Assistive computer technology used by children with physical disability in educational settings: Perceptions regarding the service delivery process

By Pauline Cassar

Abstract

For children with physical disabilities, the utilisation of assistive computer technology has the potential to facilitate meaningful achievements, thus proving to be the turning point in determining a child's productive and independent living. Assistive computer technology has played a major role in compensating for the physical impairments experienced by physically disabled children in various life situations and contexts, thus promoting successful accomplishment in children's typical occupations and developments. Nevertheless, research literature has identified that a number of fundamental elements inherent in the service delivery process, need to be implemented in order to ensure the successful application and integration of technology in the child's life. Hence, this ultimately results in generating substantial improvements in the general quality of life. *OBJECTIVE:* This qualitative research set out to explore the local service delivery process which determines the assistive computer technology needs of physically disabled children. This research study will therefore evaluate the personal experiences of individuals who have undertaken the procedure, to shed light on the resultant benefits and gaps present in the current service being delivered locally.

The following research questions were required to answer to reach the study's aim:
1. What is the process that is currently being followed locally, which provides children with physical disability the required adaptations to computers used in educational facilities?
2. What are the perceptions regarding this service, of professional and non-professional individuals, who have been involved in a service delivery procedure provided locally?

METHOD: The study employed a non-experimental evaluation research design, which allowed the gathering of perceptions of individuals who fulfilled different roles in the procedure. The researcher, therefore, was able to explore what comprises the already functioning service and how this, could be amended when the participants' personal viewpoints were taken in consideration. This was possible through the use of semi-structured in-depth interviews, conducted with professional and non-professional participants. The sample consisted of four professionals who are currently conducting AT assessments on different sites, and three parents of physically disabled children who had obtained the required assistive computer technology. *RESULTS:* The data analysis confirmed significant gaps in the current services which are provided locally. The study showed that the various organisations conducting the current process are failing to

address a number of critical elements which have been consistently highlighted in the literature reviewed in this study. *CONCLUSION:* This study henceforth concludes that the multiple shortcomings of the process need to be addressed through the founding principles of Occupational Therapy, this being oriented towards an understanding of the child's impairments which hinder accomplishment of activities and life roles.

Introduction

Throughout the last two decades, many children with physical disability have had the opportunity to successfully participate in educational processes through Assistive Technology (AT). Assistive Technology for computers and an education targeted towards children with disability share a profound relationship: AT has greatly influenced the educational outcomes of children with disabilities while the application of computers in educational settings has led to a greater opportunity for students to meet educational goals, both in typically developing children and children with disabilities.

The application of assistive computer technology can influence a vast number of limitations that the child with physical disability may experience at school with the result of substantial educational gains and fundamental life skills. All this however, is only possible if an appropriate service delivery process is implemented, thus ensuring a compatible fit between the child's needs and the device. Inherent to an appropriate service delivery process are specific factors that need to be addressed pertinently so as to ensure a successful selection, acquisition, and use of the assistive device. Thus, through the use of assistive computer technology, the child with physical disability not only improves academically, but also demonstrates a marked improvement socially, emotionally and in the child's general quality of life.

The local situation

Disability and its inclusion in society has been a predominant issue in most countries around the world, including Malta. As occupational beings, disabled individuals like all other human beings, have an innate need to use and organise time, space and materials purposefully to gain satisfaction and well-being (Wilcock, 2002). In Malta, much attention has been directed towards the promotion of this idea, that is, inclusion of disabled children in educational facilities.

In the Inclusive and Special Education Review Report (Spiteri, Borg, Callus, Cauchi, & Sciberras, 2005), it was highly emphasised that Maltese schools were to provide, to the most possible degree, environments and strategies which would enable children attending school, to equally participate in activities. Likewise, this shift in focus towards inclusive educational facilities was acknowledged in the: Special Education in Malta (Bezzina, 1993); the National Minimum Curriculum (NMC, 1999); as well as in the Creating Inclusive Schools document (2002), which attempted to

provide guidelines for the successful implementation of the NMC. These documents encourage the fostering of inclusive educational settings and attempt at increasing awareness regarding human diversity.

Unfortunately however, to this very day, this idea is still in its early stages of accomplishment. Despite their potential to improve and participate in standard activities, were they to be given the possibility, the measures that were taken so far are not addressing with effect the problems of students with disability. The Inclusive and Special Education Review Report (Spiteri, et al., 2005) has highlighted recommendations which are considered as potential solutions towards the implementation of a successful plan of action: the application of Assistive Technology for computers is considered as one method to constructively influence this issue.

Presently, there are a number of organisations working individually, involved in recommending assistive technology which would assist a child with physical disability to enhance functional performance at school. Operating in collaboration with the National Commission Persons with Disability (KNPD), the Foundation for Information Technology Accessibility (FITA), a local organisation, guides individuals with disability to access computers, whether the latter are used at the work site, for educational purposes or any other functional outcome. At present, FITA employs one IT specialist and one ICT officer trainer who are providing the foundation's services.

The Special and Inclusive Education Network working in collaboration with the founding partners, the ICT Department within the Education Division, further launched a new unit last October – the Access to Communication and Technology Unit (ACTU). Although still in its initial functioning, the main specialty of the unit is to conduct assessments in order to provide recommendations regarding AT devices, thus empower students to access the curriculum and ultimately enhance their quality of life. Being newly launched, the ACTU is administered by one professional; a graduated teacher with a special interest in Alternative and Augmentative Communication (AAC), who provides support services for parents and professionals. The unit's ultimate aims are to enhance the resources to provide its services to all Maltese schools and thus be able to ensure that all students are given the necessary support, particularly with regards to communication skills.

Another organisation which is known to assess children with disability to determine assistive computer technology needs is San Miguel Special School. This special school has learning support assistants responsible for the recommendation of devices and providing guidance to parents along the process.

CONCEPTUAL FRAMEWORKS
A Framework for OT

The OT Practice Framework: Domain and Process (AOTA, 2002) recognises that engagement in meaningful and purposeful occupations contributes to the well-being of every individual. Indeed, the ability to perform in daily activities that are deemed important is what gives value to life. This is what Occupational Therapists address in order to greatly influence human performance and the client's general quality of life.

As the framework delineates, education is considered as one of the performance areas of the child's occupation. Children's lives are mainly dominated by this area which is crucial for their overall development. If this fundamental area was to be jeopardised due to disease or disability, OT could offer a means of restoring functional performance. When a disabled student finds the alternative manner to achieve a desired activity, his/her potential, motivation, and performance, flourish and greatly develop. Such benefits could only be achieved if functional performance in educational occupations is viewed in relation to the acquired performance skills, the child's contexts and the activity demands which are placed upon completion of the task. Along these lines highlighted by this framework, the application of assistive computer technology can be successfully designed to foster the disabled child's participation and support development at school.

A Framework for Assistive Technology
The application of Assistive Technology is complicated since there is no one solution for the spectrum of problems and various possible needs of any one client. The model is consequently intended to guide the Assistive Technology Practitioner (ATP) to recommend assistive devices which meet the specific needs of every individual with a disability, ensuring that it is coherent with the person's skills and contexts encountered in daily life. The HAAT Model considers human performance as highly fundamental, focusing primarily on achieving functional results, thus assisting the individual to achieve the desired activity. The model depicts AT as being part of a synergistic system of three other components which determine human performance, these being, the human, the activity, and the context. Each of the components plays a unique part in the system, through which one inevitably influences the others.

The system integrates these four linked components into an interconnected whole. The assistive technology system primarily finds its beginning due to a person's need to independently perform an activity. Every particular activity is carried out in a specific context as deemed appropriate by the individual. Whenever the individual lacks the necessary skills to achieve the activity in its usual context, AT could be used as an enabling tool since the skills required to operate the device are adapted according to the individual's abilities.

The following is a diagrammatic representation of the HAAT Model:

FIGURE 1.1: THE HUMAN ACTIVITY ASSISTIVE TECHNOLOGY MODEL
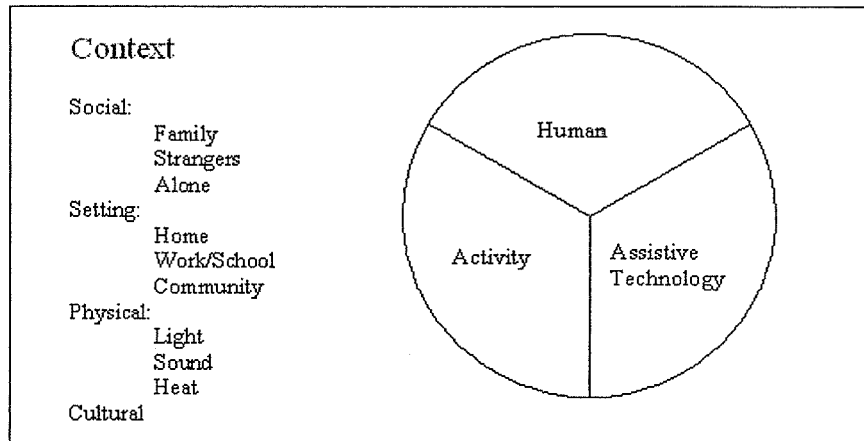
<div style="text-align: right">(Cook & Hussey, 1995)</div>

Assistive computer technology: The benefits

In the last decade, the giant leap seen in computer technology has created a new potential for children with disabilities to successfully achieve developmental goals and milestones similar to what other children experience (Judge, 2001). The child who would previously have been unable to use a computer, is now able to access it through specialised computer applications, namely specialised hardware and software (Bain & Leger, 1997). Children with disabilities are thus able to harness computer technology to enhance their independence and become active participants in school activities.

The accessibility of a computer has the dual purpose of obtaining a functional outcome and enhancing the development of skills, whether these are motor, sensory, cognitive or social skills; thus the child experiences the consequences of these actions. Computer manipulation works towards filling the gaps experienced by the child with disability, making it possible for him/her to function in a setting similar to any other typical child (Huntinger, Johanson & Stoneburner, 1996). Computers have additionally demonstrated the remarkable ability to ameliorate the experiences that children with disability gain from school.

For the child with physical disability, it is vital that the environment in which skills are acquired is conditioned and modified in ways that enable him/her to participate more fully in developmental processes (Copley & Ziviani, 2004). The employment of assistive computer technologies in educational settings has been one of the methods through which

environments were conditioned to meet the disabled child's needs and thus ensure successful academic and functional outcomes.

The AT devices for computers become the medium through which the child functions as a regular participant in the classroom setting, hence making his/her inclusion and independent learning possible (Struck, 1996). The mastering of tasks, the ability to make choices and the direction of one's own care through the use of AT devices for computers is considered as a principal contributory factor towards self-esteem, self-determination and a marked increase in motivation (Reed & Kanny, 1993). Having acquired more control over one's actions and the environment, the child is more likely to become responsible for his/her own learning experience and avoid learned helplessness, which is often brought about by embracing a passive role. Vygotsky (1997) clearly maintained that an essential feature of learning is the advancement in a variety of internal developmental processes that are able to operate only when the child interacts with people in his/her environment and in cooperation with his/her peers.

The services delivery process design

In order to address the multiple facets of the individual's AT needs, the service delivery process ought to be guided by a systematic assistive technology system. Each assistive technology system is uniquely configured to meet the individual's needs, making use of his/her skills and abilities. Various literature (Cook & Hussey, 1995; Bain & Leger, 1997; Copley & Ziviani, 2005) show that a systematic design towards service delivery procedures as well as an AT model enhances the outcomes of successful AT decision-making. Cook & Hussey (1995) and Bain & Leger (1997) state that regardless of the individual's needs, there is a basic procedure to which all service delivery processes should adhere. The following is a diagrammatic representation of an amalgamation of the major steps identified by both models, facilitating a systematic service delivery procedure:

STEPS	ACTIONS
1. Referral and Intake	At this point, the consumer or someone close refers the case, since s/he recognises a need for AT. The purpose of this phase is to (1) gather initial information, and, (2) tentatively identify possible services required. At this stage it is important to determine who will provide funding services.
2. Needs Identification	A more detailed specification of the consumer's assistive technology needs taken in relation to the consumer's life roles. Through this step, the person's needs and goals are identified, providing a basis for assistive technology intervention. This is considered as one of the most critical components of the process since it is the cornerstone for measuring the effectiveness of the outcome.

3. Identification of consumer's abilities	Becoming aware of the consumer's physical, cognitive, and sensory skills and limitations. The physical skills evaluation determines the most functional position for individual, of which the most basic is seating needs. Cognitive skills assessed through practical observation.
4. Identification of possible AT devices	The team should determine what AT devices would address the consumer's needs, goals and abilities. Life roles and consumer's expectations need to be taken into consideration. Consideration should be given to present and future environments.
5. Interface between consumer and AT device	Based on the previous four stages, the consumer should be given the chance to experience all possible AT devices and assess accordingly. For the system to be accurate, AT must be integrated with relevant equipment and tried in all possible environments in which it will be used. A time consuming stage, but one which will guarantee that device chosen will be used.
6. Recommendation of device	This stage occurs after achieving a good match between client's needs and AT device. Recommendations should be documented with a detailed report of assessment and achievement of goals through recommended device.
7. Training consumer to use device	Provide the client with written and verbal instructions on its use, care, maintenance, and contact numbers for repair services
8. Periodic re-evaluation	Changes can occur at many levels of the AT system, making periodic re-evaluations a necessity.

(Cook & Hussey, 1995; Bain & Leger, 1997)

Fundamental factors in the service delivery process

The service delivery process involved in choosing the AT device is complex, and requires specific factors to be included as a guide. The complexity of such a service could be attributed to multiple aspects, of which, the most important is the tremendous growth in the availability of technology, which leads to an infinite selection of devices. Another influential factor is the paradigm that guides healthcare professionals to view each individual holistically alongside his/her own abilities, difficulties and needs. These two issues, when taken into consideration concurrently, create a bigger challenge to match a compatible fit between the child's needs and the appropriate device.

A review of the literature (Post, 1993; Zabala et al, 2000; Lahm & Sizemore, 2002; Watts, O'Brian & Wojcik, 2004; Copley & Ziviani, 2005; Parette, Huer & Scherer, 2005; Copley & Ziviani, 2006; Gatt, 2007) strongly supports the fact that there are specific factors which influence the outcome of the service delivery process. Despite the potential benefits of AT, there will be an increased possibility of shortcomings in AT application. The factors that are considered to be the most fundamental to the service delivery process are assessment issues, use of a team approach, family involvement, and funding issues.

The occupational therapist is competent in conducting a comprehensive assessment since the foundations of the profession uniquely guide the therapist to view every individual holistically. The therapist's insight into the child's daily occupations, components required to carry out specific tasks, and the contexts in which tasks are carried out, make the occupational therapist the ideal specialist conducting the AT service delivery process (Shuster, 1993; Struck, 1996). During the evaluation process, the occupational therapist is able to take into consideration the components traditionally assessed, such as sensory, motor, cognitive, perceptual, and psychosocial; in so doing, the therapist determines the basic limitations of the child. These limitations are concurrently analysed with other aspects in the child's daily routine such as placing of equipment, positioning of the child, classroom activities, environmental restrictions, funding issues, acceptance of the device, parental concerns, feasibility of repairing the device if necessary, and various other issues that may arise.

Despite the fact that every delivery process of AT has its own characteristics, the occupational therapist's unique ability to evaluate thoroughly the child's capabilities and needs, ensures that a compatible fit between the child's needs and the device is achieved.

METHODS

Participants and Sampling Techniques

The aim was to have a sample consisting of subjects who participated in the service delivery process of assistive computer technology for physically disabled children. Due to the nature of the roles assumed by the two groups, it was decided that the target population was to be divided into two categories. One group incorporated professionals who are currently participating in service delivery processes of AT provided locally, thus including assistive computer technology for children with physical disabilities attending primary schools. The other group consisted of parents of children with a physical disability who obtained the assistive computer technology.

Being a relatively new service offered in the Maltese Islands, the population of professionals working in the specialised area of AT provision and the parents who have received such services, is a limited one. For this reason, a sample of convenience was chosen since the subjects who participated in this study were selected purposefully rather than randomly, utilizing a technique known as Criterion Sampling (Talbot, 1995). This sampling technique involved selecting all cases that satisfied established criteria in order to enhance the quality of the sample chosen.

The inclusion criteria that determined the sample population were as follows:

1. Parents/guardians of children with physical disability attending any primary educational facility, i.e. either a public mainstream school,

or a private school, or a church school, or a special school.

2. Parents/guardians who have obtained assistive computer technology devices which are used by their physically disabled children in educational facilities.

3. Clients who were referred during the period between January 2005 and August 2005, ensuring that the assistive computer devices were at least used for 6 months or over.

4. Professionals who are involved in the service delivery process of assistive computer technology for children with disability.

The total population of parents who met the inclusion criteria and were thus eligible to participate in the study amounted to four, out of whom one refused to participate due to personal reasons. The selection criteria allowed a total sample of four professionals who are currently involved in the provision of service delivery processes of AT for children with physical disability. These are represented in the following table:

TABLE 3.1:   PROFESSIONAL INTERVIEWEES

PARTICIPANTS	PROFESSION	ORGANISATION
Participant 1	IT specialist	FITA
Participant 2	Learning Support Assistant	San Miguel Special School
Participant 3	Alternative and Augmentative Communication Specialist	San Miguel Special School
Participant 4	Teacher	ICT Department within the Education Division (which works in collaboration with the ACTU)

Research Instruments

The qualitative information obtained in this study was gathered through an interview. The interview schedules followed the classical format of exploratory semi-structured in-depth interviews, thus ensuring that the participants express their perceptions in a less structured and systematic manner (Oppenheim, 1992; Stein & Cutler, 2000). A set of questions were planned beforehand, allowing significant considerations to the research questions, thus allowing the researcher to maximize the gathering of pertinent information critical to the study. These questions were phrased in an open and non-directive manner about the issue that the researcher requested the participants to describe. Any unexpected responses gathered were followed up with questions that were

constructed spontaneously according to the subjects' initial responses. Special attention was given to the wording used with the two different groups of participants. Specific complicated terminology was avoided with parents in order to put them at ease and ensure full comprehension.

The interviews were conducted by the researcher, in a time and place that was most appropriate and convenient for the participants. Before every interview, the interviewees were given an outline of the interview procedure. The interviewees were reassured and helped not to feel embarrassed or disturbed about expressing their perceptions of any situation, since their insights were highly valuable for the purpose of the research. The researcher did not take written notes during interviews, in order to allow complete attentiveness to the interviewee's responses and to assist the interviewee in expressing him/herself in order to avoid a possible block in communication. Every interview was henceforth recorded on audio tape after the participant's permission to do so was obtained.

Data Analysis Method

The information obtained on the audiocassette was transcribed verbatim, enabling the researcher to thoroughly analyse the data. About one hundred hours were allocated to transcribe seven interviews from the audiotape. These were duly translated from Maltese to English. To ensure authenticity and reliability, every transcription was checked. The audio-recording was listened to once more and correction

was done wherever necessary. This prepared the data for subsequent analysis.

Thematic analysis (Talbot, 1995) was the preferred method used to analyse the transcripts. The technique involved thorough reading of the interview transcriptions and the highlighting of keywords in order to establish the main themes. Each theme was assigned a colour code, and subsequently the transcripts were re-read so that their contents were colour coded accordingly. In order to ensure that similar findings were grouped together within the pertinent theme, every part of each transcript was cut and pasted on a separate document under the heading of its relevant theme. Finally, all the themes were cross-checked to ensure that all the information provided had been coded accordingly. This ensured a good presentation of the whole situation. The results were reported in detailed prose, quoting parts of influential and significant data to further support the findings.

RESULTS

Through Thematic Analysis (Talbot, 1995), common themes and sub themes were established in the textual data. These textual themes and sub-themes were then analysed in order to identify similarities and differences. Findings were reported in the prose form, quoting extracts to further support outcomes. The following are tabulated representations of the themes and sub themes which emerged:

TABLE 4.2: EMERGING THEMES

PROFESSIONAL PARTICIPANTS

- Theme 1: Roles undertaken by Organisations
- Theme 2: The Service Delivery Process
- Theme 3: The Assessment
- Theme 4: Trans-disciplinary Teaming
- Theme 5: Funding Sources and Related Issues
- Theme 6: Barriers that hinder the service delivery process

TABLE 4.3: EMERGING THEMES

PARENT/NON-PROFESSIONAL PARTICIPANTS

Theme 1:   The Service Delivery Process
  Sub-themes:
        i.   *The availability and need for the service*
        ii. *A review of the process*
        iii. *Assessment Issues*
        iv. *Perceptions regarding team approach*
Theme 2:   Perceptions regarding Family Involvement
Theme 3:   Funding Issues
Theme 4:   Barriers that hindered the service delivery process
  Sub-themes:
        i.   *Professionals' Attitudes*
        ii. *Lack of Resources*

Respondents' perceptions regarding the service delivery process they experienced constituted the main results in this study.

The themes that emerged subsequent to the analysis of the data were numerous since multiple questions were asked and subjective perceptions were gathered.

The following is a representation is indicative of the themes that emerged from this study: the corresponding professionals' and parents' viewpoints were compared accordingly as shown.

Summary of Results
FINDINGS: Professional Participants

Theme 1: Roles undertaken by organisations

Respondents interviewed were asked regarding the roles of each organisation during a service delivery process. Every professional outlined the roles that he/she addresses during such a service. The replies obtained from the participants evidently demonstrate a role common to all the three organisations - providing recommendation to obtain the appropriate device for the child's needs.

Theme 2: The Service Delivery Process

In this theme, the IT specialist, the learning support assistant and the AAC specialist gave an account of the service delivery process that is currently being followed in their respective entity.

This theme distinctly illustrated two aspects common to every service delivery procedure highlighted by all three professionals, namely, the assessment stage and the process of obtaining financial assistance.

Theme 3: The Assessment

The replies exemplify a substantial amount of overlap between the assessments that are conducted by the IT specialist and those carried out at San Miguel Special School. During the analysis of data, it became clear that similar principles are guiding the professionals during assessments and, consequently, there is an extensive overlap in roles.

The IT specialist stated that the assessment procedure incorporates various aspects, all of which help in determining the specific needs of the child. A typical assessment for a disabled child attending school focuses upon obtaining data about the child's functional performance. Similarly, the AAC specialist mentioned inherent factors in every AT assessment that is carried out at San Miguel Special School. Amongst these, the ones that were considered as most crucial for an appropriate device choice were the child's positioning, the access methods used, and the experimentation on various equipments.

Theme 4: Trans-disciplinary Teaming

In view of the replies obtained, this theme outlines the lack of cross-collaboration between the organisations, and the lack of a multi-professional team approach. It was evident that most of the professionals interviewed acknowledged the concept of the importance of a team approach in the AT service delivery processes as well as the failure of applying this concept in the local scene. The AAC specialist specifically stressed the importance of adopting a trans-disciplinary team approach, which enables the pooling of more ideas from various professional paradigms.

On the other hand, the replies obtained from the IT specialist were somewhat different than the ones just discussed. As the IT specialist explained, only two IT-based professionals are responsible for conducting the assessment and

providing recommendation during the service delivery process carried out at FITA. The IT specialist considered the liaison with the organisations providing funding as team involvement. However, the organisations providing funding assistance are only involved once the device has already been selected. The learning support assistant also demonstrated an individualistic approach towards determining the child's needs during the service delivery process. In cases where the learning support assistant finds difficulty in finding an appropriate fit between the child's needs and the device that would cater for his/her requirements, liaison is carried out with the CDAU:

The concept of a trans-disciplinary team approach is not being successfully put into practice in any service delivery process discussed.

Theme 5: Funding Sources & Related Issues

This theme illustrates two common funding sources mentioned by all professionals interviewed, mainly: the Malta Community Chest Fund and the National Commission Persons with Disability (KNPD). The IT specialist, the AAC specialist, as well as the learning support assistant stated that through these main funding sources, parents can opt to submit their request for financial assistance in both foundations.

Theme 6: Barriers that hinder the service delivery process

This last theme from this section will bring to light the various barriers that hinder the service delivery process currently provided. Amongst the multiple hindrances highlighted, three were common in most replies; namely, the lack of human and financial resources, the lack of awareness, and attitudinal barriers.

This section has provided a clear outline of perceptions and factors from the professionals' viewpoint. The next section contains the results and the analysis of the data gathered through interviews conducted with three parents. The results focus upon the parents' experiences and perceptions regarding the service delivery process they were involved in.

FINDINGS: FAMILY MEMBERS

Theme 1: The Service Delivery Process

i. *The availability and need for the service*

The replies ranged from the parent's own interest in becoming actively involved and well-informed, to being passive receivers of services. None of the three parents interviewed had a common source to inform them about the availability and need of such services.

ii. *A review of the process*

The three processes that were described by the participants were all considerably different from one another, irrelevant of the specific needs of each child. Notwithstanding the fact that all the three processes followed a different sequence, nevertheless, the description of each service delivery procedure highlighted factors common in every

account. One of the most significant issues emphasised by every subject was the reimbursement of money and availability of funds.

The two primary organisations mentioned by all the three participants were The Malta Community Chest Fund and the KNPD. It was commonly agreed that the two organisations offer a sum of money independent of each other's decision as to how much money should be allocated for any one case.

iii. <u>Assessment issues</u>

Out of the three procedures that were looked into, only one of the subjects, said that the child was specifically assessed to determine his AT needs. The assessment had primarily started by a learning support assistant, who thoroughly reviewed previous IEP reports carried out at an inclusive setting. The participant claimed that the actual AT assessment was a continuous process which took place over a period of time.

The other two participants' reviews of the assessment stages were very similar to each other, since both were conducted at The Eden Foundation by a physiotherapist. These two subjects stated that their children had started working on the assistive computer technology devices long before they were advised to purchase them. The process however, was not a formal assessment utilised to determine the AT needs of the child, but rather part of the therapy program.

iv. <u>Perceptions regarding Team Approach</u>

Participants were interviewed on their opinions about to what extent team approach had been adopted during the service delivery process. The findings for this matter showed that none of the three procedures adopted a trans-disciplinary team approach.

One other issue that was discussed was the lack of team approach amongst professionals working in two particular inclusive settings. Both parents commented about the barriers they faced when their children still attended an inclusive setting, wherein they attempted at communicating their children's needs to the professionals in charge.

This theme distinctly demonstrates the variation in the service delivery processes that are being carried out locally. Various organisations are recommending the purchasing of assistive computer technologies, since a common source specialised in providing such services is not operating locally. Consequently, the processes that each organisation adopts vary, due to the fact that there are no standard principles guiding the services.

Theme 2: Perceptions Regarding Family Involvement

Participants were asked to give their opinions about the importance of the family members' involvement during the service delivery process. The replies evoked two issues common to all three responses.

The first issue that the participants commented upon was the importance of the family's involvement in expressing the child's needs to others. The subjects argued that they, as parents, know their children better than any other individual, irrelevant of the professional knowledge that one has. Another highly emphasised issue acknowledged by the three participants was the active involvement required from the parents. The participants expressed that a lot of work and research has to be done by the parents, because, if they do not see to specific necessities, no else will.

The replies obtained from the participants acknowledge the importance of parents being actively involved throughout the service delivery procedure. The parents perceived their involvement as being highly important in communicating effectively the needs of the child to the professional/s.

Theme 3: Funding Issues

This third theme was given substantial importance by the participants since it highly affects the outcome of the service delivery process and future AT application. Due to the expense involved in raising a child with disability in conjunction with the high costs of AT, the three parents agreed that funding support is necessary but limited. All the three parents opted to submit an application through both the Malta Community Chest Fund and KNPD. All the three participants maintained that when one puts the application through KNPD, the system delineates that first the applicant has to

purchase the devices and subsequently apply for VAT refund.

Theme 4: Barriers that hindered the service delivery process

i. *Professionals' Attitudes*

This barrier was highly emphasised by two of the participants, both of whom referred to the experience they had in the inclusive setting. The two mothers expressed how frustrating it was for them to work with professionals whose negative attitudes regarding disability proved to be a major hindrance.

ii. *Lack of Resources*

Two of the participants, shared the same views regarding the lack of resources available locally, and how this limited the efficacy of the process. The participants viewed lack of resources as having two aspects; both human and non-human resources. It was commonly argued that the lack of human resources creates an imbalance in the workload shared by the professionals currently in charge, because they have to speed up the process in order to keep up with the demand. Additionally, one subject commented about the lack of a formal assessment unit which makes the process irregular and requires extra effort from the parent. The lack of a specific assessment unit also leads to inappropriate assessments, in the sense that the case is not viewed holistically. The participant arrived to this conclusion due to the following:

Conclusion

Respondents' perceptions regarding the service delivery process they

experienced constituted the main results in this study. The themes that emerged subsequent to the analysis of the data were numerous since multiple questions were asked and subjective perceptions were gathered. This chapter has presented the gathered data in a logical manner, so as to outline the findings that emerged. In the following chapter, the findings will be related to the research questions put forward at the beginning of the study, and compared to the relevant literature.

Discussion

This qualitative research study sought to clarify the service delivery processes of assistive computer technology in educational settings, which is currently being conducted in Malta. The fundamental questions to be answered were "What is the process, currently being followed locally, to enable children with physical disability obtain the required adaptations to computers used in educational facilities?" And "How do professional and non-professional individuals, who have been involved in the service delivery procedure, perceive the process?"

The roles undertaken by organisations and the availability of their services –
This study indicated the lack of an official source which caters for the service delivery processes of Assistive Technology (AT) needs for children with disabilities. As stated by both the professionals and the parents, the recommendation and prescription for of assistive computer technology is being conducted by a limited number of professionals, each working

individually. The ones mentioned in this study were the IT specialist, one physiotherapist at The Eden Foundation, and a learning support assistant along with an AAC specialist at San Miguel Special School.

All the professionals interviewed outlined their primary role in determining the AT needs for children with disabilities. Therefore, these professionals, guided by a different professional background, are individually conducting service delivery processes in each respective entity. This is undoubtedly resulting in a waste of resources, which could be otherwise utilised jointly, thus enabling a more efficient and effective outcome (Debono, 2006). Furthermore, this evidently indicates the lack of a multi-professional team involvement in the current service delivery processes. This is strongly opposed by Copley & Ziviani (2005), and multiple other literature on AT, in which team involvement is tremendously emphasised due to its fundamental influence on the service delivery process.

The review of the service delivery process –
The reviews provided by San Miguel Special School and FITA indicate that they are following similar principles to conduct the procedure. These focus primarily on carrying out comprehensive assessments to identify the child's functional abilities and needs. Consistent with this, published research emphasises detailed assessments as a significant predictor for future acceptance and the use of the

recommended device (Bain & Leger, 1997). The two assessments both include a trial and error procedure, through which the child is assessed using the various equipment owned by each organisation. Finally, the most appropriate device is strongly recommended by professionals, leaving the parents free to choose whichever device they consider suitable. This tallies with Cook and Hussey's (1995) published literature on assistive technology system designs to ensure a successful outcome.

Nevertheless, the two processes fail to address a number of key elements identified by Zabala et al. (2000), which enable the application of an effective service delivery process. Common to both organisations is the failure to promote active family involvement and the lack of a trans-disciplinary team approach during the assessment stage. Without doubt, this shortcoming highlights a serious gap in the current service delivery process, locally.

Furthermore, the service delivery process which is currently catering for the needs of children with physical disability is leading to misconceptions amongst parents, due to the fragmented manner in which information is being provided. This could be attributed to the fact that the process itself is complicated, time-consuming and does not follow a standard routine due to the lack of an official source.

The assessment stage –
Results from this study show that the assessment procedures carried out at

FITA and San Miguel Special School have extensive overlap between them. The two assessment procedures indicate a sole issue which both foundations aim at determining; the child's physical limitations and skills. According to Bain & Leger (1997) the physical abilities influencing the child's performance is only one factor which needs to be addressed. Nevertheless, the professional conducting the assessment should not limit him/herself on solely verifying the motor abilities and needs of the child. The approaches conducted by both organisations fail to put into practice a systematic and comprehensive assessment which is guided by clear goals that are reached by team consensus, which is strongly suggested by Copley & Ziviani (2005).

The involvement of The Eden Foundation signifies that the assessments provided by FITA and San Miguel Special School are at times not being conducted with certain children, since the AT recommendations are being carried out at this non-governmental organisation. Despite the limitations in the current assessment procedures conducted by FITA and San Miguel Special School, the attempt at implementing the assessment stage is by and large considered more effective than completely omitting such a fundamental stage. These conclusions directly raise the issue of two linked factors which contribute towards The Eden Foundation's active involvement: the lack of a local official source catering for such needs; and, the foundation's early intervention with pre-school disabled children. The parents

explained that how they were encouraged to seek additional treatment for their children from local NGOs, prior to being admitted to primary school.

The trans-disciplinary team approach –
The study then focused on exploring the application of a trans-disciplinary team approach, which is considered as a fundamental principle in any AT service delivery process (Cook & Hussey, 1995; Bain & Leger, 1997; Lahm & Sizemore, 2002; Copley & Ziviani, 2005). Results clearly show that all the processes discussed in this study, failed to adopt a team-based approach to determine the assistive computer technology needs for each child. On the contrary, the procedures outlined by both the parents and the professionals strongly indicate an individualistic approach which is being practiced in all the facilities involved in this study. These findings do not tally with any of the research literature which has been reviewed. Such literature strongly highlights the involvement of individuals representing various disciplines who are able to work as a team and communicate effectively (Bain & Ledger, 1997; Zabala et al, 2000; Copley & Ziviani, 2005, Parette, Huer & Scherer, 2004).

The study further sheds light on the lack of knowledge amongst the majority of the participants about the implications of trans-disciplinary teaming. These findings were also documented in a study conducted locally by Gatt (2007), in which stakeholders acknowledged their lack of knowledge and failure to implement team-based approaches.

Adding to the failure of putting this approach into practice, results reveal multiple misconceptions regarding the manner in which trans-disciplinary teaming should be utilised. One of the most striking misconceptions amongst 50% of the professionals and all the parents was the belief that trans-disciplinary teaming was being employed once the organisations providing financial assistance were asked to step in and evaluate accordingly. These results strongly oppose the studies conducted by Shuster (1993), who comments on the importance of having team members attending all the assessment meetings to collectively pool ideas and jointly decide upon the most appropriate device.

Family Involvement –
Although AT literature (Lahm & Sizemore, 2002; Copley & Ziviani, 2005; Knox & Menzies, 2005; and Parette, Huer & Scherer, 2004) considers the involvement of the family members during service delivery processes as highly important, the issue was scarcely discussed by the professionals. The professionals' common judgement regarding the family's involvement focused solely on the parents' role in making the final choices regarding the device purchased. Knox & Menzies (2005) similarly determined that the family members should be the ones making free choices and deciding upon all aspects regarding their child's health care. In a study regarding the role of the family members during AT service delivery processes, Parette & Hourcade (1997) suggested an opposing viewpoint

to these professionals' attitudes: the study encourages the view that parents need to acquire a sense of control over the given services, thus ensuring a greater level of contribution and active participation. A collaborative family-centred model is also recommended by Copley & Ziviani (2005), since it enables mutual collaboration, expression of personal viewpoints, and feelings of worthiness.

Contrary to the professionals' perceptions, the parents emphasized the significance of their contribution in expressing the needs of their children and ensuring that the most favorable decisions are put into practice. The parents said that their involvement should have extended to a discussion about aspects regarding their child, their way of living and their cultural beliefs, outside the school setting, since these would have influenced the outcomes of the chosen device. This is similar to the study conducted by Parette, Huer & Scherer (2004), which states that with the increasing number of students with disability from various cultural backgrounds, the service delivery process must shift its focus on strategies which promote decision-making processes sensitive to cultural factors.

Funding sources and issues –
This subject was the primary concern highlighted by all the participants, especially the parents. In fact, the reviews regarding the parents' own experiences of the service delivery process centred mostly on the stage of acquiring financial support. As discussed by Zabala et al. (2000), Lahm

& Sizemore (2002), and Copley & Ziviani (2004), this attitude is to be expected since funding is the major barrier for individuals trying to access assistive technology equipment.

It was commonly agreed by all the participants that financial assistance is rendered through two funding sources: the Malta Community Chest Fund and the National Commission Persons with Disability (KNPD), both being agencies primarily developed for the provision of such services. These findings tallied with Cook & Hussey (1995), who stated that since most individuals do not have the necessary financial resources to purchase the required devices, funding through third-party sources is essential. Although the study further draws attention to the ongoing challenge in acquiring financial assistance, this had not been a burden for any of the three parents.

Barriers that hinder the service delivery process –
Participants in this study all expressed their perceptions regarding barriers that need to be overcome to improve the current service delivery process which is provided locally. Attitudinal barriers, the lack of awareness and the lack of resources were the 3 areas given most importance by participants.

All the participants in this study firmly agreed that the professionals' attitudes (namely teachers), and perceptions in local mainstream schools, are the major hindrance influencing the service delivery processes, as well as the use of AT devices in educational settings.

These results tally with much of the literature dealing with AT for students with disabilities (McGregor & Pachuski, 1996; Parette & Hourcade, 1997; and Copley & Ziviani, 2006; Gatt, 2007), in which it is suggested that teachers and other educational professionals, are the least likely individuals to take active roles in such services. The reluctance of professionals working in educational settings might be traced to the lack of suitable training provided for the school personnel. This issue is in line with the study conducted by Copley & Ziviani (2006), where many teachers claimed that they resisted or rejected the use of assistive computer technology devices due to inadequate training and the feeling of incompetence in operating the devices.

The participants also put an emphasis on the lack of financial resources which are currently being provided in the field of AT provision. The high costs of AT devices and the lack of funds available to meet these costs were reported by every participant. These viewpoints were similar to those documented in Gelderblom & P. de Witte (2002), Debono (2006) and Gatt (2007). From the professionals' point of view, this issue was further discussed in terms of the lack of equipment available to assess the child's functioning on various assistive computer technologies, thus greatly restricting the quality of the assessments.

Conclusion

This study shows that while various organisations attempt to conduct an effective and efficient service delivery

process, multiple factors are restricting this procedure. The findings of this study clearly show that professionals who are currently providing the services lack knowledge on three primary fundamental issues, which highly influence AT provision, namely, the involvement of a team approach; adopting a family centred approach; and, conducting a comprehensive assessment. It is for this reason that this study suggests the establishment of a specialised, official centre in which Occupational Therapists assume a major role in determining AT requirements for school children with a disability.

The founding principles of OT enable the practicing therapist to address the current loopholes present in the local AT services. Occupational Therapy respects and acknowledges the importance of intervention from various professional backgrounds, thus ascertaining that the knowledge and experience of each professional attends to the complex array of factors which influence decisions regarding AT. Occupational Therapy further recognises the importance of caring for the needs of the family since active family involvement is necessary in ensuring cooperation and AT use. Finally, the occupational therapist is uniquely capable of identifying abilities and impairments in all performance components which are hindering the child's development, and to address these in conjunction with his/her personal and environmental contexts. The latter makes the therapist competent in conducting a systematic and comprehensive assessment, since

this is a crucial stage in AT service delivery processes. This would be a sound basis to empower disabled children to be fully integrated within mainstream activities since:

Computer application can serve as an equalizer for a child with disabilities so that he or she can function in the same settings and in similar activities engaged in by typical young children...Technology used thoughtfully and creatively rather than as a teaching machine can engender and support educational environments that will empower children to flourish in the 21 st century.

(Judge, 2001).

REFERENCE LIST

American Occupational Therapy Association. (1991). Position Paper: Occupational therapy and assistive technology. *The American Journal of Occupational Therapy, 45,* 1076.

American Occupational Therapy Association. (2002). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy, 56,* 609–639.

Bailey, D.M. (1997). *Research for the health professionals: A practical guide.* Philadelphia: F.A. Davis Company.

Bain, B.K. & Leger, D. (1997). *Assistive technology: An interdisciplinary approach.* USA: Churchill Livingstone Inc.

Bezzina, F. (1993). *Special Education in Malta. National Policy.* 3rd ed. Malta: National Commission Persons with Disability.

Cavanough, T.W. (2004). Assistive technology and inclusion. *Proceedings of Society for Information Technology and Teacher Education International Conference 2004* (pp. 4883-4890). Chesapeake, VA: AACE. *SITE conference,* Atlanta, GA. Retrieved December 4, 2006, from http://www.unf.edu/~tcavanau/presentations

Copley, J., & Ziviani, J. (2004). Barriers to the use of assistive technology for children with multiple disabilities. *Occupational Therapy International, 11(4),* 229-243.

Copley, J., & Ziviani, J. (2005). Assistive technology assessment and planning for children with multiple disabilities in educational settings. *British Journal of Occupational Therapy, 68(12),* 559-565.

Copley, J. & Ziviani, J. (2006). *Use of a team-based approach to assistive technology assessment and planning for children with multiple disabilities: A pilot study.* Article submitted for publication.

Cook, A.M., & Hussey, S.M. (1995). *Assistive technologies: Principles and practice.* USA: Mosby.

Debono, S.M. (2006). *ICT and disability (Bridging the digital divide).* Unpublished master's thesis E-Business, University of Malta.

Denzin, N., & Lincoln, Y. (Eds.). (1994). *Handbook of qualitative research.* Thousand Oaks, CA: Sage.

Derer, K., Polsgrove, L., & Rieth, H. (1996). A survey of assistive technology applications in schools and recommendations for practice. *Journal of Special Education Technology, 13(2),* 62-80.

Deterding, C., Youngstorm, M.J., & Dunn, W. (1991). Position Paper: Occupational therapy and assistive technology. *The American Journal of Occupational Therapy, 45,* 1076.

Durfee, J.L. & Billingsley, F.F. (1999). A comparison of two computer input devices for uppercase letter matching. *The American Journal of Occupational Therapy, 53*, 214-220.

Equal Opportunities (Persons with Disability) Act. (2000). Cap. 413. Laws of Malta.

Gatt, M. (2007). *Communication through technology: Enabling participation for Maltese students with learning disability.* Unpublished master's thesis, University of Manchester.

Guba, E.G. & Lincoln, Y.S. (1989). *Fourth generation evaluation.* CA: Sage.

Gelderblom, G.J. & P. de Witte, L. (2002). Introduction to the special issue: The assessment of Assistive technology outcomes, effects and costs. *Technology and Disability, 14,* 91-94.

Huntinger, P.L., Johanson, J. & Stoneburner, R. (1996). Assistive technology applications in educational programs of children with multiple disabilities: A case study report on the state of the practice. *Journal of Special Education Technology, 13,* 1635.

Judge, S.L. (2001). Computer applications in programs for young children with disabilities: Current status and future directions. *Journal of Special Education Technology, 16(1).* Retrieved December 12, 2006, from the JSET E-journal database.

Kellegrew, D.H. & Allen, D. (1996). Occupational therapy in full-inclusion classrooms: A case study from Moorpark Model. *The American Journal of Occupational Therapy, 50,* 718-724.

Knox, V. & Menzies, S. (2005). Using the measure of processes of care to assess parents' views of a paediatric therapy service. *British Journal of Occupational Therapy, 68(3),* 110- 116.

Lahm, E.A & Sizemore, L. (2002). Factors that influence assistive technology decision making. *Journal of Special Education Technology, 17(1).* Retrieved December 12, 2006, from the JSET E-journal database.

Lamorey, S. (2002). The effects of culture on special education services. Evil eyes, parayer meetings, and IEPs. *Teaching Exceptional Children, 34(5),* 67-71. Retrieved December 12, 2006, from the JSET E-journal database.

Lane, A. & Ziviani, J. (1999). Children's computer access: Analysis of the visual-motor demands of software designed for children. *British Journal of Occupational Therapy, 62(1),* 19- 25.

Lange, M.L. (1997). Focus on technology. *OT Practice, 2(5),* 51-52.

Longenecker Rust, K. & Smith, R. (2005). Document your AT outcomes: Learn about small "N" research designs. Retrieved March, 12, 2005, from http://www.resna.org/Conference/2005Conf erence/PreliminaryProgram/InstructionalCo urses/ThursdayAllDay/IC02.php

McGregor, G. & Pachuski, P. (1996). Assistive technology in schools: Are teachers ready, able, and supported? *Journal of Special Education Technology 13(1),* 4-15.

Ministry of Education. (1999). Creating a future together: National Minimum Curriculum. Malta: Klabb Kotba Maltin.
National Curriculum Council. (2002). *Creating Inclusive Schools: Guidelines for the Implementation of the National Minimum Curriculum Policy on Inclusive Education.* Malta: Ministry of Education.

Oppenheim, A.N. (1992). *Questionnaire design, interviewing and attitude measurement.* New York: New Ed. Printer Publishers.

Parette, H.P. & Hourcade, J.J. (1997). Family Issues and assistive technology needs: a sampling of state practices. *Journal of Special Education Technology, 13(3),* 27-42.

Parette, H.P., Huer, M.B. & Scherer, M. (2004). Effects of acculturation on assistive technology service delivery. *Journal of Special Education Technology, 19(2).* Retrieved January 14, 2007, from JSET E-journal database.

Penslar, R.L. (1995). Research ethics: Cases & materials. Indiana University Press.

Post, K.M. (1993). The promise of assistive technology. *The AJOT, 47(11),* 965- 967.

Preminger, F., Weiss, P.L., & Weintraub, N. (2004). Predicting occupational performance: Handwriting versus keyboarding. *The American Journal of Occupational Therapy, 58(1),* 193- 201.

Reed, B.G. & Kanny, E.M. (1993). The use of computers in school system practice by occupational therapists. *Physical and Occupational Therapy in Pediatrics, 13(4),* 37-55.

Rehabilitation Engineering Society of North America (RESNA). (1992). *Assistive technology and the individualized education program .* Washington, DC: RESNA Press.

Shuster, N.E. (1993). Addressing assistive technology needs in special education. *The AJOT, 47(11), 993-997.*

Smith, R.O. (2000). The role of OT therapy in a developmental technology model. *The AJOT, 54,* 339-340.

Spencer, K.C., Turkett, A., Vaughan, R., & Koenig, S. (2006). School-based practice patterns: A survey of occupational therapists in Colorado. *The AJOT, 60(1),* 81-88.

Spiteri, L., Borg, G., Callus, A.M., Cauchi, J., & Sciberras, M. (2005). *Inclusive and Special Education Review: Report.* Floriana: Ministry of Education, Youth and Employment.

Stein, F. & Cutler, S. K. (2000). *Clinical research in occupational therapy.* (4th Ed.). Canada: Singular Publishing Group.

Struck, M. (1996). Assistive technology in the schools. *Self-Paced Clinical Course: Technology and Occupational Therapy: A Link to Function.* USA: The American Occupational Therapy Association, Inc.

Struck, M. (1996). Computer access: A link to classroom learning. *OT Practice, 1(8),* 18-25.

Talbot, L.A. (1995). *Principles and practice of nursing research.* USA: Mosby.

Valiant Cook, J. (2001). *Qualitative research in OT.* Canada: Delmar Thomas Learning.

Vygotsky, L.S. (1997). *Educational Psychology.* USA: St. Lucie Publishers.

Watts, E.H., O'Brian, M. & Wojcik, B.W. (2004). Four models of assistive technology considerations: How do they compare to recommended educational assessment practices? *Journal of Special Education Technology, 19(1).* Retrieved December 12, 2006, from the JSET E-journal database.

Wilcock, A.A. (2002). A theory of human need for occupation. *Journal of Occupational Science, (Special Issue), 9,* 1-9.

Zabala, J. et al. (2000). Quality indicators for assistive technology services in school settings. *Journal of Special Education Technology,15(4).* Retrieved December 12, 2006, from the JSET E-journal database.