

# **An Empirical Study on Assistive Technology Supported Travel and Tourism for the People with Dementia**

Research shows that people with disabilities have same desire for travel and tourism as others, but many constraints prevent them from independent travelling. Although the disabled tourism market is expanding, still there is lack of empirical research on impact analysis of assistive technology (AT) assisted travel and tourism with focus on the people with dementia (PWD). This study investigates the impacts of AT assisted travel and tourism for the PWD. The questionnaire based survey gathered data from 327 PWD. Factor and canonical coefficient analysis are used exploring the usability of AT assistance. Results reveal four motivational and three achievements dimensions. Independent travel is desired by the PWD without any external help and ATs can help them in doing so. The use of AT can further accommodate in choosing the tourism activities, attractions and leisure management. The PWD feel improvements in their achievements through the use of ATs in travel and tourism. All these facets resultantly improve the confidence and self-esteem of the PWD and motivate them towards rehabilitation and independent living.

Keywords: assistive technology; dementia; mobility; motivation; achievement; travel and tourism

## **1. Introduction**

Currently tourism is regarded as one of the largest industries in the world and with an estimated annual increase of over 4%. The tourist figures reached a record breaking \$1.2 billion during 2015. This industry has a strong global impact with 10% of the total GDP. Tourism is also ranked as the largest job global provider as it provides a job to one person out of 11. The total exports involved in tourism industry has risen to a record \$1.5 trillion annually (UNWTO, 2016).

Among other aspects, the technological progress is one of the key factors for the sharp rise in increasing number of tourists. Technologies have changed the global picture of the tourism and made it easy for people to travel. The technologies have given more opportunities for the people around the world to interact with each other as well (Williams, Rattray, & Grimes, 2006). The interaction between technologies and tourism industry can be used for promoting travel and tourism opportunities for the people with special needs as well. Promoting tourism opportunities for the people with special needs can contribute further to the tourism market and can also help the quality of life these people.

### **1.1. Dementia Statistics and Economic Impact**

In recent years the world population is aging which has contributed to a sharp rise in the number of people with dementia (PWD) which currently stands at over 47 million (Pratchett, 2015). Dementia has over 100 symptoms which make it a complex disease. It is a comprehensive class of “brain diseases that includes any disease that causes loss of cognitive ability (the ability to think and reason clearly) that is severe enough to affect a person's daily functioning” (Span, Hettinga, Vernooij-Dassen, Eefsting, & Smits, 2013). The dementia population has a huge economic impact as the worldwide dementia care cost in the form of care homes, caregivers, doctors, hospitals, medical facilities etc. is worth \$800 billion a year (Pratchett, 2015). These costs are higher than the costs of any other disease (Cire, 2015). In the

coming years these costs will be hard to manage, therefore researchers and industry should come up with ideas to improve the independence of the PWD through cost effective solutions.

## **1.2. Dementia, Travel and Tourism**

The people with disabilities are a distinct group of travel and tourism market (Huh & Singh, 2007) as they have to face more economic, intrinsic, environment and interaction barriers (McKercher, Packer, Yau, & Lam, 2003). The term people with disabilities is used according to the UN definition “Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others”(Enable, 2006). The people with disabilities also show stronger desire for ease of access in traveling and at the tourism destinations. Therefore the fastest evolving market segment for travel and tourism industry is the people aged 55 and above (Cook, Yale, Marqua, Van Harssel, & Gentile, 2006).

Although the PWD should not be labelled as disabled people, yet they face many cognitive challenges. Therefore they could be considered as a distinct group for the travel and tourism market. The most famous tourism destinations are in the developed countries and their dementia population is also on the rise. Therefore the research should be carried out to know about the barriers faced by the PWD in the travel and tourism while focusing on the possible alternatives to help them.

## **1.3 Objectives of the Study**

Assistive technology (AT) is an alternate to help the PWD in their daily activities (Martins, Santos, Frizera-Neto, & Ceres, 2012) (Jedeloo, Witte, Linssen, & Schrijvers, 2002). However, the usability of existing ATs should be investigated (Asghar, Cang, & Yu, 2015). Although there are a few studies focused on helping the people with disabilities in AT assisted travel and tourism, yet there is limited

work on analysing the usability of ATs for helping the PWD in this domain (Rumetshofer & Wöß, 2004). Tourism is believed to improve psychological and mental health of the general people (McConkey & Adams, 2000). Similarly taking part in tourism activities promotes healthy life style and is considered useful in reducing the progress of dementia in the older people (Page, Innis, & Cutler, 2014). This paper therefore aims at analysing the usability of ATs in helping the PWD in travel and tourism. The study is initiated to address the following four research questions.

RQ1: What are the factors that motivate the PWD to use AT assistance for travel and tourism?

RQ2: How usable ATs are in promoting PWD independence through AT assisted travel and tourism?

RQ3: How does AT assisted travel and tourism impact the lives of the PWD?

RQ4: Does AT assisted travel and tourism contribute to the rehabilitation of the PWD?

## **2. Literature Review**

The history of AT was dated back to March 1874 when the first “Audio-phone Bone Conduction Amplifier” for hearing aid was invented (Berger, 1976). Since then ATs (from basic to advanced level) have been used for helping the people to cope with their disabilities or functional difficulties. It is just in recent years that the researchers have started to focus on the use of ATs to help the PWD during their daily activities. The ATs are useful for supporting the PWD to live more independent lives, which resultantly increase the production of ATs at larger scales (Fardoun, Mashat, & Ramirez Castillo, 2015; Tchalla et al., 2012).

These days the PWD are commonly seen using ATs at different places (markets, care homes, hospitals, public places etc.). The existing ATs offer several functionalities like; smart walkers for physical mobility (Martins et al., 2012), mobile multimedia technologies for easier communication (Boman,

Lundberg, Starkhammar, & Nygård, 2014; Donnelly et al., 2010), prompt technologies for reminders (Seelye, Schmitter-Edgecombe, Das, & Cook, 2012), activity monitoring technologies for analysing the PWD movements (Meiland et al., 2014; Rowe et al., 2009), electronic memory aids for daily activities management (Imbeault et al., 2014), leisure technologies for enjoyment activities (Torrington, 2009), GPS enabled technologies for safe walking (McCabe & Innes, 2013), automatic task assistance technologies for completion of tasks in right order (Peters, Hermann, Wachsmuth, & Hoey, 2014) and many more. All these ATs have varying scopes to help the PWD. The literature still lacks studies focused on evaluating the usability and impacts of ATs in assisting the PWD for travel and tourism. Due to the scope of this study we include the studies focused on AT facilitated travel and tourism activities for the people with disabilities and functional difficulties.

The Korean researchers studied the motivation for tourism and related activities with focus on 161 families of the disabled people. The analysis revealed five motivational factors “children’s intellectual competence, socializing, physical competence (mastery) of disabled children, relaxation and escape and family closeness” and seven activity factors “sports, nature appreciation, socializing/special events, active outdoor activities, entertainments, sedentary outdoor activities and wellness activities”. The “physical competence (mastery) of disabled children” appeared as the most significant motivational factor for disabled people families, whereas “sedentary outdoor activities” appeared as the most significant activity during the family trips (Kim & Lehto, 2013).

The motivations of the people with mobility impairments for travelling were analysed through the focus groups. The results generated by the Crompton’s push and pull model revealed that factors like “independence, accessibility, adventure and natural environment” motivated the impaired people for leisure based travelling (Shi, Cole, & Chancellor, 2012).

The attitudes of the physically impaired tourists for facilitated access to natural places were investigated. The researchers conducted a survey with 400 participants (physically impaired and normal) tourists. The results indicated that physically impaired group show significant desire for facilitated access to natural places as compared to the able bodied group (Lovelock, 2010).

The accessible tourism competitiveness for the disabled tourism market was studied in Australia and Spain. Factor and cluster analysis revealed that the competitiveness factors for Australia (infrastructure, brand and quality of service) were different as compared with those of Spain (tourist structure, location and climate). Spain already has better accessible facilities due to its long term tourism tradition, therefore it has become one of the leading tourist attractions in the world (Vila, Darcy, & González, 2015).

An interesting study in Hong Kong focused on the role of travel agent for the people with disabilities. According to the perceptions of the people with disabilities the travel agents usually lacked in fulfilling their special needs. In most cases the travel agents themselves didn't understand the needs of this special tourism market segment (McKercher et al., 2003).

Recently the researchers in Spain identified the variables affecting the travelling frequency of the people older than 55 years. The results through the count model showed that time availability, economic situation and gender have strong impact of the travelling frequency among the older people (Losada, Alén, Domínguez, & Nicolau, 2016).

The constraints and related negotiations of pleasure travel were discussed in another study. The comparative pattern analysis systematically analysed the disabled travellers written narratives and resulted into six intrapersonal themes: "physical/sensory constraint, physical/sensory negotiation, emotional constraint, emotional negotiation, knowledge constraint and knowledge negotiation", six interpersonal themes: "travel companion constraint, travel companion negotiation, service provider

constraint, service provider negotiation, stranger constraint, stranger negotiation” and eight structural themes: “transportation constraint, transportation negotiation, facility constraint, facility negotiation, environment/geography constraint, environment/geography negotiation, financial constraint and financial negotiation”. The study concluded that involving the people with disabilities during travel aid development process can also improve the travel services for them (Daniels, Rodgers, & Wiggins, 2005).

The qualitative study involving 40 vision impaired tourists reported their experiences regarding accessible tourism. The findings suggested that the tourism industry in specific and the community in general should understand the sensory needs of the people with disabilities to make tourism more accessible for them (Small, Darcy, & Packer, 2012).

Another survey showed that the tourism needs of the disabled people are far more complex as we currently understood. More studies should involve the disabled people to explore about their needs for the tourism activities (Shaw & Coles, 2004). In response to this there were several studies initiated to know the needs of the people with disabilities for AT assisted travel and tourism. There were also several studies focused on the barriers related to the leisure activities for the PWD (Innes, Page, & Cutler, 2015), music based therapies (Wall & Duffy, 2010), dementia friendly communities through stakeholders involvement (Heward, Innes, Cutler, & Hambidge, 2016), dementia friendly societies for improved independent living (Innes & Director, 2013), dementia friendly tourism (Page et al., 2014) and social tourism for the PWD (Diekmann & McCabe, 2011). Despite all these research efforts, to the best of authors’ knowledge, there is no study focused on analysing the impacts of AT assisted travel and tourism for the PWD. Therefore the present study investigates the AT needs, usability and impacts of travel and tourism with focus on the PWD through the research question highlighted in the introduction section.

### **3. Methodology**

The empirical research process used for this study has four stages, starting from literature investigation to questionnaire design and validation, data collection and data analysis. As per requirements of the current study the four staged research process is presented in figure 1.

#### **Figure 1: Research Process Used Throughout the Study**

##### **3.1 Selection of Research Method**

As this research is focused on verifiable observations, therefore the results are expressed in the form of numbers. The quantitative research is usually used to ask participants about their opinions in a structured format that produces facts and statistics. The literature investigation shows almost 66% of the top research from 1935 to 2005 used quantitative methods in almost all research fields (Hunter & Leahey, 2008). For the quantitative research, the questionnaires are the preferred method of data collection from large and geographically distributed population. All these facets motivated to adopt questionnaire based survey for this study.

##### **3.2 Questionnaire Structure**

This research used a structured paper based questionnaire. For measuring the usability of AT assistance in travel and tourism 29 variables were identified through in-depth literature review related to disability tourism research. The questionnaire further included questions related to the respondent profiling information like; gender, living condition, etc. Some questions related to the AT types used and functional difficulties faced by the PWD during their daily activities were also part of the questionnaire.

##### **3.3 Data Collection**

The respondents included in the study were shortlisted based on the following criteria:



- The respondent gave written and verbal consent to participate in the study
- The respondent had been diagnosed with mild dementia
- The respondent had moderate cognitive impairment based on Mini Mental Scale Examination (MMSE) with scores from 20 to 25.
- The respondent had prior knowledge and experience of using ATs for travel and tourism

Based on literature recommendations by using confidence level 95% and confidence interval of 7%, a minimum sample size of 196 is considered enough for the current study (Franca & da Silva, 2009). Overall the researchers distributed 500 questionnaires and received 327 completely filled responses during the specified time yielding a healthy (65.4%) response rate. The researchers used help from care homes and medical professionals for accessing the target population.

### **3.4 Data Analysis**

The variables selection, their validation and classification for the questionnaire was adapted from (Jung, 2011). SPSS 18.0 was used to analyse data gathered. For profiling of the survey participants' descriptive analyses were used. Later on exploratory factor analysis (EFA) was applied as this method "uncover the underlying structure of a relatively large set of variables" (Norris & Lecavalier, 2010). The EFA method was applied for identifying and exploring factors and their relative associations among each other (Hinton, McMurray, & Brownlow, 2014). The canonical correlation analysis (CCA) was applied to know the relationships between independent and dependent variables.

### **3.5 Ethical Considerations**

Involving the PWD in research activities is challenging, therefore well-established ethical guidelines are followed from (Mahoney et al., 2007). After a systematic procedure the ethical approval for the

conduction of this study was granted by the Research Ethics Committee. Additionally the researchers' sought willingness of the PWD and their families for their participation in this research activity.

#### **4. Results and Discussion**

The questionnaire started with the profiling related questions to discover the features and characteristics of the survey population. Figure 2 shows the summarized profiling information of the survey population. The male proportion of 81% was almost four times higher than the female (19%). One possible reason is that the men prefer to use more ATs as compared to the women (Ayalon, 2003). Almost 88% of the PWD filled the questionnaires themselves, while remaining 12% asked their caregivers or families to fill it on their behalf. All respondents aged over 55 years with the distribution of 44% aged between 56-70 years while remaining 56% aged between 71-85 years.

In total 65% respondents were living with their families, 18% living alone and 17% living at care homes. For functional difficulties questions, some respondents highlighted more than one functional difficulty. In total 42% PWD specified remembering/thinking as their major functional difficulty as dementia often influence the memory and cognition of the individuals. The learning difficulty was highlighted by 13%, physical challenge (11%), hearing and seeing issues (12%), whereas issues in interacting with others were highlighted by 22%.

#### **Figure 2: Profiling Information of the Survey Participants**

In total 45% were using social applications for contacting others to know about their plans and getting help. About 9% of the respondents used ATs for physical mobility from one place to another, 17% used cognitive applications, 17% used reminders while remaining 12% used websites. The funding question showed that most of them (76%) used their own financial resources; remaining 11% used insurance money while 13% used donations for purchasing their ATs.

#### **4.1 EFA for Travel and Tourism through AT Support**

The ordinal data gathered on likert scale usually presents non normal distribution (Hinton et al., 2014). The Shapiro Wilk test results for this study also show that the data set are not normally distributed. As the nature of this study was exploratory, therefore two EFA were performed on the data collected (N=327) samples by using the principal component method with VARIMAX rotations. The EFA1 resulted travel and tourism motivation factors are presented in table 1, whereas the EFA2 resulted travel and tourism achievements are presented in table 2. For factor extraction the Eigen value greater than one rule was followed (Cliff, 1988). The values for the Cronbach's Alpha ranged from .890 to .907 and all values were greater than generally accepted lower limit of .70 (Hair, Black, Babin, Anderson, & Tatham, 2006b). Similarly all factor loading scores ranged from .417 to .762 which fulfilled the acceptable threshold of factor loading score of .40 (Hair, Black, Babin, Anderson, & Tatham, 2006a).

The variance gained through factor analysis for motivational factors was distributed as; factor 1 (17.5%), factor 2 (14.3%), factor 3 (11.1%)' factor 4 (9.1%) and for achievements factors; factor 1(19.7%), factor 2 (16.9%), factor 3 (12.1%). The accumulated total variance gained was 52% and 48% respectively which easily fulfilled the acceptable requirement of at least 40% (Dunteman, 1989).

Table 1 shows the EFA1 results for motivational factors which are based on the survey variables that motivate the PWD to use ATs for travel and tourism. The EFA1 results in four factors below:

Factor 1: The 1<sup>st</sup> motivational factor "facilitated travel & tourism" is based on the maximum number of variables related to the help of ATs in travelling and tourism. The AT support theme of helping the PWD during travel and tourism activities is closely related to this factor.

Factor 2: The 2<sup>nd</sup> motivational factor "cost effectiveness" includes the variables related to the appropriate costs of ATs used for travel and tourism. The AT support theme of helping the PWD at affordable prices is closely related to this factor.

Factor 3: The 3<sup>rd</sup> motivational factor “easier communication” is related to the variables about improved opportunities of communication and interaction with other people through the use of ATs during travel and tourism. The AT support theme of accessible tourism by improved communication through the use of ATs is relevant to this factor.

#### **Table 1: EFA for Travel and Tourism Motivators using ATs**

Factor 4: The 4<sup>th</sup> motivational factor named “needs compatibility” is based on variables related to the functions of the ATs and their compatibility with the needs of the PWD. The AT support theme of customer requirements matching is closely related to this factor.

For this group the factor “facilitated travel & tourism” has the highest average mean score of 3.60, which shows this factor as the major motivator for AT assisted travel and tourism for the PWD. Table 2 shows the EFA2 results for achievement factors. These factors are based on the survey variables related to the achievements of the PWD gained through AT assisted travel and tourism. The EFA2 results in three factors:

Factor 1: The 1<sup>st</sup> achievements factor named as “improved achievements” contains four variables. The AT support theme of feeling something accomplished through the use of ATs is closely related to the 1<sup>st</sup> factor.

#### **Table 2: EFA Travel and Tourism Achievements using ATs**

Factor 2: The 2<sup>nd</sup> achievements factor “improved independence” is associated with the outputs of the AT usage for travel and tourism in the form of improved independence for the users. The AT support theme of increased independence is relevant to this factor.

Factor 3: The 3<sup>rd</sup> achievements factor named as “improved safety” is related to feeling secure during travel and tourism through AT assistance. The theme that AT support enhances the safety of PWD is closely relevant to this factor.

For this group the factor “improved achievements” presents the highest mean average score of 3.57, which indicates that the sense of feeling something accomplished, is the prominent achievement from the AT assisted travel and tourism.

## **4.2 Correlation Analysis for AT Motivators and Achievements**

In addition to EFA, this study also tried to examining the relationships between the motivators and achievements for the PWD who use AT assistance in travel and tourism activities. The CCA was applied on the survey data to deeply understand the relationships between what motivations resulted in what specific achievements. The CCA is a “technique for finding the correlations between one set of variables (multiple dependent variables) and a second set of variables (multiple independent variables)” (Christensen, 1983). This method is usually applied to analyse the degree of independent dimensions of the relationship between the two variable sets. The 1<sup>st</sup> portion of table 3 presents four multivariate tests to estimate either the model is statistical significant or not. In all these tests, the Wilk's lambda ( $\lambda$ ) is frequently used because it has the tendency of the maximum universal applicability. The results show that all tests are statistically significant with  $p < .05$ . Therefore, the overall canonical model is statistically significant for this study.

### **Table 3: Statistical Significance Tests for the Full CCA Model**

#### **4.2.1 Canonical Correlations for Each Function Separately**

Table 4 presents each canonical root or function separately along its canonical correlation and

eigenvalues. There are many ways to combine independent and dependent variables for making functions based on the variables in the sets. The popular canonical loadings are used for interpreting the canonical variates meanings. The variables having (canonical loadings  $> .32$ ) are used for the variates interpretation (Lee & Comrey, 1992). The 1<sup>st</sup> canonical function is selected to maximize the relationships between the two synthetic variables and it always has the largest value. Similarly, the next canonical function is created to maximize another association between two other synthetic variables (under the condition that these variables must be perfectly uncorrelated with all other proceeding variables) by using the remaining variance. This procedure continued until the functions are uncorrelated. We came up with 12 canonical functions in the output but we kept only four of them as these functions explain enough variance between the variables and are uncorrelated as shown in table 4.

#### **Table 4: Eigenvalues and Canonical Correlations**

The 1<sup>st</sup> column indicates the rank of eigenvalues (largest to smallest). The 2<sup>nd</sup> column shows the eigenvalues. The 3<sup>rd</sup> and 4<sup>th</sup> columns indicate the percentage and cumulative sum of percentage of the eigenvalues respectively. The 5<sup>th</sup> column presents the canonical correlation of the pairs of canonical variates. The first pair of the variates is the linear combination of the tourism ‘motivational’ measurements and the linear combination of tourism ‘achievements’ measurements. All values of the correlation coefficients show that both measurements have positive correlation between the pairs. The last column shows the squared correlation (percentage of variability in all dependent variables that can be explained by all the independent variables). These four functions explained 60.8%, 23%, 18.7% and 13.9% variance within their functions respectively. The remaining functions were discarded as each of them explained tiny variability within their functions.

#### **4.2.2 Hierarchal Statistical Significance Tests**

In this section we test the significance of each canonical function by testing whether each dependent variable is significantly related to the independent variable. Table 5 presents dimension reduction analysis through the hierarchal statistical significance tests.

#### **Table 5: Dimension Reduction Analysis**

The 1<sup>st</sup> column shows different sets of roots which help to describe the relationship between two sets of variables for determining the required number of dimensions. The 1<sup>st</sup> function contains full set of roots (1 to 12), then this procedure continues to test subgroups created by neglecting the extreme root in the preceding group. Firstly all roots are tested, and then 2 to 12 roots and so forth, until the last root tested itself. Only those roots that show significant results are considered for this study. The roots 1 to 12 are statistically significant with  $p < .05$  as we already identified. Similarly, the effects of roots 2 to 12 (eliminate the 1<sup>st</sup> root), 3 to 12 (eliminate the 1<sup>st</sup> and 2<sup>nd</sup> roots) and 4 to 12 (eliminate the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> roots) also show statistical significant. The remaining roots don't show statistically significant effect as  $p \geq .05$ .

#### **4.2.3 Canonical Solution for all Functions for Dependent and Independent Variable Sets**

Table 6 presents the standardized canonical coefficients (i.e. weights) for each canonical variate across all four functions for both dependent and independent variable sets.

The size of the coefficients denotes their comparative contribution towards the variate. The larger weights of the variables show the more influence on the dependent or independent variates. Similarly, the positive and negative signs of the weights show direct and inverse relationship with each other respectively.

The canonical weights for the dependent variable show that ‘improved achievement through AT’ significantly contributes to functions 1 and 4. The ‘help in decreasing fear of loss’ and ‘help to meet the needs’ are more prompting variables towards functions 2 and 3 respectively. Similarly, the 2<sup>nd</sup> part of table 6 shows the output of predictor variables on all functions. The results indicate that ‘more communication opportunities’ have primary contribution for the canonical functions 1 and 4. The ‘AT functions as claimed by the manufacturer’ and ‘help in interaction with other people’ are major contributors for functions 2 and 3 respectively.

#### **Table 6: Canonical Weights for all Canonical Functions**

Table 7 illustrates the canonical loadings that measure simple linear correlation between canonical variates and the variables in dependent and independent set for all functions. For evaluating the comparative role of individual variable to each canonical function, these loadings indicate the variance that the variable (either independent or dependent) shares by the canonical variates. Similarly to the canonical weights, the larger value of the coefficient has more importance in deriving the canonical variate.

#### **Table 7: Canonical Structure for all Canonical Functions**

The ‘improved achievement through AT’ reflects the largest correlation for maximizing the variates of functions 1 and 4. The ‘help in decreasing fear of loss’ and ‘helps to meet the needs’ indicates high degree of inter-correlation between the variables for functions 2 and 3 respectively. Similarly, the 2<sup>nd</sup> part of the table shows the canonical loadings for predictor variables on all functions. Here the highest loadings on the independent variate are ‘more communication opportunities’ for functions 1 and 4, whereas ‘AT functions as claimed by the manufacturer’ and ‘help in interaction with other people’ have largest correlation value for functions 2 and 3 respectively. All the variables with high shared variance



and having largest inter-correlation among them demonstrate the importance of travel and tourism achievements and motivations using AT support.

### **4.3 Discussion**

This study is distinctive as it treated the PWD as unique population for AT assisted travel and tourism. As evident from literature this distinct population requires more attention and easy to use AT functionalities, which makes this population different from the typical AT users. Moreover the motivations of the PWD for AT assisted travel and tourism and their resulting impacts are worth investigating. This research further argues that the requirements of the PWD should be considered while developing AT for this population as studies based on general population cannot yield the original requirements of the PWD. The empirical nature of this study gives better insights into the needs, expectations, experiences and impacts of AT assisted travel and tourism for the target population.

As literature lacks theoretical and practical support regarding AT assisted travel and tourism specifically for the PWD, the findings of this research add values to the present literature. These findings also present the first step for the development of a framework related to the motivations and achievements factors for AT assisted travel and tourism. The linkage between motivations and achievements has both conceptual and theoretical implications.

#### **4.3.1 AT Assisted Travel and Tourism Motivations**

The AT assisted travel and tourism motivations are basically the driving factors that are internally oriented and drive the PWD to use ATs. The statistical results revealed four motivational dimensions among the PWD. Basically these motivations uncover the level of needs of the PWD as depicted in figure 3. The 'facilitated travel and tourism' (order based on factor mean values) appeared as the main motivation as ATs offer various facilities to them for the travel and tourism activities. In figure 3 the

inner layer indicates more importance and outer later least importance in shaping the overall results. These facilities include (order based on mean values of each variable) ‘help during travel’, ‘mobility support’, ‘tourism activities’, ‘selection of tourist attraction’ and ‘managing leisure activities’. The upper variable and the bottom variable show most and least importance respectively in shaping the overall results.

The 2<sup>nd</sup> level of motivation ‘easier communication’ is linked to the ease and frequency of communication offered by the ATs for them for planning and during travel and tourism activities. These opportunities include ‘more communication opportunities’, ‘understanding different cultures through communication’, ‘develop social networks’ and ‘help in interaction with other people’.

### **Figure 3: The Layered Depiction of the PWD Needs for the AT Assisted Travel and Tourism**

The next level of motivation is concerned with ‘needs compatibility’ that focuses on the compatibility of the ATs with the needs and requirements of the PWD, which is very important for the success and retentions of those ATs in use. This level is based on variables like ‘the AT functions as claimed by the manufacturer’, ‘the AT is adaptable to my personality’ and ‘the AT is adaptable to my life style’.

The 4<sup>th</sup> motivation level is related to ‘cost effectiveness’ which means the ATs should provide travel and tourism support at reasonable and affordable prices. This level revolves around the variables ‘the AT is dependable’, ‘warranties with the AT’, ‘easy to handle AT maintenance’ and ‘the price and maintenance is affordable’.

#### **4.3.2 AT Assisted Travel and Tourism Achievements**

The achievements are linked to the outcomes, improvements and benefits of using AT support for travel and tourism activities. The results of this study indicate that there are lot of positive effects of AT assisted travel and tourism for the PWD which can resultantly help them in overcoming their limitations

and increase the feeling independence. The results further revealed three achievement dimensions for the PWD as depicted in figure 4. Expending on the same criteria used for the motivational dimensions the ‘improved achievements’ emerged as the top dimension for this section, which focuses on the accomplishments of the PWD through the use of ATs. The achievements of the PWD increased due to ‘the AT helps to meet their needs’, ‘improved successes through AT use’, ‘the interface effectiveness of the AT’ and ‘decreased complexity of tasks’.

The 2<sup>nd</sup> level of achievements belongs to ‘improved independence’ which indicate that the use of ATs for the travel and tourism activities enhances the independence of the PWD as they don’t have to rely so much on the external help. The contribution of different variables towards improved independence is based on the ‘help to get formal support through interaction with others’, ‘environmental control’, and ‘sensorial support’, ‘reduced dependence’ and ‘doing daily activities independently without external physical support’.

The 3<sup>rd</sup> achievements level is related to the feeling of ‘improved safety’ through the use of ATs. This level indicates that the PWD feel safer and secure while travelling for tourism activities when they use ATs for this purpose. The contributing variables for this factor are the ‘improved sense of security’, ‘help to decrease fear of loss’, ‘sense of feeling safer in carrying out routine activities’ and ‘the appropriate safety measures’ offered by the ATs.

#### **Figure 4: The AT Assisted Achievements and Their Impact of Rehabilitation**

AT travel and tourism help is highlighted as important service for the PWD by many researchers (Page et al., 2014) (Innes et al., 2015). The achievement outcomes through the use of ATs in travel and tourism increase the confidence, self-esteem and sense of belonging for the PWD. All the facets lead towards better rehabilitation opportunities for the PWD as they feel themselves to be part of the society.

The results are well supported by literature as well as research shows that physical support provided by ATs has great contribution towards rehabilitation of the PWD with disabilities (Martins et al., 2012).

Psychological support is another important area of AT assistance for the PWD by helping them psychologically through increasing their self-esteem and confidence (Henderson, Mack, & Williams, 1989). According to (Torrington, 2009), the psychological support plays an important role in perusing the PWD to use ATs for performing different activities which otherwise they are reluctant to perform.

The AT assistance in travel and tourism contributes to the wellbeing of the PWD (McCabe & Innes, 2013) (Cortés et al., 2008). Resultantly active participation in these activities along with timely medication and better eating would help in their rehabilitation and in adopting a healthy life style (Kamel Boulos et al., 2009). Therefore we conclude that AT assisted travel and tourism contribute towards the rehabilitation and independent living of the PWD.

## **5. Implications**

This study provides finer empirical understanding of the needs, motivations and achievements of the PWD who use ATs for travel and tourism. The research leading to this study suggests that the PWD should be studied as a distinct group for the travel and tourism market. It is also evident that the people aged 55 and above are the fastest growing group of travellers and tourists, therefore this distinct group of the PWD can contribute significantly to the further success of travel and tourism market (Cook et al., 2006). Since this group has different motivations and accessibility needs, their travel and tourism related behaviours might also differ from the people not identified as having dementia. Therefore tourism managers need to further to understand the PWD attitudes, behaviour and psychology which would benefit the tourism industry by generating new ideas for promotion of their business.

The AT facilitated travel & tourism, AT cost effectiveness, AT supported easier communication and needs compatibility are identified as motivational factors the PWD should be focused during the

development of PWD specific ATs. These factors will allow the PWD to better plan their travel and tourism activities without the help of their caregivers or family members. The ATs provide communication and socialization opportunities for the PWD as well, which will help them to eliminate the feeling of social isolation from rest of the community (Gössling, Cohen, & Hibbert, 2016).

Additionally this research points out that AT supported travel and tourism results into sense of improved achievements, improved independence and improved safety on the part of the PWD. Resultantly they feel more motivated to do activities which otherwise they might be reluctant to perform. The sense of safety, independence and achievements impact the PWD psychologically and would help them towards rehabilitation. The results of this study potentially offer the tourism industry better means to understand the needs of the PWD for AT supported travel and tourism to improve their business. The AT supported travel and tourism is economically efficient, as it saves the costs of caregivers and other human resources. Despite so many benefits the research on AT supported travel and tourism is still primitive and needs more efforts from the academic researchers and professionals.

### **5.1 Impact and Limitations of the Study**

The current study presents a user centric approach to investigate the usability of ATs in travel and tourism by involving the PWD. The questionnaire based survey explored factors impacting the usability of ATs. The study also explored the motivations and relevant achievements of the PWD through AT assisted travel and tourism. Such assistance can contribute towards their safety, independence and rehabilitation.

This study also has some associated limitations with it. The results are based on a single survey conducted with 327 participants, in future there is need of more such surveys in different environments and regions. This study only targeted the people with mild dementia. This study only highlights the point

of view of the PWD who use ATs. There is need of including the PWD who don't use ATs in future surveys as well.

## **6. Conclusion and Future Work**

Due to aging, the number of the PWD travelling for the tourism activities is expected to rise. Given the importance of travel and tourism as healthy activities for the PWD and their desire to go for such activities, there is a need to understand the usability of AT assisted travel and tourism for them. Therefore this research was conducted to explore important factors for AT support in this domain. The questionnaire based quantitative method was used for data collection from the 327 PWD.

The statistical results indicate that the PWD feel happy when they get travel and tourism support through the use of ATs without depending on external help. Additionally the PWD can choose tourism activities, attractions and leisure management through the assistance of the ATs. The AT support in travel and tourism helps to improve the confidence and self-esteem of the PWD. Such support increases their motivation for living independently and enhances their chances to stay longer at their homes rather than shifting to care homes.

The future work should include the repetition of such surveys in different countries with the focus on the similar population. In future we are planned to conduct case studies with the PWD by providing them ATs and asking them to perform travel and tourism activities independently.

The tourism managers can use the knowledge gained through this study for knowing the needs of the PWD for independent travel and tourism. This knowledge will help them during policy making for removing the barriers related to free travel and tourism for the PWD.

## References

- Asghar, I., Cang, S., & Yu, H. (2015). *A systematic mapping study on assistive technologies for people with dementia*. Paper presented at the 2015 9th International Conference on Software, Knowledge, Information Management and Applications (SKIMA).
- Ayalon, H. (2003). Women and men go to university: Mathematical background and gender differences in choice of field in higher education. *Sex Roles, 48*(5-6), 277-290.
- Berger, K. W. (1976). Early bone conduction hearing aid devices. *Archives of Otolaryngology, 102*(5), 315-318.
- Boman, I.-L., Lundberg, S., Starkhammar, S., & Nygård, L. (2014). Exploring the usability of a videophone mock-up for persons with dementia and their significant others. *BMC geriatrics, 14*(1), 49.
- Christensen, J. E. (1983). An exposition of canonical correlation in leisure research. *Journal of Leisure Research, 15*(4), 311.
- Cire, B. (2015, 27-October-2015). Health care costs for dementia found greater than for any other disease, from <https://www.nia.nih.gov/newsroom/2015/10/health-care-costs-dementia-found-greater-any-other-disease>
- Cliff, N. (1988). The eigenvalues-greater-than-one rule and the reliability of components. *Psychological bulletin, 103*(2), 276.
- Cook, R. A., Yule, L. J., Marqua, J. J., Van Harssel, J. H., & Gentile, M. (2006). *Tourism: The business of travel*: Pearson Prentice Hall.
- Cortés, U., Martínez-Velasco, A., Barrué, C., Martín, E., Campana, F., Annicchiarico, R., & Caltagirone, C. (2008). *Towards an Intelligent Service to Elders Mobility Using the i-Walker*. Paper presented at the AAAI Fall Symposium: AI in Eldercare: New Solutions to Old Problems.
- Daniels, M. J., Rodgers, E. B. D., & Wiggins, B. P. (2005). "Travel Tales": an interpretive analysis of constraints and negotiations to pleasure travel as experienced by persons with physical disabilities. *Tourism Management, 26*(6), 919-930.
- Diekmann, A., & McCabe, S. (2011). Systems of social tourism in the European Union: A critical review. *Current Issues in Tourism, 14*(5), 417-430.
- Donnelly, M., Nugent, C., McClean, S., Scotney, B., Mason, S., Passmore, P., & Craig, D. (2010). A mobile multimedia technology to aid those with Alzheimer's disease. *IEEE multimedia, 2*(17), 42-51.
- Dunteman, G. H. (1989). Principal component analysis. Quantitative applications in the social sciences series (vol. 69): Thousand Oaks, CA: Sage Publications.
- Enable, U. (2006). *Convention on the Rights of Persons with Disabilities*. Paper presented at the by United Nations, United Nations, available at: [www.un.org/disabilities/documents/convention/convoptprot.pdf](http://www.un.org/disabilities/documents/convention/convoptprot.pdf) (accessed 17 January 2013).
- Fardoun, H. M., Mashat, A. A., & Ramirez Castillo, J. (2015). Recognition of familiar people with a mobile cloud architecture for Alzheimer patients. *Disability and rehabilitation, 1-5*.
- Franca, A. C. C., & da Silva, F. Q. (2009). *An empirical study on software engineers motivational factors*. Paper presented at the Proceedings of the 2009 3rd International Symposium on Empirical Software Engineering and Measurement.
- Gössling, S., Cohen, S. A., & Hibbert, J. F. (2016). Tourism as connectedness. *Current Issues in Tourism, 1-15*.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006a). *Multivariate data analysis* (Vol. 6): Pearson Prentice Hall Upper Saddle River, NJ.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006b). *Multivariate data analysis 6th Edition*. New Jersey: Pearson Education.
- Henderson, V. W., Mack, W., & Williams, B. W. (1989). Spatial disorientation in Alzheimer's disease. *Archives of neurology, 46*(4), 391-394.
- Heward, M., Innes, A., Cutler, C., & Hambidge, S. (2016). Dementia - friendly communities: challenges and strategies for achieving stakeholder involvement. *Health & Social Care in the Community*.
- Hinton, P. R., McMurray, I., & Brownlow, C. (2014). *SPSS explained*: Routledge.
- Huh, C., & Singh, A. (2007). Families travelling with a disabled member: Analysing the potential of an emerging niche market segment. *Tourism and Hospitality Research, 7*(3-4), 212-229.
- Hunter, L., & Leahey, E. (2008). Collaborative research in sociology: Trends and contributing factors. *The American Sociologist, 39*(4), 290-306.
- Imbeault, H., Bier, N., Pigot, H., Gagnon, L., Marcotte, N., Fulop, T., & Giroux, S. (2014). Electronic organiser and Alzheimer's disease: Fact or fiction? *Neuropsychological rehabilitation, 24*(1), 71-100.
- Innes, A., & Director, B. (2013). Working Towards Dementia Friendly Societies. *Perspectives in public health, 133*(3), 141.
- Innes, A., Page, S. J., & Cutler, C. (2015). Barriers to leisure participation for people with dementia and their carers: An exploratory analysis of carer and people with dementia's experiences. *Dementia, 14*71301215570346.
- Jedloo, S., Witte, L. D., Linssen, B., & Schrijvers, A. (2002). Client satisfaction with service delivery of assistive technology for outdoor mobility. *Disability and Rehabilitation, 24*(10), 550-557.

- Jung, I. (2011). The dimensions of e-learning quality: from the learner's perspective. *Educational Technology Research and Development*, 59(4), 445-464.
- Kamel Boulos, M. N., Lou, R. C., Anastasiou, A., Nugent, C. D., Alexandersson, J., Zimmermann, G., . . . Casas, R. (2009). Connectivity for healthcare and well-being management: examples from six European projects. *International journal of environmental research and public health*, 6(7), 1947-1971.
- Kim, S., & Lehto, X. Y. (2013). Travel by families with children possessing disabilities: Motives and activities. *Tourism Management*, 37, 13-24.
- Lee, H., & Comrey, A. (1992). A first course in factor analysis: Hillsdale, NJ: Erlbaum.
- Losada, N., Alén, E., Domínguez, T., & Nicolau, J. L. (2016). Travel frequency of seniors tourists. *Tourism Management*, 53, 88-95.
- Lovelock, B. A. (2010). Planes, trains and wheelchairs in the bush: Attitudes of people with mobility-disabilities to enhanced motorised access in remote natural settings. *Tourism Management*, 31(3), 357-366.
- Mahoney, D. F., Purtilo, R. B., Webbe, F. M., Alwan, M., Bharucha, A. J., Adlam, T. D., . . . Becker, S. A. (2007). In-home monitoring of persons with dementia: Ethical guidelines for technology research and development. *Alzheimer's & Dementia*, 3(3), 217-226.
- Martins, M. M., Santos, C. P., Frizera-Neto, A., & Ceres, R. (2012). Assistive mobility devices focusing on Smart Walkers: Classification and review. *Robotics and Autonomous Systems*, 60(4), 548-562.
- McCabe, L., & Innes, A. (2013). Supporting safe walking for people with dementia: User participation in the development of new technology. *Gerontechnology*, 12(1), 4-15.
- McConkey, R., & Adams, L. (2000). Matching short break services for children with learning disabilities to family needs and preferences. *Child: care, health and development*, 26(5), 429-444.
- McKercher, B., Packer, T., Yau, M. K., & Lam, P. (2003). Travel agents as facilitators or inhibitors of travel: perceptions of people with disabilities. *Tourism Management*, 24(4), 465-474.
- Meiland, F., Hattink, B., Overmars-Marx, T., De Boer, M., Jedlitschka, A., Ebben, P., . . . Karkowski, I. (2014). Participation of end users in the design of assistive technology for people with mild to severe cognitive problems; the European Rosetta project. *International Psychogeriatrics*, 26(05), 769-779.
- Norris, M., & Lecavalier, L. (2010). Evaluating the use of exploratory factor analysis in developmental disability psychological research. *Journal of autism and developmental disorders*, 40(1), 8-20.
- Page, S. J., Innis, A., & Cutler, C. (2014). Developing Dementia-Friendly Tourism Destinations: An Exploratory Analysis. *Journal of Travel Research*, 0047287514522881.
- Peters, C., Hermann, T., Wachsmuth, S., & Hoey, J. (2014). Automatic Task Assistance for People with Cognitive Disabilities in Brushing Teeth-A User Study with the TEBRA System. *ACM Transactions on Accessible Computing (TACCESS)*, 5(4), 10.
- Pratchett, T. (2015). A global assessment of dementia, now and in the future. *The Lancet Neurology*, 14, 691.
- Rowe, M. A., Kelly, A., Horne, C., Lane, S., Campbell, J., Lehman, B., . . . Benito, A. P. (2009). Reducing dangerous nighttime events in persons with dementia by using a nighttime monitoring system. *Alzheimer's & dementia*, 5(5), 419-426.
- Rumetshofer, H., & Wöß, W. (2004). *Tourism information systems promoting barrier-free tourism for people with disabilities*. Paper presented at the International Conference on Computers for Handicapped Persons.
- Seelye, A. M., Schmitter-Edgecombe, M., Das, B., & Cook, D. J. (2012). Application of cognitive rehabilitation theory to the development of smart prompting technologies. *Biomedical Engineering, IEEE Reviews in*, 5, 29-44.
- Shaw, G., & Coles, T. (2004). Disability, holiday making and the tourism industry in the UK: a preliminary survey. *Tourism Management*, 25(3), 397-403.
- Shi, L., Cole, S., & Chancellor, H. C. (2012). Understanding leisure travel motivations of travelers with acquired mobility impairments. *Tourism Management*, 33(1), 228-231.
- Small, J., Darcy, S., & Packer, T. (2012). The embodied tourist experiences of people with vision impairment: Management implications beyond the visual gaze. *Tourism Management*, 33(4), 941-950.
- Span, M., Hettinga, M., Vernooij-Dassen, M., Eefsting, J., & Smits, C. (2013). Involving people with dementia in the development of supportive IT applications: A systematic review. *Ageing research reviews*, 12(2), 535-551.
- Tchalla, A. E., Lachal, F., Cardinaud, N., Saulnier, I., Bhalla, D., Roquejoffre, A., . . . Dantoine, T. (2012). Efficacy of simple home-based technologies combined with a monitoring assistive center in decreasing falls in a frail elderly population (results of the Esoppe study). *Archives of gerontology and geriatrics*, 55(3), 683-689.
- Torrington, J. (2009). The design of technology and environments to support enjoyable activity for people with dementia. *ALTER-European Journal of Disability Research/Revue Européenne de Recherche sur le Handicap*, 3(2), 123-137.
- UNWTO. (2016). UNWTO Tourism Highlights 2016. from [www.unwto.org](http://www.unwto.org)



- Vila, T. D., Darcy, S., & González, E. A. (2015). Competing for the disability tourism market—a comparative exploration of the factors of accessible tourism competitiveness in Spain and Australia. *Tourism Management, 47*, 261-272.
- Wall, M., & Duffy, A. (2010). The effects of music therapy for older people with dementia. *British Journal of Nursing, 19*(2), 108-113.
- Williams, R., Rattray, R., & Grimes, A. (2006). Meeting the on - line needs of disabled tourists: an assessment of UK - based hotel websites. *International Journal of Tourism Research, 8*(1), 59-73.

## Tables

Table 1: EFA for Travel and Tourism Motivators using ATs

Factor	Factor Loading	Mean	Eigen Value	Variance Explained %
<i>Facilitated Travel &amp; Tourism</i>		3.60	3.545	17.453
Useful for selecting tourist attractions	0.762	3.56		
Helpful during travelling	0.643	3.69		
Useful for tourism activities	0.627	3.61		
Manages leisure activities	0.610	3.49		
Improved mobility support	0.540	3.67		
<i>Cost Effectiveness</i>		3.25	2.736	14.289
Warranties with the AT	0.725	3.34		
The price and maintenance is affordable	0.701	3.05		
Easy to handle AT maintenance	0.576	3.22		
The AT is dependable	0.524	3.39		
<i>Easier Communication</i>		3.51	1.897	11.191
More communication opportunities	0.712	3.76		
Helps in interaction with other people	0.672	3.45		
Develop social networks	0.609	3.26		
Helps to understand different cultures through communication	0.567	3.57		
<i>Needs Compatibility</i>		3.47	2.344	9.127
The AT functions as claimed by the manufacturer	0.742	3.71		
The AT is adaptable to my personality	0.698	3.48		
The AT is adaptable to my life style	0.632	3.23		
Total variance explained				52.060%

Table 2: EFA Travel and Tourism Achievements using ATs

Factor	Factor Loading	Mean	Eigen Value	Variance Explained%
<i>Improved Achievements</i>		3.57	2.756	19.673
Improved achievements through AT	0.743	3.65		
The AT helps to meet my needs	0.644	3.66		
The interface of the AT is effective	0.464	3.57		
Decreased complexity of tasks	0.458	3.41		
<i>Improved Independence</i>		3.44	2.434	16.916
Daily activities independently without external physical support	0.654	3.38		
Provides sensorial support	0.621	3.45		
Provides environmental control	0.608	3.47		
Helps in reduced dependence	0.466	3.40		
Helps get formal support through interaction with others	0.417	3.52		
<i>Improved Safety</i>		3.41	1.912	12.137
Improved sense of security	0.725	3.49		
I feel safer in carrying out routine activities	0.623	3.41		
Helps to decrease fear of loss	0.598	3.43		
The AT considers appropriate safety measures	0.559	3.29		
Total variance explained				48.726%

Table 3: Statistical Significance Tests for the Full CCA Model

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sig.
Pillai's	1.4973	2.76217	192	3720	.000
Hotelling's	2.59937	4.02315	192	3566	.000
Wilk's	0.14956	3.29921	192	2914.1	.000
Roy's	0.60785				

Table 4: Eigenvalues and Canonical Correlations

Root No.	Eigenvalue	%	Cumulative %	Canonical Correlation	Squared Correlation
1	1.55008	59.63284	59.63284	0.77965	0.60785
2	0.29927	11.51325	71.1461	0.47994	0.23034
3	0.22948	8.82833	79.97443	0.43203	0.18665
4	0.16212	6.23707	86.2115	0.37351	0.13951

Table 5: Dimension Reduction Analysis

Roots	Wilks L.	F	Hypoth. DF	Error DF	Sig.
1 to 12	0.14956	3.29921	192	2914.1	.000
2 to 12	0.38138	1.86537	165	2701.63	.000
3 to 12	0.49551	1.58706	140	2487.2	.000
4 to 12	0.60922	1.33043	117	2270.58	.012

Table 6: Canonical Weights for all Canonical Functions

<i>Standardized canonical coefficients for the dependent variables</i>	Canonical Weights			
	1	2	3	4
Improved achievements through AT	0.2882	-0.1954	-0.2029	0.6169
The AT helps to meet my needs	0.1639	0.2447	0.8603	-0.1708
The interface of the AT is effective	0.1807	-0.4250	-0.1620	-0.0512
Decreased complexity of tasks	0.1294	-0.4142	-0.0030	0.0713
Daily activities independently without external physical support	0.0748	-0.2266	-0.1848	-0.4669
Provides sensorial support	0.0854	0.2882	-0.3469	0.1468
Provides environmental control	0.0189	-0.2610	-0.3782	-0.5296
Helps in reduced dependence	0.1368	-0.0465	-0.0895	0.4524
Helps get formal support through interaction with others	0.1335	-0.0314	0.2531	-0.2965
Improved sense of security	0.1210	0.0104	0.0627	-0.1101
I feel safer in carrying out routine activities	0.1905	0.4414	0.1505	-0.2216
Helps to decrease fear of loss	0.2398	0.7181	-0.3319	0.1527
<i>Standardized canonical coefficients for the independent variables</i>				
Useful for selecting tourist attractions	0.0390	-0.4539	-0.1832	-0.0912
Helpful during travelling	-0.0428	0.1354	0.4955	-0.0730
Useful for tourism activities	0.1200	0.0242	-0.1674	0.1671
Manages leisure activities	0.1672	0.3648	0.1664	-0.1978
Improved mobility support	0.1992	-0.2154	-0.3252	0.3211
Warranties with the AT	0.1542	0.2861	0.1082	0.1775
The price and maintenance is affordable	0.0776	-0.1859	-0.1956	-0.2381
Easy to handle AT maintenance	0.1050	0.1897	-0.2288	0.0187
The AT is dependable	0.1684	0.1199	0.0850	-0.2501
More communication opportunities	0.2328	-0.2782	0.1968	0.5358
Helps in interaction with other people	0.1153	-0.2588	0.6075	-0.5579
Develop social networks	0.1555	0.1076	-0.3320	0.2252
Helps to understand different cultures through communication	0.1105	-0.0419	-0.3187	-0.6354
The AT functions as claimed by the manufacturer	0.1814	0.6354	-0.0788	0.0743
The AT is adaptable to my personality	0.1107	0.0034	0.3761	0.0835
The AT is adaptable to my life style	0.0315	-0.4098	-0.2914	-0.0806

Table 7: Canonical Structure for all Canonical Functions

Correlations between the dependent variables and their canonical variates	Canonical Loadings			
	1	2	3	4
Improved achievements through AT	0.7264	-0.2253	0.0616	0.3604
The AT helps to meet my needs	0.6607	0.0343	0.5039	-0.0419
The interface of the AT is effective	0.6511	-0.3300	-0.1544	0.0590
Decreased complexity of tasks	0.5602	-0.3575	0.1248	0.0765
Daily activities independently without external physical support	0.4240	-0.1712	-0.1846	-0.4662
Provides sensorial support	0.3601	0.1579	-0.4158	-0.0167
Provides environmental control	0.3590	-0.1114	-0.4348	-0.5022
Helps in reduced dependence	0.5316	-0.1084	-0.1389	0.2439
Helps get formal support through interaction with others	0.5264	-0.0810	0.1557	-0.3537
Improved sense of security	0.4297	-0.0089	0.1012	-0.1361
I feel safer in carrying out routine activities	0.5511	0.3143	0.2196	-0.2425
Helps to decrease fear of loss	0.5133	0.5566	-0.3624	0.0198
Correlations between the independent variables and their canonical variates				
Useful for selecting tourist attractions	0.4403	-0.2997	-0.0109	0.0082
Helpful during travelling	0.4241	0.0018	0.3709	0.0090
Useful for tourism activities	0.5430	-0.0533	0.0152	0.1060
Manages leisure activities	0.4768	0.1792	0.1314	-0.1658
Improved mobility support	0.5944	-0.2066	-0.2541	0.2201
Warranties with the AT	0.5396	0.1938	0.0350	0.0526
The price and maintenance is affordable	0.4922	0.0129	-0.2410	-0.2402
Easy to handle AT maintenance	0.4551	0.2252	-0.2382	-0.1311
The AT is dependable	0.4874	0.1575	0.0479	-0.2683
More communication opportunities	0.6483	-0.2910	0.2439	0.3873
Helps in interaction with other people	0.5374	-0.1927	0.5508	-0.1945
Develop social networks	0.5706	0.0161	0.0016	0.1975
Helps to understand different cultures through communication	0.3122	-0.1248	-0.3813	-0.6009
The AT functions as claimed by the manufacturer	0.4885	0.5028	-0.0735	0.1314
The AT is adaptable to my personality	0.4431	-0.2484	0.1216	-0.1144
The AT is adaptable to my life style	0.4025	-0.4493	-0.1634	-0.0805

Figures

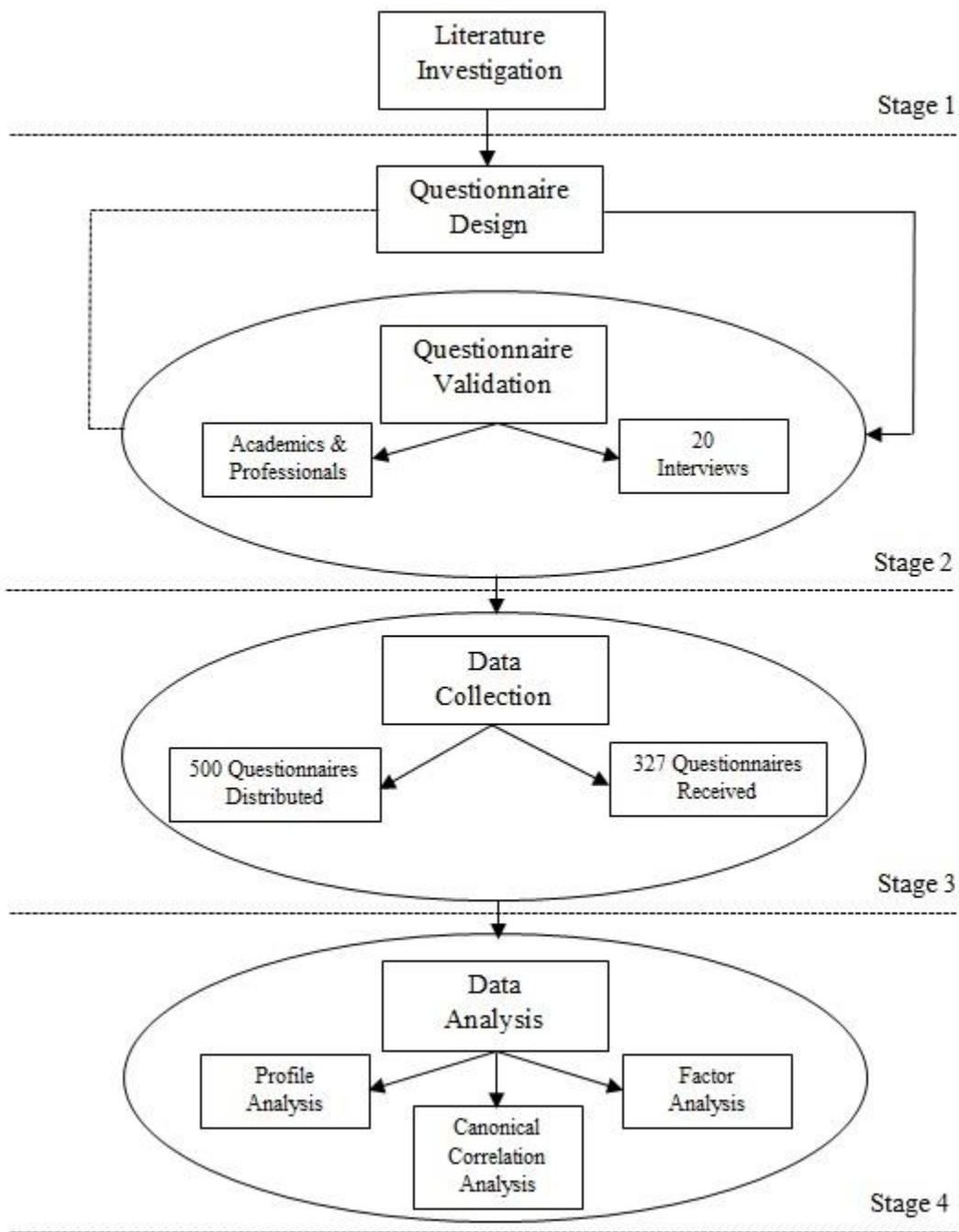


Figure 1: Research Process Used Throughout the Study

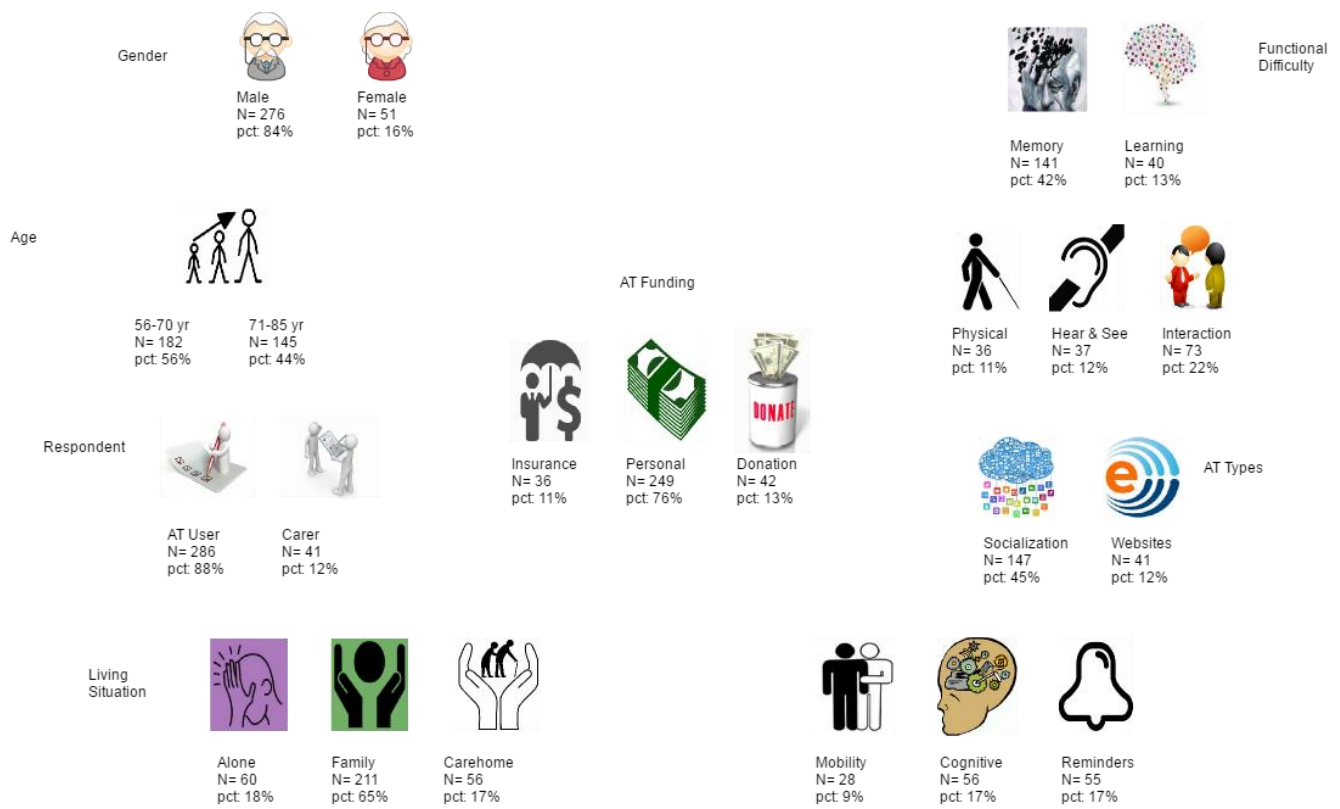


Figure 2: Profiling Information of the Survey Participants

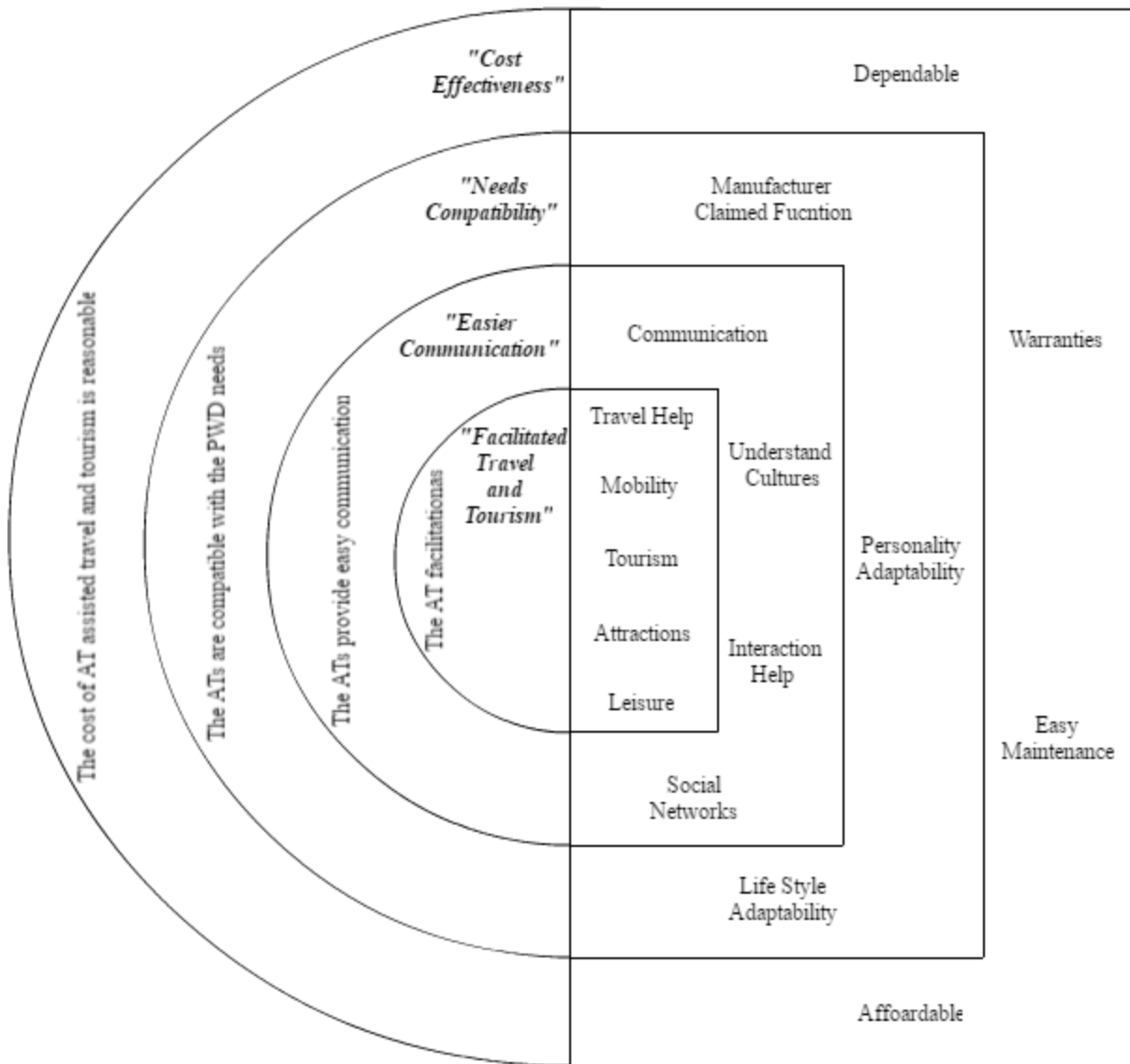


Figure 3: The Layered Depiction of the PWD Needs for the AT Assisted Travel and Tourism



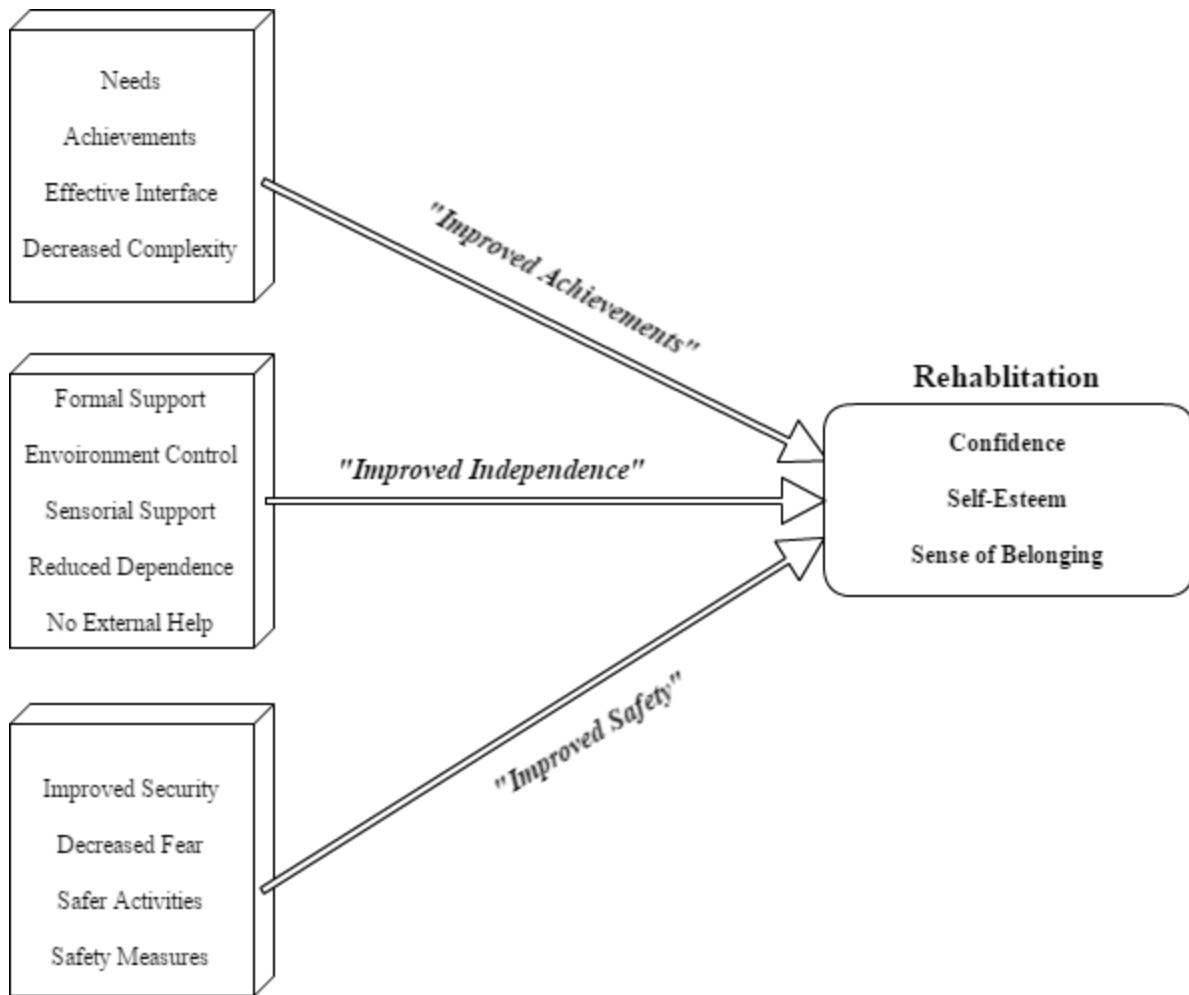


Figure 4: The AT Assisted Achievements and Their Impact of Rehabilitation