What can be learnt from the use of Information and Communication Technologies (ICT) in Special Needs Education (SNE) in the Netherlands?

What suggestions can be made to improve the use of ICT on SNE in Portugal?

Adriano de Assis Pinheiro Martins

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Examination Committee

Chairperson: Prof. João António Madeiras Pereira
Supervisor: Prof. Toon Abcouwer
Supervisor: Prof. Andreas Miroslaus Wichert
Member of the Committee: Prof. Miguel Leitão Bignolas Mira da Silva

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Abstract. As governments try to improve social inclusion of the handicaped ones, special needs education (SNE) is increasingly receiving attention and investment. Most of the progress on SNE is due to advanced and innovative implementation of information and communication technology (ICT).

The ICT usage on SNE presents some challenges. It is difficult to assess the current use of ICT because it is not even throughout countries, and regions, with different budgets for SNE. Although ICT is quite advanced in the education area, it tends to be introduced in schools without any planning or training, making its implementation not so effective.

Netherlands and Portugal represent two unique study cases for this investigation. The Netherlands has a well developed education system while Portugal, due to the economic difficulties, has an unadvanced education system with unsufficient financial support.

This study will provide: a deep analysis of the use of ICT in the particular case of the Netherlands; which benefits this analysis can bring to the SNE in Portugal; and which ICT's can be used to innovate SNE in both countries.

Keywords: Learning, Special Education, Information and Communication Technology, Netherlands, Portugal
Resumo. Ao mesmo tempo que os governos tentam melhorar a inclusividade social de cidadãos com deficiências, a Educação Especial (EE) está a receber muita atenção e investimento. Muito do progresso na EE é devido à implementação de Tecnologias de Informação e Comunicação (TICs) avançadas e inovadoras.

O uso de TICs na EE apresenta alguns desafios. É difícil avaliar o uso actual de TICs na EE porque a sua distribuição é diferente entre países e regiões com diferentes orçamentos para a EE. Apesar das TICs serem bastante avançadas na área da educação, tendem a ser introduzidas nas escolas sem formação ou treino dos profissionais, fazendo com que a sua implementação não seja muito eficaz.

Os Países Baixos e Portugal apresentam dois casos de estudo unicos para esta investigação. Os Países Baixos têm um sistema de educação bem desenvolvido enquanto que Portugal, devido a dificuldades económicas, tem um sistema de educação pouco avançado com suporte financeiro insuficiente.

Este estudo providencia: uma analise profunda do uso das TICs no caso particular dos Países Baixos; que beneficios esta analise por trazer para a EE em Portugal; e que TICs podem ser usadas para inovar a EE em ambos os países.

Palavras Chave: Ensino, Educação Especial, Tecnologias da Informação e Comunicação, Países Baixos, Portugal
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1 Introduction

SNE is being highly improved with the use of ICT more and more every day. As a measure to improve the social inclusion of handicapped persons, governments and public organizations like UN and UNESCO, are promoting the implementation ICT in SNE (UNESCO, 1994) (UN, 2006) (WHO, 2007) (Portuguese Republic Diary, 2008) (WHO, 2001) (Watkins, 2011). The ultimate goal is to achieve a standardized level of ICT use, common to all countries.

Despite all efforts, there is still a long way until a state of equality in the use of ICT on SNE is reached. Some ICT technologies are used due to local initiative (by institutions or schools) instead of a central one (by public organizations or governments). Thus, not only countries with different budgets use different ICT’s, but also different schools inside the same country (highly developed urban environments versus low development rural ones) with different budget sizes have different ICT’s in use.

Thus, ICT’s are scattered through the countries in an uneven disposition. It is difficult to assess the global current state of ICT use in SNE because this use is not completely centralized.

One last issue concerns with the ability of the teachers and schools to correctly use ICT as a tool for learning. In many cases ICT’s are acquired without any planing or training, which results in an ineffective education.
2 ICT on SNE

In an early stage of the analysis of this subject, the main goal was to find “How is ICT being used on SNE in different countries?”. The focus at this stage was to identify technology gaps between countries and comparing their requirements, effectiveness and viability within the SNE scope. Ultimately, the main goal was to gather the best ICT practices (and related information) so they can be better employed in the future.

A quick and superficial comparison between Netherlands and Portugal for the use of ICT in SNE reveals that these are much scarce and unadvanced in Portugal. I realized that the presence of ICT on SNE on both countries is completely different and that Portugal could greatly benefit from analyzing how is ICT being used in The Netherlands.

This represents an unique opportunity to contribute for the development of the portuguese SNE situation. Not only, the dutch SNE could also benefit from a critical analysis regarding the use of ICT.

2.1 Goals

The purpose of this research is to analyse the use of ICT on SNE in the Netherlands in order to compare it with the use of ICT on SNE in Portugal and, based on that, make suggestions to improve the SNE in Portugal.

2.2 Research Questions

The main research question is: “What can be learnt from the use of ICT in SNE in The Netherlands?”

The findings from the main research question lead us to an important sub research question: “What suggestions can be made to improve the use of ICT on SNE in Portugal?”
In order to create a solid knowledge base to the research I will also try to answer the following questions:

- How can ICT be applied to education?
- What is SNE?
- What is the link between ICT and SNE?

2.3 Research Methodology

This will be a qualitative research about the use of ICT on SNE. The main means of data collection will be:

- Literature Review
- Semi-structured Interviews

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1 These questions are to be answered generically and not related to a specific country.
2 Who to be interviewed and how to do it is also an item of this research.
3  Literature Review

3.1  Categorization of handicaps

In the Netherlands the handicaps are categorized in 4 different clusters (Dijk & Abcouwer) (Overheid.nl, 1982):

− **Cluster 1.** Tuition for visually impaired children or multiple impaired children with this handicap.

− **Cluster 2.** Tuition for deaf children, hearing impaired children and children with serious speech disorders or multiple impaired children with one of these handicaps.

− **Cluster 3.** Tuition for chronically ill children with a physical handicap, physically impaired children and children with severe learning difficulties or multiple disabled children with one of these handicaps.

− **Cluster 4.** Tuition for all other chronically ill children with any other type of handicap than a physical one, children that are very difficult to teach and children in schools that are connected to pedagogical institutes.

Portuguese government in an effort to improve education quality and make it available to everyone has adopted the International Classification of Functioning, Disability and Health (ICF) (Portuguese Republic Diary, 2008).

The World Health Organization endorses the ICF (WHO, 2001), and its goal is to create a “unified and standard language and framework for the description of health and health-related states”. ICF has two parts, with two components each (WHO, 2007):

1. Functioning and Disability
   
   a)  Body Functions (physiological functions of body systems, including psychological functions) and Structures (anatomical parts of the body such as organs, limbs and their components)
   
   a)  Activities (execution of a task or action by an individual) and Participation (involvement in a life situation)

2. Contextual Factors

   a)  Environmental factors that interact with all these constructs
   
   b)  Personal Factors
Each of these components can be expressed in positive and negative terms. The components consist of various domains and, within each domain, categories, which are the units of classification.

3.2 How does ICT affects children with handicaps

Dijk and Abcouwer (Dijk & Abcouwer) present a validated model to clarify how ICT can affect the three main competencies (Knowledge & skills, Social skills and Self-image) of the children in SNE, as seen in Fig. 1.

Fig. 1.

Model for the ICT contribution to core competencies

The authors state many benefits from the use of ICT by special schools. Here are some of the most important, referring to Fig. 1:

- **Adjustment teaching package**: Using ICT tools, one can work a lot more individually and differentiated. Lessons can be offered at the specific level of pupils.
- **Attention**: The light and sound stimuli of ICT tools significantly increase focused and sustained attention.
• Communicative prosthesis: ICT can contribute to communication, for example by means of speech computers.

• Independence: By means of ICT, pupils are able to undertake more things and perform more actions for themselves.

• Mobility: [...] Because of their impairment, pupils are housebound. Using ICT, pupils are able to go out (partly virtually) into the world.

• Motivation: ICT applications often supply the teaching material in the shape of a game or a competition. Whilst playing and practicing, pupils experience new knowledge & skills and commit this to memory.

• Motor system supporting prosthesis: [ICT tools] help pupils with motor disabilities. This includes for example one-button computer mice, active boards and touch screens.

• Tuition (support): A teacher cannot be in several places at once, not even when a pupil deserves an award or needs more explanation or encouragement. The computer however, is constantly ‘in conversation’ with the same pupil, which enables the computer to track precisely what the pupil is doing and is able to respond immediately to any requirements.

3.3 Human-Computer Interaction

Attention in ICT development is increasingly being drawn to the interface with the user. This is observable in a study by Wachowiak et. al. aimed at the implications of human-computer interaction for people with cognitive and learning disabilities (Wachowiak, Wachowiak-Smolikova, & Fryia, 2010). Although this study investigates the implications for e-learning exclusively, it has an extensive state of the art analysis on human-computer interaction.

Authors find that, the more an individual finds software easy to use, the more likely is he/she to use it frequently.

They define usability of an interface or software as:

Degree to which design of a particular UI takes into account the human psychology and physiology of its users.

People with special educational needs often show memory, attention, perception and reasoning problems (Keates, Adams, & Bodine, 2007), this makes the interface with ICT a crucial part. As the authors investigated, a simple interface, presenting only a few choices on the screen, is very easy for users with difficulties to use; due to the simplicity, this might create a negative
effect, because users will have to learn and memorize how to navigate through the interface. In turn, an interface with plenty of information might avoid users to forget where they are and provide faster ways to navigate, but such interface would be chaotic and distracting to users with special needs. Authors finish saying that:

*When designing an interface, it is important not to present excessive options, and to include only the tools necessary for the application.*

Authors also conclude that people with cognitive and learning disabilities can greatly benefit from remote access to applications, in the form of web-based access to public services and professional activities. However, as they also find, e-learning type of systems are excessively complicated for these people to use *(Abascal & Civit, 2002)*.

### 3.4 Application of ICT on SNE

#### 3.4.1 Areas of application to persons with disabilities

UNESCO divides the ICT application into four possible areas (within the United Nations Convention on the Rights of Persons with Disabilities) *(Watkins, 2011)* *(UN, 2006)*:

i. Supporting personal access to information and knowledge.

ii. Supporting learning and teaching situations.

iii. Supporting personal communication and interaction.

iv. Supporting access to educational administrative procedures

Researchers from the University College London *(Williams, Jamali, & Nicholas, 2006)* investigated how ICT can help people with special education needs. They analyzed several ICT types and concluded the following:

- Internet: considered to be one of the most accessible ICT, because is reachable with any computer with Internet connection. Although many schools have Internet access (as well as computers), the Internet access is still complicated for people with special needs.
• Virtual Learning Environments: it is a “set of teaching and learning tools designed to enhance a student’s learning experience by including computers and the Internet in the learning process”. A Virtual Kitchen is an example. This type of ICT may offer experiences to handicapped users, which they could not have otherwise. It has been proven especially useful for people with autism and for the development of social skills. However, these systems are difficult to develop because they use advanced technology, and very often they tap on unexplored ways of teaching.

• Augmentative and alternative communication systems: this ICT assists communication. It allows learning to take place, and fosters the social relationships through emotion and desire expression with ICTs. Speech synthesizers and expression/emotion databases are examples of such technology.

• Adaptive Devices: these are devices that allow people with handicaps to interact with ICTs in alternative ways. Examples are: software tweaks to make navigation easier, as mouse-over control and auto-scroll; key-guards for the keyboard, so it is easier to press one key at once; one-button and trackball pointing devices; touch-screen.

3.4.2 Benefits
Williams, Jamali and Nicholas also gathered the main benefits of using ICT for learning in their study (Williams, Jamali, & Nicholas, 2006):

• Florian & Hegarty find and describe six uses where ICT can be of help: facilitating tutor programmes; improving exploratory learning, using ICT as a tool for learning; help in communication; assessment purposes; and management tool (Florian & Hegarty, 2004).

• Thomas finds ICT as an “enabler”. ICT can facilitate learning to students, which increases motivation, fosters self-competition and confidence and improves self-esteem (Thomas, 1992).

• Websites can be a valuable and motivating educational asset.

Banes & Walter also state that ICT can help in communication, it is exciting and represents a positive challenge for pupils. Nevertheless, they also say this excitement can be overwhelming to the pupil and lead to exploration of subjects that would be better off explored in other ways (Banes & Walter, 2002).
3.4.3 Driving forces

Nowadays, youngsters are so used to electronic devices that managing and navigating through them is similar to having an extra capability that they develop while growing. Veen & Vrakking argue that it also helps them to communicate and to build effectively a network of peers. They state that students develop exploratory learning approaches while attempting to give meaning to the information provided (Veen, 2006) (Brummelhuis & Kuiper, 2008). This makes the application, and also the research, of ICT in SNE one of the next big steps in the education evolution.

3.4.4 Teachers and ICTs

Brodin & Lindstrand conducted a study about the use of ICT on SNE (Brodin & Lindstrand, 2003), centered in the Swedish context but interpreted to the generic application of ICT to SNE, which revealed that:

- Teachers lacked knowledge about the training and were not engaged in this special effort, although they are responsible for the development of the school. One conclusion is that technology was stressed more than the pedagogy. New thinking, innovations and knowledge in this area are judged, accepted, rejected or based on how teachers/practitioners understand their own work.

Mooij & Smeets, in a study about ICT implementation in secondary schools in the Netherlands (Mooij & Smeets, 2001) (Liu, Cornish, & Clegg, 2007), also concluded that teacher’s employ quite limited methods to adopt education to the needs of the pupils. Liu et. al add that “a great deal of knowledge within the area of special education is mainly based on how the practitioners understand their own work.”

As Brummelhuis & Kuiper say, better ICT requires better teachers. They refer to a study that finds “personal entrepreneurship” among teachers to be paramount for innovative use of ICT (Drent, 2005). They state:

The term “personal entrepreneurship” refers to teachers who create possibilities for experimenting with ICT applications, researching the use of ICT in their education, reflecting on their outcomes and exchanging ideas with colleagues.

Although teachers have responsibility to adapt and update their teaching methods, especially to the new ICTs showing up in classrooms, it is a too heavy burden for them. The authors further say

[...]it is an impossible task for a single teacher to realize effective use of ICT within the school organization. The use of ICT is complex and
may be overwhelming, requiring teachers to work on too many fronts at once.

3.4.5 Schools and ICTs
As any other organization, schools often use software solutions for managing budget and expenses, employees and their salaries, and their students. Nowadays Dutch schools use advanced management systems to perform these functions, and also to test and track the pupil’s evolution – a system with such features is called Student-Tracking-System, Leerlingvolgsysteem (Kennisnet). This system provides the teacher with an accurate view of the position a pupil takes in the learning process. It allows teachers to timely find which students need more attention, making it possible for a more efficient and personalized education.

However, the presence of ICTs (either for learning or management) in schools alone is not sufficient for an improvement of education quality. Schools must adapt their methodologies to take advantage of ICTs. Brummelhuis & Kuiper, while researching for driving forces for ICT in learning, determined that many schools have invested in ICT and superimposed them on traditional methods, without changing existing educational practices (Brummelhuis & Kuiper, 2008). This problem happens because schools are not yet prepared to make this kind of decisions. These authors defend that:

*Sustainable use of ICT in education requires investment in building long-term capacity for improvement, such as the development of teacher’s skills.*

3.4.6 Notes on ICT application areas
From the literature review, it is important to observe that there are two main areas of application of ICT on a modern education system: Learning and Management (areas ii and iv of the UNESCO’s areas of ICT application to persons with disabilities, presented in the section 3.4.1).

The learning area has been deeply investigated; ICT plays an important role in education, it can help pupils developing vital competencies and, therefore, presents a great chance of improving any pupil’s education career.

The management area is not directly linked to education, in the sense that pupils don’t have contact with it; because of its organizational nature this area has been widely researched in other scopes that are not relevant for this investigation. It is important to notice, however, that the innovation brought
by the Student-Tracking-System feature also presents a great chance of improving the education provided by any school.

Nevertheless, another important area is missing. As seen later in this research, in modern education systems there is a pre-education stage. In this stage pupils are examined for their special needs, and the education career they should have is decided. This area will be called the Indication.
4 SNE situation in Portugal

In Portugal up until now, the majority of SNE was provided by semi-private SNE schools, for public use, which were mainly funded by the government. However, SNE will no longer be provided in these schools as the policy is transiting from special education to inclusive education. Inclusive education is further analysed in section 4.1 Inclusive Education.

Luis Azevedo, Assistive Technology Researcher at IST and CEO of ANDITEC – one of the main Portuguese suppliers of special needs ICT (Anditec), informed that from his personal experience, private schools are not interested in spending their budget in expensive ICTs and therefore, the public schools (which are funded by the government) are the ones having the best ICTs at disposal in Portugal.

Luis also informed me that, for many years now, many Portuguese pupils with disabilities have adequate technological support. Although an increase in the Portuguese SNE quality is noticeable, the system still has a big lack of funding, which is reflected as a reduced and poor use of ICT in education.

4.1 Inclusive Education

The inclusive education model is endorsed by the European Commission as an effort to increase social inclusion of handicapped people, and it is widely operational in Europe (UNESCO, 1994) (WHO, 2001) (UN, 2006). In this model all children with disabilities should be included in regular education and then have the necessary support for their special needs, both from the human and technologic standpoint. When exceptions occur, especially in situations of profound cognitive deficits, (regional) "Support Units" should give adequate support.

4.1.1 Advantages

Studies and reports have shown that, pupils in inclusive education perform better academically (Baker, Wang, & Walberg, 1994) (Koster, 2008) or at a cognitive level (Sontag, Kroesbergen, Leseman, Steensel, Ven, & Wolput, 2001).

3 This information is part of an interview with Luis Azevedo, which is available as Appendix C. Interview with Luis Azevedo.

4 The government does not fund Private SNE schools. These are schools that require the parents to pay a fee that covers the education costs.
Both schools and parents are usually satisfied with the results of inclusion. Since regular schools are cheaper to maintain and more common than special schools, inclusive education also represents a major cost saving, at organizational and transportation level.

4.1.2 Disadvantages

Sontag et al. also point out some downsides of inclusive education. They state that it represents a huge structural change to the whole education model, creating space for: bad distribution of budgets; cases where inclusive education is not the best solution; unclear relations between policies and schools; insufficient budget and expertise on regular schools; and poor implementation of the inclusive education model.

4.2 Transition to Inclusive Education

As result of national and EU strategies for the inclusion of people with handicaps, as referred in the prior section, the government is transiting the current model of SNE to a model of inclusive education. As part of this change, the funding for all semi-private SNE schools in Portugal is ending in 2013. This means that, by then, a pupil with special needs should be attending a normal school. Therefore, over the course of the last few years, pupils have being transited to normal schools.

Semi-private schools, which depended on governmental funding for SNE, will cease this practice. These schools will now provide other type of education/training such as: mere occupational activities; or “functional-education” - in order to prepare/insert the pupils, that are not qualified for regular education, to the real world.

Schools are equipped with multidisability-rooms where pupils with special needs can receive SNE. When faced with special technological needs, public schools will be assisted by ICT Resource Centers for Special Education (ICTRC; CRTIC in Portuguese) created for this effect. They exist at a regional level; every regional group of schools has an ICTRC available.

When in a public school, the regular teacher is supposed to teach the regular subjects to the classroom (which some will include pupils with special needs). There will be an extra trained/specialized person to provide special support if needed.

This represents a major issue to the quality of both special needs and regular education. The problem resides in the fact that, some pupils with special needs simply cannot attend a normal class. Depending on the pathology, some
might not be able to concentrate at all; others might not be able to control
the body in order to be still in the classroom. There are some cases of pupils
that need a dedicated person full-time, which is impossible to provide in this
new model.

On top of this, the other pupils (without handicaps) will not receive proper
education because the teacher will have to provide extra attention to the pu-
pils with special needs.

4.3 Funding and ICT sources

Portuguese governmental funding is proving to be insufficient for ICT evolu-
tion on SNE. Besides this funding, schools in Portugal can find funding in
companies with CSR (corporate social responsibility initiatives) and also in
general social solidarity.

Unfortunately not all pupils can get the technical support they need, in
several cases they only have the means to have a better quality of life because
their parents worked towards that (paying for it or finding other forms of
funding).

Very often in Portuguese schools, most of the ICT for SNE is provided not
by the government but by foundations, like PT Foundation5 (Fundação PT).
This foundation has a wide catalog of ICTs that can be requested on need,
and it also provides financial support for items not in the catalogue. This
foundation actually helps the pupils and their families; however, it is a long,
bureaucratic and painful process to get the support.

Even with the support of institutions like PT Foundation, the ICTs are
very scarce when compared with what teachers consider essential for a SNE of
quality.

Portugal is going through a national wide crisis, which results in an even
smaller budget for SNE. Currently there are no prospects of an increase in the
funding of ICT on SNE. Portugal can only try to use cheap and effective
ICTs, which do not require great amounts of funding or training, but give
high chances of improving the SNE.

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5 PT Foundation provides support in the fields of health, education and digital inclu-
sion. This foundation is a private, non-profit, institution for public use, with the
goal of providing CSR from one of the biggest companies in Portugal, PT – Portu-
gal Telecom.
4.4 ICTs in use

ICTs in use differ from the semi-private to the public schools. Since the pupils with special needs were mainly attending semi-private SNE schools, most of the ICTs in use are on those schools. With the transition to the new “inclusive education” policy, it is most likely to observe a shift of the ICTs from the semi-private SNE schools to the public ones.

Nonetheless, the ICTs used in the semi-private schools are still very scarce. Schools can only count with some computers, software and adaptive devices. It is impossible for schools to base education on these ICTs because there is not enough computers for all of the students, neither is the available software versatile enough for a strong support to the education.

In the particular case of a semi-private SNE school that I visited (located in the suburbs of Oporto, the second biggest city in Portugal), for three classes of pupils with special needs there were around seven computers; with two or three educational software’s each; and a couple of alternative pointing devices and keyboard guards. This school has a computer that pupils liked especially, as well as the teachers; this computer has a touch screen and the educational software GRID2 (GRID 2), provided by PT Foundation and produced by ANDITEC. It is an all purpose software, customizable to every pupil (several profiles feature) and with a “talking with symbols” feature. It even runs on smartphones, being very useful for pupils who cannot talk.

Despite the insufficiency of ICTs in Portugal they still are considered essential. Depending on the pathologies, without ICTs the education would be very difficult or almost impossible. For instance, those pupils who cannot talk have available ICTs that make possible for them to interact with the teacher. Not only this, from their experience, teachers also consider that ICTs are very effective in capturing the pupils’ attention and in transferring knowledge, therefore greatly improving the learning experience.

Because ICTs are not in every classroom, teachers do not rely on ICTs to provide education. Teachers provide SNE through the usual and normal means, and use the ICTs more for communication and accessibility problems (such as teacher-pupil communication). When the pupils are dealing with educational software it is more as entertainment.

Also, because of the scarce ICT, teachers are not fully capable of using ICTs for teaching. They are simply not used to deal with ICTs and, even if

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6 This information is part of an interview with Raquel Cruz, Occupational Therapist at APPACDM – Vila Nova de Gaia, which is available as Appendix D. Interview with Raquel Cruz.
they get access to them, they will not be able to use all of the ICTs’ teaching features and capabilities.

4.5 Quality of the Portuguese SNE

Special education is provided as in any other regular public school, with the support of trained/specialized people in special needs, meaning that the educational contents are the same for both education types.

However, SNE teachers face themselves with a deficiency of resources to effectively teach. On top of this, as result of the aggressive economic crises Portugal is going through, there is a high student-per-teacher ratio, making education only more difficult, especially for the SNE.

It also seems that, although teachers usually follow educational methods, they do not pay much attention to them or whether the pupils achieve all of the goals or not, this is reflected in a poorer education.

4.6 Notes on ICT application areas

From the SNE situation in Portugal, it is important to note that the three main areas of ICT application in an education system (presented in the section 3.4.6 of the literature review) are not explored.

The Learning area, at the current moment, does not play a vital role, even though professionals state that it would bring great benefits and highly improve the general education of pupils.

The management area has no innovation yet. Schools only use regular organizational management systems that do not directly add value to the education process.

Regarding the indication area, until recently, parents and pupils had to find a suitable school individually; the school would then decide if the pupil could be accommodated there or not. With the transition to the inclusive education system, it is unclear how pupils are assessed for their special needs and how their education career is decided.
5 SNE situation in the Netherlands

In the Netherlands, special education is provided public and freely through public schools or other types of private, non-profit school boards. It is similar to the Portuguese situation, after the transition to “inclusive education”. A big part of the education is provided with the support of ICTs. These are common in every school; there is almost one computer per pupil in the classroom.

Every normal child is entitled to regular education, provided by the Dutch Education Ministry. Every child with special needs is entitled to: i) SNE, this is, a place in a school adequate to the child’s special needs; and ii) an adequate amount of money to support the special needs the child has, a backpack, as it is called. This backpack is to be used by the pupils’ school, to provide appropriate SNE (ICTs included). It is funded by the Dutch Education Ministry to ages 4-12 (SBO), and funded by the Dutch Wellbeing Ministry to the ages 11-16 (SO). Fig. 2, in the next section, illustrates the current Dutch SNE situation.

A pupil with special needs can either attend to a special or regular school. Through a “visiting teacher” program, called Ambulante Begeleiden, if the school does not have enough human resources to provide proper education to a pupil, an ambulant teacher can be contracted to satisfy any special educational needs, using the pupil’s backpack (Meijer, 1994).

Every child is evaluated by an arbitration committee (AC), which evaluates the child’s special needs and decides on the size of the backpack. This system has proven to be effective for most of the children; however, there are some loopholes in the system.

With the current Dutch education system, there are some children, with special needs (but not only), that get lost in the system. Sometimes the school where a pupil is currently attending says that he/she needs SNE, however, the AC determines that the pupil does not needs SNE. At this point this pupil is lost in the system, he/she cannot go to a regular school, and cannot either go to a SNE school. Also, when a pupil ends the first stage of the education, primary education (PO), and is assessed by the AC again before the next stage, he/she might lose the status of SNE pupil (for instance, due to not very accentuated disabilities, the AC might think the pupil does not need SNE anymore). This means that a SNE pupil on primary education is now considered a regular pupil. This might be correct in some cases, nevertheless, in other cases pupils that need SNE education will be lost in the (regular) education system.
5.1 Transition to Appropriate Education

Like Portugal, the Netherlands is also changing its SNE policy. Netherlands is transiting from a treatment-based to a demand-based policy. This means that, instead of defining which treatments should be prescribed to each type of handicap and special need, education should adapt to each and every pupil individually, for the best education possible.

An extensive description of the current state, and change processes, of the Dutch education can be found in the report for inclusion measures in schools in the Netherlands (Muskens & Peters, 2009), commissioned and accepted by the European Commission. This report is the base for the next two subsections, 5.1.1 and 5.1.2, which describe the past and new SNE situation in the Netherlands. Also, Fig. 2 illustrates the transition process as Muskens & Peters describe.

5.1.1 Past Situation: Treatment-Based policy

The treatment-based policy, in use before the initiation of the transition, would shape the pupil’s education based on the treatment planned for his/her handicap.

This policy would count with inclusive education (in regular schools), special education (with 2 types of schools, for severe and light handicaps) and the funding for the special needs (the backpack).

In 2008, the Dutch education policies where analysed by a parliamentary investigation (Committee Dijsselbloem, 2008) where it was concluded that:

_The Investigation Committee concluded that most major innovation policies have not contributed to better education, to a certain extent even on the contrary. Reasons were unclear aims, political compromise and conflict, missing backup from the field, restricted resources, short timelines in relation to the Parliamentary time cycle of four years and low attention for implementation tracks. (Muskens & Peters, 2009)_

Muskens & Peters also add that this might be the result of a premature introduction of inclusive education to the Dutch education, which took place in the nineteen-eighties and –nineties under the name Together to School Again (Weer Samen naar School).

Kammer & Reerink also conclude that an important issue was the fact the number of “care-needing” pupils is growing very fast. This means that the backpack expenses are also growing very fast, and that they would soon exceed
what is planned in the national budget plan (Kammer & Reerink, 2008) (Muskens & Peters, 2009).

5.1.2 New situation: Demand-based policy
The main purpose of the demand-based education policy, represented by the program Appropriate Education (Passend Onderwijs), is to increase the social inclusion of handicapped persons. For this, the government tries to include pupils with special educational needs in regular schools as much as possible, providing all the special support necessary. The Demand-based education policy also came as a response to the problems posed by the past situation mentioned above. Up until this moment the government would come up with laws and rules for education, like the inclusive education, and the schools would have to comply with them. In order to reduce the “burden of laws and rules” that schools had, and to improve their autonomy, the government introduced the appropriate education. One other reason to change the education policy was the costs associated with the special education; this new education policy also represents a cost reduction, which is examined at the end of this section.

Appropriate education (Passend Onderwijs) defends that education should be flexible and able to adapt to the needs of pupils. It comprises all kinds of (special) education supported by the government. The Dutch State-Secretary of Education defines it more generally as:

\textit{Appropriate education refers to all forms of education for pupils with a disability or special need as practiced and as financed by the state, in relation to the most appropriate educational tracks and streams for each individual pupil. (State-Secretary of Education, 2007)}

The State-Secretary also discloses the aims of appropriate education:

\textit{Parents should easily find a school that is appropriate for the special needs of their child. Schools were to be obliged to make them an offer and to co-operate regionally as to guarantee the offer. Quality of education is to be improved in relation to school career plans for all pupils concerned. More tailor-made solutions, e.g. through less rules and more fixed regional budgets for appropriate education.}

Also mentioned is the fact that the inclusive education programme was to be incorporated in the appropriate education model. Furthermore, in the Dutch National Budget Plan for 2008 was planned that, by 2012, 16% of the pupils would be pupils receiving special care in regular schools (Primary Education, 2008). \textbf{Fig. 2} illustrates the past and current Dutch SNE situation.
SNE transition from Treatment- to Demand-Based policy.

5.1.3 Advantages of Appropriate Education

Inclusive education already took many pupils to the regular schools, but appropriate education will tend to take pupils to regular schools whenever it is possible. With this new model of education, pupils are individually analysed and checked for possible integration in regular schools. Whenever possible a pupil will attend to a normal school, therefore, increasing even more the inclusive effects of special education in regular schools.

This not only means that the whole integration of handicapped persons will greatly increase, but it also means that much more pupils with special needs will end up receiving education in the wide network of regular schools. Regu-
lar schools are cheaper and simpler to run than special schools, thus, resulting in a major cost saving for the government.

Since regular schools are much more common than special schools, a pupil with special needs that attends to a regular school will much probably have to travel less, having more time for leisure or to receive education. This advantage might even be more important in rural areas where, due to reduced population density, special schools are very scarce. In this case, instead of traveling a long way to the nearest special school, maybe in the closest town, a pupil with special needs can attend to the local regular school with the appropriate support for his/her special needs.

5.1.4 Risks of Appropriate Education
Muskens & Peters gather the main risks of appropriate education from a study of the care policies by Ledoux et al.:

- Insufficient regional and multi-disciplinary co-operation in practice, leading to an unwanted number of outplacements of pupils in special care institutions;
- Therefore, possibly the unwanted further growth of special education and special schools;
- The latter might be reinforced by the pressure to exclude pupils with special needs, exerted by parents of children without special needs and disabilities – they might have objections to the attention paid to appropriate education for children in need. Regional differences.
- Best chances for assertive parents compared to those of amenable parents. (Ledoux, Karsten, Breetvelt, Emmelot, Heim, & Zoontjes, 2007)

5.2 Quality of the Dutch SNE
SNE in the Netherlands follows the same governmental guidelines as regular education. The guidelines are divided in seven areas of knowledge (mathematics, Dutch, English, art, etc.). Each area has several goals that have to be reached by the pupils (Nationaal Expertisecentrum Leerplanontwikkeling). The Netherlands enjoys a consistent service of education, both for regular and special education, when compared to Portugal; nevertheless there are some issues that, if resolved, would greatly improve the general education quality.

One of these issues arises when accomplishing these goals with ICT. With the uprising of ICT on education, a misalignment between ICT and educational practices has become common within schools. Pupils sometimes seem to
be more entertained than actually being taught. The educational guidelines referred above are being forgotten.

One other issue deals with schools having difficulties to match all of the educational goals when acquiring new ICTs. Software tools are mostly chosen taking into account word of mouth communication, user/buyer feedback and budget constrains associated to the schools, resulting in a lack of coverage of great part of the learning goals. These tools are only as good as the criteria used to choose the ICT tools; if a school has an ineffective ICT coordinator, the tools that he chooses will result in a bad education for the pupils, or at least, not as good as it could be. This architecture has a bottleneck, represented by the ICT coordinator/manager of the school, which directly determines how good is the education provided by the ICT tools.

It is also important to refer that this happens even though most software makers usually provide the list of goals covered by the tools they sell.

This situation is also inconsistent with the whole education system: months are spent to choose the (regular) education manuals/books, checking every detail and predicting the learning processes. Such a comprehensive process does not exist to acquire expensive educational ICTs.

5.3 ICTs in use

As said before, in the Netherlands ICTs are common in every school. These can be divided by their purpose: education, management or knowledge-sharing.

5.3.1 Education

In the classroom there is almost one computer per pupil and a big part of the education is provided with the support of ICTs.

The computer, together with an alternative keyboard/mouse, is reported to be the most essential piece of educational ICT in use, mostly because it can be used to run any type of educational software. There is a wide array of educational software products in use; in some cases the products are acquired in order to satisfy specific and individual pupil needs. Each and every educational product satisfies different educational goals in different ways.

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7 This information is part of an interview with Annemieke Hoffman and Lotte de Rooij, which are available as Appendix A. Interview at Mytylschool with Annemieke Hoffman and Appendix B. Interview with Lotte de Rooij.
These products excel in distinctive ways, making them especially suitable for specific situations. Worth mentioning are the cases of adaptive and immersive educational software.

The adaptive software individually adapts the learning contents to the learning progress of every pupil. The software is aware of the pupil’s difficulties and the attention he/she paid to the exercises. With this information the software can then provide personalized exercises to the pupils, enhancing their learning capabilities. An example of such software is the Rekentuin (Oefenweb.nl) software product for mathematics. This product can entertain and teach pupils, and also track their educational progress in the school’s management system. It is used for regular education, and it is especially useful for SNE pupils with learning difficulties.

Even though adaptive software offers incredible personalized characteristics, in some cases it lacks the capacity to effectively attract the pupil’s attention, or at least it is not as good as some immersive software products. The immersive software differs by the use of a rich interface, which effectively attracts the pupil’s attention. Tech Ed (Ranj - Serious Games) is an example of such software. However, immersive software is (usually) not adaptive, meaning that every pupil has the exact same learning experience and it does not update the pupil’s educational progress on the school management system.

Some schools are also adopting a centrally hosted thick client application\(^8\) infrastructure, which consists in the transition to a central client/server network structure for all of computers, where all the educational software would be available in any computer.

5.3.2 Other
Some innovative ICT solutions can also be found on the areas of management and knowledge-sharing.

Is common to find in Dutch schools a Student-Tracking-System. This system is used by teachers and therapists where, besides the usual pupil management features, includes the pupil learning evolution using the educational goals. Some schools have more advanced versions of this software, with the capability of automatically receiving the learning and progress data from educational software.

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\(^8\) Centrally hosted thick client application is a similar network infrastructure to the ones in the universities computers, for instance. It allows an user to log in into his/her personal account, with his/her documents and applications, using any computer in the network. Not to be confused with a web-based cloud system.
Some regions of the Netherlands use ICT tools for the process of identification of the pupils’ handicaps and selection of appropriate schools. One of these ICT tools is the IVO. IVO is a two piece tool, and the name stands for both, *Indicatietelling Vanuit Onderwijsbehoeften* (indication of educational needs), and *Instrumenten Voor Onderwijszorgorganisatie* (instruments for education/care organizations) *(M&O groep, 2012)*. These tools use manually inserted information regarding the pupil (such as handicaps, financial constraints, geographical constraints and personal tastes); the first tool deduces the special needs the pupil probably has; the second one outputs an informed decision of which facilities the pupil should attend.

There is an interesting and simple ICT for knowledge-sharing; it is the Wikiwijs.nl and it is identified as a Meta-tag Database of Lessons *(Wikiwijs)*. This is a free online database where teachers can share and consult resources to teach, sorted by the Dutch guidelines for education.

### 5.4 Notes on ICT application areas

The Dutch education system has been exploring and bringing innovation to the three main areas of ICT application (presented in the section 3.4.6 of the literature review).

The Learning area is the most advanced; ICT plays a vital role in the learning experience of all pupils. Innovative solutions have been developed and implemented which can improve learning and provide professionals with insight never seen before.

The management area counts with the innovative Student-Tracking-System features that allow schools to efficiently deploy their resources. Students now can easily receive personalized education.

The indication area was unexplored until recently, it is still under research and development but the results are already promising. It has made the indication process more accurate, fast and easy.
6 Model for Integrated and Unified ICTs on SNE

In this section the current Dutch indication process will be analysed for possible optimizations, resulting in a conceptual model for integrated and unified ICTs on SNE that offers several advantages to the whole system.

Among these advantages are: the optimization of the indication process itself; reassessment of previous indications; and use of pupil’s progress and adaptation information for future indications.

First, a state of the art description of this process is made in the next section, the following sections study how can this process be optimized in different areas.

6.1 Current Dutch Indication Process

The Indication Process is the procedure that identifies both the handicaps that a pupil has, and the appropriate education that pupil should have. This is the first contact with the (special) education system that a pupil has, and it will shape his/her education career. This is, therefore, an important step that will define how a pupil will learn in the future.

When the Treatment-Based policy was in use, the arbitration committee would check if a pupil has a handicap and, in the affirmative case, this pupil would be able to join a special school, and a backpack/budget would be defined to support the special needs the pupil has. The parents then had to find an appropriate special school for their child; in some cases this was a problem, because parents couldn’t find a school with vacancies or capability to support their child.

With the new education policy, the indication process was revised. As before, after the evaluation from the arbitration committee, the parents apply to a school and this school evaluates the fit of the pupil; if appropriate, the school would then receive the backpack. With the revised indication process, if the school finds that the pupil doesn’t fit, it is then accountable to indicate another school more appropriate for that pupil. In this way, parents have less risk of not finding a school for their child with special needs. Also, with the new education policy is easier for schools to contract Ambulante Begeleiden (visiting teachers) with the backpack budget, which is especially useful for regular schools accommodating pupils with special needs. This is described in the final report for inclusion and education in the Netherlands (Muskens & Peters, 2009), and is illustrated in Fig. 3.
The usual procedure for this process consists in a series of meetings and tests with the pupil, and then a committee constructs a final evaluation of his/her handicaps that will decide how should the education career of the pupil be. Some regions of the Netherlands use ICT tools in this process, an example of such are the IVO tools, as referred in section 5.3.2, which help in the decision with a deep assessment of special needs, and an educated suggestion of facilities that are appropriate to the pupil.
The indication process is as effective as the members that form the arbitration committee. This creates space for inconsistencies in the system, leaving some pupils without appropriate education, especially for pupils being evaluated for a second time by a different committee. This problem has been stated in the introduction of chapter 5. The current indication process also lacks the follow up after the indication, to check if it was appropriate and if it needs adjustments. Currently parents or teachers do this, but only if they detect something obviously wrong because they are not trained for detecting more subtle problems. Generally this process is not very efficient and could be optimized with some features of modern ICTs, as constant monitoring, ICT integration and data mining.

6.2 The conceptual model

Looking at the current education model, not only in the Netherlands, but also in most developed countries, we can find 3 main areas of application of ICT: indication of appropriate education, learning and school management. The goal of this model is to bring value to the SNE system; it integrates innovation in each of those areas to come up with an optimized information cycle.

Fig. 4 illustrates a high level representation of the concept model on the right, versus the current model on the left. Fig. 5 illustrates a detailed representation of the concept model and all of the incorporating elements, as well as their functions and influence on the education system.

The model starts by the indication process, which forwards pupils to the most appropriate schools; these pupils then learn using educational software, this educational software monitors their performance; the school management software receives performance data from the educational software in order to maintain an accurate overview of each pupils learning evolution; finally, the indication software fetches this data from the school management software and uses it for: reassessment of previous indications (follow up), and to give more educated suggestions in the next indications (based on the success and knowledge of previous ones).

As much iterations this cycle completes, as comprehensive the knowledge base of the indication software gets. With time, the indication software will profile pupils and assess the most appropriate education for them, based on similar cases in the past. Like so, the arbitration committee can make better decisions, and parents can find the most appropriate schools and resources for their child. If more pupils get the most appropriate education they can, it
means that they will have the education that works best for them, and therefore, they will perform better.

**Fig. 4** illustrates a comparison between the current model and the Model for Integrated and Unified ICTs on SNE. It is visible the opportunity at hand in this situation, the education process can get much more optimized.

**Fig. 4.**

Current vs. Concept model for ICT on SNE

6.2.1 **Synergies between ICTs**

ICTs can be found almost in every stage or area of the education system. Ultimately, these ICTs are all means for the same end: a better education. Putting it in that way, it is obvious that they all can do a better job if these ICTs can help each other.

Normally every software tool produces data in its normal operations. For the tool itself this data may only represent a log file⁹, but for a different tool in a different stage, it may represent extra information. This extra infor-

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9 Log file refers to the registry of all operations executed in a piece of software.
mation may be helpful in decision processes or knowledge base construction, for instance.

Currently the several ICT tools present in the educational system are not cooperating among themselves\textsuperscript{10}. Considerable amounts of valuable information are not being utilized. This is one of the main drives of the model for Integrated and Unified ICTs on SNE.

As illustrated in Fig. 5, integration between software tools is the capability of communicating data, through mutually known protocols or data structures. This data will add value to the normal processing of the software tools throughout the education system, making it possible to achieve higher and more intelligent collective processing.

In Fig. 5 this is represented by the sharing, of the pupil’s progress and adaptation information, between the school/pupil management system, the integrative educational software, and the ICT tools for indication through open protocols, data structures or APIs.

Adapting current ICT tools in the education system, or creating new ones with equivalent features, including integrative capabilities will lead to an unified ICT structure that will boost the whole education process, only by making use of all of the information produced by the very same process.

\textsuperscript{10} Except for the adaptive type of educational software. Nevertheless, only a small part of the educational software in use is adaptive and includes cooperating features with the school’s management system.
6.2.2 Optimizing the indication process

This optimization would account with the existing indication capabilities of the IVO tools, as introduced in section 5.3.2. But, instead of just reasoning over the manually inserted information about the pupil, the optimized version
would use information on the success of past indications to other pupils; more in particular, past indications to other pupils in similar conditions as the pupil receiving indication.

The extra information flow for this optimization would be the following:

- Pupil learns with the adaptive educational software, which produces learning progress data;
- School management software receives data from educational software in the school, and stores pupils’ learning progress data;
- Indication software fetches data from schools’ management software and processes it for patterns, trends and other information. It also reassesses previous indications to measure if pupil progress is what is expected, and checks if these indications need adjustments or if the pupil would be better of with other different indication.
- In the next indication, after manually inserting the pupil’s information, the indication software searches for similar pupils, checks the success of their indications (through the success of their education, available as the educational progress), and assesses: which special needs the pupil should have satisfied; which schools are appropriate to the pupil; and it even can indicate which educational software tools would work better on that specific pupil (based on a possible match between personal preferences of the pupils).

With this procedure, the indication by the arbitration committee is improved, and parents can rest assure that the education indicated will be the one where the pupil has the best chances of being successful. One issue in the current indication process is that there is no follow up after the indication; this model corrects it by checking the fit between the pupil and the indication, every time the software fetches learning progress data from the school management software. Also, as many indications are done, as large the knowledge base gets, and as high is the chance of a pupil to find a match in the database when being indicated. Of course, all of the data would be kept confidentially.

This optimization is also illustrated both in Fig. 4 and Fig. 5 through the information cycle that is complete when the indication process optimizes the indication of appropriate education by using progress and adaptation information of previous indications, making future ones better.
6.2.3 Optimizing Learning

As concluded by Dijk and Abcouwer, ICTs can greatly develop the 3 main core competencies of a child in SNE: knowledge & skills; social skills; and self-image. More particularly, educational software can provide tuition support by delivering constant support to the pupil and tracking precisely what is the pupil doing. It also makes space for the use of “Adjustment teaching packages”, as adoptive software, which work individually and differentiated to each pupil. Authors state that this application of educational software improves the attention and motivation of the pupil, greatly improving the competency “Knowledge & Skills” (Abcouwer & Dijk). These advantages are included in the model by having the Educational software to assist the Teaching, as illustrated in Fig. 5.

The learning process would be better optimized if schools adopt adaptive educational software and school management software - which can be integrated both with the adaptive educational software, and the indication tools.

This would be the extra information flow for the learning optimization:

- Pupil makes exercises in the educational software;
- Educational software updates the school management software with the results.
- Educational software also monitors which exercises pose a challenge to the pupil, which exercises catch the pupil’s attention, which exercises the pupil takes more time to complete, etc.; and then adapts the learning contents of the next exercises for the areas the pupil has more difficulty, choosing for methods the pupil has proven to pay more attention or being more successful with;
- School management software gathers the education data from all of the educational software tools, updates the educational progress of the pupil, advises which should be the next educational steps, and gives an overview of his/her evolution.

With this methodology, not only pupils get a highly personalized learning experience optimal for their learning characteristics (learning faster, better and exactly what they need to learn), but also teachers can have a better insight on the pupil’s evolution, being easier to identify learning issues and very quickly solve them.

This optimization is understandable in Fig. 5 where, through the continuous flow of the information cycle, the indication process indicates with more and more accuracy the best appropriate education, increasing the general success rate of the appropriate education.
6.2.4 Issues
Unfortunately this model is too ambitious. Almost every piece of software would need adaptation and many new software tools would have to be built from ground up.

There is also the need for the creation of a data structure and a communication protocol that can withstand national, or regional, wide centralization of learning progress data without creating unmanageable databases after some run time.

Such a big project would represent enormous difficulties for a national wide implementation. Not only it requires the software, but it also requires extensive training to make professionals as effective as we want the software to be.

6.3 Notes on ICT application areas
This model gathers the best practices of the three main areas of application of ICT (presented in the section 3.4.6 of the literature review), connecting and combining them for the maximum optimization of the whole education system.

With the use of advanced and innovative ICT in the Learning area, additional information can be inputted in systems of the Management and Indication areas. This information cycle, which is presented by the model above, not only makes it possible for more informed decisions on pupils’ education careers, but also follows pupils throughout them.
7 Conclusions and Recommendations

This chapter closes the investigation with conclusions about the study, and recommendations for both the Netherlands and Portugal.

7.1 Netherlands

The Netherlands has an efficient system for SNE. A child with handicaps will have good support for his/her needs throughout the entire education career. The government has been quite active improving the inclusion of the handicapped. This resulted in the demand-based policy, which ensures the individual fulfilment of special needs for the best education possible, while including as many pupils as possible in regular schools for the best inclusion effect.

There are state of the art ICTs in almost every classroom, and the budget for their new acquisitions is appropriate. Adaptive educational software has shown promising properties, as the highly personalized education and the continuous monitoring. The direction should be of merging this type of software with the properties of immersive software, as the rich interface; which would create the ultimate educational software.

With the current state of evolution of technology, would also be possible to provide remote education through web, or remote access to the school educational software. This feature would be especially useful for pupils with reduced mobility, or pupils with special needs attending regular schools that need some educational software not available in that school.

However, this well-organized system has some discrepancies. Even though state of the art ICT is available, teachers and schools still don’t bear in mind the national educational goals for education. Teachers often entertain pupils instead of teaching them, and schools purchase new ICTs without thinking of the extra educational value they actually need to acquire. The educational goals aren’t being given much importance, when the opposite should happen; the education is the result from the educational goals covered in the classroom.

SNE could greatly benefit from the standardization of the educational goals in the educational software market, meaning that the covered educational goals would be a main part of the software characteristics and schools would be required to cover all of them.

There are also advanced ICTs in the management field. Although not widely in use, software like the Student-Tracking-System brings powerful insight
to the teachers on the evolution of the pupils. This is made possible by using information generated by the pupils while executing the educational software.

The IVO tools, which support the indication of special needs and schools for pupils with handicaps, also represent an important step in the use of ICT in the education system. Although it is used in a small scale it is a leap forward that can lead to series of changes that will shape the future education system.

Even though advanced and powerful ICTs are available to schools and teachers, the effect isn’t as prominent as expected. Professionals still need a big deal of training to successfully take advantage of all the features of these modern ICTs. This is an important issue particularly for the educational software, where many times teachers don’t know how to use it correctly, let alone teaching the pupils how to use it.

Fortunately there are some easier and cheaper ways of fighting the existent lack of training. Initiatives for knowledge-sharing, like the open database of lessons Wikiwijs.nl, support and help teachers improve their skills and keep updated. It is a cheap solution because it doesn’t require a complex technical infrastructure. Knowledge practices like this are promising because they gather the collaborative power of the teachers, and make it available to all teachers as well.

The model for Integrative and Unified ICT on SNE would be a major advance in the education system structure. Such project has never been done in an education system, thus, representing a major risk, but also a remarkable technologic innovation.

7.2 Portugal

Unlike the Netherlands, the Portuguese SNE system is poorer as the budget constraints are higher. A pupil with handicaps won’t have much ICT support in Portugal. On top of this, the education system is transiting to the Inclusive Education policy. Although the goals of this policy are all positive, due to poor structure and reduced budget, it is having negative effects already. Regular schools don’t have conditions to receive pupils with special needs, neither these schools will have enough support.

ICTs are available in a very limited amount, mainly through CSR or charity. The few ICTs schools can get are highly valued by them, teachers hope they could have ICT support for teaching. As of management ICTs, they are not common at all; usually the school management software tools serve only for organizational purposes and don’t manage the pupils’ progress.
As Dutch teachers, Portuguese teachers also end up not paying due attention to the educational goals. Also, teachers don’t really have expertise on how to operate the few ICTs that are available, which is a problem originated by the lack of training.

A shortcut for the resolution of lack of training would be the implementation of knowledge-sharing practices. When presented with the Dutch ones, Portuguese teachers reacted enthusiastically; having a free online database class and inter-school knowledge-sharing communities would highly increase the skill set of the teachers. Teachers could refresh their teaching methods, get to learn how to use the ICTs available and get to know ICTs that schools can and should acquire.

Currently these practices are not common, but their implementation is easy and cheap, as they require only basic ICT. For better result, these knowledge-sharing practices should be implemented nation wide, and for that it should come from a governmental initiative.

7.3 General Conclusions

ICT has the capability to be the next major step in the education. It can solve difficult problems, increase productivity and effectiveness, and save costs.

ICT can improve the Learning area by teaching in a more effective and pleasant way, which is essential when dealing with pupils with special needs; ICT can also reduce the need for a high teacher-per-student ratio, making pupils more autonomous and saving costs.

Not only that, ICT can be paramount in the Management area as well, providing teachers with feedback that was not available before. Teachers can then direct their attention to the students who need it the most, at the right moment; avoiding students to get behind or forgotten in the classroom.

ICT also presents a major advancement in the Indication area. With the use of a continuously updated knowledge base, decisions on the pupils’ education career are even more educated and effective.

With all of these benefits, ICT makes it easier for pupils with special needs to attend regular schools, highly increasing the social inclusion of the handicapped ones.

However, it requires expertise and extensive knowledge to properly select and implement ICTs. Teachers and education professionals need training to adapt to these modern ICTs. It is also important to notice that, too much ICT is not the answer for a better education system. ICTs can only help if the education system has a strong foundation, without it they will only increase
the complexity and decrease the efficiency of the system. Even with a good foundation for the application of ICTs, when a major introduction of ICTs takes place, there is the need for adjustment of the education practices used at that moment.

Knowledge-sharing practices, like online class databases and inter-school groups for sharing knowledge, are an important token from this investigation. They represent a cheap and effective alternative to training, and can keep the professionals up to date with the newest ICTs. This can also result in a cost reduction, because informed professionals can make better (budget) decisions related to the ICT.

The Model for Integrative and Unified ICTs on SNE can bring a new level of innovation to the education, optimizing and improving the system while taking advantage of existent resources. It can be applied to any education system that uses ICTs to support teaching and management, and offers a sustainable source of information to improve the whole education system.
8 Acronyms

UvA – Universiteit van Amsterdam, Amsterdarn
IST – Instituto Superior Técnico, Lisboa
SNE – Special Needs Education
ICT – Information and Communication Technology
ICF – International Classification of Functioning, Disability and Health
AC – Arbitration Committee
CSR – Corporate Social Responsibility initiatives
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Appendix A

Interview at Mytylschool with Annemiek Hoffman

ICT use on Special Needs Education at Mytylschool
Thursday, 22 of March, 2012

by Adriano Martins

Introduction

Orion Foundation and Mytylschool
Orion is a foundation providing public primary and secondary special education in Amsterdam. Has a network of 16 schools and offers special needs education (SNE) and appropriate care for the needs of pupils from 4 to 20 years. Orion specializes in education and counseling to youngsters with (Orion foundation):

- Cluster 2: Deaf children, hearing impaired children and children with serious speech disorders or multiple impaired children with one of these handicaps.
- Cluster 3: chronically ill children with a physical handicap, physically impaired children and children with severe learning difficulties or multiple disabled children with one of these handicaps
- Cluster 4: chronically ill children with any other type of handicap than a physical one, children that are very difficult to teach and children in schools that are connected to pedagogical institutes. (Abcouwer & Dijk) (Overheid.nl, 1982)

Mytylschool is one of Orion’s foundation schools. This school is mainly focused on Cluster 3, mental or physical disability or a chronic illness. After a quick visit to the Mytylschool with the school director, Jack Deen, my thesis supervisor, A.W. Abcouwer, and other master student, I planned to visit the school again to see the used information and communication technologies (ICTs) in more detail.

Mr. Deen forwarded me to the ICT coordinator, Ms. Annemiek Hoffman, who set up an appointment with me for this meeting.

Interview (Questions and Answers)

1. Q: Which specific handicaps have more ICT support? (Deafness, blindness, physical handicap, dyslexia, or others.)
A: Every pupil has his/her handicaps supported by ICTs. The ICTs are evenly distributed throughout all of the handicaps.

2. **Q:** Which fields of ICT have more technology available? (VLE, AAC systems, adaptive devices, or others.)
   
   A: The handicaps of the pupils in Mytylschool are so diverse that every kind of technology ends up being used (at least the ones I suggested above).

3. **Q:** How are the results of the ICT application? (Are the results visible in the short run? Which are the vital ICTs?)
   
   A: Depending on the handicap or learning stage the results can be visible both on the short and long run. Every ICT is useful for the learning/therapy and should be analyzed only as a whole.

4. **Q:** Which are the main uses of ICT at the Mytylschool? (Diagnostics, learning/training, entertainment, management, or others.)
   
   A: The main use of ICT is for learning and training. These ICTs also have to be somehow interesting or entertaining for improving the focus of the pupil. There is also a student management system (student-tracking-system from the direct translation) used by teachers and therapists where, besides the usual management features, includes the pupil evolution. There is no diagnostic ICTs because the children arrive to schools only after being diagnosed with some handicap.

5. **Q:** Are there custom tailored ICTs? (Are the ICTs general for all the pupils? Are there some special ICTs for very specific cases?)
   
   A: There are standard ICTs available for SNE, however, most of the pupils require a different treatment and, therefore, different ICT applications. Some ICTs are usually acquired because of a specific pupil, becoming also available for future needs. In some cases, the ICTs are too expensive and they are not acquired by the school (issue also discussed in the following question).

6. **Q:** Do you follow a general method of education? (Is there specific steps to take and stages of learning?)
   
   A: No, there is no general way or method for teaching. Usually the therapist or teacher instructs the pupil to perform some regular task, nothing in special. However, when the therapist or teacher detects the lack of some basic ability/skill, he/she will exercise that. For instance, before jumping into computer software, the pupils play a game called “My First Mouse”, which starts with playing with little toys, then playing with more complex toys, and finally playing with a one button mouse.

7. **Q:** Were does the funding for ICT comes from? (Government, school budget, parents, or other)
   
   A: Funding comes mainly from two sources: · The government, through the school budget. It is usually not enough for expensive/rare ICTs; · The pupil’s parents, with their possessions, through insurance companies, or other means. This is the only way of acquiring very expensive ICTs. There is the example of a
pupil that required the use of eye tracking technology, which is very expensive. The pupil’s parents acquired the equipment through an insurance company. There is also some cooperation between the Orion foundation and other institutions to find affordable alternatives for ‘out-of-reach’ ICT (as an example, the Orion foundation is cooperating with the Groningen University to develop a cheaper eye tracking technology).

8. **Q: Is it easy to ask questions to the kids regarding the use of ICT?** *(If some alternative ICT is better or worse for example.)*
   A: Always depends on the pupil’s ability to talk, nevertheless, children have likes, dislikes and preferences. For a simple question, even if they don’t talk, they will express their preferences in other way.

9. **Q: Do you use internet based or remote learning ICTs?** *(Do the pupils also work at home? Is there any sort of eLearning?)*
   A: Pupils do not usually have homework, when they arrive to school they will be instructed with work. Nevertheless, pupils also have ICTs available at home, usually with better and more modern computers. This situation is about to change, the Orion foundation is with a project in hands to move/create applications in a central server accessible from the computers of all of the schools. Mytyschool will have this technology in December this year. By then pupils might be able to access the ICTs also at home, and have their progress managed on the school.

10. **Q: What are the 3 ICTs you find more important?** *(If you were to open a school, what would be the 3 ICTs you would take?)*
    A: Hard to choose, depends very often on the pupils in hands. However, I find the following of the most (general) importance: touch screens, different mouse and keyboards devices, and many computers.

11. **Q: How do you usually get to know new ICTs?**
    A: Through: Congresses, as the IPON 2012 – ICT Platform Onderwijs Nederland *(IPON - ICT Platform Onderwijs Nederland)*; other schools; teachers with webpages containing ICT and SNE related matters; and special groups – as the Orion’s “Ambassador for Education”, which consist of several workers of the various schools for the exchange of ideas and knowledge.
Acronyms
ICT – Information and Communication Technologies
SNE – Special Needs Education
VLE – Virtual Learning Environments
AAC – Augmentative and Alternative Communication

Bibliography
Appendix B

Interview with Lotte de Rooij

ICT use on Special Needs Education in the Netherlands
Friday, 6 of April, 2012

Lotte de Rooij · Freelance consultant for innovation in education

by Adriano Martins

Introduction
In the past two months, I developed a deeper understanding in the Dutch special education as well as in the ICT role in the SNE. To the date, my main bases of knowledge were: the information available in articles and in the internet; the insight given by my thesis advisor, professor A.W. Abcouwer; and the insight acquired at (Orion Foundation’s) Mytylschool through the course of two visits. So far was of my knowledge that, in the Netherlands, special education is provided public and freely through public schools, foundations, or other types of school boards, not directly controlled by the government. The government funds these boards of schools; the budget is then sliced throughout all of the incorporating schools. The schools provide most of the ICT used by the pupils. In many cases, personalized ICTs.
The types of ICT used are endless, and usually shaped to the pupils needs at the moment of the buy. The most used (or important) piece of ICT used was the computer (together with an alternative keyboard/mouse), which can be used to run any type of educational software. However, it was not clear the existence of a method of teaching to the pupils, with steps or goals to reach. Instead, pupils seemed to be more entertained than actually being taught, in the schools. I was also informed about other important ICT’s and practices, such as: the Student-Follow-System; the groups of school representatives for exchanging ideas in ICT on SNE; and the transition to a client/server network structure for all of computers at Orion foundation (similar to the one used for the university computers, for instance. Not to be confused with a web-based cloud system.).

At this point I was trying to narrow my research to the ICTs and education used for the cluster 3 · chronically ill children with a physical handicap, physically impaired children and children with severe learning
difficulties or multiple disabled children with one of these handicaps (Abcouwer & Dijk) (Overheid.nl, 1982).

My thesis adviser, A.W. Abcouwer, forwarded me to Lotte de Rooij, a consultant for innovation in education, so I could get insight on the SNE scene in The Netherlands, on a more professional level. The interview was semi-structured. I prepared several questions, which I would like to be answered, with the extra purpose to trigger a conversation on the subject in question.

**Interview**

During the course of the interview, the conversations triggered by the prepared questions would drift into other related subjects, also relevant to the research. These subjects are present after each answer to the questions distinguished by a small title (Like this: ).

**Questions**

1. **Q: What resources does a disabled child have in the Netherlands? (ICT and education wise.)**
   
   A: In the Netherlands, every normal child is entitled to regular education, provided by the Dutch Education Ministry. Every child with special needs is entitled to: i) SNE, a place in a school adequate to the child’s special needs; and ii) an adequate amount of money to support the special needs the child has, (a *backpack*, as it is called). This *backpack* is to be used by the child’s school, to provide appropriate SNE (ICTs included). It is funded by the Dutch Education Ministry to ages 4-12 (SBO), and funded by the Dutch Wellbeing Ministry to the ages 11-16 (SO).

   **(Evaluating Committee: )**

   Every child is evaluated by a committee (EC), which evaluates the child’s special needs and decides on the size of the *backpack*. This system has proven to be effective for most of the children; however, there are some loopholes in the system.

   **(Children lost in the system: )**

   With this system there are some children, with special needs (but not only), that get lost in the system. Sometimes the school where a pupil is says that he/she needs SNE, however, the EC might determine that the pupil does not needs SNE. At this point this pupil is lost in the system, he/she cannot go to a regular school, and cannot either go to a SNE school.

   Also, when a pupil ends the first stage of the education, primary education (PO), he/she might loose the status of SNE pupil (perhaps due to not very accentuated disabilities, the EC might think the pupil does not need SNE anymore). This means that a SNE pupil on primary education now is considered a regular pupil in the following stage of education. This is correct in some cases;
nevertheless, in others cases pupils that need SNE education will be lost in the (regular) education system.

2. Q: (In your opinion) Is the financial support adequate for the SNE?
A: Yes, so far almost every pupil has his/her special needs for education covered. The education is also good, although there are many aspects that could be drastically improved in order to get a much better SNE (as seen in questions 1 and 3).

3. Q: Is there a learning method for SNE? (Set of goals or steps to track the evolution of a pupil.)
A: Yes, there is. SNE follows the same governmental guidelines as regular education. The guidelines are divided in 7 areas of knowledge (mathematics, Dutch, English, art, etc.), each area has several goals that have to be reached by the pupils (Nationaal Expertisecentrum Leerplanontwikkeling).

(Student-Follow-System: )
The student-follow-system, present in most of the schools to manage the pupils and their learning progress, uses these goals to track how far is the pupil on the learning process. However the input has to be done manually by the teachers.

(Schools are forgetting the goals: )
Lately, schools (or school boards) are forgetting these goals, or are even not aware of them. Instead of identifying which goals are currently being address, and which goals are not being address at all, schools appear to be using the rule of thumb when choosing new educational software.

Software makers usually provide the list of goals covered by the tools they sell. The responsible of choosing which tools to acquire to a school should then check if the goals the school needs to cover are in the list.

However, this is not happening. Software tools are mostly chosen through word of mouth communication, user/buyer feedback and budget constrains associated to the schools. This results in a lack of coverage of great part of the learning goals.

Instead of buying what they really need, schools appear to be buying (good) tools without paying detailed attention to the learning goals, therefore, not contributing for a better education.

This situation is inconsistent with the whole education system: months are spent to choose the regular education books, checking every detail and predicting the learning path. However, to acquire expensive ICTs there is no such comprehensive process.

(One size does not fit all:) 
Despite the success of a certain ICT tool on a class of pupils, this very same tool might not have an equal result on other pupils. Happens sometimes that the ICT tools chosen by a school do not completely match the needs all of all it’s pupils.

(Bottom-up architecture:)
The ICTs used in schools are usually chosen by the school itself. Therefore, the tools used in a school are only as good as the choosing criteria used to choose the ICT tools. If a school has an ineffective ICT coordinator, the tools that he chooses will result in a bad education for the pupils, or at least, not as good as it could be. We can say that this architecture has a bottleneck, represented by the ICT coordinator/chooser of the school, which directly determines how good is the education provided by the ICT tools.

4. **Q: (In your opinion) Is ICT essential in education?** *(Would you even consider providing SNE without ICTs?)*
   
   A: Yes, indispensable. Although approximately 90% of the materials are paper based, the ICTs can present much better results in a shorter time frame. ICTs can be more attractive, stimulating, adaptive and effective. When dealing with pupils with very specific needs, ICTs are very often the only solution for a good education career.

5. **Q: From the ICTs available, (based on your experience) which are the must-haves, the best, and the more cost-effective?**
   
   A: That is a very difficult question, and very simple at the same time: it depends. Almost every times it will depend on the pupil’s disabilities.

   Computers and software are easily the *must-haves*, the computers can run virtually any software and can support almost any kind of supportive/adaptive devices. The question should be around software instead: which are the *must-haves*, the *best*, and the *more cost-effective*? Even like this the answer is still: it depends.

   One of the *best* types of software would be the **adaptive software**. This kind of software adapts the learning contents to the learning progress of every pupil. The software is aware of the pupil’s difficulties and the attention he/she paid to the exercises. With this information the software can then provide personalized exercises to the pupils, enhancing their learning capabilities. An example of such software is the Rekentuin (*Oefenweb.nl*) software for mathematics. This software can entertain, train, track (automatically update the pupil’s progress on the *Student-Follow-System*) and teach pupils, used for regular education and applicable to SNE.

   Even though this software offers incredible adaptive characteristics, it lacks the capacitive to effectively attract the pupil’s attention.

   Also, other one of the *best* types of software would be the **Immersive software**. This is regular educational software with a (very) rich interface, which effectively attracts the pupil’s attention. This software, however, is not adaptive, every pupil has the exact same learning experience and it does not update the pupil’s progress on the management system. Tech Ed (*Ranj - Serious Games*) is an example of such software.
And finally, the more cost-effective ICTs. I would suggest a meta-tag database of lessons for teachers like Wikiwijs.nl (Wikiwijs). This is a very cheap solution and yet very powerful. It is cheap because it is a simple database available online, as any other website. It is very powerful because it allows the teachers to add, share and consult all of the lessons (in any format) from primary to university education, and matching the governmental goals for Dutch education (referred in question 3).

**Acronyms**

ICT – Information and Communication Technologies  
SNE – Special Needs Education  
EC – Evaluating Committee

**Bibliography**

Interview with Luis Azevedo

ICT use on Special Needs Education in Portugal
E-mail interviews from Apr 9th to Apr 19th

Luis Azevedo – CEO of ANDITEC (rehabilitation technologies), Assistive Technology Researcher at Instituto Superior Técnico (IST), Lisbon.

by Adriano Martins

Introduction
In the Netherlands, special needs education (SNE) is provided public and freely through public schools, foundations, or other types of school boards, not directly controlled by the government. Every child with special needs is entitled to: i.) special needs education, a place in a school adequate to the child’s special needs; and ii.) an adequate amount of money to support special needs the child has, (a backpack, as it is called). This backpack is to be used by the child’s school, to provide appropriate SNE (ICTs included). The Dutch ministries of Education and Wellbeing fund it.
Every child is evaluated by a committee, which evaluates the child’s special needs and decides on the size of the backpack. This system has proven to be effective for most of the children; however, there are some loopholes in the system and, therefore, children that do not get the education they need.
SNE follows the same governmental guidelines as regular education (Nationaal Expertisecentrum Leerplanontwikkeling). However, because each SNE school acquires it’s own ICTs, the guidelines are often ignored. SNE schools also tend to apply the same ICTs to every pupil without assessing the fit before.
There are some special ICTs that caught my attention:

- **Student-Follow-System**: used by teachers and therapists where, besides the usual pupil management features, includes the pupil learning evolution.

- **Adaptive Software**: a kind of software that adapts the learning contents to the learning progress of the pupil, being aware of the pupil’s difficulties and the attention he/she paid to the exercises. With this information the software can then provide personalized exercises to the pupils, enhancing their learning capabilities, and
can also automatically update the pupil's progress on the Student-Follow System. For example the software Rekentuin (Oefenweb.nl).

- Meta-tag Database of Lessons: online free database where teachers can share/consult resources to teach, sorted by the Dutch guidelines for education. For example the Wikiwijs.nl (Wikiwijs).

I also noticed an interesting practice, consisting of a group of representatives from several schools, for the exchange of ideas and knowledge.

At this point I decided to start studying the Portuguese situation of ICT on SNE. Mostly through email, I collected a set of opinions and perspectives on the Portuguese SNE. Several of these contacts referred me to a prominent Portuguese ICT company for handicapped persons, ANDITEC (Anditec). I contacted ANDITEC and got in touch with the CEO, Luis Azevedo.

**Interview**

This interview is the result of a series of emails exchanged between Luis Azevedo and me. Although I asked some initial questions, Luis gave me much more insight, and so, the following questions are formulated after all the information Luis provided me.

**Questions**

1. **Q: How is SNE provided in Portugal? (As compared to the Netherlands [as I introduced])**
   
   **A:** In Portugal there are no special schools like in the Netherlands as the policy in use is of an "inclusive education" and not "special education". That is, all children with disabilities should be included in regular education and then have the necessary support for their special needs, both from the human and technologic standpoint. Of course exceptions occur, especially in situations of profound cognitive deficits, but there are "Support Units" for those cases.

2. **Q: From what I have researched so far, I observe very scarce ICT use on SNE in Portugal, is this true?**
   
   **A:** No, that is not correct. For many years now, Portuguese pupils with disabilities, the ones with neuromotor disorders in particular, have adequate technological support (obviously, perhaps, not all of them). For instance, ANDITEC, which specializes in the use of ICT-based technologies, provides all the features and technologies available in international markets, including the most sophisticated ones such as "eye tracking" systems.

3. **Q: Who are the main ANDITEC's customers? (Private versus public education)**
   
   **A:** From my personal experience, public education has more (specific/advanced) ICTs for children with disabilities than private
education has. Generally, private schools are not interested in spending money on support that can be costly. What happens is that there are many institutions, private but non-profit, which accommodate children with severe learning difficulties and, in those cases, they have appropriate ICTs. Nevertheless, these institutions are most of the times widely supported by the government.

4. Q: Does ANDITEC provides (or is aware) of: i.) Pupil Management Software; ii.) Adaptive software?
A: i.) [No] We don’t have it. Also I am not aware of this type of software, which doesn’t mean that there isn’t any, it is just not our "area";
ii.) [No] All the software we sell is inclusive because any child, with or without disabilities, can use it. The content is the same. What can change is the access method. It may differ depending on the pupil’s pathology.

5. Q: How is a children with special needs diagnosed?
A: Diagnosis is usually performed by hospitals and, for instance, in the case of cerebral palsy, at the Centers for Cerebral Palsy [private, non-profit institution for cerebral palsy] that normally prescribe assistive technologies for users.

6. Q: To which extent are the ICT needs on SNE met in Portugal?
A: Depends on who evaluates and prescribes; (especially) the entity which he/she works for (Ministry of Health or Social Security); the existing funds; the knowledge (or ignorance) of professionals, etc. I only know of two children who were prescribed with an eye tracking system.

Acronyms
ICT – Information and Communication Technologies
SNE – Special Needs Education

Bibliography
Appendix D

Interview with Raquel Cruz

ICT use on Special Needs Education at APPACDM – Vila Nova de Gaia (and in Portugal)
Friday, April 20, 2012

Dr. Raquel Cruz – Occupational Therapist, APPACDM – Vila Nova de Gaia.

by Adriano Martins

Introduction

Netherlands situation
In the Netherlands, special needs education (SNE) is provided public and freely through public schools, foundations, or other types of school boards, not directly controlled by the government. Every child with special needs is entitled to: \(i\). special needs education, a place in a school adequate to the child’s special needs; and \(ii\). an adequate amount of money to support special needs the child has, (a \textit{backpack}, as it is called). This \textit{backpack} is to be used by the child’s school, to provide appropriate SNE (ICTs included). The Dutch ministries of Education and Wellbeing fund it.

Every child is evaluated by a committee, which evaluates the child’s special needs and decides on the size of the \textit{backpack}. This system has proven to be effective for most of the children; however, there are some loopholes in the system and, therefore, children that do not get the education they need.

SNE follows the same governmental guidelines as regular education (\textit{Nationaal Expertisecentrum Leerplanontwikkeling}). However, because each SNE school acquires it’s own ICTs, the guidelines are often ignored. SNE schools also tend to apply the same ICTs to every pupil without assessing the fit before.

Interesting ICT’s and Practices
There are some special ICTs that caught my attention:

- \textbf{Student-Follow-System}: used by teachers and therapists where, besides the usual pupil management features, includes the pupil learning evolution.
- \textbf{Adaptive Software}: a kind of software that adapts the learning contents to the learning progress of the pupil, being aware of the pupil’s difficulties and the attention he/she paid to the exercises.

With this information the software can then provide personalized
exercises to the pupils, enhancing their learning capabilities, and can also automatically update the pupil’s progress on the Student-Follow-System. For example the software Rekentuin (Oefenweb.nl).

- **Meta-tag Database of Lessons**: online free database where teachers can share/consult resources to teach, sorted by the Dutch guidelines for education. For example the Wikiwijs.nl (Wikiwijs).

I also noticed an interesting practice: **Ambassadors of Education**, consisting of a group of representatives from several schools, for the exchange of ideas and knowledge.

**Portuguese Situation so far**
Luis Azevedo, CEO of ANDITEC (Anditec) and Assistive Technology Researcher at IST, introduced me to the “inclusive education” model, used in Portugal, where all children with disabilities should be included in regular education and then have the necessary support for their special needs.

Luis told me that for many years now, Portuguese pupils with disabilities have adequate technological support, although not all of them. Contrary to what I thought before, Luis also told me that private schools are not interested in spending money in expensive ICTs and, therefore, the public schools (which are funded by the government) are the ones that have the best ICTs at disposal.

**This Interview**
At this point I wanted to visit a special needs school, and so I contacted a large array of non-profit private schools that I found information on the Internet.

**APPACDM – Vila Nova de Gaia** was kind enough to receive me at their school and put me in touch with Dr. Raquel Cruz, occupational therapist. APPACDM is the (private, non-profit) **Portuguese Association of Parents and Friends of Mentally Retarded Citizens**, which started providing SNE 50 years ago, and today counts with 26 schools scattered all over Portugal. It is a private, non-profit citizen association/society funded partly by: the government; corporate social responsibility initiatives (CSR) by big companies; and solidarity in general.

In Portugal there are several more associations like APPACDMs scattered all over the country providing special needs support to the Portuguese Citizens.

**Interview**
Dr. Raquel is quite acquainted with SNE in Portugal; she has been working in the field for several years. Although I reached her through the school where she is working at the moment, we talked about education both in the particular case of that school, and generally in the Portuguese SNE scene. Every subject derived from a question is shown in the answer with a small title *(Like this:).*
Questions

1. **Q**: How is SNE provided: i.) at this school; ii.) in public schools?
   **A**: i.) Education is/was provided as in any other regular public school, with the support of trained/specialized people in special needs. However, we do not have any SNE going on because, in 2013, the government is ending the funding for SNE in all non-public schools. This means that, a pupil with special needs should be in the (regular) public school. Therefore, over the course of the last few years, pupils have been transited to normal schools. Although we still have the capabilities to provide SNE, now a days we mainly provide “functional-education” in order to prepare/insert the pupils, that are not qualified for regular education, to the real world.

   ii.) In public schools, every pupil attends to normal classes and has (extra) support for any special needs they have. When faced with special technological needs public schools will be assisted by ICT Resource Centers for Special Education (ICTRC; CRTIC in Portuguese) created for this effect. They exist at a regional level, this is, every regional group of schools has an ICTRC available.

   Also, schools are equipped with multidisability-rooms where pupils with special needs can receive SNE.

   (This model will not work:)

   At the public schools, the regular teacher is supposed to teach the regular subjects to the classroom (which some will include pupils with special needs). There will be an extra trained/specialized person to provide special support if needed. The problem is that some pupils with special needs simply cannot attend a normal class. Depending on the pathology, some might not concentrate at all; others cannot control the body in order to be still in the classroom. There was some cases of pupils that needed a dedicated person full-time, that is impossible to provide in this new model.

   On top of this, the other pupils (with no disabilities) will not receive proper education because the teacher will have to provide extra attention to the pupils with special needs.

2. **Q**: Who decides if a pupil is entitled to be in the public SNE?
   **A**: The Regional Education Management [There is one for each Portuguese region]. They assess the need of the pupil for SNE. If they decide the pupil needs SNE, he/she will be forwarded to a school that can provide SNE.

3. **Q**: How is the school funded?
   **A**: As I said before, the government funding is about to end [The funding for SNE. Government will continue funding the “functional-education” for instance]; parents also pay a small fee for the pupil to be in this school [APPACDM – Vila Nova de Gaia, not the public ones]; companies with CSR; and social solidarity. Unfortunately not all pupils can get the technical support they need, in several cases they only have the means to have a better quality of life
because their parents worked towards that (paying for it or finding other forms of funding).

*Where our ICT comes from:*  
Almost all of our ICT is provided, not by the government but, by PT Foundation (*Fundação PT*) [PT Foundation is a private, non-profit, institution for public use with the purpose of providing CSR from the company PT – Portugal Telecom, one of the biggest in Portugal. It provides support in the fields of health, education and digital inclusion.]. This company has a wide catalog of ICTs that can be requested, and it also provides financial support for items not in the catalogue. It actually helps the pupils and their families. However it is a long, bureaucratic and painful process to get the ICTs.

Even with the support of institutions like PT Foundation the ICTs are not enough [especially when compared to the Dutch schools the ICTs at APPACDM are very scarce.]. Some colleagues that work at public schools also get ICTs through this method because the ICTRCs cannot keep up with the need.

4. **Q: What education method do you follow?**  
   A: The same methods as in regular education.

5. **Q: i.) What ICTs does this school have and ii.) which ones do you think are essential?**  
   A: *i.*) We have several computers [not more than 10] with only some software available [less than 5 educational software’s]. We also have a couple of alternative keyboard and pointing devices.  
   *ii.*) We like especially the computer with tactile screen. The pupils like it very much. We also like the GRID 2 software (*GRID 2*), it is produced by ANDITEC, but provided by PT Foundation. It is an all purpose software, customizable to every pupil (several profiles), and has a “talking with symbols” feature. It even runs on smartphones, which is very useful for pupils that cannot talk.  
   [There some screenshots available in the section Appendix D – Annex A – GRID 2]

6. **Q: Do you consider ICTs essential on SNE?**  
   A: Yes, essential. Depending on the pathologies, without ICTs the education would be very difficult or almost impossible. For instance, those pupils who cannot talk have available ICTs that make possible for them to interact with the teacher.

7. **Q: Referring to the Interesting ICT’s and Practices I found in the Netherlands, do you think they would improve SNE?**  
   A: They all sound like very promising ICTs. The practice of the “*Ambassadors of Education*” it is a good idea without great costs.
**Acronyms**
ICT – Information and Communication Technologies
SNE – Special Needs Education
IST – Instituto Superior Técnico, Universidade Técnica de Lisboa
APPACDM – Portuguese Association of Parents and Friends of Mentally Retarded Citizens
ICTRC – ICT Resource Center
CSR – Corporate Social Responsibility initiatives

**Bibliography**

Appendix D – Annex A – GRID 2

Main window of GRID 2
Talking with symbols

Personalization of the software/interface