REHABILITATION COUNSELORS' PERCEPTIONS OF IMPORTANCE AND COMPETENCE OF ASSISTIVE TECHNOLOGY

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ABSTRACT

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Assistive technology (AT) has been identified as one of the most effective interventions for rehabilitation purposes of individuals with disabilities. Due to the positive potentials, assistive technology has attracted tremendous attention among the rehabilitation counselors during the past decades. As a result, numerous AT devices have been created and research has been conducted attempting to improve quality of lives of individuals with disabilities. While many successful rehabilitation stories were revealed by AT assisted individuals, the implementation of AT does not always equal to successes. In fact, the high AT abandon rate has been a critical issue for the rehabilitation counselors. One of the identified reasons for the high AT abandon rate is the mismatch between the person and the device. In order to increase successful rate and decrease the possibility of mismatch, training specifically designed for building rehabilitation counselors' AT skills is needed. However, despite the recognition of AT training needs, very few master level rehabilitation counseling programs offer stand-alone AT classes to their students. Reasons for the missing of designated AT training include the lack of time, financial resource and manpower among these programs. Therefore, in order to design the AT training with the constraints these programs have, it is crucial to learn what the most important AT knowledge and skills are for the rehabilitation counselors.

As a response to the current issue, this study focused on exploring current certified rehabilitation counselors' (CRC) perception of importance and competence in relation to their AT knowledge and skills. A sample of 242 CRCs was randomly drawn from the database of

Commission on Rehabilitation Counselor Certification (CRCC). An Internet-based instrument was utilized as means for data collection. The quantitative design of this study yielded several statistical analyses.

Results showed that AT was consistently considered one of the most important skills that rehabilitation counselors should have. However, although AT was considered to be important, rehabilitation counselors in general did not perceive competent to provide such services. The finding was alarming and demonstrated that more AT trainings were needed. In addition, for both perceived importance and perceived competence scales, significant differences were found between AT skill areas (understanding AT, using AT, and making AT decision), which provided insights of what AT skills should be prioritized when designing curriculum. Specific AT skills, which the participants rated important and less competent, were also identified for future training references.

Data generated from this study can be used to inform current practitioners, rehabilitation counselor training programs, and future research directions. Limitations and implications were also discussed.

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CHAPTER ONE: INTRODUCTION

Assistive technology (AT) has received much attention among rehabilitation professionals during the past several decades. One of the most important reasons for the growth of AT in rehabilitation professions is its value on enhancing physical capacity, increasing independent living, promoting self-image, and improving overall quality of life (Day, Jutai, & Campbell, 2002; Scherer, Sax, & Glueckauf, 2005; Viney, 2003). Due to its promising rehabilitation effects, rehabilitation professionals such as occupational therapists, physical therapists, special education teachers, and rehabilitation counselors have devoted tremendous energy to study how AT can be helpful to the individuals with disabilities. As an example, Bryant and Bryant (2003) found positive vocational rehabilitation outcomes to be associated with assistive technology usage among people with visual and hearing impairments. Similar results were also suggested by Schonbrun and Kampfe (2004) for a traumatic brain injury population.

While the potential benefits AT can bring to individuals with disabilities are encouraging, there are also challenges. In fact, the intervention and implementation of AT does not guarantee successful rehabilitation outcomes. As Phillips and Zhao (1993) noted, approximately 30 percent of AT users tend to abandon their AT devices. Cushman and Scherer (1996) also suggested that almost one-third of AT users will abandon their devices within the first three months of implementations. The high abandon rate is especially alarming because of two: (a) the cost of AT implementation does not equal to the rehabilitation gain, and (b) the mismatch between the person and the device could potentially harm both the practitioner and the client's trust in AT, and hence, question the effectiveness of it in the future. In order to alleviate such issue, it is critical for rehabilitation practitioners to effectively assist their clients in choosing the most appropriate AT devices.

Statement of the Problem

Due to the benefits and the positive influence on individuals with disabilities' lives, rehabilitation researchers devote more energy to explore AT knowledge and skills. However, despite the recognition of the importance of AT, education and training specifically focused on assistive technology may not be well enough developed. Chan, Leahy, Saunders, Tarvydas, Ferrin, and Lee (2003) conducted a study, in which they focused on identifying the most important skill sets to current certified rehabilitation counselors (CRCs) and how well they perceive themselves prepared in these skill areas. Among different skill areas being identified, accommodations/rehabilitation engineering services and assistive technology are two areas considered to be important by most CRCs. Specifically, 83% of the participants in this study perceived accommodation and rehabilitation engineering services as important, and 86% perceived assistive technology as important. While their perceptions of importance on both skills are high, their perceptions of preparedness are much lower. Specifically, they were 67% and 68% respectfully. In fact, that was not the only study that revealed the lack of AT education among rehabilitation counselors. Riemer-Reiss (2003) conducted a study that focused on comparing current rehabilitation counselors' perceptions of AT competence and their actual AT service provision. The result of this study suggested that although majority of the rehabilitation counselors reported they received some level of AT education (range from 1 hour to 15 hours) in the past, they still expressed the need and the desire for additional AT trainings. This really suggested that most rehabilitation counselors considered that the AT education they received was not sufficient for the quality service provision. Further, Reimer-Reiss emphasized the strong and positive correlation between the amount of AT education these individuals received and the amount of assistive technology service they provided. In other words, practitioners who received

more training on AT skills were more likely to provide AT services. Reimer-Reiss concluded his study with the suggestion that in order to empower clients with disabilities and improve quality of their lives, rehabilitation counselors should continue and update their learning of AT knowledge and skills.

In respond to AT education needs, Estrada-Hernandez, Wheaton, Dawson and Krispinsky (2007) devoted their effort to explore how AT knowledge and skills were trained in master level of rehabilitation counseling programs. In the study, they developed a survey and obtained data from 88 current Council on Rehabilitation Education (CORE) accredited rehabilitation counseling programs. The results of the study showed that majority of the rehabilitation counseling programs considered assistive technology to be an important skill and that it should be included in professional preparation courses. Further, they pointed out that despite AT was identified by most programs to be an important skill to have, however, most master rehabilitation counseling programs did not offer any stand-alone AT class. Instead, most of them merely infused AT materials into other classes. For example, the AT concept and knowledge were only introduced in one or two class sessions of the rehabilitation counseling foundation class. In addition, although most master programs anticipated that AT would be more and more important to the field, they did not expect any change in curriculum designs in the near future. While reasons such as lack of time, financial supports and manpower could all contribute to the missing of stand-alone assistive technology courses, there might be reasons beyond these. As Noll, Owens, Smith, and Schwanke (2006) noted, what AT knowledge and skills are important to the future rehabilitation counselors is still blurry. In order to develop AT education for rehabilitation counselor preparation programs, it is crucial for researchers to identify what AT skills are the most relevant and necessary to the rehabilitation counselors.

Purpose of the Study

Several studies were conducted examining the benefits that AT can provide for individuals with disabilities (Day, Jutai, & Campbell, 2002; Viney, 2003; Riemer-Reiss, 2003). These studies also raised important questions regarding how to train the future rehabilitation counselors. As many researchers noted, education addressed rehabilitation counselors' AT knowledge and skills needs to be strengthened and expanded. (Estrada-Hernandez et al., 2003; Sherer, Sax, & Glueckauf, 2005). While many emphasized the insufficient AT training among rehabilitation counselors, not many addressed specifically what AT skills should be trained.

As a response to the gap of the current rehabilitation literature, this study attempted to shift attention from professional training programs to current rehabilitation practitioners. It is through the investigation of current service providers, the most important and relevant AT knowledge and skills could be identified. Specifically, the focus of this study was to explore Certified Rehabilitation Counselors' (CRCs) perception of the importance and the competency in AT services they provided. The research questions of interest in this study were as follows:

1. How important do CRCs perceive for assistive technology skills in rehabilitation counseling practice?
    a. Is there a difference in perceived importance across three different factors (i.e., understanding AT, using AT, and making AT decision) among assistive technology skills?
    b. Do CRCs' backgrounds (e.g., gender, years of practice, practice setting, disability) associate with perceived assistive technology importance?
2. How competent do CRCs perceive themselves in providing assistive technology services?

    a. Is there a difference in perceived competence among three assistive technology factors (i.e., understanding AT, using AT, and making AT decision)?
    b. Do CRCs' backgrounds (i.e., gender, years of practice, practice setting, disability) associate with their perceived assistive technology competence?
3. How do CRCs perceived importance differ from perceived competence in assistive technology skills?
    a. Are there differences between CRCs perceived importance and perceived competence across three AT factors?
4. What can be improved in relation to assistive technology service provision?

Definition of Terms

Rehabilitation counselor. A practitioner with a master's degree who assists persons with physical, mental, developmental, cognitive, and emotional disabilities to achieve their personal, career, and independent living goals in the most integrated setting possible through the application of the counseling process. Techniques and modalities used by rehabilitation counselors may include, but are not limited to: (a) assessment and appraisal; (b) diagnosis and treatment planning; (c) career (vocational) counseling; (d) individual and group counseling treatment interventions focused on facilitating adjustments to the medical and psychosocial impact of disability; (e) case management, referral, and service coordination; (f) program evaluation and research; (g) interventions to remove environmental, employment, and attitudinal barriers; (h) consultation services among multiple parties and regulatory systems; (i) job analysis, job development, and placement services, including assistance with employment and job accommodations; and (j) the provision of consultation about and access to rehabilitation technology (Scope of Practice for Rehabilitation Counseling, 2007).

Certified Rehabilitation Counselor. Rehabilitation counselors who have been certified by the Commission on Rehabilitation Counselor Certification (CRCC) as having at least an acceptable minimum level of knowledge and skills to practice as a professional in rehabilitation counseling.

Assistive technology. Assistive technology device' means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability (Assistive Technology Act, 1998).

Competency. The specific knowledge and skills required of rehabilitation counselors to provide effective services to the client in relation to a third party, be it an individual, group, or organization

CHAPTER TWO: LITERATURE REVIEW

The purpose of the study is to investigate current Certified Rehabilitation Counselors' (CRC) (a) perceived importance of assistive technology (AT) skills and knowledge, and (b) perceived level of competence in providing AT services to their clients. To develop the research plan, a thorough examination of the literature is necessary. A series of definitions, benefits, and challenges of AT were discussed, and the role of AT in rehabilitation counseling was examined in order to demonstrate the need of continuous training in AT knowledge and skills. A theoretical framework was provided as a fundamental basis of the research. Lastly, since this study attempted to identify training needs on the basis of comparing perceived importance and perceived competence, the motivational theory was included in the literature review session.

Definition of Assistive Technology

The term assistive technology (AT) was initially introduced in the Technology Related Assistance for Individuals With Disabilities Act of 1988 (P.L. 100-407). However, its definition was not clearly developed until 1998, when the Assistive Technology Act was passed. AT was defined as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Scherer, 2000). AT is a broad concept that includes any product that facilitates users with disabilities in functioning in activities of daily living (ADLs), thus enhancing the quality of their lives (QOL) (Dell, Newton & Petroff, 2008). Therefore, regardless of hardware devices or software applications and high tech or low tech, if they can achieve the purpose of empowering persons with disabilities, they are examples of AT.

There are more than 26,000 AT products available nowadays for individuals with needs to select. Scherer (2002) provided a list that categorized AT products into five groups on the

basis of their functionalities: (a) recreation, (b) sensory aid, (c) communication, (d) personal care, and (e) mobility. In detail, recreation AT devices are products which increase integration of social activities, team sports, and other forms of indoor and outdoor recreation for individuals with disabilities. Examples of recreational AT devices include sport wheelchairs and hand-cycles. Sensory disability AT refers to devices that provide individuals with visual or hearing assistance. Examples of this category include Braille printers, screen readers, and hearing aids. Communication AT refers to devices that facilitate individuals with disabilities in receiving and sending messages verbally or in written form. Examples of this category include video relay system, captioned television and computer dictation systems. Personal care AT refers to devices that increase the independence of individuals with disabilities in fundamental areas such as grooming, bathing, dressing, and eating. Examples of this category include reachers, commode chairs, and electronic toothbrushes. Mobility AT refers to devices that provide extra support for individuals with disabilities in moving around in the environment. Examples of this category include powered wheelchairs, walkers, and crutches.

In addition to devices, AT also refers to services individuals with disabilities receive from rehabilitation service providers to meet their accommodation needs. According to Individuals with Disabilities Education Act (IDEA, 1997), AT service is defined as " any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device." Therefore, the comprehensive AT service involves service providers' AT knowledge, skills in selecting AT, and their abilities in communicating with users with disabilities. As Scherer, Jutai, Fuhrer, Demers and Deruyter (2007) mentioned, AT intervention really requires extensive interactions between service providers and users of AT devices. In other

words, successful implementation of AT intervention is only possible when there is a combination of the right AT products and effective AT services.

AT Benefits

Efforts have been devoted to understanding what advantages individuals with disabilities can benefit from by the use of AT. Evidence suggests that AT not only directly and indirectly enhances opportunities for individuals with disabilities (Edyburn, 2003; Langton & Ramseur, 2001), but it also substantially improves the quality of their lives (Burgstahler, 2003; Agree & Freedman, 2011). In order to understand better how AT can impact rehabilitation plans of individuals with disabilities, a systematic review of the literature is necessary. The following section discusses the impacts of AT in terms of education, employment, and social inclusion.

Education. During the past decades, efforts have been devoted by governments as well as rehabilitation professionals to promote ideas of de-institutionalization and social inclusion for individuals with disabilities. As a result, the number of students with disabilities in regular classrooms has been increasing for the past few years (Hasselbring & Glaser, 2000; Nelson, 2006). While the increasing integration of students with disabilities in regular schools is encouraging, there are still challenges. For example, students with disabilities might not have equal access to all educational resources, despite the law mandates otherwise (Smith & Jones, 1999). Fortunately, supports provided by AT allow these students to obtain the extra assistance they need and thus enhance their equal opportunity (Alsalem, 2010; Curtis, 2005; Angelo, 1997; Male, 1994; Rudnick, 1997).

One of the identified benefits of implementing AT in education settings is enhancing students' learning experience. For example, the infusion of computer technology in curriculum designs has significantly increased learning opportunities for students with special needs

(Hasselbring & Bausch, 2005). Specifically, Hasselbring and Bausch demonstrated that students' reading and comprehension abilities could be significantly enhanced with the use of screen reader software. Similarly, Bransford, Vye, Kinzer and Risko (1990) claimed that the inclusion of multimedia in learning materials would deepen students' conceptual understandings. Multimedia provides multiple cues that stimulate students' vision and audio senses, consequently strengthening students' learning and prolonging their memory of learned knowledge. In an overview of research, Raskind and Higgins (1998) concluded that it is effective to utilize AT to improve the reading and writing skills of children with learning disabilities.

In addition to learning enhancements, AT has also been identified as useful in increasing students' learning motivation. As Hetzroni and Shrieber (2004) noted, AT increases interaction opportunities between students, teachers, and curriculums. As a result, students can be encouraged to participate actively in class activities. Similarly, Owston and Wideman (1997) also suggested that the use of computer technology significantly alleviates students' frustration in learning, and hence increases their motivation in responding to teachers' instructions.

Employment. One of the most important functions of rehabilitation counselors is to assist individuals with disabilities to find and retain employment opportunities (McMahon, 2009; Chan, Leahy, Saunders, Tarvydas, Ferrin & Lee, 2003). Therefore, extensive efforts have been devoted to understanding and promoting employment situations for individuals with disabilities. However, while there have been some successes (e.g., supported employment, job development strategies, specialized placement, and follow-along assistance) in promoting employment rates, challenges are still there for individuals with disabilities to compete in job markets and be treated equally to people without a disability. In fact, the disparity of the employment rate between people with and without a disability is still significant. According to the U.S. Bureau of Labor's

statistics (2012), the employment rate for people with disabilities was as low as 17.8% in contrast to 63.5% for those without a disability. Similarly, the United State Department of Labor (2012) has shown that the unemployment rate of people with disabilities is almost twice as high as those without a disability. Causes and possible interventions have been studied intensively in recent years in order to improve the low employment rate. Among different foci, accommodation implementations (i.e., assistive technology) have been identified as one of the most promising and effective interventions that could improve the employment situation (Dong, MacDonald-Wilson & Fabian, 2010; Roessler, Rumrill & Fitzgerald, 2004). As Hedrick, Pape, Heinemann, Ruddell & Reis (2006) noted, AT is particularly beneficial to individuals with disabilities because of its capacity to decrease environment barriers, promote independence, and invite integration.

On how AT devices facilitate individuals with disabilities in job-related performance, Zeitzer (1991) provided examples such as computers that "read" typed material automatically to the person as feedback, machines that "speak" text for individuals with visual impairments or learning disabilities, and machines that "hear" and "understand" person's speech or conversations. McNaughton and Bryen (2002) showed the same in their review of multiple studies on how augmentative and alternative communication (AAC) has evidently increased the employment success for employers with disabilities. Similarly, in a review of the recent assistive technology literature, Sauer, Parks and Heyn (2010) found that devices such as the cuing system are very effective for supporting the job performance of people with cognitive disabilities. Sauer et al. further explained that the cuing system provides visual as well as vocal prompting signals that help on cognitive tasks such as memorizing and recalling.

As AT evolves, more options will be available for individuals with disabilities. The variety of AT options creates the possibility of customization for the individual user. As an example, for different purposes, the individual might need high or low tech, general or specific functions and single or multi-purpose AT. These advancements not only increase the applicability of AT to different situations, but also lower the costs of implementation. As Sauer et al. (2010) noted, devices such as Personal Digital Assistants (PDA) and smartphones are designed to handle more and more tasks; however, the costs of those devices are less and less. Consequently, cost effectiveness has become one of the most appealing reasons why AT is so popular in recent years.

Social inclusion. As mentioned above, AT may have positive impact on the education and employment statuses of individuals with disabilities. Whereas the possibility created by AT is already encouraging, the benefits of AT are beyond just education and employment. As an example, AT have the capacity to create even more social inclusion. In fact, AT have proved to be especially beneficial for individuals with disabilities in aspects such as transportation, accessibility, and recreation.

Transportation has been recognized as an important indicator of being independent. Apparently, transportation can affect every kind of social participation. As identified by Gray, Gould and Bickenbach (2003), without successful means of transportation, individuals with disabilities cannot actively participate in employment and community activities. Therefore, transportation should not be overlooked when considering individuals' independent living and the quality of their lives. Unfortunately, despite the awareness that transportation is a critical element for integration, barriers to transportation still exist and are prevalent to individuals with disabilities. A study conducted by Fitzgerald, Songer, Rotko and Karg (2007) reported that

approximately one third of wheelchair users experienced some level of difficulty when using transportation. With the recognition that transportation barriers really hinder employment possibilities, rehabilitation outcomes and social participation, efforts have been devoted to exploring these barriers and studying possible solutions.

AT is one of the most frequently mentioned solutions for overcoming transportation barriers and increasing accessibility. In fact, the use of AT among wheelchair users and their transportation accommodations have been extensively studied during past decades (Brinkey, Savoie, Hurvitz, & Flannagan, 2009; Evcil, 2009; Fitzgerald et al., 2007; Frost, van Roosmalen, Bertocci, & Cross, 2012; Owens & Simonds, 2010; Scheider, Manary, Hobson, & Bertocci, 2008). Most of these studies not only identified the potential benefits of using AT (e.g., powered wheelchairs), but also made suggestions for future AT designs that can promote users' mobility as well as safety. Beside wheelchair AT, there are also studies that have been conducted to learn how AT can improve transportation situations for people with different disabilities. As an example, Blenkhorn and Evans (1997) introduced a low cost AT solution for individuals with visual impairments. They explained that a handheld device with the capacity to send omni-directional radio signals could detect what are nearby the user and hence send vocal signals to inform the user where he/she is. As an implication, they suggested that the device could significantly promote independent traveling for individuals with visual impairments.

Similar to transportation, accessibility enhancements have been intensively studied and explored in the AT literature. Among different foci, AT that promotes physical accessibility and virtual accessibility has gained the most attention from researchers and experts.

Regarding physical accessibilities, researchers have focused on environmental barriers and how AT can successfully circumvent these difficulties. As an example, Vasiliadis and

Angelidis (2005) noted that environmental barriers are prevalent which significantly affect individuals with disabilities in accessing public services. These barriers should be carefully measured and solved in order to create an integrated environment for everyone. They further introduced and described technology devices that could successfully improve these situations. A smart card, as an example mentioned by Vasiliadis and Angelidis, is a phone card tailored to the user. When the user inserts the smart card in public phone system, the phone would recognize the user and tailor the service to him/she. These tailored services include pre-defined volume, sound quality, font sizes, and preferred languages. In addition, they also mentioned the technology for functions of voice recognition and noise cancellation. These technology devices are really beneficial for individuals with hearing impairment and visual impairments. Another AT which helps in promoting accessible environment was proposed by Ikonen-Graafmans and Graafmans (2003). They introduced a barrier-free suburb in Finland which would be impossible without the use of AT. They explained that the use of assistive technology devices not only improved the mobility situation for individuals with disabilities, but also made accessing public services easier for them. In the suburb, AT was utilized for automatic windows and doors, customized elevators, and supporting rails. This AT enabled individuals with mobility concerns to travel around the environment independently. In addition, according to Ikonen-Graafmans and Graafmans, daily chores such as disposing garbage, were also made easier for wheelchair users by the use of multiple technology solutions. With help from the use of assistive technology and universal design, the suburb won the golden Helios-prize from the European Union. Although this was just a case that happened in a small suburb of Finland, it showed the benefit AT can bring to individuals with disabilities.

Virtual accessibility is another advantage which could be achieved by the use of AT. Virtual services such as the Internet or the World Wide Web (WWW) have been among most participated in daily activities for most people nowadays. However, despite the nature of the Internet service as highly customizable, not all websites are designed or prepared to be fully accessible for individuals with disabilities. For example, screen readers for individuals with visual impairment might not be able to capture picture information if the picture on the website is not accompanied by explanation texts. Dazzling special effects from certain websites might cause further confusions for individual with cognitive impairments. The difficulty of finding desired information (e.g., how many pages does the person need to go through in order to find the right information) on the Internet might affect individuals' frustration levels. Due to these situations, the enhancement of web accessibility has been emphasized and studied considerably in the AT and rehabilitation literature in the past years. In fact, the journal, *Disability and Rehabilitation: Assistive Technology*, used a special issue to specifically discuss web accessibility research in 2009. Several important considerations and elements were identified for designing accessible websites, for examples, web adaptability, which focuses on flexibility of the website in order to fit every user's need and browsing habit (Kelly, Nevile, Sloan, Fanou, Ellison, & Herrod, 2009); website design standards and protocols, which detail the necessary elements in developing accessible websites (Bigham, Brudvik, Leung, & Ladner, 2009; Obrenovic, 2009); and website accessibility evaluations, which provide measurable standards for websites' accessibility (Vigo, Brajnik, Arrue, & Abascal, 2009; Watanabe, 2009). While Internet accessibility for individuals with disabilities is still a new territory that needs more effort, AT has the potential to create more accessible web browsing environments for them.

Another social inclusion benefit that could be gained by the use of AT is promoting the participation of recreational activities among individuals with disabilities. As Guttmann (1976) mentioned, recreational activities such as sports are the most natural remedial exercises for individuals with rehabilitation needs. Guttmann further explained that with adequate exercises, individuals could improve their strength, speed, coordination, and endurance. Similarly, Brittain (2012) also claimed that sport contests such as the Paralympic games could significantly improve the psychological and physical wellbeing of individuals with disabilities. Due to the positive outcomes of sport activities, researchers have devoted efforts to explore the means of promoting sport participation for the disability population. Among possible solutions, AT is one that consistently provides flexibilities and supports for individuals with disabilities to participate in various sports activities. As an example, De Groot et al. (2003) introduced a new wheelchair design specifically for users to have higher quality performances in basketball games. They articulated that the new design provides advantages such as light weight, rolling resistance, and footrest stability. In addition, the advancement of wheelchair technology allows more customizations, and hence lowers cost on tailor made wheelchairs. Another recreational activity, gaming, has also been also emphasized in the AT literature for the past few years. For instance, Puret, Archambault, Monmarché, and Slimane (2006) introduced a new game generating system that facilitates children with disabilities' learning through playing games. Similarly, Shimizu, Yoneda, Minagawa, Ohnishi, and Uchiyama (1999) unveiled an AT system that can provide extra cues for blind children to have better spatial awareness. As Shimizu et al. mentioned, this system helped children in games such as tic-tac-toe.

For the past few decades, promoting and advocating a fairer environment for individuals with disabilities have been the center of emphases in the literature across different rehabilitation

disciplines. Although there are no simple answers for these challenges, AT sheds light on the path to the goal. In fact, as evidence shows, AT has provided not only extra physical support for users, but also psychological empowerment. In short, AT is powerful and helpful for individuals with disabilities in every aspect of their lives. Hence, continuous research and development of the AT should be addressed and emphasized. At the same time, it is also rehabilitation practitioners' responsibility to be competent in providing AT services.

Challenges of Assistive Technology

Although it is well recognized that AT has positive impacts on the everyday lives of people with disabilities, the implementation of AT does not guarantee successful rehabilitation outcomes. In reality, mismatches between the individual and the AT device are frequently seen scenario in rehabilitation cases. As a result, these mismatched devices are often abandoned or discarded. In a study conducted by Phillips and Zhao (1993), two hundred and twenty-seven users of AT devices were surveyed to understand their experience of using AT. The result showed that among the participants, 29.3% of them completely abandoned their AT by the time of the study. This situation was especially more robust in the case of mobility devices. As Phillips and Zhao (1993) pointed out, mobility aids were the highest abandoned tools compared to other categories. Similar abandoned situations were also found in Cushman and Scherer's (1996) study. Cushman and Scherer reported that one hundred and twenty-eight AT approaches were prescribed to forty-seven participants with mixed diagnoses. Three months after the AT prescriptions, only eighty-six devices were still in use among participants. In other words, the abandonment was as high as 32.8 in percentage. This high rate is particular alarming because (a) the expenses of AT were wasted without positive outcomes, and (b) users abandoned their AT as

a result of frustrations from using them, which in turn affects their impression of the effectiveness of AT in the future.

Given high abandonment issue of the AT devices, it is crucial for rehabilitation professionals to understand possible reasons and how to alleviate such situations. As Brown-Triolo (2003) stated, most research concerning AT use and abandonment has focused on factors such as the cost of devices, the physical skills necessary for use, demographics, and device reliability and safety. While some of the identified factors are limitations of AT, others are related to rehabilitation services. For instance, Phillips and Zhao (1993) pointed out four factors predicting the abandonment of the AT devices by users with disabilities. These four factors include (a) lack of consideration of user opinion in selection, (b) easy device procurement, (c) poor device performance, and (d) change in user's needs or priorities. Among these factors, (b) and (c) concern the availability and affordability of AT devices. These two factors really require rehabilitation technology engineers and researchers to continue their efforts on inventing and developing better AT devices to meet the needs of individuals with disabilities. On the other hand, factors (a) and (d) are related to rehabilitation service planning and delivery. In order to raise the successful rate of matching persons with AT devices, rehabilitation professionals should be competent in providing AT information and professional suggestions for making appropriate AT selections. As for the service planning, good communications between clients and rehabilitation professionals will strengthen the rehabilitation plans. Therefore, the AT selected after careful discussions between practitioners and clients should be able to meet and accommodate clients' dynamic needs even after a period of time. As a matter of fact, the number of abandonment of AT could be reduced simply with close collaboration between practitioners and individuals with disabilities. For example, in the study conducted by Bates, Spencer, Young,

and Rintala (1993), they found that the perceived stigma of the accommodations would affect individual's decision to abandon them. When an AT is implemented, the user needs to adjust himself/herself to accept the accommodation not only physically but also emotionally. Bates et al. (1993) mentioned it is the emotional adaptation that takes longer time than the physical adaptation. They further suggested that practitioners should recognize client's emotional desires and communicate with them to smoothen the implementation process of the accommodation.

To sum up, although AT has been identified to be powerful and efficient in improving the quality of lives of individuals with disabilities, the successful outcome is not a guarantee. In fact, no matter what the challenges are for AT itself or the users, researchers and practitioners play an important role in understanding and coordinating the person and the AT device. It is through careful communications and meticulous plans between the practitioners and the clients that the successful rate of AT could be raised. As a result, as frontline service providers, rehabilitation practitioners are responsible for being competent to provide AT services.

Assistive Technology in Rehabilitation Counseling

As with many other rehabilitation professionals, such as occupational therapists, physical therapists, and special education teachers, rehabilitation counselors work with individuals with disabilities to promote the quality of their lives. Among various services rehabilitation counselors provide, accommodation has been identified as one of the most important interventions which substantially affect rehabilitation outcomes (De Groot et al., 2003). Langton and Ramseur (2001) argued that assistive technology, as a major example of accommodations, should be emphasized among rehabilitation counseling professionals. The following section demonstrates the importance of AT in the profession of rehabilitation counseling from the perspectives of (a) regulatory organizations and (b) the literature's suggestions.

Regulatory organizations. Two of the most important regulatory organizations concerning rehabilitation counselors are the Council on Rehabilitation Education (CORE) and the Commission on Rehabilitation Counselor Certification (CRCC). CORE (2012) is a specialized accreditation organization that is recognized by the Council for Higher Education Accreditation (CHEA), and it is a member of the Association of Specialized and Professional Accreditors (ASPA). CORE's mission is to accredit graduate programs that provide professional rehabilitation counselor preparation. Currently, there are 95 master rehabilitation education programs that have received accreditations from CORE (2012). In order for a program to receive accreditation, its curriculum must be assessed by the Standards for Rehabilitation Counselor Education Programs. These standards detail the knowledge and skills that should be included in professional preparation programs. Among the standards that stress different knowledge domains, AT is emphasized in several areas. For example, under the knowledge domain, C4.2.b, rehabilitation counselors should be able to apply the techniques of job modification/restructuring and the use of assistive devices to facilitate the placement of people with disabilities. Under C4.11.a, rehabilitation counselors should be able to identify and describe assistive technology resources available to individuals with a disability for independent living and employment. Under C9.4.a, rehabilitation counselors should be able to determine the need for assistive technology and the appropriate intervention resources, and C9.4.b points out that rehabilitation counselors should be able to support the evaluation of assistive technology needs as they relate to rehabilitation services. Similarly, knowledge domain C10.15 lists the assistive technology and accommodation competencies rehabilitation counselors should have. This is consistent with what Chan et al. (2003) found in their study, in which they suggested that rehabilitation counselors should be competent in providing assistive technology services.

Another important regulatory organization for rehabilitation counselors is the Commission on Rehabilitation Counselor Certification (CRCC). CRCC's mission is to set the standard for quality rehabilitation counseling services in the United States and Canada (CRCC, 2012). Therefore, while CORE sets standards for professional preparation programs, CRCC sets standards for qualified individuals to become certified rehabilitation counselors (CRCs). Currently, there are more than 35,000 rehabilitation counselors who have received certification from the CRCC. Specific to standards, CRCC sets ten knowledge domains that certified rehabilitation counselors should be competent with. These domains include (a) assessment and appraisal; (b) diagnosis and treatment planning; (c) career (vocational) counseling; (d) individual and group counseling treatment interventions focused on facilitating adjustments to the medical and psychosocial impact of disability; (e) case management, referral, and service coordination; (f) program evaluation and research; (g) interventions to remove environmental, employment, and attitudinal barriers; (h) consultation services among multiple parties and regulatory systems; (i) job analysis, job development, and placement services, including assistance with employment and job accommodations; and (j) the provision of consultation about and access to rehabilitation technology (CRCC, 2012). It is clear that rehabilitation technology is one of the most important areas that rehabilitation counselors should be familiar and competent with. In addition, CRCC's professional code of ethics also reveals that it is rehabilitation counselors' responsibility to be able to provide services associated with assistive technology. For example, since January 1st 2010, CRCC has modified ten areas in its professional code of ethics. Section J, as one of the major changes, explicitly requires rehabilitation counselors to be competent with the use of advance technologies. Specifically, under section J.12.a, rehabilitation counselors are held responsible for determining that clients are functionally and linguistically capable of using the

application and that the technology is appropriate for the needs of clients when technology assisted services are used to increase accessibility. Section J.4 and section G.4 both indicate that rehabilitation counselors are responsible for competency in providing technology-assisted assessments.

Literature**.** Assistive technology and its application have been mentioned in the literature of rehabilitation counseling for many years. Although rehabilitation counselors have had mixed perceptions toward the use of technology in service delivery systems, they have generally agreed that assistive technology does improve the clients' quality of life (Barros-Bailey, Benshoff, & Fischer, 2009). As Barros-Bailey et al. mentioned, rehabilitation technology is perceived as both threat and opportunity. In their study, a number of current rehabilitation counselors expressed concern that the emphasis on rehabilitation technology would significantly shrink the attention given to the individual client, and would therefore harm the relationship between the counselor and the client. However, the majority of the participating rehabilitation counselors (61%) believe that assistive technology would improve the capacity and the opportunities for their clients. As a result, although with mixed perceptions toward AT, Barros-Bailey and her colleagues concluded that AT education should be included in rehabilitation counselor training curriculums.

Similarly, Noll, Owens, Smith, and Schwanke, (2006) conducted a study on rehabilitation counselors in the state of Wisconsin. The interest of the study concerned how rehabilitation counselors considered themselves as a role in providing AT services. One hundred and eighty five rehabilitation counselors from the Wisconsin Division of Vocational Rehabilitation participated the study. Noll et al. found that in general, rehabilitation counselors considered AT as cost-effective interventions that could largely enhance employment opportunities for their clients. In addition, although rehabilitation counselors recognized their role as AT service

providers, they did not have complete confidence in services such as determine the AT solution, identify clients' AT needs, and provide consumers AT information. Noll et al. (2006) concluded their study with the suggestion that AT education should be recognized and included in the future rehabilitation counselor preparation programs.

Scherer, Sax, and Glueckauf (2005) authored an article with the title "Activities and Participation: The Need To Include Assistive Technology In Rehabilitation Counselor Education". In the article, Scherer et al. utilized International Classification of Functioning, Disability and Health (ICF) model from World Health Organization (WHO) to illustrate the importance of AT in promoting quality of lives of individuals with disabilities. Beside all the potential positive outcomes that could be gained by the use of the AT, they also pointed out the "underutilize" issue among rehabilitation professionals. Some reasons for underutilization of AT could be attributed to misunderstanding of AT to be only "high-tech" or high cost solutions and the lack of training among rehabilitation counselors in relation to their AT knowledge and skills. As a conclusion, Scherer and her colleagues suggested that rehabilitation counselors should receive more AT education training with the emphases on understanding AT and coordinating services.

To sum up, AT has been a very effective and promising intervention that provides additional supports for individuals with disabilities in their rehabilitation process. However, if rehabilitation counselors are not fully prepared to provide quality AT services to their clients, the effectiveness of such intervention will be limited. As the regulatory organizations (e.g., CRCC and CORE) specify, it is rehabilitation counselors' professional and ethical responsibility to update their AT knowledge and skills continuously. Similarly, the rehabilitation literature has

suggested that the AT education should be emphasized in the rehabilitation counselors preparation programs.

Current Education Provision

As identified above, the AT knowledge and skills are crucial for rehabilitation counselors to assist their clients effectively in rehabilitation processes. Education needs are also identified through the review of the past literature. The next task is to understand how the AT trainings are offered currently in rehabilitation counselor preparation programs.

Estrada-Hernandez, Wheaton, Dawson, and Krispinsky (2007) conducted a study to explore how the AT education were offered in the master level of rehabilitation counseling programs. A total number of eighty-eight rehabilitation counseling programs which have received the accreditation through the CORE were surveyed on their AT education offerings. Estrada-Hernandez et al. reported that of all programs which responded (47 programs), there are only 36% of the schools offer at least one AT course. In addition, among these 47 programs, only nine schools list AT as a required couse. The low rate on offering AT education is really alarming considering ATs have been identified as a very important intervention and scope of practice for rehabilitation counselors. According to Estrada-Hernandez et al. (2007), another concern which worth more attentions is that the majority of the rehabilitation counseling programs only infuse AT training into other classes such as medical aspect of disability, job placement and development, and rehabilitation assessment. While it is sometimes appropriate and necessary to infuse AT topics into the classes such as ethics class, solely depends on infusion of the class might not be sufficient for the purpose of the training. In fact, the depth and width of the AT knowledge and skills are beyond material infusions can offer. The same suggestion was also made by Scherer et al. (2005). Scherer and her colleagues noted that depends on the

individual rehabilitation counseling program's curriculum designs, some invite guest lectures to disseminate AT knowledge as a part of the other classes, some create instructional module to teach AT, and still some develop the specific class for AT trainings. Although different curriculum designs provide flexibility to the program, some programs might suffer from insufficient trainings in both the breadth and depth of the AT education.

As Estrada-Hernandez et al. (2007) noted, one of the reasons for the rare dedicated AT class in some rehabilitation counseling programs can be attributed to the limited resource they have. Specifically, the time constraint, financial support, and personnel needed to develop a standalone AT class are not fully available for most of the rehabilitation counseling programs. As a result, most rehabilitation counselor training programs choose to infuse AT knowledge and skills into other classes as mentioned above. While the infusion means is useful for future practitioners to gain more AT skills, the selection of material becomes an important decision for these rehabilitation counseling programs to make. Because the lack of resource most rehabilitation counseling programs have, they have to decide what to be included and what to be excluded from the required curriculum. In fact, given the limited resource, only the most relevant materials could be used to train future rehabilitation counselors.

Given the resource limitation, it is important to understand what are the most relevant AT skills to the rehabilitation counselors so that the infusion of the training could be more effective and efficient. Therefore, the intention of this study is to understand what are the most important AT skills from the perspective of current rehabilitation counselors. Specifically, the foci will be addressed on rehabilitation counselors' perception of importance and competence in providing AT services. By comparing and contrasting perceived importance and competence, it will

provide valuable information of what the most frequent used AT skills are for the rehabilitation counselors. In addition, AT skills that need the most enhancements could also be identified.

Theoretical Framework

Various AT models have been proposed to facilitate rehabilitation practitioners providing AT services. For example, Cook and Hussey (1995) developed the Human Activity Assistive Technology (HAAT) model that addresses the properties of the client and the tasks in AT planning. Similarly, Zabala (1995) introduced the Student Environment Tasks Tools (SETT) model that emphasizes the harmony of the student's ability, the environment, and the technology. While these models are very useful in service planning, they do not address the properties of the rehabilitation practitioners. In fact, the ability and the skill of the service providers should not be overlooked. Therefore, in order to understand the importance of the rehabilitation practitioners in AT service delivery, a model with the emphasis on the service provider is needed.

Assistive Technology Device (ATD) selection framework is identified to provide basis for the current study (See Figure 1 below).

Assistive Technology Device Selection Framework

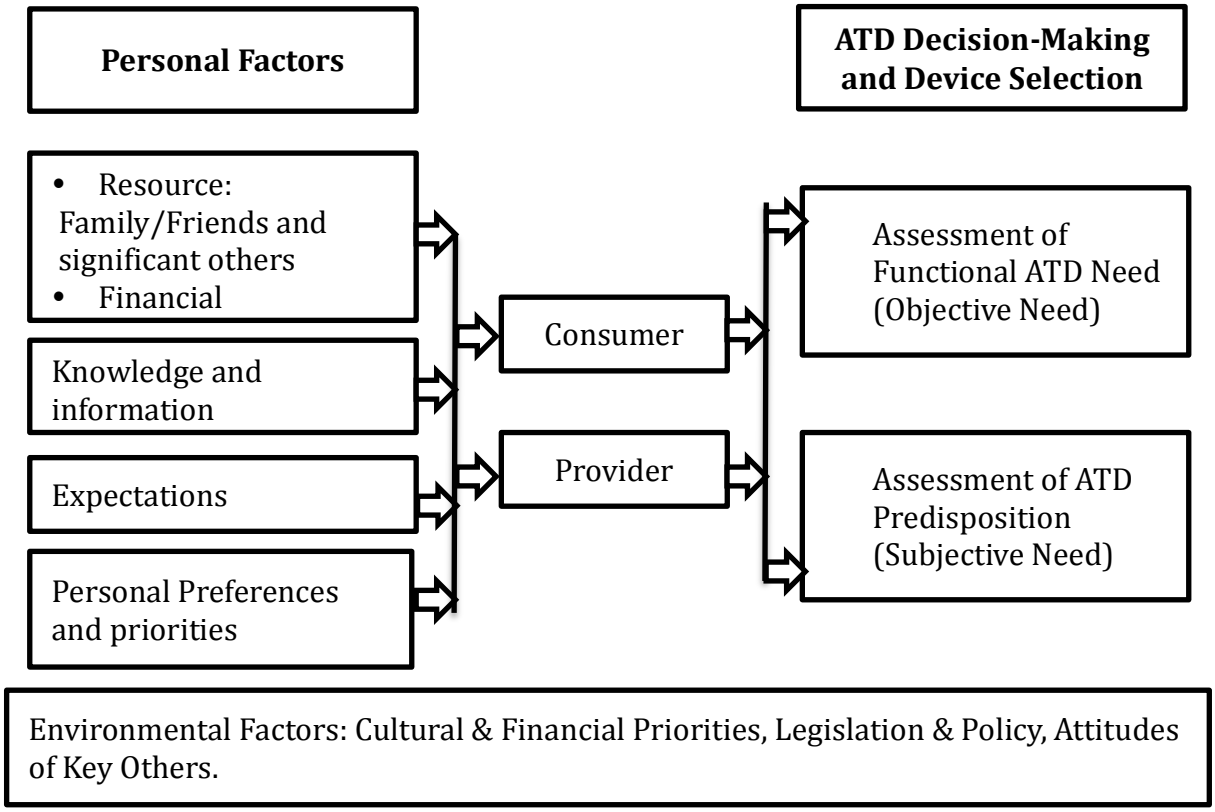

Figure 1. Framework for Modeling The Selection of Assistive Technology Devices.

According to Scherer et al. (2007), the ATD selection framework involves two major "players" in the process: (a) the consumer of the assistive technology devices, and (b) the service provider. To fit the context of the current study, the consumer would be considered as the client with a disability and the service provider would be considered as the rehabilitation counselor. As identified, the process of selecting appropriate ATDs for individuals with disabilities is a product of close communication and collaboration between these two roles. Both the client and the rehabilitation counselor have their own personal factors. These personal factors include individuals' resources, levels of knowledge, expectations, references, and priorities. Personal factors could be strengths and also could be constraints. The second factor, ATD decision-

making and device selection, is a result of the interaction between the client and the rehabilitation counselor. One last key factor affecting the ATD selection is the environmental factor. The details of personal factors, ATD decision-making and device selection, and environmental factors are introduced as below.

Personal factors**.** Personal factors involve four major elements which include (a) resource/financial, (b) knowledge and information, (c) expectations, and (d) personal preferences and priorities. For the client, resource and financial factors represent supports he/she can obtain to purchase or implement the AT device. For example, the financial constraint can be a significant limitation when selecting appropriate AT device. In addition, whether resources such as insurance funding and loan programs are available for the client also could affect the AT selection outcome. For the rehabilitation service provider, the resource/financial factor represents whether the practitioner can find additional funding to support his/her client's AT decision. Knowledge and information represent both the client and the rehabilitation practitioner's awareness and recognition of AT that is available on the market. It is especially important for rehabilitation practitioners to be knowledgeable of the variety of AT devices since it is unlikely for them to help their clients implementing the devices they do not even know exist. This is consistent with Riemer-Reiss' (2003) finding in which he suggested that the rehabilitation practitioners tend to provide more AT services if they feel competent in using such AT devices. Therefore, knowledge of AT as well as competency of using such devices are identified as one important indicator by the ATD selection model. Both the client and service provider's expectation would affect the ATD selection as well. The expectation mainly focuses on the functionality of the AT. In other words, what the goals are to be achieved by the use of ATD is the main concern. Through the communications between the client and the rehabilitation service

provider, the expectation toward the AT could be positive and realistic. One last personal factor is the personal preferences and priorities. As identified, there are more than 26,000 AT devices available nowadays. Some of them overlap on functions. While the variety of selection increases flexibilities, it also creates complexities. As a consequence, it is critical for the service provider to implement AT that satisfies client's physical needs as well as emotional and psychological desires.

ATD Decision-Making And Device Selection. As the step before ATD is purchased and implemented, it involves the collaboration and communication between the client and the rehabilitation service provider. Two factors affecting the final decision are assessment of functional ATD need (objective need) and assessment of ATD predisposition (subjective need). The objective assessment addresses the client's functional capacities and limitations (e.g., the client cannot lift more than 20 lbs. independently). The subjective assessment describes the psychological desires of the client (e.g., the client desires to work independently on the job which includes lifting goods more than 20 lbs. in weight). As the client has better vision toward his/her functional needs, he/she would also have better ideas of what AT is needed. On the other hand, if the client does not understand his/her needs and desires, the ATD selecting process would not be effective and could harm the decision-making process. Therefore, it is very important for the rehabilitation service providers to facilitate their clients' decision-making by having effective discussion with their clients on objective goals and subjective desires.

Environmental factors**.** As depicted in Figure 1, the environmental factors really involve the consideration of culture and financial priorities, legislation and policy, and attitudes of key others. The rehabilitation service providers have to be aware of their clients' culture and financial backgrounds in order to successfully match them with ATDs. For instance, the client

cannot afford certain ATDs or the client comes from a place that internet service is not fully accessible. In addition, the rehabilitation service providers also have to understand the legislation of policy that could potentially affect the ATD selection. For instance, the company in which the client works might have its own accommodation policies. Lastly, the attitudes of key others might also influence the ATD selection outcome. For example, the client from a family that has biases against accommodations might affect the ATD selecting outcome.

Perceived Importance and Competence

The relationships between an individual's ability beliefs (i.e., perceived competence), subjective values (i.e., perceived importance), and expectancies for success have been studied for decades in the psychology literature. Specifically, motivation theorists focus on studying (a) how individuals' ability beliefs and values form and change overtime (Wigfield Eccles, Suk Yoon, Harold, Arbreton, Freedman-Doan & Blumenfeld, 1997), and (b) how they affect individuals' activity performances and choices (Wigfield & Eccles, 2000). While both are important for understanding an individual's learning motivation and performance, the latter is particular relevant to the present study. In order to better understand their implications, perceived competence and perceived importance need be examined individually and jointly.

Perceived competence**.** The positive association between an individual's perceived competence and his/her subsequent performance has been identified. For instance, in the domain of mathematics, Meece, Wigfield and Eccles (1990) report that children's ability belief is a strong predictor of their actual performance. In other words, children who perceive more competent in mathematics tend to perform better in mathematics as well. While this example seems to only apply to children with younger age, researchers have provided evidence supporting the opposite (Bandura, 1994; Wigfield et al, 1997). In fact, Wigfield et al. suggest that the same

effect can be seen across different age groups: competence beliefs of children, adolescents, and adults are all positively associated with their achievement performances, amount of effort devoted to the given tasks, and senses of self-worth. Therefore, age does not make any difference in predicting an individual's performance on the basis of his/her perceived competence.

Another important contribution of the finding which links perceived competence to actual performance is when the measure of the skills is not directly achievable. For example, one focus of the present study is to learn rehabilitation counselors' competence in providing assistive technology services. The direct measurement of rehabilitation counselors' mastery of such skill seems to be ideal and straightforward, whereas there is no simple way to do so due to the complexity of the AT service itself. Therefore, the investigation of perceived competence becomes a useful and logistic way for the purpose. In fact, the method using perceived competence to map the actual competence has been validated in the context of vocational rehabilitation professionals and the assistive technology: Riemer-Reiss (2003) investigates vocational rehabilitation professionals' perception of AT competence and their actual provisions of the service, in which they finds positive associations between these two. Therefore, using perceived competence to identify actual competence would be a reasonable, and in some cases, the only means to achieve the purpose.

Perceived importance**.** Just as perceived competence, motivation psychologists have also devoted significant efforts on studying the relationship between perceived importance, outcome expectancy, and activity choice. For instance, as early as fifty years ago, Atkinson (1964) has attempted to define attainment value and its relationship with performances. In Atkinson's theory, the value a person attaches on a task will determine his/her achievement motivation on the task. Thus, if an individual perceives an activity to be important, he/she will try to perform better as

well. Eccles, Adler, Futterman, Goff, Kaczala, Meece, and Midgley (1983) further suggested that attainment value has broader influences. In fact, the literature indicates that the perceived importance on a task not only determine an individual's positive performance, but also have a positive association with one's learning motivation on the given task. Eccles et al. (1983) uses an example to illustrate the idea: if a student thinks of himself as "smart" and perceives a certain course (e.g., math) as intellectually challenging subject, he will try to perform better in the subject because it will enhance the self-concept. Further, it is because the belief that the "smart" student should take the "smart" course, he will choose to learn more from the subject. This is correspond to what Wigfield and Eccles (2000) suggest, in which they report that children tend to take more classes in relation to subjects which they perceive as more important.

Comparing perceived competence and perceived importance**.** As indicated, it is important to explore perceived competence and perceived importance separately because each of them has different implications on the person's learning and performance of the given skill. On the other hand, it is also important to study the difference and similarity of the perceived competence and importance. In fact, the technique that compares and contrasts perceived competence and perceived importance has been used in social science for decades. This technique is especially useful for identifying training needs of a given professional. The idea is to identify those skills that the sample rates the highest perceived importance and the least perceived competence at the same time. When such a skill is identified, it represents that the skill is regarded as important whereas most people do not feel competent with, and consequently, more training will be needed. This technique has been used in the field of rehabilitation counseling for years. For examples: Berven (1979) uses the technique to identify training needs for state agency rehabilitation counselors, Chan, Leahy, Saunders, Ferrin, and Lee (2003) attempt to explore training needs for

certified rehabilitation counselors (CRC) comparing these two, and Zanskas (2007) and Austin (2012) use the same idea to find educators' needs in training new rehabilitation practitioners. Since it is one of the main foci of the present study to explore what the most important training needs are for the CRC concerning their assistive technology skills, the same technique which comparing perceived competence and importance is utilized. The specific analysis method is discussed in chapter three.

Summary

Assistive technology has been identified as an important and effective intervention for the rehabilitation counselors to promote clients' quality of life. While the positive effect of AT is really encouraging, the implementation of AT does not guarantee successful outcome. As a matter of fact, there are still challenges. As one of the major challenges, the high AT abandon rate indicates the problem of mismatch between individuals with disabilities and AT devices. The lack of AT training among current rehabilitation counselors could be one of the reasons responsible for the low successful rate. As identified by the rehabilitation literature, professional AT training and continuous education are needed for the rehabilitation service providers in order to provide quality AT services.

However, while the AT education needs are apparent for every rehabilitation counselor, it is not an easy task to achieve. In fact, due to the resource limitation and manpower constraint, the majority of rehabilitation counselor preparation programs choose to infuse AT knowledge and skill training in classes such as assessment, medical aspect of disability, and ethics. Although the infusion of knowledge and skills invites the advantages of saving time and cost, the amount and quality of the AT training might not be sufficient. Therefore, it is very important to identify what are the most relevant and necessary skills for rehabilitation counselors to have for providing

quality AT services. The current study will attempt to answer this question by investigating current rehabilitation counselors for their perceptions regarding AT services.

Scherer et al.'s (1997) ATD selection framework was used to provide fundamental basis for the current study. As illustrated in the model, in order to provide quality AT services and facilitate decision-making process, rehabilitation counselors are responsible to acquire AT knowledge and help AT decision-making.

CHAPTER THREE: METHOD

Due to the purpose of the study, a quantitative design was selected. The study utilized Internet-based instruments to investigate the assistive technology competency and importance perceptions of current Certified Rehabilitation Counselors. The quantitative data was used to conduct descriptive as well as ex post facto analyses. It was anticipated that findings of this study would inform CRCs and rehabilitation educators regarding assistive technology skill training needs and priorities. The qualitative data had provided references for future educational ideas. This chapter addresses research questions, participants, instruments, variables, demographic information, procedures, research design, data analysis, and the limitations of the study.

Research Questions

This study focused on exploring Certified Rehabilitation Counselors' assistive technology knowledge and skill. Specifically, the emphasis was on CRCs' perception of the importance and the competency in providing AT services. The research questions of interest in this study were as follows:

1. How important do CRCs perceive for assistive technology skills in rehabilitation counseling practice?
    a. Is there a difference in perceived importance across three different factors (i.e., understanding AT, using AT, and making AT decision) among assistive technology skills?
    b. Do CRCs' backgrounds (e.g., gender, years of practice, practice setting, disability) associate with perceived assistive technology importance?
2. How competent do CRCs perceive themselves in providing assistive technology services?

    a. Is there a difference in perceived competence among three assistive technology factors (i.e., understanding AT, using AT, and making AT decision)?
    b. Do CRCs' backgrounds (i.e., gender, years of practice, practice setting, disability) associate with their perceived assistive technology competence?
3. How do CRCs perceived importance differ from perceived competence in assistive technology skills?
    a. Are there differences between CRCs perceived importance and perceived competence across three AT factors?
4. What can be improved in relation to assistive technology service provision?

Participants

The population of interest in the proposed study was Certified Rehabilitation Counselors (CRCs). According to Commission on Rehabilitation Counselor Certification (CRCC, 2012), there are currently approximately 16,000 CRCs across the United State. CRCs were chosen to be the population of interest in this study because CRCs received professional trainings from rehabilitation counseling programs and have passed the national certification examination. Therefore, CRCs represent skillful and qualified professionals who can provide quality rehabilitation counseling services. In addition, CRCs perform their jobs in different employment settings such as private/public agencies, for profit/non-profit organization, and in different states. The diverse nature of CRCs was particularly useful for this study because these demographic data could be used to investigate whether different settings would yield different results of perceived importance and perceived competence related to AT.

Sample Size

Prior to the sampling process, an appropriate sample size had to be determined. Several techniques were considered for the sample size determination. First, since multiple regression analysis was chosen to answer research questions (i.e., "are there differences in perceived importance across three assistive technology factors relative to CRC demographic characteristics" and "are there differences in perceived competence across three assistive technology factors relative to CRC demographic characteristics"), an *a priori* power analysis was conducted. For such calculation, 12 predictors (please see data analysis section) were identified, power was set as .80, and alpha was set as .05. In addition, according to Cohen (1988), a medium effect size (f = .15) was used. The analysis yielded an appropriate sample size of 127. In addition to power analysis, item-participant ratio is also considered. As Costello and Osborne (2005) argued, item-participant ratio for the survey study is reasonable at 10:1. Since there were 18 items in the ATPRC, the target number for sample size was approximately 180. In comparison of the *a priori* power analysis and subject to item ratio suggestion, the researcher decided to use the more conservative 180 as target sample size for the current study.

Instrumentation/Variables

In review of the assistive technology and rehabilitation counseling literature, there were no instruments identified that directly measure rehabilitation counselor perceptions of the importance and their competence in performing assistive technology tasks. However, an instrument to assess the assistive technology knowledge and skills of special education teachers was developed by Michaels and McDermott (2003). For the purpose of this study, the researcher adopted the survey, Special Education Teacher Preparation Survey – Assistive Technology Integration (SETPS). However, for the purpose of this study, some modifications of SETPS were

necessary. The new survey, Assistive Technology Perception for Rehabilitation Counselors (ATPRC), was then developed to fit the context of the rehabilitation counseling discipline and CRCs. In specific to modifications made, there were incidental changes such as word substitutions. For instances, the SETPS has items, "use a variety of AT hardware devices and software applications to support students' individual needs", "use AT, the internet and other media to actively engage students in research and independent learning", and "facilitate student/family involvement and collaboration in AT decision-making", and the ATPRC has modified items such as "use a variety of AT hardware devices and software applications to support clients' individual needs", "use AT, the internet and other media to actively engage clients", and "facilitate client/family involvement and collaboration in AT decision-making". Therefore, "student" was changed to "client". Other modifications such as "use AT to increase access to the general education curriculum" was modified to "use AT to increase access to rehabilitation services", and "use AT to promote access within school, community, and leisure environments" was modified to "use AT to promote access within services, community and leisure environment. For further comparison, the SETPS (Appendix A) and the ATPRC (Appendix B) are included at the end of this document.

Although the instrument was only modified incidentally to fit the context of rehabilitation counseling, the potential influence of the changes should be appraised. As a cautious step to ensure the instrument, ATPRC, has its reliability, face validity, clarity, and appropriateness in wording, a group of rehabilitation counseling doctoral students was asked to pilot the instrument. Specifically, these individuals were asked to provide professional opinion on instrument's (a) content, (b) clarity, (c) appropriateness, and (d) appearance. The ATPRC was again revised according to the suggestions these individuals made. For instances, item one, "define AT and

describe its potential impact on the lives of persons with disabilities", was change to "ability to define AT and describe its potential impact on the lives of persons with disabilities" to prevent participants' confusion on how to answer the question; for item ten, "use differential rehabilitation plans to infuse assistive technology into services", the word "differential" was eliminated to prevent misunderstanding. The final version of the ATPRC is included in Appendix B.

The Assistive Technology Perception for Rehabilitation Counselors (ATPRC) consisted of three sections: demographic information, quantitative survey and exploratory open-ended questions. The demographic section was designed to gather basic information of participants such as gender, age, years of practice, job title, ethnicity and the highest education level. The second section, quantitative survey, included two sets of the same 18 items. Items were designed on the basis of 7-point Likert scale. The first set of questions was designed to investigate participants' perceived importance in understanding AT, using AT and making AT decisions. Therefore, the 7-point scale ranged from Not Important At All (1) to Extremely Important (7). The second set of questions was designed to explore participants' perception of their competency in understanding AT, using AT, and making AT decisions. The 7-point scale ranged from Not At All Prepared (1) to Extremely Prepared (7). The last section of the survey consisted of two open-ended questions designed to investigate participants' willingness and preferred means of receiving additional assistive technology related training.

The instrument was designed to measure one construct (i.e., domain), Assistive Technology Skills. Consistent with original survey created by Michaels and McDermott (2003), factors associated with assistive technology skills in this study referred to competencies in: (a) understanding of AT, (b) using AT, and (c) making AT decisions. Although these factors were

initially identified by National Council for Accreditation of Teacher Education (NCATE, 1997) for special education teachers, they were consistent with the likely application, use, and understanding of AT in a rehabilitation counseling context. For example, Sax (2002) reported that rehabilitation counselors should be able to identify the benefits of using of AT, assess clients' needs through a person centered approach, coordinate within an interdisciplinary team, complete research on possible AT options, and make recommendations for modifications to assist an individual in access to work, education, recreation, or social activities. These skills identified by Sax (2002) were identical with those identified by NCATE (1997). Therefore, the three-factor construct was also utilized for the present study.

In specific to three factors, the first factor, understanding AT, pertains to knowledge of AT, fundamental AT skills and awareness of how AT could potential impact clients' quality of lives. Examples of survey questions include "Describe the impact of AT legislation and policy on service delivery", and "Describe the potential use and benefits of AT in employment, community, and leisure environments". A total of six items are included for the understanding AT factor.

The second factor, using AT, pertains to rehabilitation counselors' competencies in practical experiences such as familiarity with hardware AT devices as well as software applications. Examples of survey questions include "Use AT to increase access to rehabilitation services", and "Use AT, the internet and other media to actively engage clients". Six items were included in this factor.

The third factor, making AT decisions, pertains to rehabilitation counselors' skills in providing professional AT advice, coordinating resources, planning and implementing AT interventions, and monitoring the use of AT. Example questions include "Facilitate

clients/families' involvement and collaboration in AT decision-making", and "Serve as a resource for AT information, consultation and technical assistance to colleagues and families". A total of six items were included in this factor.

Reliability and Validity

According to Michaels and McDermott (2003), SETPS has established well internal reliabilities. In specific, the internal reliability figures (i.e., Cronbach's alpha) of perceived importance construct are .93, .95 and .95 for understanding AT, using AT and making AT decisions, respectively. Internal reliability figures of perceived competence construct are .91, .90 and .92 for understanding AT, using AT and making AT decisions, respectively. According to Nunally (1978), the reliabilities should be considered acceptable.

In relation to validity, Michael and McDermott (2003) established SETPS's validity by (a) reviewing AT literatures and (b) consulting experts of AT and survey development. In specific, a literature review provided a foundation of the instrument development that allowed appropriate content to be included in the first draft of the SETPS. Upon the completion of first draft of the SETPS, it was sent to experts of AT and survey development for consultation. Experts were asked to provide professional opinion on instrument's (a) content, (b) clarity, (c) appropriateness, and (d) appearance. The final version of SETPS was a result of a series of modifications and revisions on the basis of experts' professional suggestion. Hence, social validity, content validity, and face validity were grounded in the instrument's design.

Procedure

Approval for the use of human subjects in research was obtained from the Michigan State University Institutional Review Board (IRB) prior to the initiation of data collection. Following receipt of approval from IRB, a submittal letter and the current study proposal was sent to the

Council on Rehabilitation Counselor Certification (CRCC) research committee for approval of the study. CRCC provided a list of e-mail addresses using method of convenience, non-probability sampling (Trochim, 2006). Based on reviews of similar studies conducted in the context of rehabilitation counselors (Zanskas, 2007; Austin, 2012) and research on Internet based surveys (Cook, Heath, & Thompson, 2000), the expected response rate for the current study was approximately 20%. Hence, in order to enlist an adequate number of participants (n=180), approximately 900 email addresses were requested from the CRCC.

E-mails was sent to each potential participant through the list provided by the CRCC. A consent form (see Appendix C), invitation to participate in the study, and the link to the online survey were included in the e-mail. Specifically, each participant was presented with informed consent form which explained that the purpose of the study was to understand current CRCs' perceptions of importance and competence in regard to AT knowledge and skills, and preferred means of receiving AT-related training. In addition, informed consent also included statements that notify participants that participation in the study was completely voluntary and was anonymous. Participants were prompted to read the consent form.

The initial invitations were sent out through e-mail. One week after the initial e-mail was sent, a second email was sent to remind those who have not yet responded. A third and final reminder e-mail was sent again one week after the second reminder email was sent.

In specific to the data collection process, the study utilized online automated survey instrument "Qualtrics" to collect information from participants. Although demographic data was also collected for purposes of data analyses, no identifiable personal information was included in the survey. The raw data of individual responses to the survey was kept on Qualtrics and secured and protected utilizing Secure-HTTP system.

Data Analysis

The quantitative research design of this study was an Internet-based ex post facto survey design where a series of descriptive statistics, exploratory factor analysis (EFA), one-way univariate analysis of variance (ANOVA), multiple regression analysis, and paired t-tests were utilized to interpret results and answer research questions. The data was downloaded from Qualtrics' database and imported into Statistical Package for Social Science 20.0 (SPSS) for Mac. The initial step involved data cleansing processes that included importing data, naming variables, and checking accuracy and examining missing data.

Descriptive statistics, frequencies, and percentages were used to report demographic information (e.g., gender, ethnicity/race, years of practice, and employment settings) of participants. The EFA was not chosen as a method to answer research question, instead, EFA was used to test if items on the ATPRC measure theoretical construct of interests. In addition, EFA also provided information to determine if the items could be better explained by fewer factors that held common item interrelationships and significant loadings (Raykov & Marcoulides, 2008).

To answer research questions 1, 2, and 3, quantitative data was used to process analyses such as descriptive statistics, frequency tables and percentages. These data was obtained on 7-point Likert scales and was handled as interval scales to interpret findings and answer research questions. The purpose of the analyses was to provide general information of data distribution. In specific to data analyses, descriptive statistics of CRCs' perception of importance and competence were generated and reported.

To answer research questions 1a and 2a, a one-way univariate analysis of variance (ANOVA) was utilized. 1a and 2a's major concern was to understand whether there were

differences between factors within perceived importance and competence. Therefore, one-way ANOVA utilized F-test to determine whether there was an overall significant difference between three factors. Further, within each construct of perceived importance and perceived competence, three one-by-one comparisons (i.e., understanding AT versus using AT, understanding AT versus making AT decision, and using AT versus making AT decision) were performed to inform researcher if one factor was significantly different (two-sided) from the other.

To answer research question 1b and 2b, multiple regression analysis was used. Question 1b and 2b's concern was to understand whether there were significant associations between participants' demographic characteristics and their perceptions of AT importance and competence. Therefore, the initial step of this analysis involved the conversion of demographic information. Specifically, each demographic data such as gender, ethnicity/race (i.e., white, black, and others), employment settings (the original data will be categorized into five groups: education unit, public sector, private-for-profit, private-non-profit, and others), disability, AT experience and AT training received was converted into one or more dichotomous variables. As a result, ten dummy variables were created. In addition, age and years of practice were considered as continuous variables. As a result, a total of 12 explanatory variables were included in the multiple regression analyses. Scores on perceived importance and perceived competence were used as dependent variables according to the research question. Consequently, two multiple regression analyses were performed to test if each demographic information significantly contribute to the variance. R^2 was obtained to determine if the model has a good fit.

To answer research question 3a, a cluster technique was used. The purpose of this analysis was to understand if there is a significant difference between perceived importance and perceived competence. Three factors (i.e., understanding AT, using AT, and making AT

decisions) were analyzed separately to inform the researcher which factor has the most disparity between perceived importance and perceived competence.

To answer research question 4, the qualitative information was summarized and reported. Due to the exploratory nature of the design, no predetermined theme was used. Upon the completion of data collection, the investigator proceeded to review through participants' answers gathered from two open-ended questions. Answers were presented genuinely to the investigator without any modification in an Excel spreadsheet. The most frequently mentioned terms were selected for further process. Subsequently, these frequently mentioned terms were categorized into groups for further interpretations.

CHAPTER FOUR: RESULT

The purpose of the present study was to explore CRCs' perceived importance as well as perceived competence in relation to their assistive technology skills. A series of statistical analyses including exploratory factor analysis (EFA), one-way univariate analysis of variance (ANOVA), multiple regression analysis, and cluster technique analysis were conducted. Specifically, the EFA was conducted to determine whether the instrument and items measure the assistive technology construct as proposed in this study. The one-way ANOVA was conducted to investigate whether differences exist between factors among perceived importance and competence. Multiple regression analysis was used to identify associations between participants' demographic characteristics and their perceived importance and competence. Lastly, the cluster technique analysis was conducted to compare perceived importance and perceived competence on specific AT skills.

This chapter addresses the characteristics of participants, the process of screening data, EFA results, and statistical analyses conducted to investigate the four research questions. The Statistical Package for Social Science 20.0 (SPSS) for Mac was used for all analyses.

Response Rate

A total of 1051 CRC email addresses were acquired from the CRCC. Of 1051 emails sent to these potential participants, 56 could not be delivered due to invalid or discontinued addresses. As a result, 995 valid emails were counted and sent. Of these 995 potential participants, 242 entries were valid (please see below) and recorded by the Qualtrics online survey system yielding a response rate of 24.3%.

Missing Data and Data Screening

Since the online survey system (i.e., Qualtrics) was set to prevent participants from proceeding any further in the survey if they miss any question, there were no missing data found in the data set. However, there were eight individuals who ended their participation before the completion of the survey. Five of these eight left the survey while filling the demographic section, and three of them left the survey during the second section (i.e., perceived importance section). These eight entries were deleted from the data set. As a result, the final dataset used for conducting analysis was 242 participants.

As Osborne and Overbay (2004) noted that although reasons for statistical outliers might not be the same, all could be a potential threat to the integrity of a data set, and thus negatively impact statistical analyses and the subsequent interpretations. Therefore, before any statistical analysis was conducted, the raw data for the present study was subject to a data screening process. The SPSS boxplot and stem-and-leaf were chosen to screen univariate outliers. In order to process the outlier screening, several steps were used. First, the sum of each of the three factors within perceived importance and perceived competence was computed. Since each factor contains six items, and each item ranges from 1 to 7 points (i.e., for perceived importance, 1 represents not at all important and 7 represents extremely important; for perceived competence, 1 represents not at all competent and 7 represents extremely competent), the score range of each factor is from 6 to 42. Following the same procedure, six sums were obtained for each participant (sums of perceived importance: understanding, using and decision making, and sums of perceived competence: understanding, using and decision making). After obtaining these six sums, boxplot and stem-and-leaf analyses were performed. Outliers in this case would mean those scores of participants who rate all items either low or high (i.e., all 1s or 7s). After the

analysis, five outliers were identified. The investigator proceeded to review these five participants' raw data and found that one of these five answered high (i.e., 6s or 7s) across all items while the rest answered low (i.e., 1s or 2s) across all items. These five entries were then excluded from further data analyses. Therefore, the complete data was lowered to 237 participants in total.

Demographics and Characteristics

Of the 237 certified rehabilitation counselors who responded to the survey, 73.4% (n=174) were female, and 26.6% (n=63) were male. Regarding age, 8.9% (n=21) were under 30 of age, 15.2% (n=36) were age between 30 to 39, 24.8% (n=59) were age between 40 to 49, 30.0% (n=71) were age between 50 to 59, and 21.1% (n=50) were age over 60. Regarding participant race/ethnicity, 83.5% (n=198) were White, 7.2% (n=17) were Black/African American, and 9.3% (n=22) were others. Regarding employment settings, 35.9% (n=85) of the participants reported to work in state/provincial rehabilitation agency, 11.4% (n=27) in private for profit rehabilitation agency, 7.6% (n=18) in a college/university, 6.3% (n=15) in a private not-for-profit rehabilitation agency, 4.6% (n=11) in K-12 school, 4.6% (n=11) in mental health center/psychiatric facility, and 29.5% (n=70) work in other settings. In relation to years of practice, 13.5% (n=32) had equal or less than 5 years experience, 20.3% (n=48) 6 – 10 years experience, 18.5% (n=44) 11 – 15 years experience, 12.7% (n=30) 16 – 20 years practice, 7.6% (n=18) 21 – 25 years experience, and 27.4 (n=65) more than 25 years of practice experience. Regarding level of education, 92.4% (n=219) have a master degree, 5.5% (n=13) have a Ph. D degree, and 2.1 (n=5) have other level of education. A total of 25.7% (n=61) participants report to have a disability and 74.3% (n=176) reported to not have a disability. A total of 58.2% (n=138) of participants reported to have used at least one AT device in the past, and 41.8% (n=99)

reported that they had never used an AT device. A total of 65.4%(n=155) of the participants reported to have received AT training and 34.6% (n=82) reported that they had never AT training.

In order to verify the equivalence between the sample drawn for this study and the overall CRC population, the demographics characteristics of the population were obtained from the CRCC to demonstrate the comparison. The data was obtained on May 21, 2013. Table 1 shows the comparisons between the sample data in the current study and the overall CRC population.

Table 1
Comparison of Sample and Overall CRC Demographic Characteristics

Variable	Sample	Population
Gender		
Male	26.9%	26.77%
Female	73.1%	73.19%
Age		
<30	8.7%	6.64%
30-39	15.3%	18.84%
40-49	24.3%	22.07%
50-59	30.6%	26.51%
>60	21.1%	25.87%
Ethnicity/Race		
White	83.9%	79.11%
Black/African American	7%	10.16%
Hispanic/Latino	2.5%	4.15%
Others	6.6%	6.58%
Years of practice		
0-4	11.6%	26.63%
5-9	21.5%	15.98%
10-14	10.7%	8.17%
15-19	16.1%	11.16%
20-24	8.7%	10.43%
25+	31.4%	18.12%

Exploratory Factor Analysis

The Assistive Technology Perception – Rehabilitation Counselor (ATPRC) instrument was a modified version of Special Education Teacher Preparation Survey (SETPS). Although the

modifications were primarily wording changes and can be considered minor, as a conservative approach, an EFA was conducted to determine whether the ATPRC measured the theoretical constructs of interest. Specifically, principle components analysis was used to verify if items included in ATPRC could be explained by the proposed (i.e., understanding AT, using AT, and making AT decision) factors. Items included in the perceived importance rating were selected for the EFA analysis. As a result, 18 items from perceived importance were included in the EFA to determine interrelationships between these items. It was anticipated that the subsequent statistical analyses used to answer research questions would be based on the results of the EFA.

The principle components method was selected for the factor analysis. In order to increase the interpretability of the finding, the varimax rotation was utilized for maximizing item loadings on identified factors. The Kaiser-Meyer-Olkin (KMO) measure of adequacy of sample size for the factor analysis yielded a result of KMO= .93, which according to Field (2013) is considered very good. With the respect to Bartlett's test of sphericity, the analysis yielded a result of χ^2 (153)= 2811.94, $p < .001$. Therefore, the factor analysis is appropriate for the study data (Field, 2013). With the requirement of Kaiser's eigenvalue greater or equal to 1, three factors were extracted. Specifically, factor loadings for the three factors after the varimax rotation were 4.43, 4.13, and 3.24. The percentages of variance explained were 24.7%, 22.9%, and 18.0% respectfully (total variance = 65.6%). Table 2 shows the specific factor loadings (with loading greater than .400) on perceived importance scale with varimax rotation.

Table 2
Factor Loadings For Perceived Importance Scale With Varimax Rotation

Item#	Item description	Factor 1	Factor 2	Factor 3
1	Ability to define AT and describe its potential impact on the lives of persons with disabilities.			**.758**

Table 2 (Cont'd)

2	Describe the transdisciplinary nature of AT planning and application.			**.806**
3	Describe a variety of AT devices and their potential uses with individuals with disabilities.			**.644**
4	Describe the impact of AT legislation and policy on service delivery.		.575	.555
5	Describe the potential use and benefits of AT in community and leisure environments.		.433	**.503**
6	Describe strategies for determining AT funding potential and establishing AT funding eligibility.		.550	**.565**
7	Use a variety of AT hardware devices and software applications to support clients' individual needs.	**.468**	.431	
8	Use AT to increase access to rehabilitation services.	**.671**		
9	Use computer-based instruction, software programs and other media to aid all clients.	**.789**		
10	Use rehabilitation plans to infuse assistive technology into services.	**.613**		
11	Use AT, the internet and other media to actively engage clients.	**.765**		
12	Use AT to promote access within services, community and leisure environments.	**.715**		
13	Implement AT interventions using a process of assessment, self-reflection and impact evaluation.	.553	.546	
14	Serve as a member of a transdisciplinary team conducting AT assessments.		**.763**	
15	Collaborate with other members of a team to determine AT needs and implement AT supports.		**.745**	
16	Serve as a resource for AT information, consultation and technical assistance to colleagues and families.		**.717**	
17	Facilitate clients/families' involvement and collaboration in AT decision-making.	.521	**.617**	
18	Facilitate the selection of AT solutions based on clients' needs and preferences.	.583	.537	

Note: factor loadings for each factor appear in boldface. N=237. Factor 1= using AT, factor 2= making AT decision, and 3= understanding AT.

Three items (#4, #13 and #18) from the perceived importance scale were excluded from further statistical analyses due to cross loading across factors. As a conservative approach, the reliability analyses (i.e., Cronbach's Alpha) were conducted to ensure the quality of instrument's integrity after the exclusion of these items. As a result, the internal reliability for each factor remained reasonably high (Cronbach's Alpha = .838, .891, and .861 respectively for understanding AT, using AT, and making AT decision factors). The internal reliability for the perceived importance scale as a whole after the exclusion the three items yielded a Cronbach's Alpha of .933. Therefore, these three items were excluded.

Descriptive Statistics

Descriptive statistics were used to answer two major research questions: (1) how important do CRCs perceive for assistive technology skills in rehabilitation counseling practice, (2) how competent do CRCs perceive themselves in providing assistive technology services, and (3) how do CRCs perceived importance differ from perceived competence in assistive technology skills?

Regarding the perceived importance scale, participants rated using AT as the most important skill with the mean of 5.52 (SD = .98). Among six using AT questions, item #8 (i.e., use AT to increase access to rehabilitation services) was rated the highest with a mean of 5.69 (SD = 1.18), while item #9 (i.e., use computer-based instruction, software programs and other media to aid all clients) was rated lowest with a mean of 5.39 (SD = 1.30). Of 15 items included in the ATPRC instrument perceived importance scale, all items were rated higher than neutral point (i.e., with a mean score greater than 4), which represented that rehabilitation counselors participated in this study considered these skills were important. The specific mean score and standard deviation for all 18 items can be found in Table 3.

Table 3
Perceived Importance Scale Summary

Factor/Item	M	SD
Understanding AT	**5.40**	**0.95**
Ability to define AT and describe its potential impact on the lives of persons with disabilities.	5.70	1.07
Describe the transdisciplinary nature of AT planning and application.	5.08	1.34
Describe a variety of AT devices and their potential uses with individuals with disabilities.	5.68	1.11
Describe the potential use and benefits of AT in community and leisure environments.	5.41	1.22
Describe strategies for determining AT funding potential and establishing AT funding eligibility.	5.12	1.34
Using AT	**5.52**	**0.98**
Use a variety of AT hardware devices and software applications to support clients' individual needs.	5.45	1.27
Use AT to increase access to rehabilitation services.	5.69	1.18
Use computer-based instruction, software programs and other media to aid all clients.	5.39	1.30
Use rehabilitation plans to infuse assistive technology into services.	5.57	1.21
Use AT, the internet and other media to actively engage clients.	5.52	1.19
Use AT to promote access within services, community and leisure environments.	5.51	1.15
Making AT decision	**4.87**	**1.19**
Serve as a member of a transdisciplinary team conducting AT assessments.	4.45	1.51
Collaborate with other members of a team to determine AT needs and implement AT supports.	5.16	1.37
Serve as a resource for AT information, consultation and technical assistance to colleagues and families.	4.72	1.43
Facilitate clients/families' involvement and collaboration in AT decision-making.	5.16	1.34

Regarding the perceived competence scale, participants rated using AT as the most competent skill with the mean of 4.04 (SD = 1.38). Among the six using AT questions, item #11 (i.e., use AT, the internet and other media to actively engage clients) was rated the highest with a mean of 4.34 (SD = 1.52), while item #7 (i.e., use a variety of AT hardware devices and software applications to support clients' individual needs) was rated lowest with a mean of 3.66 (SD =

1.69). Of 15 items included in the ATPRC instrument perceived competence scale, 10 items (i.e., #2, #3, #5, #6, #7, #9, #11, #12, #16, and #17) were rated with a mean below 4, which represented that participants did not feel competent in such skill areas, while 5 items (#1, #8, #10, #11, and #14) were rated with a mean greater than 4, which indicated that participants felt competent in these skill areas. The specific mean score and standard deviation for all 18 items can be found in Table 4.

Table 4
Perceived competence scale summary

Factor/Item	M	SD
Understanding AT	**3.79**	**1.40**
Ability to define AT and describe its potential impact on the lives of persons with disabilities.	4.27	1.53
Describe the transdisciplinary nature of AT planning and application.	3.73	1.52
Describe a variety of AT devices and their potential uses with individuals with disabilities.	3.93	1.59
Describe the potential use and benefits of AT in community and leisure environments.	3.92	1.52
Describe strategies for determining AT funding potential and establishing AT funding eligibility.	3.12	1.71
Using AT	**4.04**	**1.38**
Use a variety of AT hardware devices and software applications to support clients' individual needs.	3.66	1.67
Use AT to increase access to rehabilitation services.	4.02	1.63
Use computer-based instruction, software programs and other media to aid all clients.	3.92	1.56
Use rehabilitation plans to infuse assistive technology into services.	4.33	1.61
Use AT, the internet and other media to actively engage clients.	4.34	1.52
Use AT to promote access within services, community and leisure environments.	3.97	1.52
Making AT decision	**3.74**	**1.52**
Serve as a member of a transdisciplinary team conducting AT assessments.	3.49	1.67
Collaborate with other members of a team to determine AT needs and implement AT supports.	4.10	1.63
Serve as a resource for AT information, consultation and technical assistance to colleagues and families.	3.44	1.71

Table 4 (Cont'd)

Facilitate clients/families' involvement and collaboration in AT decision-making.	3.95	1.69

Univariate Analysis of variance (ANOVA)

One-way repeated measure univariate analysis of variance was used to answer two primary research questions: (1a) Is there a difference in perceived importance across three different factors among assistive technology skills? and (2a) Is there a difference in CRC perceived competence among three assistive technology factors? Since there were different numbers of items within each of the three factors (understanding AT, using AT, and making AT decision), it was necessary to compute a mean score for each factor before the ANOVA procedures. For the perceived importance scale, mean scores for the three factors were 5.40 (SD = 0.95), 5.52 (SD = 0.98), and 4.87 (SD = 1.19) respectively. For the perceived competence scale, the mean scores for the three factors were 3.79 (SD = 1.40), 4.04 (SD = 1.38), and 3.74 (SD = 1.52) respectively. Upon obtaining the mean scores of each factor, one-way repeated measure ANOVA was processed with three factors set as independent variable and their mean scores set as dependent variables. This procedure was used twice for perceived importance and perceived competence scales. The results of F-test can be found in Table 5.

Table 5
One-way ANOVA for perceived importance and perceived competence on three factors with Greenhouse-Geisser correction used

Factor	Type III Sum of Squares	DF	F	Sig.
Perceived Importance	56.600	1.85	79.532	**.000**
Perceived Competence	12.041	1.91	16.857	**.000**

Note: since both results for the Mauchly's test of sphericity were significant for the perceived importance and perceived competence scale, the Greehouse-Geisser (1959) correction was used for conservative interpretations.

Since both results of Mauchly's test of Sphericity were significant ($p < .05$), the Greenhouse-Geisser correction was used to have a better interpretation on F-test (Field, 2013). Consequently, perceived importance scale yielded a significant result with $F (1.85, 236) = 79.53$, $p < .05$, and perceived competence scale also yielded a significant result with $F (1.85, 236) = 16.86$, $p < .05$.

Since the one-way repeated measure ANOVA yielded significant results, the post hoc analysis was appropriate for further investigation, which would determine if there were differences between the three factors. As suggested by Field (2013), the Bonferroni adjustment was used as a conservative approach to prevent false rejection of null hypothesis. Table 6 shows results of the post hoc analyses conducted on mean comparisons of three factors within perceived importance and perceived competence scales. Regarding the perceived importance scale, there were three significant results: (a) understanding AT was rated significantly lower than using AT ($MD = .122$, $SE = .047$, $p = .029$), (b) understanding AT was rated significantly higher than making AT decision ($MD = .528$, $SE = .061$, $p = .000$), and (c) using AT was rated significantly higher than making AT decision ($MD = .650$, $SE = .056$, $p = .000$). Therefore, using AT was rated the highest, which was followed by understating AT, while making AT decision was rated the lowest. In relation to the perceived competence scale, there were two significant results: (a) understanding AT was rated significantly lower than using AT ($MD = -.247$, $SE = .049$, $p = .000$), and (b) using AT was rated significantly higher than making AT decision ($MD = .298$, $SE = .058$, $p = .000$. Understanding AT and making AT decision did not have any difference statistically ($MD = .051$, $SE = .058$, $p = 1.000$).

Table 6
Post Hoc Analyses On Three Factors

Perceived Importance			
Factor	**Mean Difference**	**Std. of Error**	**Sig.**
Understanding AT – Using AT	-.122	.047	**.029**
Using AT – Making AT Decision	.650	.056	**.000**
Understanding AT – Making AT Deicison	.528	.061	**.000**
Perceived Competence			
Factor	**Mean Difference**	**Std. of Error**	**Sig.**
Understanding AT – Using AT	-.247	.049	**.000**
Using AT – Making AT Decision	.298	.058	**.000**
Understanding AT – Making AT Deicison	.051	.058	1.000

Note: Bonferroni adjustment was used for conservative result.

Multiple Regression Analysis

General linear model multiple regression analysis was used to investigate research questions: (1b) Do CRCs' backgrounds (e.g., gender, years of practice, practice setting, disability) associate with perceived assistive technology importance, and (2b) Do CRCs' backgrounds (i.e., gender, years of practice, practice setting, disability) associate with their perceived assistive technology competence? Demographic data (i.e., gender, age, ethnicity, year of practice, practice setting, disability, AT experience, and AT training received) were used as independent variables (i.e., predictors), and scores of perceived importance and perceived competence were set to be the dependent variables (i.e., outcomes). In addition, in order to proceed the regression analysis, six categorical variables (gender, ethnicity, practice setting, disability, AT experience, and AT training received) were transformed into one or more dichotomous variables. Specifically, one dummy variable for each variable such as gender, disability, AT experience, and AT training received was created. Ethnicity data (i.e., white, black/African American, and others) were transformed into two dichotomous variables, and practice settings (i.e., public, private, and others) were transformed into two dichotomous variables. Years of practice and age were

included in the model as continuous variables. Since no specific order for predictors were identified, the forced entry method was used to perform the regression analysis (Field, 2013). Two linear models (perceived importance and perceived competence) were created.

Regarding the linear model performed on perceived importance scale, there was no multicollinearity detected. Specifically, as indicated by the correlation matrix of the predictor variables, the highest correlation was -0.721, which was considered appropriate for linear regression analysis (Field, 2013). In addition, predictors' indexes of variance inflation factor (VIF) ranged from 1.07 to 2.25, which was also considered appropriate (Bowerman & O'Connell, 1990). Therefore, multiple regression analysis was conducted, and yielded an insignificant model which $R^2 = .054$, $F\ (10, 226) = 1.288$, $p = .238$. Due to the insignificant result from the model, no further identification of individual predictors was conducted.

Regarding the linear model performed on the perceived competence scale, there was also no multicollinearity detected. The model was, therefore, conducted with a significant result which $R^2 = .168$, $F\ (10, 226) = 5.763$, $p = .000$. The total variance explained by the model was 20.3%. Due to the significant model, individual predictors were further investigated for statistical significance. Among different 10 predictors included in the model, two (i.e., AT experience and AT training received) were identified with slopes that significantly contributed to the model. Specifically, AT experience had a significant result with $B = 5.10$, $t\ (237) = 2.03$, $p = .044$, and AT training received also had a significant result with $B = 15.60$, $t\ (237) = 5.94$, $p = .000$. Table 7 shows the details of the predictors in relation to the regression model.

Table 7
Multiple Regression Model For Perceived Competence

Variable	B	SE	β	t	Sig.
Gender					
Male	3.314	2.896	0.073	1.144	0.254
Age	-0.069	0.144	-0.041	-0.483	0.630
Years of Practice	-0.100	0.162	-0.055	-0.616	0.539
Work Setting					
Public	2.081	2.772	0.050	0.751	0.454
Private	-1.239	3.496	-0.023	-0.354	0.723
Ethnicity/Race					
White	3.320	4.301	0.061	0.772	0.441
Black/African American	1.624	6.035	0.021	0.269	0.788
Disability	3.671	2.923	0.080	1.256	0.211
AT Experience	5.101	2.513	0.125	2.030	**0.044**
AT Training Received	15.600	2.628	0.368	5.936	**0.000**

Note: R^2 = .168, F (10, 226) = 5.763, p = .000 for the model.

Clustering Technique

A clustering technique was administered to investigate research question: (3a) are there differences between CRCs perceived importance and perceived competence across three AT factors? The clustering technique has been used in the rehabilitation literature (Berven, 1979; Chan et al., 2003; Austin, 2012) for years to identify training needs by comparing participants' perceived importance and perceived competence. Specifically, it is through the comparison of the professional skills which participants rate with high importance and low competence that the training needs are identified.

In order to conduct the clustering technique, few steps were needed. First, the frequency of high importance rating from the participants was calculated for each of the 15 items included in the ATPRC perceive important scale. In this study, since 7-point Likert scale was used, ratings equal or above 5 (i.e., 5 = quite importance, 6 = very important, and 7 = extremely important) were considered "high importance". For example, skill item "describe a variety of AT devices and their potential uses with individuals with disabilities" had the highest frequency of high importance ratings by the participants, which 85% of participants rated such skill with a 5 or above. The item, "use AT to increase access to rehabilitation services", was the second highest rated skills which 84% of participants gave a rating of 5 or above. Same raking procedure was taken until the order of the 15 skills was identified.

Same ranking procedure was performed for all 15 items included in perceived competence scale as well. However, due to the intention of the design, the ranking target was shifted to address items with the "limited competence" in the perceived competence scale. Since 7-point Likert scale was used, items rated below 4 (i.e., 3 = somewhat competent, 2 = slightly competent, and 1 = not at all competent) were considered "limited competence". As a result, 15 items were ranked in order base on participants' rating with the least competence. For example, the item "describe strategies for determining AT funding potential and establishing AT funding eligibility" was rated with the least competence which 62% of participants gave a rating of 3 or less. The item, "serve as a resource for AT information, consultation and technical assistance to colleagues and families", received a second lowest competence rating which 54% of participants rated with a 3 or less. Same raking procedure was taken until the order of the 15 skills was identified.

Upon the completion of sequencing the orders of perceived importance and perceived competence items, the definitions of "high importance" and "limited competence" were decided. Specifically, items at or above the median were designated to be "high importance" and "limited competence". As a result, for the total sample, the median percentage for "high importance" items was 78%, and the median percentage for "limited competence" items was 41%. As a technique used by several studies (Berven, 1979; Chan et al., 2003; Austin, 2012) to increase the breadth of findings, the median for both scales was arbitrarily lowered to 77% and 37%, respectively. The high priority AT training needs were identified as an area in which the given items fell above the median on both perceived importance and perceived competence scales. Table 8 shows skill areas, which were identified as AT training needs base on clustering technique. Two items identified in "understanding AT" were "describe a variety of AT devices and their potential uses with individuals with disabilities", and "describe the potential use and benefits of AT in community and leisure environments". Four items identified in "using AT" were "use a variety of AT hardware devices and software applications to support clients' individual needs", "use AT to increase access to rehabilitation services", "use computer-based instruction, software programs and other media to aid all clients", and "use AT to promote access within services, community and leisure environments". No item was identified in "making AT decision".

Table 8
High Priority Assistive Technology Training Needs

Skill Areas	High importance (%)	Limited Competence (%)
Understanding AT		
Describe a variety of AT devices and their potential uses with individuals with disabilities	85%	43%

Table 8 (Cont'd)

Describe the potential use and benefits of AT in community and leisure environments	78%	42%
Using AT		
Use a variety of AT hardware devices and software applications to support clients' individual needs	80%	49%
Use AT to increase access to rehabilitation services	84%	39%
Use computer-based instruction, software programs and other media to aid all clients	77%	41%
Use AT to promote access within services, community and leisure environments	81%	37%
Making AT Decisions		
N/A		

Qualitative data

Two open-ended questions were asked at the end of the survey to answer the research question: (4) what can be improved in relation to assistive technology service provision? Due to the exploratory nature of this aspect of the study, no predetermined themes or specific qualitative analyses were used for coding. Information was collected and the most frequently mentioned themes were identified and reported. As a result, the seven most frequently mentioned themes were identified in relation to how to improve rehabilitation counselors' AT competence. First, the training should expose rehabilitation counselors as much as possible to different and new technology devices. For example, participants stated "it would be helpful to see new and different types of technology available now", "I would love to learn latest and greatest innovations in AT", "I enjoy the opportunity to try out new devices and equipment", and "Knowledge of the variety of technology, new products and techniques and uses". Second, the

training should include information to access AT funding. For example, participants reported the following: "it is important to have knowledge of potential funding sources and how to access them", "how to obtain funding", "who pays for it and how much it costs", and "funding sources and strategies for identifying and securing comparable benefits". Third, the training should include information on AT consultation resources. For example, participants stated "a list of resources that I can consult when I have clients with different needs", "I'd like to see some websites, for instance, with informational descriptions of technologies-matched to the each type of disability", and "Who to call when I need help". Fourth, training should include how to properly assess clients AT needs. For example, participants stated: "it is important to know about resources for assessment", "assessment, how to choose hardware/equipment", and "assessment to assist in the proper selection of AT based on client needs". Fifth, training should include rehabilitation counselors' competence in describing pros and cons of specific devices. For examples, participants stated "the cost/benefit of the use of technology devices", "Information about strengths vs. weaknesses of product options", and "benefits and disadvantages could be best presented to the client in question". Sixth, training should emphasize hands-on AT experience. For example, participants stated "better hands on training and ability to actually use the technology", "training should include demos and hands-on use of the equipment", and "I would want hands on demonstrations". Seventh, training should emphasize the importance of receiving feedback from clients using AT. For example, participants stated "learn from patients of how the devices have changed their lives", and "counselors should follow up on client's use of AT".

CHAPTER FIVE: DISCUSSION

In order to investigate research questions regarding CRCs' assistive technology skills and the future training needs, a quantitative design was utilized. The data collected via an Internet-based survey system (i.e., Qualtrics) was analyzed using SPSS 20.0 for Mac. In this chapter, an analysis of these statistical results, and a discussion of these findings are provided. In addition, limitations, which address the generalizability of the findings, are indicated. Finally, implications for practitioners, educators, and future research are discussed.

ATPRC Instrument

The instrument utilized in the present study, ATPRC, was a modified version of SETPS, which was used to evaluate special education teachers' perceptions of assistive technology skills. While the AT services provided by special education teachers and rehabilitation counselors are likely similar, the adoption of the instrument from the special education literature still raised concerns. In addition, instrument validation was needed since the validity of original SETPS was based on expert opinion and the related literature (i.e., expert validity). Hence, the exploratory factor analysis was conducted. As the results indicate, three factors (understanding AT, using AT, and making AT decision) were identified and differentiated from each other in the domain of AT skills, which corresponded to the original design of SETPS. Although three items were excluded (i.e., one from understanding AT and two from making AT decision) from the final version of the ATPRC, the reliability of the whole instrument remained high (Cronbach's Alpha = .933). Therefore, the ATPRC can be considered as a reliable instrument in exploring rehabilitation counselors' AT perceptions and the subsequent statistical analyses based on the ATPRC can also be considered appropriate.

AT Skills

Although AT has been identified as an effective rehabilitation strategy, the underutilization situation remains high. In addition, even among those clients who receive AT implementations initially, they tend to abandon their AT devices within the first three months (Phillips & Zhao, 1993; Cushman & Scherer, 1996). Such a situation not only limits the potential AT benefit but also causes extra financial burden to rehabilitation agencies. One of the suggestions made to improve the situation is to provide more training for service providers (Scherer et al., 2005). In fact, as specified in the assistive technology device selection model (Scherer et al., 2007), service providers are key persons to ensure the effective match between individuals with disabilities and the AT devices. Therefore, the professional training of rehabilitation service providers is vital. The need for AT training is clear, however, what content should be included in the training remains unclear.

Before providing the needed AT training, it is important to understand what AT skills are. The EFA result of the present study may have shed some light on the topic. Specifically, three themes were identified among the 15 items included in the present study. They are defined as understanding AT, using AT, and making AT decision. "Understanding AT" pertains to knowledge of AT, fundamental AT skills and awareness of how AT could potential impact clients' quality of lives. "Using AT" pertains to rehabilitation counselors' competencies in practical experiences such as familiarity with hardware AT devices as well as software applications. "Making AT decision" pertains to rehabilitation counselors' skills in providing professional AT advice, coordinating resources, planning and implementing AT interventions, and monitoring the use of AT.

AT importance

As suggested by Scherer (2002), assistive technology refers to two components: assistive technology devices and assistive technology services. While AT devices seem relatively clear in concept, which pertains to "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability" (Assistive Technology Act, 1998), the meaning and the breadth of AT services, on the other hand, can be vague. In fact, although it is ideal to have interdisciplinary collaborations between professionals such as a physician, rehabilitation engineer, occupational therapist, physical therapist, special education teacher, and rehabilitation counselor when providing comprehensive AT services, rarely does such a rehabilitation team form to serve the individuals with disabilities. As a result, AT service relies heavily on single service providers or a single agency. Such a situation not only increases the chance of mismatch between clients and the AT devices, but also confuses rehabilitation professionals regarding what their roles are in providing AT services.

The same question was raised among the profession of rehabilitation counseling as well. For instance, a decade ago, Chan et al. (2003) suggested that assistive technology was one of the most important skills that rehabilitation counselors should have. Specifically, among 631 participants they included in the study, 83% rated "assistive technology" important and 84% rated "accommodation and rehabilitation engineering services" important. Chan et al. further suggested that although competence level of assistive technology among rehabilitation counselors might not be as high, the importance of AT skills seemed to be certain. However, six years later, McMahon (2009) argued that rehabilitation counselors should only devote their efforts on disability issues, case management, short-term counseling and vocational related

services. He also emphasized that services such assistive technology should be provided by other professionals. The argument of whether assistive technology should be part of the professional scopes of practice for the rehabilitation counselor remains unanswered.

A decade after Chan et al.'s study, the present study detected similar findings. Among the 237 participants included in this study, as the descriptive statistics showed (Table 3), understanding AT received an average rating of 5.40 (with a 7-point Likert scale rating above 4 considered as important), using AT received an average rating of 5.52, and making AT decision received an average rating of 4.87. In addition, all five items included in the "understanding AT" factor received average ratings above 4.0, which the highest average rating was 5.70 (i.e., ability to define AT and describe its potential impact on the lives of persons with disabilities) and the lowest average rating was 5.08 (i.e., describe the transdisciplinary nature of AT planning and application). All six items included in the "using AT" factor received average ratings above 4.0 as well, which the highest average rating was 5.69 (i.e., use AT to increase access to rehabilitation services), and the lowest average rating was 5.39 (i.e., use computer-based instruction, software programs and other media to aid all clients). All four items included in the "making AT decision" factor also received average ratings above 4.0, which the highest rating was 5.16 (i.e., facilitate clients/families' involvement and collaboration in AT decision-making) and the lowest average rating was 4.45 (i.e., serve as a member of a transdisciplinary team conducting AT assessments). In sum, all 15 items included in the perceived importance scale of the ATPRC were rated "important". Such data provided evidence that a decade after Chan et al. (2003), AT was still widely recognized as an important skill to have by rehabilitation counselors.

Upon the recognition that AT was very important to the field of rehabilitation counseling, this study attempted to gain better insight on which specific AT skill was more important to

rehabilitation counselors. The one-way ANOVA was used to determine whether there was difference among three AT factors. As Table 5 showed, the F-test yielded a significant result conducted on three factors in the perceived importance scale, which indicated that there was significant difference between these factors. The post hoc was then conducted to test for the detail difference. As shown in Table 6, three significant results were obtained. Specifically, participants rated using AT as the most important AT skill, followed by understanding AT, and the least important was making AT decision. Since a major function of rehabilitation counselors is to promote clients' career outcomes, independent living, and quality of life, interventions that can directly benefit clients in these objectives should attract the most attention. Therefore, it is logical that using AT was rated the highest among AT skills. In addition, there are currently more than 26,000 assistive technology devices available on the market. If rehabilitation counselors are unaware of what devices are available and how to use these devices, how can they effectively assist their clients in choosing the right ones?

A surprising finding of the analysis was that "understanding AT" was rated higher than "making AT decision". Rehabilitation counselors are trained to communicate with clients and to facilitate them in making life decisions. As such, one would intuitively assume that rehabilitation counselors would value decision-making more than others. However, the data suggested the opposite. One possible explanation was that the AT intervention outcome was significantly influenced by legislation, policies, and available funding sources. In other words, rehabilitation counselors' understanding of service eligibility, feasible programs, and available financial support are vital for effectiveness of AT interventions. An ability to make effective AT-related decisions is only possible when his/her rehabilitation counselor has good AT knowledge. Therefore, understanding AT was rated higher than making AT decision.

AT Competence

While items in the AT importance scale were generally rated high in this study, the items in the AT competence scale were rated much lower. Specifically, the understanding AT factor received an average rating of 3.79 (with a 7-point Likert scale, ratings below 4 were considered not competent), the using AT factor received an average rating of 4.04, and the making AT decision factor received an average rating of 3.74. The results indicated that rehabilitation counselors included in this study did not consider themselves as competent in providing AT services. This is especially alarming when compared to their perception of AT importance, which suggested that rehabilitation counselors realize the importance of AT for their clients, however, they might not be prepared to offer such services. In fact, two possible consequences might occur: (a) rehabilitation counselors provide AT services of less than desired quality, which in turn, results, in part, in clients' high AT abandonment, and (b) rehabilitation counselors avoid providing AT service, which results in clients' underutilizing AT devices. As indicated by the literature, rehabilitation professional consider the high AT abandonment (Phillips & Zhao, 1993; Cushman & Scherer, 1996) and underutilization of AT (Scherer, 2002) issues as critical. Therefore, in order to improve the situation, it is important and necessary to infuse more AT training in rehabilitation counselor preparation programs.

Table 5 showed that a significant difference was found between three factors in the perceived competence scale. Subsequently, a post hoc analysis was conducted to determine the relationship between three factors. As shown in Table 6, two significant results were obtained. Specifically, using AT was rated the highest among three and had significant differences when compared to understanding AT and making AT decision. When comparing understanding AT to making AT decision, there was no significant difference found. This finding suggested that

despite that rehabilitation counselors in general reported to be less competent in AT, they had relatively better ideas of how to actually use AT devices. This finding provides useful information for an AT training priority for rehabilitation counselors. For example, a large portion of rehabilitation counselor's job is to determine eligibility, secure useful funding, and facilitate clients' decision-making. If the rehabilitation counselors are not competent in providing these services, the benefit of AT interventions could be limited. Therefore, although the ability to use AT devices is important, it is also important to enhance knowledge of AT and AT decision-making.

Lastly, the regression analysis conducted on the perceived competence scale yielded a significant result. As Table 7 showed, significant positive relationships were found in participants' AT experience and AT training received. This finding suggested two implications. First, it represented that participants who had past AT experience were positively associated with their perceived competence level. While such a finding is intuitive, it reveals the importance of exposing rehabilitation counselors to available AT devices. Second, a positive association was also found between rehabilitation counselors' AT training and their perceived competence level. The result provided evidence and echoed findings indicated by Riemer-Reiss (2003) and Noll et al. (2006), in which they suggested that additional AT training can improve rehabilitation counselors' AT competence level and, in turn, they might choose to provide more AT service in the future. As Estrada-Hernandez et al. (2007) noted, there are currently very few masters level classes designated to strengthen rehabilitation counselors' AT competence. While there are several constraints causing the lack of the AT training, the finding in the present study provide incentive for rehabilitation counselor training programs to infuse more time and energy into promoting such training.

Training Needs

One goal of this study was to identify the most needed rehabilitation counselor AT skills. A clustering technique was used to serve the purpose by comparing participants' perceived importance and perceived competence. As a result, six items met the selection requirement. As shown in Table 8, two items from understanding AT and four items from using AT were identified to be the most needed training areas. There was no item from making AT decision identified.

Two items identified as the most needed training areas in "understanding AT" were "describe a variety of AT devices and their potential uses with individuals with disabilities", and "describe the potential use and benefits of AT in community and leisure environments". In order to facilitate choosing a variety of AT devices, rehabilitation counselors have to understand and be able to discuss potential benefit of the devices with their clients. However, there are new AT devices created to improve quality of life of individuals with disabilities everyday. It becomes a difficult but necessary task for rehabilitation counselors to keep their AT knowledge up-to-date. While traditional in-class training is important and useful, it is also beneficial if there are resources such as websites and workshops that keep rehabilitation counselors informed regarding new AT devices. Furthermore, the results also revealed that the use of AT devices in leisure environments or for recreation purposes has been overlooked. While AT for vocational rehabilitation is important, AT for recreational purposes such as sport and entertainment should also be emphasized.

Four items identified as the most needed training areas in "using AT" were "use a variety of AT hardware devices and software applications to support clients' individual needs", "use AT to increase access to rehabilitation services", "use computer-based instruction, software

programs and other media to aid all clients", and "use AT to promote access within services, community and leisure environments". It was apparent that rehabilitation counselors perceived a great need of training regarding their computer skill and software knowledge. While hardware AT devices help a significant amount of individuals with physical challenges, accommodations such as computer software programs can provide extra assistance for individuals with intellectual and cognitive impairments. In addition, it is important to note that rehabilitation counselors perceived the need to use AT for promoting service accessibility. Lastly, the result again revealed the importance of rehabilitation counselors' knowledge in assisting clients with selecting AT devices not only in the vocational context but also in places such as leisure environments. The findings provoke considering whether rehabilitation counselor preparation programs should more thoroughly address the importance of clients' leisure activities.

The qualitative data collected by the current study also yielded important training ideas for the rehabilitation counseling programs to take into considerations when designing curriculum. As indicated, seven major training areas in relation to AT skills should be emphasized: (a) new and innovative AT devices, (b) AT funding, (c) AT consultation and referral, (d) AT assessment, (e) ability to describe specific AT's strengths and weaknesses, (f) hands-on experience, and (g) ability to communicate with clients regarding their feedback of using AT. While the exploratory nature of the qualitative data in this study might limit its generalizability, it should provide insight for future research as well future training directions.

Limitations of the Study

Due to the research design of this study, which relied on a self-report questionnaire, participants' bias was difficult to avoid and should be carefully assessed when interpreting the findings. As Heppner et al. (1999) noted, participants may answer items more socially acceptably

or tend to answer in ways that correspond to the researcher's expectations. In addition, response patterns, which participants tend to answer items in the middle of a Likert scale, should not be overlooked. Another possible limitation is the low response rate (24.3%). Although the response rate is not considered uncommon comparing to those of similar studies such as 22.7% for Austin (2012), 12% for Coduti (2009), and 29.2% for Zanskas (2007), caution is still needed when interpreting and generalizing the findings. To demonstrate equivalence, the comparison between the sample drawn for this study and the overall CRC population was presented in Table 1. Moreover, since the study utilized an Internet based survey system, participants needed to have a certain level of computer skill in order to complete the survey. Therefore, careful consideration is needed whether there was systemic difference between participants who completed the survey and those who did not.

Another possible limitation is that the ATPRC was a revised version of SETPS. SETPS was initially designed to evaluate special education teachers' AT perceptions. Therefore, in order to use the instrument to measure perceptions of rehabilitation counselors, item wording was changed to fit the context. Although changes from SETPS to ATPRC were incidental (i.e., "student" change to "client"), whether the revision changed the core conceptual nature of the instrument is unknown.

An addition limitation of the study is the validity of the instrument. As noted, the ATPRC was a revision of SETPS. The validity of SETPS relied on experts' opinion and the related literature. There was no systematic validity measurement found for the SETPS. Therefore, the ATPRC inherited the same validity concerns as with the SETPS. As a conservative approach, factor analysis and reliability Cronbach's alpha tests were conducted in this study. As the results showed, three factors were identified and internal reliability of the instrument was high (α

= .933). Although these analyses provided validity and reliability evidence, a more thorough analysis is needed to further justify the integrity of the instrument.

Implications of the Study

The results found in this study have implications for current practitioners, educators, and future research.

Implications for Practice. It is clear that AT has become one of the most important skills that rehabilitation counselors should have in order to effectively serve their clients. A decade ago, Chan et al. (2003) suggested that AT skills should be emphasized. This study echoed the same suggestion. Findings of the current study provide evidence that AT continues to be a skill that rehabilitation counselors should devote more energy in learning. As suggested by Scherer (2002), new and the more innovative AT devices are created everyday. If rehabilitation counselors do not keep their knowledge up-to-date, they will be unable to effectively assist their clients with identifying and securing the appropriate technology. Moreover, as indicated by the results, understanding AT (e.g., legislation, policies, and available funding) and making AT decision (e.g., assisting clients and family in choosing AT devices) were two areas in which rehabilitation counselors perceived they were less competent. While these areas are not directly related to AT devices, they are essential in dealing with issues such as AT underutilization, the mismatch between person and technology, and high AT abandonment. For instance, the inability to secure available funding for clients might limit clients' opportunity in purchasing the right AT devices.

One interesting phenomenon found in the open-ended questions of this study was that a number of participants expressed the desire to learn where can they receive AT consultation. As the role of the rehabilitation counselor keeps growing and expanding, it is almost impossible for

them to master every service provided. Therefore, referral and consultation resources become a useful means for obtaining addition assistance. Currently, there are many online resources available for AT consultation. For example, the Job Accommodation Network (JAN: http://askjan.org) and AbleData (http://abledata.com) provide ideas for employment related accommodations and the recreational use of AT devices. Such information is instrumental when exploring possible AT solution with clients. However, as many participants pointed out, this type of information is underutilized. Therefore, it is crucial rehabilitation counselors to become familiar with such resources as such. A few ways such as subscribing to newsletters from websites (e.g., JAN), joining AT professional organizations (e.g., Rehabilitation Engineering and Assistive Technology Society of North American (RESNA)), participating in AT workshops, and attending AT sessions at conferences may be particularly effective in acquiring more AT information and skill.

Implications for Education and Training. As indicated by the findings in this study, AT skill is important to rehabilitation counselors. However, as Estrada-Hernandez et al. (2007) and Scherer et al. (2004) indicated, there are currently very few rehabilitation counseling training programs actually require students to take a course in AT. This is particularly alarming because it suggests that rehabilitation counselors provide AT services for which they are not well-prepared to do. This study provides reference and incentive for current rehabilitation counselor preparation programs to include AT when considering curriculum development and revision plans.

While implementing comprehensive AT training may not be impossible for most rehabilitation counselor training programs due to financial constraint and time limitations, this study provided ideas for the prioritization of specific AT skill training. For example, the findings

of this study suggest that rehabilitation counselors did not feel competent in AT related knowledge such as the legislation, policies, and available funding programs. Therefore, future AT training specifically addressing these areas should be a high priority. In addition, rehabilitation counselors did not feel competent in facilitating client AT decision-making. A number of rehabilitation counselors expressed the lack of ability in communicating with clients regarding strengths and weaknesses of specific AT devices. While decision-making processes involve various factors, one necessary step for the rehabilitation counselor is to inform clients about potential benefits and possible side effects of each available option. If rehabilitation counselors do not have such knowledge about AT devices, they likely will not be able to facilitate client AT decision making. Therefore, it is not hard to understand why the rehabilitation counselors in this study did not feel competent in making AT decision with their clients. As an implication for future training programs, the information of specific AT characteristics should be introduced.

Another implication of the current study stems from the identification of training needs, which were identified by the clustering technique. Based on the results, three major areas should be emphasized for future AT trainings: First, the training should include learning about hardware devices as well as software proficiency. It is a trend that computer technology will be utilized more and more in the future. Software applications specifically designed for special needs such as screen readers, voice dictation, and electronic reminder should be introduced. Second, training should also include AT devices that increase the accessibility of rehabilitation services. Although a majority of AT devices may be used as a means to improve client employability, it is worth noting that AT can also improve the rehabilitation service delivery. Third, training should

increase rehabilitation counselors' awareness of recreational AT devices. Therefore, future AT training should extend its territory and include devices for recreational purposes.

Lastly, the open-ended questions of this study also yielded useful data for AT training considerations. Few areas were identified. First, practical experience should be emphasized. For instance, rehabilitation counselors should be familiar with the most innovative AT devices, and be able to describe their strengths and weaknesses. Second, rehabilitation counselors' ability to facilitate decision-making should be emphasized. For instance, rehabilitation counselors should be able to perform adequate assessments, which target users' experience before and after implementations of AT devices. Finally, the importance of consultation skills should also be stressed. For instance, rehabilitation counselors should be aware of other AT resources (e.g., funding resources and AT device vendors), which they can consult with when they have questions.

Implications for Future Research. The need for further research is apparent due to the limitation and findings of the current study. First, the ATPRC was a revision of SETPS. An instrument that specifically measures rehabilitation counselors' AT competence is needed. Given that very few studies have been conducted to gain an understanding of rehabilitation counselors' AT skills, there is limit knowledge of rehabilitation counselor AT competency. As a result, the validity of the instrument used in this study relied heavily on expert opinion. It would be beneficial to utilize this study as a foundation to create an instrument with wider and deeper understanding of rehabilitation counselor AT skills.

Second, although the technique which uses the comparison between perceived importance and perceived importance to inform training needs is common to the rehabilitation literature, it is worth of further investigation regarding what they really mean and how they

interrelate to each other. In fact, while it might seem easy to gather a person's value on a given area by collecting his/her perceived importance data, there might not be a simple way to evaluate his/her actual competence level. The question is whether the information gathered from the perceived competence scale reflects the real competence level? For instance, does rehabilitation counselors with more experience perceive their competence level more accurately than others with less experience? The sample drawn for this study composed of 31.4% of participants with more than 25 years of experience. Whether the overwhelming amount of more experienced CRCs included in this study deviated the statistical results remains unanswered. Therefore, future research is needed to clarify what the perceived importance and perceived competence really mean and how they can be affected by participants' backgrounds.

Lastly, Estrada-Hernandez et al. (2007) studied how AT education was provided in rehabilitation counseling programs, in which he and his colleagues found that the trainings were not sufficient. In fact, most programs choose not to have a separate AT course but rather infuse AT knowledge into other courses. Therefore, it is important to choose which AT materials should be included in a master's degree rehabilitation counseling training program. This study provided ideas for what can be implemented or infused in coursework. Future research is needed to evaluate whether such suggestion made by this study improve rehabilitation counselor AT competence as well as the quality of AT service they provide.

Conclusions

The findings of this study are useful and complement previous studies which emphasized the AT training needs for rehabilitation counselors. Results showed that AT was consistently one of the most important skills that rehabilitation counselors should have when providing services to their clients. In addition, although AT was considered to be important to their clients,

rehabilitation counselors in general did not perceive themselves competent to provide such services. This is alarming because rehabilitation counselors can only choose not to provide such services or to provide less quality services. In either case, the rehabilitation outcomes of their clients may be compromised. Therefore, one important finding of this study is the confirmation that there is a need to include AT training in rehabilitation counselor preparation programs. The results of this study can also be used to inform education programs regarding the AT skills that should be prioritized when designing curriculum. Although it may be difficult to include all aspects of AT skills in mainstream rehabilitation counseling trainings, several important areas were suggested.

APPENDICES

APPENDIX A

SPECIAL EDUCATION TEACHER PREPARATION SURVEY

IMPORTANCE	CURRENT ATTAINMENT LEVEL
1=not important at all	1=no level of attainment
2	2
3	3
4	4
5	5
6	6
7=extremely critical	7=extremely attained

1. Ability to define AT and describe its potential impact on the lives of persons with disabilities.
2. Describe the transdisciplinary nature of AT planning and application.
3. Describe a variety of AT devices and their potential uses with students with disabilities.
4. Describe the impact of AT legislation and policy on service delivery.
5. Describe the potential use and benefits of AT in school, community and leisure environments.
6. Describe strategies for determining AT funding potential and establishing AT funding eligibility.
7. Use a variety of AT hardware devices and software applications to support students' individual needs.
8. Use AT to increase access to general education curriculum for all students.
9. Use computer-based instruction, educational software programs and other media to aid all students.
10. Use differentiated lesson plans to infuse instructional assistive technology into curriculum.
11. Use AT, the Internet and other media to actively engage students in research and independent learning.
12. Use AT to promote access within school, community and leisure environments.
13. Implement AT interventions using a process of assessment, self-reflection and impact evaluation.
14. Serve as a member of a transdisciplinary team conducting AT assessments.
15. Collaborate with other members of a team to determine AT needs and implement AT supports.
16. Serve as a resource for AT information, consultation and technical assistance to colleagues and families.
17. Facilitate student/familie involvement and collaboration in AT decision-making.
18. Facilitate the selection of AT solutions based on student/family needs and preferences.

APPENDIX B

ASSISTIVE TECHNOLOGY PERCEPTION FOR REHABILITATION COUNSELORS

INSTRUCTIONS FOR COMPLETING THIS INVENTORY

This inventory presents a list of assistive technology skills that can be used to facilitate clients with rehabilitation needs. For each item, you will be asked to rate its importance for practice and how competent you perceive yourself in applying these skills.

IMPORTANCE: IMPORTANCE OF AT SKILLS AND KNOWLEDGE.
SCALE FOR PERCEIVED IMPORTANCE

1=not at all important
2=slightly important
3=somewhat important
4=important
5=quite important
6=very important
7=extremely important

COMPETENCE: THE ABILITY TO PROVIDE AT SERVICES TO CLIENTS.
SCALE FOR PERCEIVED COMPETENCE

1=not at all competent
2=slightly competent
3=somewhat competent
4= competent
5=quite competent
6=very competent
7=extremely competent

PART I

Demographic Information (7 questions):

1. Gender:
    a. Male
    b. Female
2. Age:_____
3. Race/Ethnicity (check only one)
    a. American Indian or Alaskan Native
    b. Asian (including Chinese, Filipino, Japanese, Korean, Vietnamese)
    c. Asian Indian
    d. Black or African American.
    e. Hispanic, Latino, or Spanish Origin alone
    f. Native Hawaiian or Other Pacific Islander
    g. White
    h. Other Race
    i. Two or More Races

4. Employment setting:
    a. Center for Individuals with Developmental Disabilities
    b. Private Not-For-Profit Rehabilitation
    c. College or University
    d. Retired
    e. Corporate Environment
    f. State/Provincial Rehabilitation Agency
    g. Corrections Facility
    h. Student
    i. Independent Living Facility
    j. Unemployed
    k. Insurance Company
    l. Veterans Benefits Administration (VBA)
    m. K-12 School
    n. Veterans Health Administration (VHA)
    o. Medical Center or Rehabilitation Hospital
    p. Workers' Compensation Setting
    q. Mental Health Center/Psychiatric Facility
    r. Private For-Profit Rehabilitation
    s. Other-Specify:_____
5. Years of practice: _____
6. Level of Education:
    a. Master
    b. Ph. D
    c. Others
7. Do you have a disability:
    a. Yes
    b. No
8. Have you used an assistive technology device:
    a. Yes
    b. No
9. Have you received AT trainings?
    a. Yes
    b. No

PART II
Assistive Technology Skills Rating

For each item, rate its importance and how competent you perceive yourself in applying these skills.

SCALE FOR PERCEIVED IMPORTANCE	SCALE FOR PERCEIVED COMPETENCE
1=not at all important 2=slightly important 3=somewhat important 4=important 5=quite important 6=very important 7=extremely important	1=not at all competent 2=slightly competent 3=somewhat competent 4= competent 5=quite competent 6=very competent 7=extremely competent

19. Ability to define AT and describe its potential impact on the lives of persons with disabilities.
20. Describe the transdisciplinary nature of AT planning and application.
21. Describe a variety of AT devices and their potential uses with individuals with disabilities.
22. Describe the impact of AT legislation and policy on service delivery.
23. Describe the potential use and benefits of AT in community and leisure environments.
24. Describe strategies for determining AT funding potential and establishing AT funding eligibility.
25. Use a variety of AT hardware devices and software applications to support clients' individual needs.
26. Use AT to increase access to rehabilitation services.
27. Use computer-based instruction, software programs and other media to aid all clients.
28. Use rehabilitation plans to infuse assistive technology into services.
29. Use AT, the internet and other media to actively engage clients.
30. Use AT to promote access within services, community and leisure environments.
31. Implement AT interventions using a process of assessment, self-reflection and impact evaluation.
32. Serve as a member of a transdisciplinary team conducting AT assessments.
33. Collaborate with other members of a team to determine AT needs and implement AT supports.
34. Serve as a resource for AT information, consultation and technical assistance to colleagues and families.
35. Facilitate clients/families' involvement and collaboration in AT decision-making.
36. Facilitate the selection of AT solutions based on clients' needs and preferences.

PART III
Open-ended Questions

1. As identified by the rehabilitation literature, the high assistive technology abandonment has been a serious concern of rehabilitation service providers. In your opinion, what can service providers do to improve such a situation?

2. If assistive technology continuing education were available to you, what knowledge or skills should be included in such a training?

APPENDIX C

INFORMED CONSENT

INFORMED CONSENT

1. PURPOSE OF RESEARCH:

You are being asked to participate as a research participant in this internet-based survey study of rehabilitation counselors' perceptions of assistive technology skills. You have been selected as a participant in this study because you have been identified as a certified rehabilitation counselor (CRC). Your participation in this study will take about 10 - 15 minutes of your time.

2. WHAT YOU WILL DO:

All that will be required of you is that you take the time to complete this internet-based survey. There are three parts and a total of 50 questions to answer. You can save your selected answers by pushing the next button. In addition, you have the option to save your responses and log out and return to the survey where you left off. However, you will be unable to go back and change your answers once you have submitted them since no identifying information will be included with your responses.

3. POTENTIAL BENEFITS:

Your participation in this study may generate data useful for better understanding rehabilitation counselors' perceptions of assistive technology knowledge and skills. Further, it is anticipated that the findings from this study have the potential to both inform and enhance the clinical training curricula of master's rehabilitation counseling programs.

4. POTENTIAL RISKS:

There are no foreseeable risks associated by participating in this study.

5. PRIVACY AND CONFIDENTIALITY:

The data for this project will be kept confidential. All data will be collected on the web using the web-survey service program, Survey Monkey. Access to Survey Monkey will be password protected. Only the researchers will have access to the password to Survey Monkey needed to access the data. The researchers will maintain your privacy throughout the research process by ensuring you are automatically assigned a Case ID number that remains blind to the researchers. No identifying information will be stored with the data. The only identifying information will be your email address that is linked to your survey on Survey Monkey and will be used only for sending email reminders to you to complete this survey. All the data will be imported and stored on one of the researcher's personal computer and software programs where data will be entered

and stored for data analysis. The personal computer used and data files created will be password protected to ensure protection of all participant data. Only the researchers and Michigan State University Institutional Review Board will have access to the data. The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous.

6. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAWAL:

Participation in this research project is completely voluntary. You have the right to say no. You may change your mind at any time and withdraw. There are no consequences of withdrawal or incomplete participation. You may choose not to answer specific questions or to stop participating at any time.

7. COSTS AND COMPENSATION FOR BEING IN THE STUDY:

There are no costs to you to participate in this study other than the value you place on your time. You will not receive money or any other form of compensation for participating in this study.
If you have any questions about this study, such as scientific issues, how to do any part of it, or prefer an alternative method for taking this survey (e.g., by phone or hard copy), please contact the researcher, Hung Jen Kuo, Michigan State University, 457 Erickson Hall, East Lansing, MI 48824, kuohungj@msu.edu, 517-402-2187.
If you have any questions and concerns about your role and rights as a research participant, you can also contact responsible project investigator, Dr. John Kosciulek, at 517-353-9443, or e-mail jkosciul@msu.edu. If you would like to obtain information or offer input, or would like to register a complaint about this research study, you may also contact, anonymously if you wish, the Michigan State University Human Research Protection Program at 517-355-2180, FAX 517-432-4503, or e-mail irb@msu.edu, or regular mail at: 408 West Circle Drive Room 207 Olds Hall, MSU, East Lansing, MI 48824.

By clicking the “NEXT” button below, it means that you voluntarily agree to participate in this research study.

Please print a copy of this form to keep before proceeding.

THANK YOU

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