

# **Cognitive Impairments, Information Technology Systems and the Workplace**

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## ***What are the cognitive impairments that can cause functional limitations in the workplace specifically with relation to interaction with information technology systems?***

21.3 million Americans have some form of cognitive disability and a large majority of these individuals are working age adults (Braddock, 2005). Cognitive impairment, often labeled as a “hidden disability” is loosely defined as a disability that affect’s an individuals awareness; memory; and ability to learn, process information, communicate and make decisions. “Cognition” refers to “understanding,” the ability to comprehend what one sees and hears, and to infer information from social cues and body language. Persons with cognitive impairments have difficulty learning new things, expressing themselves through spoken or written language, and making generalizations from one situation to another [1, 2].

Persons with cognitive disabilities present with varying diagnosis along with varying levels of impairment. There is ‘no one size fits all’ definition or description of individuals with cognitive impairments. Cognitive disabilities may be neurobiological (Asperger’s Syndrome, Attention Deficit Hyperactivity Disorder (ADHD)). They can also be acquired (Traumatic Brain Injury) or inherited (Tourette’s Syndrome, Fragile X Syndrome) [3-5].

Functional limitations in the workplace that can significantly impact an individual’s ability to interact with information technology systems can include obsessive, repetitive routines and preoccupations with a particular subject matter; developmentally inappropriate levels of attention, concentration, activity, distractibility and impulsivity. A number of individuals with cognitive disabilities struggle with the inability to ‘take in’ information through their senses (touch, movement, smell, taste, vision and hearing). This sensory integration disorder can co-exist, or be the result of, other disorders such as learning disabilities, autism or brain injury [6, 7].

Persons with specific learning disability have significant difficulties in understanding or in using spoken or written language, manifesting itself in difficulties with listening, thinking, speaking, reading, writing, spelling, or doing mathematical calculations. Other cognitive disorders include visual perceptual deficits; difficulty in receiving and/or processing accurate information from the sense of sight, although there is no acuity

impairment. Many individuals have difficulty picking out an object from a background of other objects or seeing things in correct order. Auditory perceptual deficits are reflected in difficulty receiving accurate information through auditory means, even though there is no hearing impairment. The deficit lies in how the brain interprets what it is hearing. Many individuals have difficulty understanding and remembering oral instructions, differentiating between similar sounds, or hearing one sound over a background of noise [8-13].

Traumatic Brain Injury (TBI) can significantly affect many physical, cognitive and psychological skills. Physical deficits often include ambulation, balance, coordination, fine motor skills, strength and endurance. Cognitive deficits manifest themselves in language and communication, information processing, memory and perceptual difficulties. Psychological status is often altered and the majority of individuals with acquired brain injuries struggle with adjustment issues [13].

Cognitive disabilities impact an employee's basic skills, social skills or both. Other problems that may exist include an inability to manage time, restlessness, distractibility, poor memory, and the need for extra time and extra supports to complete projects [14].

Interacting with information technologies by persons with cognitive disabilities in the workplace can be exceptionally frustrating and lead to abandonment of technology and often the job itself. Seemingly small problems such as the inability to visually track information from a horizontal to a vertical plane can literally stop someone from using a computer. The size of the font, background colors, the amount and kinds of information that must be perceptually comprehended, inattention, inability to remember more than one or two steps in a sequence, etc. all create barriers to the use of information technologies [11, 12, 14, 15].

***What are the specific causes or conditions that lead to difficulties in securing and succeeding at initial employment?***

National data shows that 77% of those with non-severe disabilities are engaged in some form of employment, while only 26% of those with severe disabilities are employed. However, the vast majority of these workers with disabilities are not utilizing information technologies in their jobs. In fact, most are employed in low wage or minimum wage job settings that do not involve any type of information technology [16].

Specific causes or conditions that lead to difficulties in securing or succeeding at initial employment vary from social or attitudinal barriers to the inability to learn to use the various technologies inherent within the job itself. For the majority of individuals with cognitive disabilities the learning curve or time it takes to learn to use information technologies is prohibitive. The complexity of the technologies can be overwhelming. A simple task such as turning on a computer, waiting for the password dialogue box, entering a password, locating the start menu and selecting the appropriate program to launch can be, and often is, an impossible task for persons with cognitive disabilities.

Interestingly enough, the primary difficulty encountered by persons with disabilities, particularly those with cognitive disabilities in securing and succeeding at initial employment involves social skills. The number one reason individuals do not succeed in employment settings is because they do not demonstrate 'acceptable' social behaviors.

Poor social skills coupled with difficulty learning or executing job tasks frequently leads to difficulty maintaining employment.

It is important to note that recent studies and rehabilitation clinicians are reporting that computer-based learning tools can be very effective strategies for training or re-training cognitive skill sets [6, 17-20]. Many individuals with cognitive disabilities such as autism, ADHD and traumatic brain injury respond exceptionally well to programs designed to specifically remediate various cognitive deficits.

***What are the specific causes or conditions that lead to difficulties in long-term employment and “aging in place”?***

Virtually all individuals with Down Syndrome have ‘Alzheimer-like’ manifestations by the age of 35 and 30% of individuals with Fragile X syndrome demonstrate similar cognitive decline over time [17]. For many individuals with cognitive impairments, ‘aging in place’ in the workforce presents myriad difficulties. Tasks previously within their range of competence can become increasingly difficult to perform. Short- and long-term memory skills can fluctuate over time and physical difficulties can exacerbate. Vision and hearing can change, often dramatically and often without notice by peers or the individual themselves. Persons with cognitive disabilities may not react to change and the additional barriers of aging and decline can be prohibitive.

For individuals without disabilities who prefer to remain in the workplace as they age various declines can occur. Elders often manifest similar disabilities to those experienced by individuals with known cognitive disabilities. Difficulties with complex materials or instructions, memory loss, physical, visual and auditory access, and fatigue impact day-to-day work performance. Attitudes between the two groups can be dissimilar however. While very few individuals intentionally advertise their disability, elders in particular, do not appreciate being identified as having a cognitive deficit, nor do they like to be perceived as obviously disabled.

***What types of assistance are available today and what types of workplace issues do they address? Why these difficulties and not others?***

Available assistance for persons with disabilities include national and State programs such as the Division of Vocational Rehabilitation, entirely devoted to assisting persons with disabilities to achieve, maintain or regain employment; the Office of Workforce Development (the old ‘unemployment offices’); Community Centered Boards (CCBs); The ARC and other social service networks. Employment assistance can range from full-time job coaching services to assistance with filling out employment applications or providing leads for jobs.

The most sought after and recognized assistance by these agencies is called ‘natural supports’. Natural supports consist of identifying individuals or environments that lend themselves to helping or facilitating an individual’s ability to succeed in the workplace. A sympathetic co-worker or supervisor who ‘watches out’ for the individual with a disability; a quiet environment someone can retreat to when they become over stimulated; all tend to be highlighted as natural supports.

***Please also give examples of technology-based solutions and initiatives that today address the issues discussed above.***

Technology-based solutions that address cognitive disabilities can range from very simple low-tech, low-cost solutions such as a picture-based instruction set or schedule of events (AbleNet Technologies, Inc; Attainment Corporation, Inc.), to high-tech, high-cost computer based environmental control systems, auditory prompting systems (AbleLink Technologies, Inc), and communication aids for individuals who have significant expressive/receptive communication deficits (Saltillo Corporation, Prentke Romich, Inc.; Dynavox Systems, Inc.).

The Job Accommodations Network, or JAN, lists thousands of job categories with requisite accommodations or modifications that can be made to enable employment within the various job categories. The Office of Workforce Development provides a 'one-stop' shopping experience for individuals who need assistance with everything from qualifying for Temporary Aid to Needy Families (TANF) to qualifying for Social Security or vocational supports.

***Consider and discuss future scenarios for technology-based solutions and initiatives that you believe would help.***

Persons with cognitive disabilities struggle with everyday issues. Getting out of bed on time, selecting appropriate apparel to wear to work, eating nutritious foods, traveling to and from work, executing job tasks effectively, making friends; all of these activities can be facilitated with various technological supports.

For example, learning to use public transportation requires significant cognitive and physical effort. In Colorado, we are exploring the use of Mobility Agents to aid individuals with cognitive disabilities with transportation issues. Almost 70% of individuals with cognitive disabilities struggle with how to travel to and from work in a timely and safe manner.

The cost of job coaches, supported employment and other vocational supports are prohibitive and often unavailable outside major metropolitan areas. Persons with cognitive disabilities need 'error-free' learning opportunities and continuous repetition of learning tasks in order to become successful in the workplace. Information technology has the capacity and the potential to facilitate job skills development and retention.

We are exploring the use of Virtual Tutors and various context-aware, prompting systems to support these extensive training needs. There are myriad opportunities to develop systems that can operate on a continuum of repetition, degree of complexity, and across thousands of vocational skill sets for individuals of all abilities.

Future scenarios should include unobtrusive, context-aware technologies that assist individuals to live independently, travel safely, and execute job or learning tasks. Information technology should also respond intuitively to the end-user. The abilities of persons with cognitive disabilities (auditory, visual, physical, and cognitive) can fluctuate from day-to-day, hour-to-hour, and sometimes minute to minute. Information technology can and should respond fluidly to fluctuations in performance.

The notion of 'natural supports' must be explored within the context of information technology development, deployment and everyday usage. A 'sympathetic' information

technology system can be aware of the need to provide additional supports on an as needed basis; intuitively adjust job tasks to the performance barriers experienced by the end-user and can guide the end-user to learn new tasks and experience new opportunities.

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