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Bridging the ICT and ICT-AT digital divide for work: Lessons from the United States

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Abstract. ICT is a key driver for the successful employment of persons with disabilities. Empowering persons with disabilities to compete in the increasingly digital work environment will require access to ICTs and ICT-ATs and relevant training to use them. This paper shares findings from two surveys on consumers' experiences with obtaining ICT and ICT-AT for employment through the vocational rehabilitation system as well as through their employers in the United States. It explores the role of ICT and ICT-AT in workplace productivity, performance, and growth. It also explores the nature and impact of training and education on AT for effective use. The results from these different cohorts offer important lessons in developing strategies to overcome the digital divide and allow meaningful access to ICT and ICT-AT for successful employment outcomes in today's technology-based workplace.

Keywords. Employment, ICT/ICT-AT, training, accommodations, MPT

Introduction.

The proliferation of ICT in work has changed how people learn, do work, and interact with others (Raja et al., 2013). ICT based assistive technology (ICT-AT) is enabling persons with disabilities to level the playing field in education, skills development, and employment (Broadband Commission for Digital Development et al., 2013). In most developed countries, the three main channels for AT access are: (i) the education system, (ii) vocational rehabilitation (VR) and disability programs that support transition to work, and (iii) employers (Broadband Commission for Digital Development et al., 2013). This paper delves into ICT/ICT-AT access through the latter two systems. It shares findings from two surveys on consumers' experiences with obtaining ICT/ICT-AT for employment through the VR system and through employers in the United States. It explores the critical role of ICT/ICT-AT in workplace productivity and growth and the nature and impact of AT training and education on effective use.

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Methods.

The data come from two different surveys with persons with disabilities who need ICT/ICT-AT for employment.

Workplace Survey

The first (“workplace survey”) was a national survey of employed individuals to understand experiences with receiving technology accommodations at the workplace. The survey adapted existing measures with input from an extensive network of experts to ensure validity. Researchers used a company that provides respondent panels to obtain the sample of individuals (1) identifying as having a disability or (2) who had asked for accommodations. About 2000 respondents answered the survey. For this paper, we selected employees with disabilities who needed ICT/ICT-AT, resulting in 480 respondents. The majority (89%) worked full-time and 54% worked at their companies for greater than 5 years. Table I in the Appendix depicts the range of health conditions or impairments experienced by the respondents.

VR survey

The second survey (“VR survey”) used a selective sampling of persons with disabilities receiving services from five state VR agencies. VR agencies operate through state and federal funds to assist individuals with disabilities in pursuing employment, including provision of AT services. The agencies disseminated the surveys to random samples of current and past clients. For this paper, we are reporting findings from 83 VR consumers who received ICT/ICT-AT. Of these, 51% were receiving VR services at the time of the survey and the remaining were past clients. Fifty-four percent were seeking employment (38% seeking full-time work, 16% part-time), 38% were already employed but needed VR services to continue their job, and the remaining were not actively seeking employment. Table II in the Appendix depicts the types of disabilities of the respondents.

The Syracuse University Institutional Review Board approved both surveys. Data was analyzed using SPSS 20 and Qualtrics software.

Results.

Workplace survey

Impact of ICT and ICT-AT accommodations

Respondents assessed the accommodation’s impact in enhancing functional ability on a 5-point scale (1= not helpful, 3 = somewhat helpful, 5 = definitely helpful) as follows: Seeing ($\mu = 4$), Hearing ($\mu = 3.5$), Speech ($\mu = 3.5$), Understanding, remembering ($\mu = 3.7$), Physical strength/ stamina ($\mu = 3.6$), Lower body use ($\mu = 3.4$), Grasping and use of fingers ($\mu = 3.7$), Upper body use ($\mu = 3.6$), Mobility ($\mu = 3.5$).

Table 1 shows how participants rated the impact of ICT/ICT-AT accommodations on the respondent’s performance and productivity.

Table 1: ICT/ICT-AT impact on workplace experience

	Significantly worse/less likely	Slightly worse/less likely	No change	Slightly better/more likely	Significantly better/more likely	Don't know	N/A
Possibility of working at this company	2%	4%	20%	25%	45%	3%	2%
Level of productivity (quantity of work)	1%	4%	15%	29%	49%	2%	2%
Level of job performance (quality of work)	1%	4%	14%	29%	48%	2%	2%
Level of attendance or hours of work	1%	5%	20%	25%	43%	4%	2%
Level of morale or job satisfaction	2%	5%	15%	24%	49%	3%	3%
Likelihood of staying at this company	2%	4%	18%	23%	47%	4%	2%
Level of stress at work	1%	9%	17%	32%	37%	3%	2%
Possibility of promotion within the company	3%	6%	29%	25%	28%	6%	3%
Level of communication	1%	5%	27%	27%	34%	4%	2%
Level of self-esteem	1%	5%	23%	23%	41%	5%	2%
Range of work possibilities	2%	6%	24%	25%	38%	4%	2%
Interaction with co-workers	1%	11%	27%	22%	30%	6%	3%
Job security	1%	8%	28%	22%	32%	6%	3%
Level of ability to work independently	1%	4%	20%	27%	41%	3%	3%
Level of ability to acquire training, new skills	2%	4%	28%	26%	31%	6%	3%
Timeliness of projects	1%	4%	24%	26%	37%	4%	4%

Workplace training supports

Most respondents (64%) strongly felt their workplace provided sufficient training and practice time to learn to use the technology, 69% had on-going access to technical support, 64% strongly felt that training took their learning style and needs into consideration, and 58% strongly felt that they will be rewarded for mastering the technology. A majority (65%) strongly asserted that the training occurred where they could become familiar with the technology and make mistakes in a non-threatening atmosphere. Seventy-three percent were very confident that the ICT/ICT-AT was useable with little or no discomfort, stress, or fatigue and an equal number felt confident that they could adjust the technology to meet their preferences and requirements.

Changing needs over time

Forty-three percent of the sample experienced changing technology needs over time due to changes in job roles and functions (20%), changes in the technology that was available over time (22%), and changes in their functional abilities, disability progression, or secondary conditions (20%).

VR Survey

Impact of receiving ICT and ICT-AT services on employment goals

Sixty-nine percent of the respondents were able to achieve their employment goals after receiving ICT and ICT-AT services, 10% were not. The remaining 20% cited non-AT related reasons for not yet achieving their goals. Respondents believed that receiving AT would enhance or had enhanced their ability to perform significantly better at a job (77%), pursue education or training relevant to their employment goals (46%), secure employment (43%), and get promoted (33%).

Information on ICT and ICT-AT through VR agencies

Forty-four percent said that that prior to receiving services they had little knowledge about the different AT options, while 32% had no knowledge. A majority felt that their knowledge improved upon starting services at the agency. Fifty percent said that after they started working with the agency they feel they have a lot of knowledge about the different AT options and have learned more about how AT can help them and how to use it. Eighteen percent reported that they now know exactly what AT would work best for them.

Education and training on selection and use

Respondents expressed satisfaction with the timeliness and relevance of the education and training they received to understand the ICT/ICT-AT options (table 2).

Table 2: Experiences with training

Were you able to get timely and relevant education and training to understand:	To some extent	To a great extent	Completely
How AT could help you?	21%	33%	35%
What AT options are available?	23%	31%	33%
How to choose between the available options?	19%	34%	34%

The survey enquired about the types of education and training they received from VR agencies to become better equipped in selecting and using ICT/ICT-AT (table 3).

Table 3: Type of training

Number of respondents who were provided with training on:	Yes
Evaluation of your needs for assistive technology	79%
Buying, leasing or otherwise providing you with an AT device	76%
Selecting or designing an assistive technology device for your needs	83%
Fitting, customizing, or adapting an assistive technology device for your needs	88%
How to use an assistive technology device	100%
Training or information to your family, caregivers, employers or coworkers	100%

Seventy-four percent of the respondents said that they received information about a variety of AT options and 54% had an opportunity to try out a variety of devices before selection. The majority received training in the correct and effective use of the device,

whereas training in the maintenance and repair of the device, troubleshooting, and adjusting the ICT/ICT-AT for different environments varied across type of technology. See Table 3 in Appendix for split by technology.

Matching person and technology, consumer participation

The survey asked about the process respondents went through in receiving ICT/ICT-AT services that matched their needs (table 4).

Table 4: Matching person and technology

During the AT selection process, did your counselor try to match the AT service to:	Yes
Your specific requests	73%
Your device preferences and needs	66%
Your preferences regarding the tasks and goals you wish to accomplish using the device	61%
The characteristics and resources of the environments where you will use it	45%
Your characteristics and resources	38%
Your service delivery preferences and needs	23%
Your history of AT use (including comfort, satisfaction, and non-use)	17%

Eighty-four percent stated that they were frequently or almost always directly involved in the planning process, 87% were frequently or almost always directly involved in their AT choices, service, and delivery, and 89% felt that they were a valued participant in all phases of service delivery.

Discussion.

The results from these two different cohorts of persons with disabilities in the United States offer important lessons in developing strategies to overcome the digital divide and promote meaningful access to ICT/ICT-AT for successful employment.

ICT/ICT-AT play key role in employment

Persons with disabilities from both cohorts, those who are successfully employed and those seeking employment, reported strong and positive impacts on achieving their employment goals from receiving ICT/ICT-AT. Persons with disabilities receiving VR services reported that receiving education, training, and access to ICT/ICT-AT improved their likelihood of receiving and retaining employment. Employees with disabilities reported that receiving ICT/ICT-AT at their workplace strongly impacted their performance, productivity, efficiency, interactions, and in-turn, their workplace satisfaction. This supports the need to ensure that persons with disabilities have access to resources to obtain ICT/ICT-AT at all stages - job search, hiring, retention, and promotion.

Develop strong training programs

Training and education in ICT/ ICT-AT use were offered through both service delivery systems. VR agencies offered a range of education and training services to support not just the use of technology, but also build capacity in understanding the choices available, the selection and service delivery process, and customization and adaptation. Training was offered to caregivers and family members. While training in the use of the technology was very common, there were lowered reports of training through VR programs on maintenance, troubleshooting, and adapting the technology to different needs for some types of ICT. It is important to incorporate these aspects into training to ensure prolonged use and effectiveness.

Matching Person and Technology

The complexity of matching a person with technology arises from the individual's combination of physical, sensory, and cognitive abilities, and expectations of and reactions to technology (Kirsch & Scherer, 2010). VR agencies use a range of factors to match solutions to consumers including the consumer's preferences and requests, environment and activities to be performed, and past use and comfort with technology. Education and training programs will empower a consumer to become an informed driver of the decision-making process. Respondents reported being directly involved and active in the process to select and obtain their technology. A well informed and empowered end-user is important to ensure a successful match with technology (Scherer, 2008).

Ongoing access to resources

Obtaining a workplace ICT/ICT-AT solution is an ongoing, dynamic process: Technology, ICT skillsets for work, and the needs of the individual with disability change over time. The workplace survey showed that even after a person with a disability has secured ICT/ICT-AT, there is a need to offer mechanisms to re-evaluate their needs. Individuals with disabilities should have ongoing access to resources across the lifecycle of employment to learn about and use new technologies.

In summary, developing services and resources to address the digital divide in accessing ICT/ICT-AT must take a holistic approach. It is important to assess how the existing service delivery systems can offer training and education supports to improve the optimal selection and use of the ICT/ICT-AT to match a person's employment needs. These supports will be needed both within and outside the workplace based on an individual's stage of employment. Training and education on ICT/ICT-AT will enable a consumer to be more involved in the service delivery process, making them a driver of the process rather than a recipient, resulting in a more effective match and use of technology.

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Appendix

Table 1: Health conditions or impairments experienced by respondents in workplace survey

Selected health condition or impairment	Percent
Are you deaf or do you have serious difficulty hearing?	7%
Are you blind or do you have serious difficulty seeing even when wearing glasses?	8%
Because of a physical, mental or emotional condition, do you have serious difficulty concentrating, remembering or making decisions?	13%
Do you have difficulty with processing information, expressing thoughts or appropriate behaviors, or perceiving information?	10%
Do you have serious difficulty walking or climbing stairs?	20%
Do you have difficulty with bending, sitting, or standing?	32%
Do you have difficulty with reaching, grasping, pinching, or controlling hand/finger motion?	15%
Do you have difficulty producing speech or thinking of the right words to say?	7%
Do you have difficulty dressing or bathing?	3%
Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?	5%
Do you have another type of health condition or impairment that was not captured by the questions above?	32%

Table 2: Types of disabilities for VR agency consumers

Primary disability	Percent
Blindness and vision impairments	20%
Hearing impairments	46%
Neuromuscular	13%
Traumatic brain injury (including stroke)	11%
Psychiatric disability	1%
Cognitive disability	6%
Multiple disabilities	11%
Other	10%

Table 3: Types of training for each across different types of ICT/ICT-AT in VR survey

Augmentative/alternate communication technology (n=5)	
Correct and effective use of the device	80%
Maintenance and repair of the device	20%
Troubleshooting if something went wrong	60%
Adjustments for different environments	20%
Not provided training	0%
Computer applications (n=26)	
Correct and effective use of the device	54%
Maintenance and repair of the device	4%
Troubleshooting if something went wrong	12%
Adjustments for different environments	8%
Not provided training	23%
Job/workplace accommodations (n=13)	
Correct and effective use of the device	69%
Maintenance and repair of the device	15%
Troubleshooting if something went wrong	15%
Adjustments for different environments	31%
Not provided training	0%
Technology for visual impairment (n=13)	
Correct and effective use of the device	69%
Maintenance and repair of the device	15%
Troubleshooting if something went wrong	8%
Adjustments for different environments	23%
Not provided training	8%
Technology for hearing impairment (n=26)	
Correct and effective use of the device	73%
Maintenance and repair of the device	58%
Troubleshooting if something went wrong	42%
Adjustments for different environments	46%
Not provided training	4%
Enhanced learning devices/aids (n=12)	
Correct and effective use of the device	75%
Maintenance and repair of the device	25%
Troubleshooting if something went wrong	33%
Adjustments for different environments	33%
Not provided training	17%
Electronic aids for daily living (n=6)	
Correct and effective use of the device	67%
Maintenance and repair of the device	17%
Troubleshooting if something went wrong	17%
Adjustments for different environments	17%
Not provided training	17%
Education and training devices (n=9)	

Correct and effective use of the device	67%
Maintenance and repair of the device	11%
Troubleshooting if something went wrong	44%
Adjustments for different environments	11%
Not provided training	11%