some terms need to be defined before we indulge further. Representational states are configurations of physical media that model the properties of another when engaged by interpretive processes (Hezerlhurst et. al., 2008). For instance, verbal utterances are a representational state. It can relay information of properties about a patient's condition but only if the person perceiving the information engages in an

interpretive process. That is, listening, translating, understanding, engaging memory etc., to generate meaning from the verbal utterance. In healthcare, the ICU is an activity system that involves people (doctors etc.) and their equipment (heart monitors etc.). A coordination device is an arrangement of constraints within the activity system. This can refer to time or other constraining variables. Medical informatics has been under the misconception where they conflate properties of the system with properties of the individual. As a result, there are several consequences such as the loss of context. Technology implementation assume information used in practice have context-free semantics (Hazelhurst et. a., 2008). By analyzing information through a cognitive lens then you can get proper framing of a problem and proper information flow which leads to better decision making and a more efficient organization. Information flow is at the core of any organization as it allows parts of the organization to coordinate varying activity systems. Due to the usually large amount of data in a company at any given time, it may be useful to implement strategies to minimize any lag. Information bottlenecks disrupt the entire organization on a whole and reduces efficiency, reliability etc. The best example for this lies in Canadian healthcare or any form of government. In the justice system, it is not uncommon to hear of people remaining in jail for extensive periods of time (months, even years) awaiting trial. By implementing proper coordination between activity systems, these types of situations may be avoided or at the very least minimized. One way of doing is by implementing information buffers. This acts as a medium that holds information for later retrieval. In addition to this, information hubs may be used to redirect traffic to its proper destination. An information hub refers to anywhere where multiple information channels meet.

Coordination

Another facet of distributive cognition lies in coordination. It has been argued that there is an innate desire in humans to coordinate with others, particularly when geared towards a mutually beneficial goal. Current neuroscience has suggested there are neural mechanisms for pleasure that fire when we coordinate with others. This innate desire to coordinate with others can be used to maximize gain for both the company and the employee. Proper coordination makes a person's job easier, more efficient and creates an innovative environment. This environment promotes healthy competition of coworkers, a safe environment to share ideas and concerns as well as it leads to better work culture. Proper coordination requires proper balancing of a number of ideas including but not limited to:

1. Communication. This is the largest predictor of coordination. When groups are able to communicate well, it fosters trust, empathy etc., and promotes problem solving skills.
2. Framing. This refers in ways groups frame a problem. The benefit of acting in groups and coordinating is that it allows for multiple frames of a problem so there are multiple open pathways to the goal.
3. Rewards and punishment. Benkler, 2011 argues that simple monetary reward and punishment is insufficient for fostering community and cooperation. Rather, we should motivate people socially and intellectually by making cooperation social, rewarding and fun. Of course, in a professional organization punishment must still be enforced to ensure people remain civil. Similarly, reward is also used motivate employees to work harder towards a possible reward. The argument here is that the duality of reward and punishment is insufficient in promoting proper coordination.

Systems that harness intrinsic motivations and self-directed cooperative behavior don't need to limit themselves to knowledge of what people will do (Benkler, 2011). People become better employees and coworkers when the activity system promotes good coordination. Coordination then can be understood as the division of labour among partners, pooling of resources, communication and integration among partners (Castaner et. al., 2020). Coordination has a significant and positive role in the development of employees' performance (Wang et. al., 2021). Another aspect that affects an organization's performance is the psychological safety of employees. Psychological safety is a sense of showing and employing self-respect without negative consequences (Siemens et. al., 2009). To foster a psychologically safe environment, the organization must promote situations where employees can flex their ideas and show off their skillset. This boosts confidence and encourages employees to take risk and show performance. In addition, this safe environment also entails employees to speak up on anything they don't necessarily agree with or think can be done better. This deals with the groupthink bias. As a result of tapping into distributed cognition, the risk of groupthink bias is always present. This is simply a bias where everyone in a group desires conformity. This may be as a result of possible punishment by standing up to authority, fear of rejection for proposing an idea or simply fear of being ostracized for having differing views. By eliminating this from the organization, better decisions can be made because you open up the possibility to look at problems from multiple frames.

Personal application

I find this topic to be potentially influential in both my personal and professional life. This is especially true as I want to eventually open my own business. The success of a company is dependent on the quality of your employees and by fostering a good work culture within that organization, you can get the best out of your employees while simultaneously making their working experience enjoyable. Similar to large societies with large cultures, small societies also need to build their own cultures (Tran, 2017). Proper corporate culture requires paying attention to efficacy of processes and interpersonal relationships among employees. The dominant culture within a company depends on not just the employees but also management style. Perhaps the best example of a gold-standard company culture is in Google. Employees enjoy a wide variety of benefits and in return create an effective working environment for employees to function optimally. There are certain variables to pay attention to when trying to foster good culture:

1. Tolerate mistakes. Humans make errors- get over it. Instead of pointing out and punishing errors, the company should be more interested in finding the cause of the problem and fixing it. In addition, steps should be taken to ensure the errors does not happen again in a firm but compassionate manner.
2. Talent. You can hire anyone off the street to work for your company but what makes the difference is their competence for their job. Talent comes at a price and in order to attract that talent, one needs not just the money but also an environment that fosters and promotes their skills.

This ties into the last variable: building a stimulating work environment. This recognizes the creativity and ideas of employees. In Google, employees are allowed to design their offices etc. Making sure your employees' innovation and creativity is capitalized on is critical in a company.

You're already paying them, so having them not just do their job, but also come up with potentially better ideas to make money or save time etc., seems like a bonus to any company.

In addition to this, upon learning about distributed cognition, I realized it was everywhere; it was a part of every interaction with people and objects. I find this may be helpful especially if you are on the path to bettering certain aspects of your life. For instance, consider a daily task such as cooking. The *mise en place* refers to the action of assembling all needed ingredients and utensils so they would be readily accessible during cooking. Chefs employ this to save time and make the process more efficient. In this instance, the cognitive process of cooking is being refined to be more efficient by previously organizing their workplace. In contrast, if this preparation did not take place, chefs would most likely be in a state of chaos especially during peak hours. The step of the *mise en place* was taken after it was noticed that cooking could be made more efficient if ingredients etc., were in place and readily accessible. Similarly, one can look at the cognitive processes in everyday life, example studying or work, and examine the processes from a distributed lens. This involves taking note of equipment, technology and other people that are present in the cognitive process. In doing so, you are then able to access more frames to a given situation and therefore better your problem solving. If you realize you keep getting distracted while studying, you can conduct an informal ethnography on yourself and your study habits to notice where your attention goes and how to stop it. By simply being aware of the problem, steps can then be taken to resolve them. Particularly in organizations, one can look at the cognitive processes from a systems level perspective to gain insights into how these processes can be made better. I intend to make use of this knowledge when I enter the corporate world and use this to my advantage. Through distributed cognition, it is possible to make my job less stressful than it

needs to be by imploring techniques to maximize distributed cognition. I intend to, within the limits of my authority, to create some sense of coordination in a collaborative environment that would enable both my coworkers and myself to flourish while doing our job.

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