Audiovisual Translation in Education

Towards a Universal Design for Accessible Online Content

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ABSTRACT

The aim of this research project is to investigate the current role and the potential of Audiovisual Translation in online education environments for the purpose of enhancing accessibility for adult learners with sensory impairments, with the use of subtitling for deaf and hard-of-hearing people and audio description for blind and visually-impaired people.

In order to provide a holistic theoretical background for this study, essential connections are established among Disability Studies, Audiovisual Translation, Online Education and Information Communication Technology, with focus on Accessible Web and Assistive Technology. The ultimate goal is to analyse the educational use of audiovisual content and its provision with access services in a comprehensive manner. Under the principles of Universal Design for Learning, and guided by existing standards for accessible web content as well as guidelines for accessible audiovisual material for educational purposes, a range of strategies is proposed for the successful provision of audiovisual content for the benefit of university-level learners with sensory impairments.

The research also includes an investigation of the way in which a sample of universities around the world provide accessible education and online learning, the role of audiovisual content and translation practices in this context and the general framework within which these are provided. The analysis of the data collected is used as a reference indicator of current accessibility practices in higher education and can help in understanding how best to design e-learning platforms. It can also offer an understanding of the circumstances under which accessibility is provided and the level to which it is offered in a higher education context.

The project explores scenarios for the implementation of audiovisual translation solutions in accessible online platforms, and suggests prototypes that accommodate audiovisual content and access services. Ultimately, this project aims to highlight the importance of audiovisual translation and access services in the education of individuals with sensory impairments and to promote future research in this area.

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LIST OF ABBREVIATIONS

AD	Audio Description
AVT	Audiovisual Translation
ASR	Automated Speech Recognition
AT	Assistive Technology
BBC	British Broadcasting Corporation
CART	Communication Access Real Time Captioning
CCTV	Close-circuit television
CMC	Computer-mediated communication
CPB	Corporation of Public Broadcasting
DVB-T	Digital Video Broadcasting – Terrestrial
DVD	Digital Versatile Disc
EBU	European Broadcasting Union
EU	European Union
FCC	Federal Communications Commission
FM	Frequency modulation
ICF	International Classification of Functioning, Disability and Health
ICIDH	International Classification of Impairments, Disabilities and Handicaps
ICT	Information and Communication Technology
IEP	Individualised Education Programme
IFL	Identity First Language
INCLUDE	Inclusive Universal Design for Accessible Online Content
INDCP	International Network on the Disability Creation Process
IOM	Institute of Medicine
ISPS	Institute of Social Protection and Solidarity
IT	Information Technology
ITC	Independent Television Commission
MEP	Member of the European Parliament
MOOC	Massive Open Online Course
MT	Machine Translation
OC	Online Courseware
OCL	Online Collaborative Learning
ODL	Online Distance Learning
OE	Online Education
OPHQ	Office des personnes handicapées du Québec
OU	Open University
PDA	Portable Digital Assistant

PFL	People First Language
QCICIDH	Quebec Committee on the ICIDH
RNID	Royal National Institute of Deaf People
RST	Real-time text
SaaS	Software as a Service
SDH	Subtitling for Deaf and Hard-of-Hearing People
SMS	Short Message Service
STT	Speech to text
TDD	Telecommunication Devices for Deaf People
TS	Translation Studies
TTS	Text to speech
TTY	Teletype
TV	Television
UD	Universal Design
UDL	Universal Design for Learning
UN	United Nations
UPIAS	Union of the Physically Impaired Against Segregation
VCO	Voice Carry Over Telephone
VODER	Voice Operating Demonstrator
W3C	World Wide Web Consortium
WCAG	Web Content Accessibility Guidelines
WHO	World Health Organisation

DECLARATION OF ORIGINALITY

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at Imperial College or any other educational institution, except where due acknowledgment is made in the thesis. Any contribution made to the research by colleagues, with whom I have worked at Imperial College or elsewhere, during my candidature, is fully acknowledged.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

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Chapter 1

Introduction

Online Education (OE) is an area of research interest and multifarious investigation that has become very visible in academia and research groups due to the digitalisation of many areas of societies. The various forms in which educational material can be provided online have affected the way in which courses are designed and information is delivered to students. While providing an alternative to the more traditional type of in-class education in many cases, it can also act as supplementary to that, and accommodate far more participants than an in-class course most of the times. Although it offers some solutions to a number of educational constraints, including ease of access to courses that are provided in different parts of the world, it can also act restrictively if the full frame of access to the online material, and more importantly educational material, is not taken into consideration. One such downside arises when disabled internet users want to access educational material but the mode of provision is not user-friendly to all or when the material itself has not been designed with accessibility in mind. The problem of access in such a scenario is therefore identified in terms of access to the hosting environment and access to the educational material itself, which becomes more difficult to handle when that material is audiovisual in nature and can be out of boundaries for users with sensory impairments. In an attempt to explore accessible online education, with special focus on access to audiovisual content, this thesis aims to combine theories and developments from various academic fields to build a relevant theoretical framework and to suggest potential approaches to guarantee the provision of online education for all.

The starting point of this research is Audiovisual Translation (AVT), a research field characterised by its multimedia and interdisciplinary nature, which in this particular research project is combined with disciplines like sociology, technology, education and film studies to name but a few. My knowledge of the subject matter and my professional involvement with AVT access services, which are used to meet the needs of people with sensory impairments in the more traditional settings of television, theatre and cinema, have been instrumental in the design of a framework for the creation of accessible audiovisual content that can be used in educational contexts. However, the nature of OE is complex and requires a combination of inputs in any research approach with an aim as inclusive as the one of the present research.

This thesis is an attempt at exploring and combining knowledge from various fields that have been observed to influence each other and that can have a positive impact in the provision of a type of OE that is accessible to all, irrespective of the user's potential sensory impairments. To fully understand this research, it is necessary to describe its origins, aims and structure as well as the potential applications of its outcome, i.e. the materialisation of ways in which AVT access services can be embedded in educational environments and improve online learning for people with sensory impairments. Following a rights-based approach to disability and applying Universal Design for Learning (UDL) – two concepts introduced in section 1.2 of this chapter –, one of the main objectives of this project is to investigate the role of two types of AVT access services (i.e. subtitling for deaf and hard-of-hearing people and audio description for blind and visually-impaired people) in the provision of holistically accessible online content in higher education. To complete such an endeavour, concepts and premises from disciplines like Disability Studies (DS), OE and Information and Communication Technology (ICT) have been borrowed, thus highlighting the interdisciplinary nature of this project.

1.1. Aims and Motivation

The main objective of this study is to investigate the current provision, the role and the potential of two key AVT practices aimed at fostering access to information and entertainment to people with sensory impairments, i.e. subtitling for deaf and hard-of-hearing people (SDH) and audio description (AD) for blind and visually-impaired people, in the specific context of online educational environments and with accessibility in mind. The results yielded by such study are expected to boost the provision of holistically accessible online content in higher education. To achieve this, the investigation adopts a human rights-based approach to disability and draws from the main premises and concepts that underlie the philosophy of UDL.

This study also has four secondary aims:

1. To explore and explain the connections among the various disciplines involved in the research, i.e. DS, AVT, OE, and ICT, as well as some of their most relevant developments and practices.
2. To build a solid theoretical framework that would account for the understanding and explanation of the various parameters that have an impact on accessible online education.
3. To explore empirically how higher education institutions approach accessibility, by conducting a survey distributed among a number of high-profile institutions that provide disability support.
4. To suggest possible routes to enhance accessible online education, based on the survey findings, the case studies and the theoretical conclusions.

The motivation to conduct this research came partially from my contacts with groups of disabled activists and partially from my previous research and professional involvement in AVT, without forgetting the influence exerted by prominent academics in the field. Given my extensive participation in disability groups, mostly activist, and my previous investigation in access services, together with having a language teaching and AVT professional background, as well as having received training in various access scenarios and web accessibility, the idea for this research resulted from the identification of a gap in the current provision of access for all in educational settings and the potential that some AVT practices showed to guarantee full access to all. The realisation, on the one hand, of the existence of this inequality in society when it comes to sensory access, and being aware, on the other hand, of the continuously expanding applications of AVT access services, were key factors in raising my curiosity about the ways in which the needs of disabled people who want to embark on an online course could be met with the implementation of some AVT practices. Interest on this subject matter has also been piqued by the multiple technological developments that have accompanied the digital era, by the passing of legal provisions aimed at guaranteeing equal access to information for all, by the numerous innovative research projects that are being conducted in the field of access services and by the fact that learners are increasingly turning to e-learning, and area destined to grow in the near future.

1.2. Research Framework

This project pays special attention to certain phenomena observed in society as well as prior research conducted in academia, with the ultimate aim of finding synergies between them and proposing solutions that can bolster access to online education for learners with sensory impairments. For the purposes of the present study, from the point of view of education, the decision was to focus on the nature of OE, universal design practices, and some of the teaching methodologies related to the topic. The discussion on AVT concentrates on SDH and AD, although, as discussed in Chapter 3, there are more types of AVT that facilitate sensory access to content. Assistive technologies and web accessibility have been selected from ICT as the two most relevant sub-areas, while the exploration of DS pays particular attention to the social model of disability and to the approaches to research that are relevant to the purposes of this study.

In order to be able to provide a focused and in-depth account that could yield meaningful results, some parameters have been excluded from the study, such as different levels of education, the nature and degrees of individuals' impairments and age ranges of the students or course takers. The study focuses on adult learners, with visual or hearing impairments, in the context of online education at a higher education level. The main reason behind this focus is mainly the fact that personal involvement and experience would facilitate such a research approach much more than any other. At the same time, education at lower levels would require a more in-depth analysis as to the teaching practices involved for deaf, hard-of-hearing, blind and visually-impaired children, which would add more parameters to an already complex scenario. It was considered that with the mosaic of areas involved in the current attempt to approach accessible OE systematically, these first steps should not be too ambitious in terms of the range of learners, although such directions are considered for future developments of the suggestions of this thesis. It is important to mention that levels of impairments were also not considered at great depth with regard to learning methodologies and approaches to OE, for the same reasons. On the other hand, it was considered important to look at the basis of what would make accessible OE possible in detail, meaning the tools and the main principles that would facilitate such an endeavour. These restrictions were purposefully applied to the research, while recognising various further directions, which however should be examined thoroughly with a range of parameters that could not be considered here in mind. For such purposes, more geographically-focused studies would potentially prove more well-fitted, as the results would be directly linked to national legislation, as well as the health, social support and education systems per area of investigation.

Despite the decision to concentrate only on some focal areas from each of the disciplines already mentioned, the interdisciplinary nature of this project has led to a rather intricate, yet holistic framework of research, as illustrated in Figure 1.1 below:

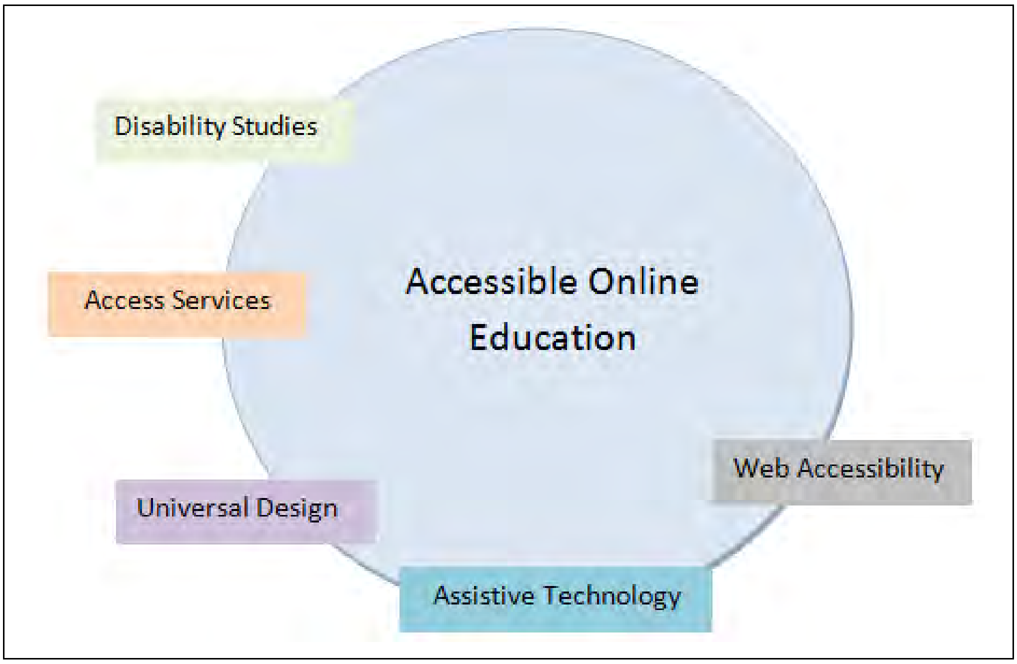


Figure 1.1: Research framework

Disability Studies is the backbone of any research that, in one way or another, touches on disability, as the current project does, and provides the fundamental, theoretical pillars to understand the world of people with impairments. In these pages, its applicability is based on two main principles: (a) a rights-based approach to the topic of the research, (b) an approach that is emancipatory. The European Network of National Human Rights Institutions (2016) describes a human-rights based approach as one that empowers stakeholders, according to the established human rights framework, with a clear accountability and prioritises those who are most discriminated against. With social justice in mind, and according to some of the declarations and legislation presented in Chapter 2, access to all types of education is considered an indisputable human right. Close to the idea of equality is emancipatory action too, which is concerned with “the systematic demystification of the structures and processes which create disability and the establishment of a workable dialogue between the research community and disabled people in order to facilitate the latter’s empowerment” (Barnes 1992: 122). In line with these principles, active involvement in social groups was considered a prerequisite in order to design the present study. Indeed, the decision has been taken to base it on the premises emanating from DS in order to make it truly emancipatory.

Access to OE for disabled people is made possible through assistive technology combined with access services. One of the characteristics of the current doctoral project resides in the activation of two access services, namely SDH and AD, in a non-traditional, interdisciplinary framework as the one of OE. The contemporary exploitation of access services as an assistive tool to grant access to online educational content to individuals with impairments can be considered as being still underdeveloped, despite its great potential. Traditionally, research conducted around the topic of access services tended to be descriptive in nature and to focus on the terms and standards of their provision. Nowadays, a shift seems to be taking place, whereby researchers are investigating the reception of these services by end users. In both cases, though, audiovisual media used in the entertainment industry, and to a lesser extent in live performances, have been given priority by scholars, who have used them as their main object of study. One of the novel aspects of this study is the widening of scope of action of this type of material and assistive services, by paying special emphasis to their role in higher education for students’ accessibility purposes.

Assistive technology tools are instrumental if this type of innovation is to be concretised. Yet, they are more commonly employed to test and evaluate general access in online educational environments than to secure that audiovisual material is fully accessible to individuals with sensory impairments. One of the objectives of this thesis is to foreground their potential role in promoting and safeguarding access not only to written text but also to audiovisual content. Web accessibility provides the main standards that can guarantee the successful implementation of these innovative measures to boost access to audiovisual productions in online educational environments. Likewise, knowledge and understanding of the critical premises behind Universal Design are imperative in order to be successful in such enterprise.

Coming back to wide spectrum of applications that research of this type could have, it should be clarified that the content provided in this research is not characterised by geographical focus, not even at the level of continents, but rather by thematic relevance. The various sections concentrate on current practices on the web, in education, in AVT and in assistive technology. They also touch on the history of access services, on topics related to disability, on legislation, and on some relevant research achievements. Geographical focus on Europe or on the UK would perhaps have yielded more consistent and homogenous results, but would not have permitted to find out some of the innovative examples that in this field have been observed in other parts of the world, particularly in the USA. Similarly, if this research had solely focused on the USA, the risk would have been the missing of the potential offered by some of the AVT solutions, as they are practised in Europe, which show substantial differences with the way in which they are implemented in the USA.

As mentioned above, the audience it contemplates as the recipients of access services are considered to be deaf and hard-of-hearing learners with any level of hearing loss, as well as learners who are blind or visually-impaired, irrespective of their degree of impairment. Although the access services discussed in these pages have the potential to serve a wider group of recipients, the present research does not expand in that respect, though it does refer to the notion of ‘reverse accessibility’, which is explained in detail in Chapter 2 (section 2.5). Finally, this research project focuses on higher education and educational content that is provided fully or partially on the web, without examining access from different devices or testing such scenarios, as such an analysis would also require the involvement of further technical parameters and extensive testing in controlled groups.

1.3. Research Methodology

As already mentioned, this research project is highly interdisciplinary because of the need to draw from various knowledge areas. With its roots in Medical Science, interdisciplinary research emerged as an answer to the need to combine input from various disciplines in order to "fully answer critical questions, or to facilitate application of knowledge in a specific area" (Aboelela *et al.,* 2007). According to Klein and Newell (1998: 393-394), interdisciplinary research is:

> A process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession [… It] draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective.

It is this comprehensive perspective that this project aims to provide for the case of accessible Online Education. According to Tait and Lyall (2007: 1), interdisciplinary research occurs "where the contributions of the various disciplines are integrated to provide holistic or systemic outcomes". Research of this kind "aims to further the expertise and competence of academic disciplines themselves, e.g. through developments in methodology which enable new issues to be addressed or new disciplines or sub-disciplines to be formed" and it is "problem focused and addresses issues of social, technical and/or policy relevance with less emphasis on discipline-related academic outcomes" (*ibid*.). This description of interdisciplinary research is very close to the nature of the present study. According to the same scholars, the difference between interdisciplinary and multidisciplinary research lies in the fact that in the latter "each discipline works in a self-contained manner with little cross-fertilisation among disciplines or synergy in the outcomes" (*ibid*.). Giusti *et al.* (2017: online) also consider the differences between these two terms and explain that "multidisciplinarity refers to the addition of the competencies of multiple professionals who stay within the boundaries of their fields, whereas interdisciplinarity denotes that the various disciplines are coordinated toward a common and coherent approach", which is more attuned to the ethos of this study.

This investigation is also educational, with a clear applied slant. As Elliot (2002) explains, applied Education Research is a flexible type of investigation whose primary objective is to link research with action in a manner that they can both generate actionable knowledge. Applied Education Research is thus determined by educational practitioners and policy-makers, relies on the understanding that the research topic is directly related to society and assumes that the researchers have the latitude to shape certain situations according to the results yielded in their projects. In this respect, the theoretical background and the relevant conclusions drawn, as well as the suggested INCLUDE theoretical framework (sections 5.4 and 7.2), have been shaped with the aim to propose solutions that will allow truly accessible online education.

The study is mainly descriptive and qualitative, based on observations, with reference to quantitative data. The qualitative analysis derives from the input collected through a survey conducted among 23 chosen universities, as well as observations from society and the industry. The input provided by the participants that took part in the survey, i.e. university representatives, as regards the status of accessibility-related provisions in their institutions is then scrutinised. Quantitative analysis of the responses provided in the survey, based on data extracted from the aggregation and correlation analyses of the input obtained in the survey, is used to facilitate the qualitative analysis, which focuses on addressing three study questions:

1) On what level do universities apply a framework for accessibility?
2) Do universities offer audiovisual translation access services to students and, if so, to what extend?
3) Do universities provide accessible online courses/content?

Drawing on this analysis and the theoretical connections established in Chapters 2, 3, 4 and 5, the Inclusive Universal Design for Accessible Online Content (INCLUDE) framework is put forward. Both the quantitative and qualitative data are used as supplementary material for the design of the INCLUDE framework and they are not the main aim of the study. To test the validity of INCLUDE, three prototypes are discussed in detail and it is hoped that this framework will inspire educators and policy-makers with responsibility in the design and delivery of fully inclusive educational courses in online environments. Case studies have been employed on three different British universities as examples of applied accessibility practices in three different modes of online learning. The purpose here is to track potential best practices and to discover which can be the main hurdles when it comes to the implementation of accessibility measures and frameworks in online environments.

As already mentioned, the philosophy underlying the current analysis is rooted on human rights and UDL principles, and gives for granted that access to education is a fundamental human right for all individuals. Bearing this in mind, educational courses should thus be offered in flexible forms and formats that will then ensure equal access and participation by all, including those with sensory impairments.

1.4. Thesis Structure

The thesis consists of eight chapters and is supplemented by a bibliography containing a list of references as well as various appendices. Chapter 1 is the Introduction of the thesis and contains information about the aims, the motivation and the structure of the study, as well as the research framework, the methodology that has been followed, and the roles played by the various disciplines contributing to the research.

Chapters 2, 3, 4 and 5 build the theoretical construct of the thesis and throughout them, essential connections are made among the various disciplines that articulate the research. In Chapter 2, DS and the general notion of disability are introduced, providing essential terminology and a detailed account on the various models of disability.

Chapter 3 focuses on AVT and the access services that can be found within this wide umbrella term. In this chapter, a theoretical discussion is put forward to try and locate the place that access services occupy within the field of Translation Studies. It also focuses on the various types of AVT practices encountered in the industry, on the nature of access services and on their applications in the profession and in society at large.

Chapter 4 provides an extensive account of the rapid and far-reaching technological advancements that are taking place in this field and pays special attention to the key role played by technology in the design, preparation and implementation of access services. A detailed presentation of various assistive technologies as well as an analysis of the main accessibility standards that are used on the web make up the last sections of this chapter.

Chapter 5 centres on OE and Universal Design, without forgetting the instrumental importance that access services and assistive technology have in the provision of accessible education in online environments.

Chapter 6 provides a detailed account of the methodology applied in this thesis, including information on qualitative and quantitative methods of data analysis, and presents the reader with the questions asked in the survey.

Chapter 7 consists of two parts. The first one includes a parallel quantitative and qualitative investigation of the responses provided in the survey by the various universities. The questions used in the survey are clustered by thematic area. The analysis of responses is followed by further discussion on the issues that are more relevant to the main goal of this research. The second part of the chapter presents the Inclusive Universal Design for Accessible Online Content (INCLUDE) framework, which is then applied in the design of three different prototypes that deal with three educational courses of a different nature. The three prototypes are presented in the form of guidelines. Three relevant case studies, one of each type of courses identified, are included to facilitate a discussion on the feasibility and viability of the prototypes.

Chapter 8 summarises the conclusions of the research conducted in the previous pages and provides an account of the main theoretical, legal, social, technological and methodological implications of this interdisciplinary research. It is then followed by a commentary on the limitations encountered as well as by suggestions for future research in the area.

Finally, a list of the bibliographical works referenced in this study is included and followed by a number of appendices that supplement the main body of the thesis.

Appendix 1 is a glossary containing the main terminology used in the thesis. Appendices 2a, 2b and 2c include checklists for accessibility standards: WCAG 2.0, EN 301 549 and Section 508, respectively. Appendix 3 contains the Universal Design for Learning guidelines and Appendix 4 includes the survey questions and responses. Appendix 5 presents an example of the feedback provided by the researcher to the survey participants. Appendix 6 comprises of the audit reports produced for the discussion of the case studies presented in Chapter 7, while Appendix 7 is made up of a list of suggested resources for the preparation of accessible material for educational purposes.

Chapter 2

Disability and Accessibility

Relevant research on disability has been carried out from various different perspectives. The rationale behind the current research project is to implement a social rights-based approach to disability and to the various areas discussed in this thesis as a result of years of professional occupation in the field and active participation in disability activist groups. Personal experience, which has mainly been gained through professional and social involvement, has provided an insight into the most ‘politically and socially correct’ framework for discussion within the social circles mirrored in similar research. This is particularly relevant to the case of a research project of this nature, one that is related to disability and based on principles set out by the Disability Movement. In order to discuss this framework further, this chapter provides an introduction to concepts commonly discussed and debated by Disability Studies (DS) scholars, yet not often clearly understood in other related disciplines. The range of this debate is very broad, so that this analysis focuses on the main aspects related to understanding the field and its main concepts, since this is one of the first attempts to link research in Translation and Technology to DS in the context of Education. Although connections between each of these areas have been researched individually, no research to date has examined them collectively.

In this chapter I aim to lay the foundations on which this and the next levels of the research are conceptualised (section 1.2). To start with, I specify what terminology will be used, not merely from a descriptive point of view, but in order to make clear decisions on the principles underlying the relevant discourse choices made. Language is conceived as a powerful tool closely related to equality, human rights and discrimination. Although the research is not carried out within DS, the fact that it is interdisciplinary makes such decisions mandatory.

I then move on to a description of disability models, since they have greatly influenced the way in which society and governments provide access to education, with an emphasis on the social model, which underpins this research. Their description allows for an overview of the field's main concerns, which usually relate to culture, medicine, sociology and activism. Although the borders between models might seem blurred at first sight, their comparison facilitates a more complete overview of the topic, before a discussion of the place occupied by disability in academia can take place.

Finally, the focus is shifted from disability to accessibility and inclusion, two concepts that are introduced as the main goals of this research. As a parameter that leads to inclusion, accessibility is another theoretical key point that needs to be fully understood, so that this new interdisciplinary research area can be properly contextualised.

2.1. Disability, Disablism and Impairment

According to a recent *World Report on Disability*, published by the World Health Organisation (WHO) in 2011, more than a billion people in the world live with some form of disability – that is around 15% of the population. There is an increase of 5% between this and the previous WHO estimates from the 1970s. According to the *World Health Survey* (2003), around 785 million (15.6%) people aged 15 years and over live with a disability. The 2004 estimate of the *Global Burden of Disease* (Mathers *et al.*, 2008) gives a figure of around 975 million (19.4%) people. The 2011 WHO report also states that the number of disabled people is growing due to ageing populations and a global increase in chronic health conditions that can be associated with disability, e.g. diabetes and cardiovascular diseases. Vulnerable populations are affected disproportionately, with a higher prevalence of disability in lower income countries.

Several terms have been used in relevant demographics, reports and publications and in society in order to refer to what is most commonly called 'disability'. These include ‘impairment’, ‘difficulty’ and ‘limitation’, while another equally interesting term found in Disability Studies (DS) is ‘disablism’. The *English Oxford Living Dictionaries* (n.d.: online) defines disability as “a physical or mental condition that limits a person’s movements, senses, or activities” and as “a disadvantage or handicap, especially one imposed or recognised by the law”, while impairment is defined as “the state or fact of being impaired, especially in a specified faculty”. In a similar vein, the Merriam-Webster dictionary (n.d.: online) defines disability as “a condition (such as an illness or an injury) that damages or limits a person’s physical or mental abilities” and as “the condition of being unable to do things in the normal way: the condition of being disabled”. Under the entry for ‘impair’, the dictionary includes the term ‘visually impaired’ as a phrase related to the verb. Although a separate entry for ‘impairment’ is not available in the dictionary, the definitions provided for the verb include “to make (something) weaker or worse”, “to damage or make worse by or as if by diminishing in some material respect” (term found in the Medical Dictionary section), and “to affect injuriously” (*ibid.*). The two definitions from the Merriam-Webster dictionary mirror the two main different approaches to disability in society and in academia, although in rather vague terms due to the limited scope of a dictionary entry, while both dictionaries indicate a connection between ‘disability’ and ‘impairment’, albeit in a rather unclear manner.

As early as in the 1970s, the Union of the Physically Impaired Against Segregation (UPIAS 1976: 3-4) stated:

> In our view, it is society which disabled physically impaired people. Disability is something imposed on top of our impairments by the way we are unnecessarily isolated and excluded from full participation in society. Disabled people are therefore an oppressed group in society. To understand this, it is necessary to grasp the distinction between the physical impairment and the social situation, called ‘disability’, of people with such impairment. Thus we define impairment as lacking part of or all of a limb, or having a defective limb, organ or mechanism of the body; and disability as the disadvantage or restriction of activity caused by a contemporary social organisation which takes no or little account of people who have physical impairments and thus excludes them from participation in the mainstream of social activities. Physical disability is therefore a particular form of social oppression.

As Thomas (2002: 38) argues, terms like ‘abnormality’, ‘deficiency’ or ‘incapacity’ refer to “people with impairments as disabled [and] signals that they belong to that group of people who cannot engage in ‘normal’ activities because of their ‘abnormal’ bodily or intellectual ‘deficit’ or ‘incapability’”. Thomas (*ibid.*) explains that DS activists and writers have changed the meaning of this commonplace term ‘disability’ and its derivatives in many academic disciplines, so that “the inability of people with impairments to undertake social activities is a consequence of the erection of barriers by the non-disabled majority”. These barriers then act as social, physical and attitudinal limitations and constraints on the activity and the lives of people with impairments, as they “socially exclude and work to oppress those with a socially ascribed impairment”. This interpretation has led to the emergence of ‘disablism’ as a form of social oppression, like sexism and racism, with multiple political and conceptual implications. In the circles of biomedicine, perceptions of disability differ from those expressed by Thomas (*ibid.*), as impairment is largely equated with disability and is of central concern, since it is perceived as a deviation of the body and mind from social norms.

The combination of the two approaches, social and biomedical, form the basis of the International Classification of Impairments, Disabilities and Handicaps (ICIDH), which was developed by Philip Wood, Elizabeth Bradley and Mike Bury in the 1970s and was published in 1980 (WHO, 1980). According to Bury (2000: 1073), the ICIDH attempted to move away “from a narrow medical model of health and disease [...] to one which recognised the consequences of health-related phenomena”, using the notion of ‘impairment’ to refer to losses and abnormalities. The term was considered more inclusive than ‘disorder’, while it retained a medical causal link between impairment and disability in the form of a chain, as illustrated in Figure 2.1:

Disease → Impairment → Disability → Handicap

Figure 2.1. Overview of the ICIDH

At the same time, definitions like ‘handicap’ as “a disadvantage for a given individual resulting from an impairment or a disability, that limits or prevents the fulfilment of a role that is normal” (*ibid.*: 182) and of ‘disability’ as the lack of ability to do something, have enforced the biomedical view of disability. The latest version of ICIDH-2 of 2001, which was entitled International Classification of Functioning, Disability and Health (ICF), took one step closer to the reconciliation of the two conflicting ideas, as a result of the opposition of numerous activists to the initial classification. The WHO (2001: 2) team of authors claims to have moved away from the ‘consequence of disease’ classification of 1980 to a ‘components of health classification’, in order to take “a neutral stand with regard to etiology so that researchers can develop causal inferences using appropriate scientific methods”. In the most recent version of the paper, ‘activities’ and ‘participation’ have been used as a substitute for the terms ‘impairment’, ‘disability’ and ‘handicap’. An overview of the concepts found in ICIDH-2 is provided in Table 2.1:

	Part 1: Functioning and Disability		**Part 2: Contextual Factors**	
	Body Functions and Structures	**Activities and Participation**	**Environmental Factors**	**Personal Factors**
DOMAINS	1. Body functions 2. Body structures	Life areas (tasks, actions)	External influences on functioning and disability	Internal influences on functioning and disability
CONSTRUCTS	Change in body function (physiological) Change in body structures (anatomical)	Capacity Executing tasks in a standard environment Performance Executing tasks in the current environment	Facilitating or hindering impact of features of the physical, social, and attitudinal world	Impact of attributes of the person
POSITIVE ASPECT	Functional and structural integrity *Functioning*	Activities Participation	Facilitators	Not applicable
NEGATIVE ASPECT	Impairment *Disability*	Activity limitation Participation Restriction	Barriers / hindrances	Not applicable

Table 2.1. Overview of the ICIDH-2 (WHO, 2001: 15)

A chapter dedicated to the meaning of ‘disability’ is included in the WHO (2011) report, adopting the ICF classification, and giving emphasis to the environment and the factors that cause disability. More specifically, based on the ICF classification, the report recognises three interconnected areas of “problems with human functioning” (*ibid.*: 5), namely, impairments, activity limitations and participation restrictions. Based on this categorisation, impairments are “problems in body function or alterations in body structure – for example, paralysis or blindness”; whereas activity limitations are understood as “difficulties in executing activities – for example, walking or eating”; and participation restrictions are considered as “problems with involvement in any area of life – for example, facing discrimination in employment or transportation” (*ibid.*). Based on ICF, the authors of the WHO (*ibid.*: 5) report argue that “disability arises from the interaction of health conditions with contextual factors – environmental and personal factors”.

2.2. The Language of Disability

According to Barnes (1993: 8):

> The first and most important thing to remember about discussions of language and disability is that they arise because disabled people experience discrimination daily and are denied the same rights and opportunities as the rest of the population. Apart from the fact that words can be deeply hurtful to disabled individuals, they have power and are used extensively to justify oppression. The phrase ‘special educational needs’, for example, frequently justifies the separation of disabled children from non-disabled children into segregated special schools.

Political correctness is a frequently occurring issue when it comes to disability and has often been discussed by scholars such as Oliver (1990b), Zola (1993), Millington *et al.* (1996) and Barnes (1999). Oliver (1996) argues that, apart from the problem of definitions, language and the way it is used are very important. He raises the issue of medical discourse that can be offensive to disabled people. In addition to being objectionable, terminology of this kind often distorts their experiences at the same time as victimising them as a social group. Within the social approach to disability, the tendency to use language in a way that can offend disabled people is seen as a natural outcome of the normalisation of societies, which in turn leads to non-normal images being understood as being part of a constant struggle to achieve normality. Through time, terms like ‘spastic’, ‘wobbler’ and the like have largely been eradicated, but others like ‘disabilities’ (plural) and ‘special education’ are still matters of debate.

Being or becoming ‘normal’ within a supposedly perfectly normalised social scheme is one of the challenges disabled people have faced over the years. However, as Oliver (1996: 6) emphasises:

> From rejections of the ‘cure’, through critiques of supposedly therapeutic interventions such as conductive education, cochlear implants and the like, and onto attempts to build a culture of disability based upon pride, the idea of normality is increasingly coming under attack.

To this end, universities and organisations that embrace this view tend to promote political correctness in the form of guides. EQuality Training (n.d.: online), a company that delivers tailored-made training in diversity, inclusion and leadership, has published a guide that focuses on understanding disability and related terminology. It gives advice on language use and helps readers avoid dehumanisation, victimisation and discrimination through incorrect use of language. Many attempts were made before the establishment of People First Language (PFL), including Guth and Murphy (1998), Titchkosky (2011) and Snow (2005). PFL is a linguistic movement that promotes a more respectful and appropriate way of referring to disabled people, especially in the United States, where organisations and institutions have published numerous guides on its use. Examples of such attempts include the guidelines produced by the Texas Council for Developmental Disabilities and the Georgia Council on Developmental Disabilities, available on the official websites of the two organisations. When using PFL, one is not expected to say ‘the blind’ but rather ‘people who are blind’. Instead of using the term ‘special education’, one is expected to say ‘student who receives special education services’. However, it is largely argued that although disabled people understand where this impulse comes from and see how PFL accepts their personality as not solely identified by a disability, the fact remains that the latter is part of their existence. Liebowitz (2015) explains that:

> Though person-first language is designed to promote respect, the concept is based on the idea that disability is something negative, something that you shouldn’t want to see. After all, no one tells me that I should call myself a person

> with femaleness or a person with Jewishness. I'm a Jewish woman. No one questions that.

The author then continues with a comparison between this language model and Identity First Language (IFL), which is preferred by some groups of society as it is closer to the social model of disability, where disability is seen as an inaccessible barrier put up by society. The main distinction between the two approaches is that PFL is used to avoid perceived and subconscious dehumanisation while IFL places the disability-related word first in a phrase, since disability is seen as part of a disabled person's identity.

Research carried out by Kassenbrock (2015: online) indicated a variety of opinion among disabled people, with some preferring IFL and some others preferring PFL. The opinions published on the website are interesting in that, even among disabled people, opinions on the topic differ. Comments like "I prefer person first language. I am a person with a disability, not a disabled person" and "Identity first. Disability is a part of who I am" prove the idea behind each of the two language models. It seems that the way in which each individual wants to be addressed should be seen as a personal decision that ought to be respected individually, since it is shaped by personal and cultural stimuli, as well as by established local norms and the inner meanings of words among various languages.

Another level of diversity is observed among different countries as well as various organisations within the same country. With regard to the Disability Movement and other organisations, institutions and legal acts related to disability, the terms 'people with disability', 'people with disabilities' and 'disabled people' tend to be used interchangeably, often not consistently, and not always necessarily as a rights-driven decision. For example, the Disability Movement in European countries is represented through the *European Disability Movement*, the *Free Movement of People with Disabilities in South East Europe,* but there is also a *Disabled People's Movement* in the United Kingdom. The *People with Disability* movement and the *Disability Rights Movement* are found in Australia; in the United States it is the *American Association of People with Disabilities* and in Singapore, the *Disabled People's Association*. The UK has the *United Kingdom Disabled People's Council* and the government website includes a section dedicated to legislation for *Disabled People.* Other organisations in the US include the *Disabled American Veterans* and the *American Foundation for the Blind.* These examples highlight the fact that the choice and use of terminology is not always consistent. However, the examples related to the UK indicate that the social model approach has been largely incorporated into the social structures of the country and, as such, is devoid of any negative connotations. In this thesis, it is a matter that requires no further investigation. The choice of terminology, which is closely related to the understanding of the social model and based on the discussion above, is justified in the next two paragraphs.

Evolvement in society and the passion with which activists have been trying to inform and educate society about the values and connotations conveyed by terms related to disability have affected the approach adopted in this research to a great extent. In order for their use to be valid in their very context – as this is clearly a research project related to disability –, and with the aim of respecting the field of DS and those immediately affected by the outcomes of this research, the ideas expressed in the current thesis will follow the principles adopted by the UPIAS.

The current thesis approaches the topics under discussion from a social-model point of view, which has been mainly developed in the UK, and understands 'impairment' to refer to functioning, to a medical condition, whereas 'disability' is the condition caused by the barriers raised by society. Impairment is thus not equal to disability and is not the cause of disability. Accordingly, the term 'disabled people' is used in this thesis instead of 'people with disabilities', because if disability is considered as a barrier, it is society that then imposes the barrier rather than the person affected by it. Furthermore, the plural form of the term indicates multiple medical problems instead of indicating the inability of society to treat people equally, regardless of their medical condition. Of course, it could be argued that reference to multiple social barriers naturally entails multiple 'disabilities' in terms of grammar, so that the term is essentially correct, yet the argument here is that it shifts the focus from the responsibility of society to an individual's lack of 'normal functioning'.

Further decisions need to be made within other fields, like education, in order for this research to adopt an approach that is fully consistent with that of the social model. In the area of education, for example, a common concern is whether it is politically correct to refer to 'special needs', with 'learning difficulties' being another equivalent option, as the first is often seen as a way of concealing-disability behind a term that will make it less noticeable and conspicuous, e.g. 'Special Olympics' and 'special or specific needs population'. According to My Child at CerebralPalsy.org (N.d: online), in Special Education "[t]he term 'special needs' generally refers to a child's actual need, particularly in situations where accessibility is required" (Chapter 5).

As the UPIAS principles alone are insufficient for a clear-cut distinction and definition of the terms used in this thesis, a number of articles have also been used from the library of the Centre for Disability Studies of the University of Leeds to support the language choices made here. Therefore, for the current thesis, the following terminology is used, based on one of the most straightforward presentations of rights-based terminology for accessibility, written by Clark and Marsh (2002):

- 'disabled people' versus 'people with disabilities', as redefined by the UK disabled people's civil rights movement to mean "people with impairments who are disabled by socially constructed barriers" and because the term 'disabilities' usually "refers to a person's medical condition and thus confuses disability with impairment" denying "the political or 'disability identity' which emerges from the disabled people's civil rights movement" (*ibid.*: 2);
- emotive and inaccurate terms, such as 'afflicted', 'restricted', 'wheelchair bound' or 'confined to a wheelchair' shall not be used;
- 'Deaf people', 'hard-of-hearing people' and 'blind people' will be preferred to 'the deaf', 'the hard-of-hearing' and 'the blind' as they are regarded as dehumanising (Barnes, 1992: 21);
- terms that involve the concept of 'normality' shall not be used, such as 'abnormal' or 'defective';
- 'Deaf', 'deaf', and 'hard-of-hearing' will be used, as the latter were recognised as official designations by the World Federation of the Deaf in 1991, while 'deaf' is used to refer to both members and non-members of the Deaf community in this thesis;

- ‘blind’ and ‘with visual impairment’ or ‘visually-impaired’ are preferred to ‘partially-sighted’, which is seen as a deviation from normality;
- ‘special education needs’ is preferred to ‘special needs’ and ‘people with learning difficulties’ will be used instead of ‘people with learning disabilities’;
- ‘personal assistant’ or ‘supporter’ shall be used instead of ‘carer’ as the latter indicates the dependency of disabled people on others in order to lead their lives.

In general, any expressions containing any degree of negativity will be substituted with the term ‘disabled person’ or with the actual type of impairment, e.g. ‘blind person’ or ‘deaf person’. For inclusive types of impairment, priority will be given to terms like ‘physical impairment’, ‘visual impairment’, ‘learning difficulty’ and ‘deaf or hard-of-hearing’.

2.3. Disability Models

Discussions on the various disability models have been taking place since disability was first understood as a social phenomenon, with the social model emerging as ‘the big idea’ of the UK Disabled People’s Movement in the 1970s (Shakespeare and Watson, 2001). Ever since, the debate between the social and the medical model has dominated discussions on disability at various levels: academic, philosophical, sociological, political, linguistic and more. Although the two dominant models – social and medical – and the affirmative model that emerged later have taken up most of the discussions on the topic of how disability should be understood and are discussed later in this chapter, several other models have been identified (Figure 2.2), some of which are listed below and are mainly based on the explanations provided by Black Disability (n.d.) and Smeltzer (2007):

- *Religious/moral model*, which views disability as a punishment or curse inflicted upon the disabled person by an external force, stigmatising the whole family.
- *Tragedy/charity model* depicts disabled people as pitied victims of a certain circumstance.

- *Expert/professional model*. Among professionals, this model is based on identifying impairment and its limitations in order to take proper action to improve the position of disabled people in society, whereby the disabled person is seen as a passive recipient.
- *Customer/empowering model* is the opposite of the expert/professional model, whereby professionals provide services based on the client's choice.
- *Economic model.* In this model, disability is defined by the disabled person's inability to work, and impairment is viewed as a cause of productivity and financial problems.
- *Rights-based model* refers to disability as a socio-political construct. It highlights the importance of independence with disabled people being seen as individuals with an active political presence.
- *Social barriers model* is synonymous with the social model of disability and draws on disabled people's experiences in society (Davis, 1990).
- *Individual model*. Often used as a synonym for the medical model, this model focuses on the problem of disability, viewing it as a misery that has been caused by functional limitations or psychological loss (Oliver, 1990a).
- *Rehabilitation model*: This model is based on the idea that disability is something that can be overcome with an effort and proper medical support.
- *Interface model*: In this model "disability exists at the meeting point or interface between the person's medical diagnosis and the environmental factors that affect disability" (Smeltzer, 2007: 193). Disability is identified by disabled people who seek a way of improving their daily life.
- *Biopsychological model*: In this model, disability is seen as a condition that stems from physical, emotional and environmental factors.

The problematic nature of models, i.e. the fact that they can be too simplistic at times, has led to fiery debates in the past, with people often expressing radical ideas that seem to put up research barriers rather than opening doors to the field. At the same time, the various models that have been identified and discussed often limit discussions due to the simplification and/or overgeneralisation of their context of discussion. To avoid this rather unfruitful road, and due to the fact that most of the models mentioned above seem to stem from the social and the medical model (Figure

2.2), this research will focus on the three main disability models – i.e. social, medical and affirmative –, as these are the models most closely related to education.

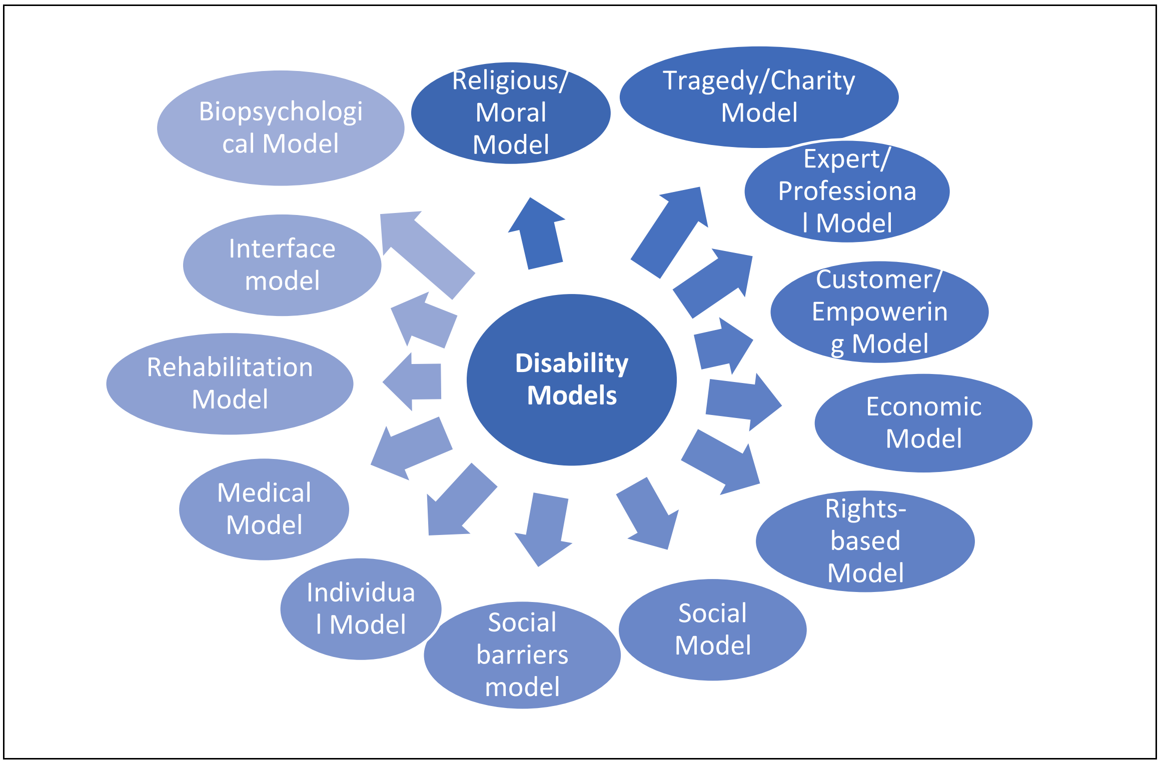


Figure 2.2. Examples of Disability Models

Before discussing the main disability models, it is important to look into the history of their development. I will therefore build on one of the most recent analyses of the disability models, enriching it with facts in order to depict a more comprehensive overview. Bickenbach (2012) identifies six critical points in the development of disability models. The author traces the first disability model back to the 1960s and the USA, where the so-called 'Nagi model' emerged, which established correlations among impairments, functional limitations, and disability. Brandt and Pope (1997: 65) explain that although this model is one of the earliest attempts made to include the environment in the realisation of disability, the model "was limited in how it conceived of the environment" and within this model "the process that gives rise to disability is still inherently a function of the characteristics of medical conditions and attendant impairments". The second model discussed by Bickenbach (2012) is the social model, which is based on the idea that disability is different from impairment and is caused and imposed by society. Its roots can be traced to the 1970s and the UPIAS principles mentioned earlier in this chapter. The third model, which is based on the Nagi model, is identified by Bickenbach (*ibid*.: 54) author as the IOM (Institute of Medicine) model that became popular in the 1990s and defines disability as "[t]he expression of a physical or mental limitation in a social context – the gap between a person's capabilities and the demands of the environment". However, it is important to mention that the first classification of impairments, disabilities and handicaps carried out by the WHO (1980) took place between the Nagi and the IOM models. Enriched with the ideas proposed by the IOM model, the WHO classification led to the first update of the ICIDH in 1993, which focused on restrictions or deficiencies in the deviation from what is considered normal for the human being. This is the fourth model in Bickenbach's chronology, who then moves to the updated ICIDH-2, a revision draft that was released in 1999 as a result of the April 1997 international meeting of Collaborating Centres, and the final version of ICF (WHO, 2001).

Another model that is not commonly mentioned in European literature is the é model, which Bickenbach places in the 1990s, before the final ICF. The first major application of the ICIDH model in Quebec was closely associated with the development of the 'On Equal Terms' government policy of 1984 in the area of impairment prevention, rehabilitation and social integration of disabled people. Interestingly enough, that implementation developed into a fruitful collaboration that affected the shape of the ICF. According to the International Network on the Disability Creation Process (INDCP, n.d: online), a meeting held in 1987 between the Office des personnes handicapées du Québec (OPHQ) and the Quebec Committee on the ICIDH (QCICIDH) (OPHQ, 2009), in the presence of representatives who defended the rights of disabled people and international organisations representatives, including the WHO, the United Nations (UN) and the Council of Europe, "was the starting point of an international dialogue centred on improving understanding of the Disability Process and the eventual revision of the ICIDH". This gathering eventually led to the birth of the Disability Creation Process (DCP) classification: "an explanatory model of the causes and consequences of disease, trauma and other disruptions to a person's integrity and development" (Fougeyrollas *et al.*, 1999: 8), whereby risk factors are the elements that cause a disease that affects the personal intrinsic characteristics (factors), causing disruptions to a person's integrity or development. Environmental factors, which determine society as a whole, interact with personal factors and affect life habits, with accomplishments being measured on a scale from social participation to total handicap. The anatomy of the model is presented in Figure 2.3, adopted from Fougeyrollas *et al.* (1999: 9):

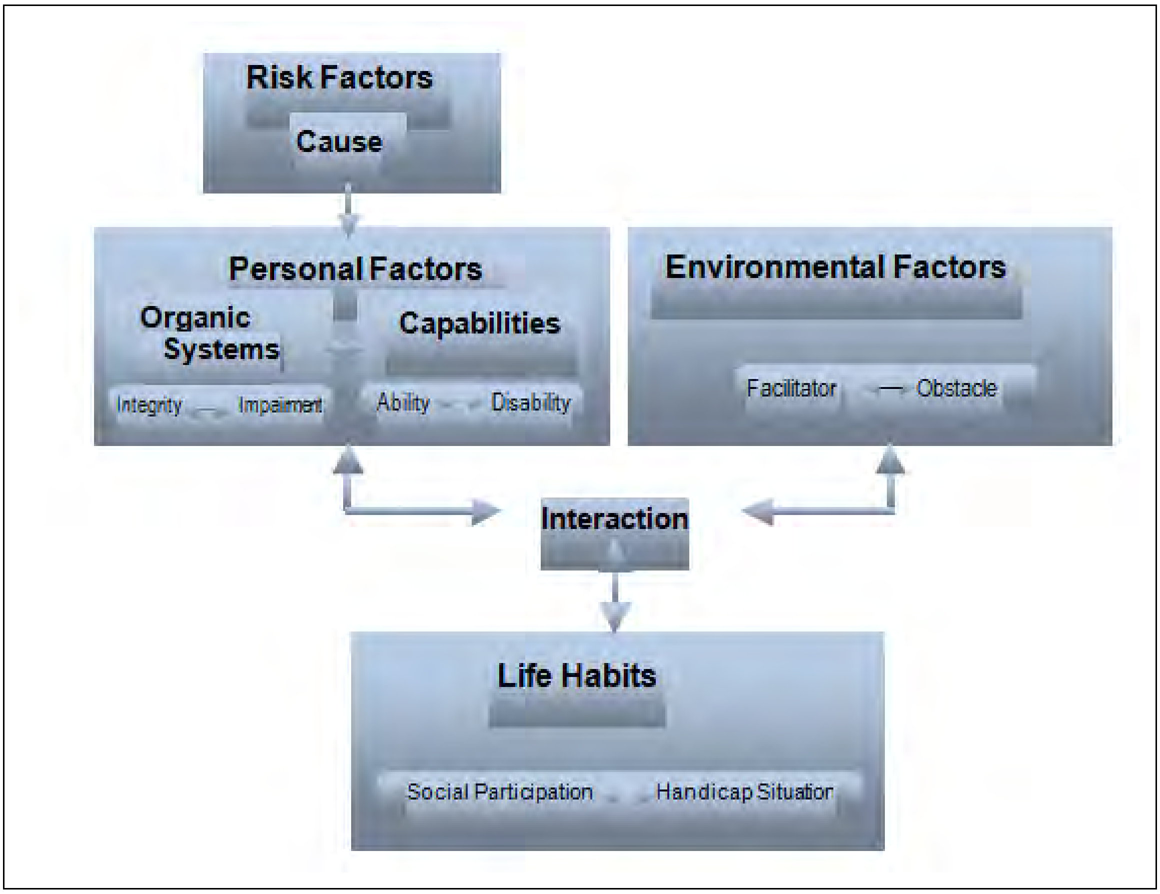


Figure 2.3. The DCP Anatomy Model (Fougeyrollas *et al.*, 1999: 10)

The most recent development in disability models is the affirmative or affirmation model proposed by Swain and French in 2000, which developed into a complete model in 2010 (Cameron, 2014a). The affirmative model is based on the idea that impairments are a core part of a person's being and experience. The aim of this model is to challenge the underlying assumption that impairment is a personal tragedy and that disabled people are victims. Swain and French (2000: 569) explain that the affirmation model "is essentially a non-tragic view of disability and impairment which encompasses positive social identities, both individual and collective, for disabled people grounded in the benefits of life style and life experience of being impaired and disabled".

Figure 2.4 summarises the main approaches to disability and their development over time:

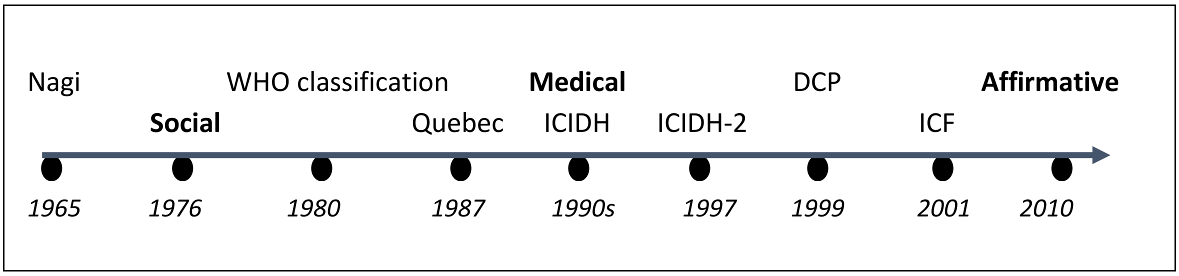


Figure 2.4. Chronology of the emergence of approaches to disability

2.3.1. Examination of the main disability models

The chronology illustrated in Figure 2.4 shows how the social and the medical models have been rivals for many decades. It could be said that, due to limited education and understanding of both medicine and human rights, the years before the mid-20th century was a dark time for disability, when disabled people were seen as strange, abnormal creatures. According to Disability Social History Project (n.d.). from 1840 until 1940, 'freak shows' and 'human zoos' were organised in the USA and proved a popular type of entertainment, as illustrated in Figure 2.5, borrowed from Sorene (2018):

Figure 2.5. Vermont's Rutland Fair Freak Show in 1941

Smith (2013: online) notes that this trend existed as early as the 1500s in Europe, arguing that: “freaking—exploiting the perceived peculiarities of your own body for an audience—was a means of support for some disabled people who might otherwise have died or struggled to survive”. With the Eugenics Movement of the early 20th century, focus was shifted from the fascinating freaks to a danger to society that needed to be institutionalised (Spalding, 2006; Boëtsch *et al.*, 2012). At the same time, developments in medicine solved the mystery behind these unique creatures. Grande (2010: online) explains that “[w]ith advances in medicine, freaks were faced with actual diagnoses” and were no longer thought of as “miraculous or entirely unique”. Grande (*ibid.*) also explains that “[s]ome even stayed away from sideshows for fear of catching the freaks’ ‘diseases’”. Freak shows have nowadays been substituted by ‘human libraries’, open groups for discussion where disabled people explain how they live, as well as ‘human zoos’, i.e. dramatic street representations, often static, that are presented to audiences in order to challenge stereotypes and prejudice. In her article, Grande (*ibid*.) also explains that the early 20th century saw a rise in disability rights, which inspired people to refrain from sideshows that were now deemed as a form of exploitation.

2.3.2. Medical model

The case of freak shows or sideshows is one of particular interest to historians and sociologists, but it is also one that proves how, in fact, medicine and social movements placed disability on more humane grounds. This is something that is almost forgotten in long-lasting discussions on which of the two models – social or medical – is correct and which should be used to describe disability. Although both models have been heavily criticised for various reasons, the personal view expressed here is that nowadays there are two levels of realisation of the models: pragmatic and social. It is understandable that people who work in medical circles will refer to disability by means of impairments and that they might consider such a distinction trivial or unnecessary. It is also logical that activists in the field of disability, and most specifically disabled people, will fight against that perception in order to raise awareness of the daily barriers they have to face and to make a statement of equality that is not respected by society in many cases, without necessarily denying the importance of medical intervention. The strictness with which this issue is dealt with by disabled people, though, highlights the need for greater understanding in society at large. This division is because the level of education, the background and the social involvement of individuals affect how disabled people and disability are understood, on occasions even by disabled people themselves.

The medical model is based on a pragmatic interpretation of impairments, whereby disability is usually equated with impairment. Oliver (1990a) explains how disability was medicalised in the 19th century with the rise of Western medicine, leading to the belief that disability was a form of illness or disease that could be cured once the cause had been found (Maynard, 2014), a perception that is considered erroneous from a social point of view. For Maynard (*ibid.*: 300), this attitude still affects disabled people today with the rise of genomic technology, according to which "our genes are understood to hold the key to our identity" and the focus is on "'finding the key for' a whole range of impairments" (*ibid.*). As mentioned earlier, language plays an important role in the way disability is depicted in each model. In the medical model, terms that may carry negative connotations are still used to address several cases, for example 'faulty' or 'defective' genes, which for many people imply that there is something wrong and abnormal about the disabled person that needs to be fixed. The focus of biomedicine on a cure for impairments indicates that the main concern of the medical model is the "detection, avoidance, elimination, treatment and classification" (Thomas, 2002: 40) of the impairment, which is enhanced by the idea that disability is a deviation of the body and mind from what is understood as social norms. At the same time, rehabilitation is seen as the second best choice when cure is not an option. In the case of rehabilitation, the underlying idea is "the adjustment and adaptation of disabled individuals to a life 'as near normal' as possible" (*ibid.*: 41). It is thus impairment that leads to social exclusion by creating the barriers encountered by disabled people on a daily basis.

Regardless of whether the medical approach is understood as right or wrong, disabled people have proved that the way they perceive disability is not always the same. They may decide to use whatever medical means are available in order to improve their daily lives or overcome their impairment. Even those who embrace their impairment as part of their identity may consider that they are suffering from its effects and would prefer to have it treated (Crow, 1996). For example, a blind person who has been raised in a family with a history of blindness will most probably consider themselves blind in terms of culture, i.e. members of the society of blind people, with the term denoting a sociocultural identity rather than the physiological state of not having sight. Similarly, the term 'Deaf', with a capital 'D', is used by individuals who identify themselves as members of a unique community, whose method of communication is sign language, as opposed to the term 'deaf', which emphasises the fact that the individuals belong to the mainstream community. This shows disability as being an idiosyncratic characteristic of one's identity that would be denied if they addressed it solely as an impairment, which in turn would run counter to an acceptance of human diversity. This dichotomy affects both the society and the impact that medical developments have on it. As such, research for the cure or improvement of an impairment is a fact that can be described objectively, but the way in which it is implemented in society can be positive and helpful for some of its members or negative in its raising of more barriers.

2.3.3. Social model

The need for a cure for disability is one of the main ideas on which the social model was developed, along with exclusion from the labour market, the enforced state of poverty in which disabled people find themselves, and the fact that the only way in which society could 'manage' them seemed to be institutionalisation and exclusion from the rest of the population. One of the most active movements for the social inclusion of disabled people is the Disabled People's Movement in Britain, which was developed in the 1970s and aimed to reform the idea of disability so that it was no longer a medical and welfare issue. The social model, which was shaped through the actions of the movement, gave prominence to the gap created by society between people with impairments and people who were considered 'normal' and fought against the idea that "the restrictions of activity and social disadvantage are the inevitable and tragic consequence of being impaired" (Thomas, 2002: 40). On the contrary, within this approach, disability is seen as the result of the social arrangements that restrict the activities of people with impairments by creating barriers. As Oliver (1990a: 3) states, "[i]t is not individual limitations, of whatever kind, which are the cause of the problem but society's failure to provide appropriate services and adequately ensure the needs of disabled people are fully taken into account in its social organisation".

The role of the medical community in the social model is one that is often questioned. Oliver (*ibid.*) explains how doctors' intervention to treat illness is perfectly acceptable, but their intervention in a social phenomenon is not understood and cannot be effective either. He criticises attempts to 'fix' impairments instead of 'fixing' society in order to provide equal opportunities for all, which is mostly a result of a lack of awareness of disabled people's experiences. Within the area of medical sociology, research on the phenomenology of people's experiences when living with a chronic disease or with impairments is quite extensive (Kelly and Field, 1996; Bury, 1997; Charmaz, 2000). There is, however, a focus on how difficult it is to live with an impairment, which "throws people out of ordinary life [and] order becomes disorder, the controllable becomes uncontrollable, the understandable becomes unfathomable" (Charmaz, 2000: 280). Within the social model, the crux is to address issues like poverty, education, communication and accessibility.

It is important to consider, though, how the social model can be interpreted slightly differently depending on the country. In the US and the UK, the two leading nations in these social developments, the interpretation of some of the aspects of this model have led to some differences. Although the model was reframed in both countries in the 1970s, focus on the 'minority-group model' in the US seems to have resulted in two different versions of the social model, whose foundations can be traced to the "motivational catalysts" (Mole, 2008) that originally led to the recognition of the model. The two versions are the welfare state and idealistic liberal-functionalist sociology in the UK, and the civil and constitutional rights in the US (Williams, 2001), resulting in focus on the recognition of minorities, which is also depicted in language (section 2.2).

Another aspect of the medical methods that advocates of the social model have criticised is the normalisation of the human body, which marginalises the experiences of disabled people depending on their impairment (often called impairment/disability dualism). This was not originally a topic of concern, since the body has been treated as a subject-area within medicine. For decades, it was not mentioned in the literature concerning the social model, as there was an implicit acceptance that "all disabled people have impairments" (Oliver *et al.*, 2012: 30). In recent years, though, there has been a clear attempt within the social movement to incorporate impairment as part of the debate and to accept and take pride in the ‘disabled’ body. However, the problem raised by this perception, as Hughes and Paterson (1997) note, is that it precluded DS from developing a sociology of impairment. Hughes (2002: 69) claims that disabled people “have recognized that interpretation of impairment cannot be left exclusively to the normalizing sciences of biomedicine” and identifies three stages in the relationship between disability and the human body. The first is related to the normalisation of the body, mostly as a result of medical interpretations of disability, and regards disability as “predicated on the presence of physical or mental impairment – that is an ‘objective fact’ of embodiment” (*ibid.*: 73). The second considers the reformulation of disability as a problem of social organisation and politics, rather than nature. In the third stage, society is understood as related to the body – i.e. disability is embodied and impairment is social – highlighting the fact that bodies are political tools rather than impaired and disabled organs.

Like the medical model, the social model has also been criticised from various angles, with the first being the separation of the mind and the body, which was discussed earlier. It has also been accused of being over simplistic in that it completely refuses to acknowledge that part of disablement comes from an actual medical condition. Shakespeare and Watson (2001) bring this, and more points, to the discussion, by extending this oversimplification to the language and the terminology used and by bemoaning the fact that based on this, organisations and policies are, on occasions, evaluated in a rather harsh manner. They argue that parts of the social manifestation can be extreme positions that do not allow further development and research in the area of DS. More specifically, with the example of Morris’s (1991) *Pride against Prejudice*, which was considered ‘ideologically doubtful’ by some members of the British disability movement, they claim that “[t]his tendency, to evaluate ideas on the basis of their conformity to social model orthodoxy, can be seen regularly in the pages of the international journal *Disability and Society*” (Shakespeare and Watson, 2001: 8). Based on this and other claims, they consider the social model ‘outaged’, leaving two different paths open to it: reformation or demolition.

The answer seems to have come directly from the circles of DS, in the form of a call for unity towards a more up-to-date social model, instead of the formation of new models that may put years of research and development in the field at stake. In a collective book, Shakespeare and Watson (1997: 263) reflect on the importance of the fact that DS is largely ignored in other disciplines, and the authors seem to accept that annihilation is not an option:

> Using examples from academics outside disability studies, we argue that the battle for the social model has by no means been won in the world at large, and that therefore the main priority is to advocate a social analysis of disability, not nit-pick or navel-gaze amongst ourselves.

Another two replies to the two theoreticians were published in the same book. The first comes from Johnston (1997: 281), who explains that it would be more useful to "identify shared and cohesive strands" between existing models than defend or attack them. The second is provided by Pinder (1997), who agrees with the points made by Shakespeare and Watson in their critique, suggesting a more holistic version of the social model. According to Slowey and Watson (2003), Oliver and Barnes, the 'founding fathers of the UK disability studies', returned to the topic in their work *The New Politics of Disablement*, published in 2012. They accept that several aspects, including terminology, need to be challenged and revisited, fully aware that criticism of the social model can lead to a focus on 'fixing' the individual rather than the society (Oliver and Barnes, 2012: 21). They reply to Shakespeare's (2006) criticism of the distinction between impairment and disability, arguing that such an approach does not facilitate research, policy or practice (Oliver and Barnes, 2012: 20), and further to that, to general criticisms of the social model (*ibid.*: 120):

> At the same time, attacks by social scientists on the social model have multiplied (Bury, 1997; Williams, S., 1999; Williams, G., 2001) from 'without' with additional criticism 'from within' (Shakespear, 2006; Shakespeare & Watson, 2001). The problem with much of this criticism is that: 'Sadly a lot of people have come to think of the social model of disability as if it were an explanation, definition or theory and many people use the model in a rather sterile formalistic way' (Flinkenstein, 2002 (sic, 2001), p. 6).
>
> […] However, Peters, Gabel & Symeonidou (2009, p. 544) have been happy to incorporate it into their work on resistance: 'The social model, then, has been useful as a tool in that it raises awareness of oppression - a critical first step needed in order to challenge through action.'

Despite internal and external criticism, the social model articulates past and present needs in education and advocates the establishment of inclusive environments, which fully accommodate disability, something that is not conveyed through the medical model. Attempts made to link disability models with education and to build upon the social and medical models are largely based on the idea of autonomous learning and individual abilities. Although the case of education is much more complicated than one would think and, as it is characterised by varying interrelatedness among local authorities, individual schools, parents, children and society (UNICEF, 2012), the social model has indeed affected the way in which education is delivered and has played a vital role in the construction of an inclusive educational environment, preparing students for an inclusive society (Chapter 5).

A defining feature of the social model is the ways in which it has been conceptualised by academics in the UK and the USA. A striking difference can be found in the use of terminology since, as discussed previously, the term ‘people with disabilities’ is often interpreted as a sign that, in their redefining of ‘disability’, US perspectives have not gone as far as the British social model, where social oppression is given priority (Shakespeare and Watson, 2001). It has also become evident that most of the discussions in US circles have revolved around self-support and independent living, which has been a crucial development in the UK disability movement’s progress to emancipation, yet criticised as being too prominent a part of the social model. As Finkelstein (2007: 16) argues, this raises a crucial question that puts the historical understanding of disability in the two countries under discussion: “[S]hould we aim at the right (civil rights law) to be independent (independent living services) or should it be for the nationalisation of appropriate social services under our control (integrated living services)?” Barnes (2012: 21) also comments on this variation, explaining that the USA approach “adhered to a conventional functionalistic/deviance analysis commensurate with American ideology and culture: ‘radical consumerism’ and ‘independent living’”. The author further explains that more radical approaches to the social model have been expressed by activists outside the academy.

2.3.4. Affirmative model

In brief, the affirmative model is based on the idea that impairments are a core part of a person's being and of their experience. It emerged as an alternative understanding of disability between the time when the social model completely rejected impairment as the cause of disability and the time when it was acknowledged as part of the disabled person's experience. With its roots in Disability Arts, and based on two of the most important weaknesses of the social model – i.e. its overgeneralised rejection of impairment and its excessive emphasis on socio-structural barriers –, the affirmation model found an audience in disability circles. Cameron (2011: online) explains that this model is a critique of the personal tragedy model that resulted from the over-objectification of the medical model. She explains that "living with impairment can be experienced as valuable, exciting, interesting and satisfying" (*ibid.*) without denying the negative experience that comes with it.

This model is heavily based on Morris's (1991: 10) view that "there is a tendency within the social model to deny the experiences of our own bodies" and not to acknowledge the bodily nature of disabled people. More specifically, she argues that "[w]hile environmental barriers and social attitudes are a crucial part of our experience of disability – and do indeed disable us – to suggest that this is all there is, is to deny the personal experience of physical and intellectual restrictions, of illness, of the fear of dying" (*ibid.*). The affirmation model identifies impairment as a difference that disabled people should be proud of in a realistic context, where both positive and negative aspects of their circumstances should be equally realised and dealt with. Cameron (2014a) explains how disability can act as a role, and disabled people as actors, either passively or in denial of the restrictions that impairments pose on them. With this in mind, the affirmation model is seen as a tool for the extraction of valuable information from disabled people's experiences and interactions, and she considers it crucial "to recognise that what is going on involves other people in meeting their own identity needs" (*ibid.*: 29).

The affirmation model seems to be mostly valuable for people in need of determining their identity, affirming their role, and acquiring a positive stance. What is more, it seems to be based on the presumption that "there is a negative figure of myself that I need to fight against so that I can claim my social position separately from my disabled state". At the same time, it also challenges "the determination of identity through the value-laden presumptions of non-disabled people" (Swain and French, 2000: 578). The main difference with the social model is summarised by Swain and French (*ibid.*): "Whereas the social model is generated by disabled people's experiences within a disabling society, the affirmative model is borne of disabled people's experiences as valid individuals, as determining their own lifestyles, culture and identity". Like the social model, the affirmation model requires the individual to take a political stance. As far as the authors are concerned, the social model oppresses individuals by determining aspects of their lives and identities, and so do non-disabled people by shaping identities for disabled individuals. However, the reality is that all members of society have their own personality, and the risk of being identified as something different to what you are is one that everybody runs.

Another important aspect of this model is the recognised right of the individual to have control over medical intervention and its strong bonds with impairments in general. Swain and French (2000) explain that the affirmative model is different from any incorporation of impairments in the social model in that it focuses on the positive experiences and the identity of disabled people, which is built by them from scratch. Within this model, telling who is disabled and who is not is considered impossible, as a disabled person can also be an oppressor (Lang, 2007). As this model is directly connected with the Disability Art Movement, disabled people are seen as collectively affirming their positive identity through art. Swain and French (2000: 580) see it as a continuation of the social model in that "[d]isabled people not only look towards a society without structural, environmental or attitudinal barriers, but also a society which celebrates difference and values people irrespective of race, sexual preference, gender, age or impairment". However, to what level this restricts disabled people from society is an issue that requires further discussion. Swain and French (*ibid.*: 581) specifically state that "the affirmative model is held by disabled people about disabled people", which is understandable from the point of view of personal experience. Nonetheless, it also brings to the fore questions such as the relationship between disabled people and the rest of the society, the risk of interacting only with marginalised social groups without further interaction with the rest of society, and the potential unrealistic identification of the self in terms of role in relation to other members of the society, disabled or non-disabled.

If we consider that the identification of the self-proposed by Swain and French does not exceed the realm of social reality, and that it involves the need to accept one's own identity including one's impairment, it could be argued that this is, in fact, a valid perspective. As Cameron (in Hambrook, 2009: online) puts it "[i]n many ways, there's not exactly anything new about it but it's about putting a name to a perspective developed within the disabled people's movement and the disability arts movement". Yet, this perspective has made two major contributions to disability by re-defining impairment as "physical, sensory, emotional and cognitive difference, divergent from culturally valued norms of embodiment, to be expected and respected on its own terms in a diverse society" (Cameron, 2014b: 6) and by examining disability as a productive force, with an aim of escaping social fragmentation and isolation. Both ideas are well received in this current research, as they relate to personal freedom when it comes to the choice of identity. However, given the limitations previously identified, the affirmative model appears to be weak in the face of the 'true problems' that have led activists' groups to develop and support initiatives promoting equality, and thus the social model is considered suitable for the present research.

2.4. Disability Studies and Other Disciplines

The notion of impairment and the medical view on disability dominated academic interest until the 1980s. Divergence from normality was a very interesting area for some sociologists, with the example of Goffman's (1968) account on social normality, while others focused on interpretations of illness in relation to the social environment (Parsons, 1951; Scheff, 1966; Rosenhan, 1975). Although the 1960s and 1970s had seen a number of publications on disability in sociology (Scott, 1969; Albrecht, 1976; Blaxter, 1976; Townsend, 1979), "each of these studies drew attention to the various economic and social consequences of the ascription of a conventional 'disabled' identity" and "none of them made any serious attempt to question its ideological underpinnings" (Barnes *et al.*, 2002: 4). In their account on the emergence of DS, Barnes *et al.* (*ibid.*) explain that it is owed to disability activism of the 1960s and 1970s, which materialised in the form of protests about poverty and discrimination in the USA, Canada and Europe, and gave rise to activist groups such as the American Independent Living Movement, UPIAS and the Liberation Network of People with Disabilities. It is within such organisations that the core of DS was born, with the inspirational works of Hunt (1966), UPIAS (1976), Finkelstein (1980) and Oliver (1983; 1990b), who moved away from the idea that individual restrictions are the causes of disability in society.

The first DS course, *The Handicapped Person in the Community*, was developed at the Open University (OU) in 1975 by Finkelstein, a founding member of UPIAS, and his interdisciplinary team. In the words of Barnes *et al.* (2002: 6), "[p]ioneering a variety of multi-media teaching strategies and distance learning techniques the OU provided unprecedented opportunities to all those disadvantaged by Britain's educational system, including disabled people". The material produced for the course aimed to help students improve their skills in order to achieve autonomy, and formed the basis for the development of other DS courses and professional training programmes. In the USA, the first DS course was offered in 1977 in the area of medical sociology and focused on the experience of living as a disabled person. In 1981, Zola founded the *Disability Studies Quarterly* and co-founded the USA-based Society for Disability Studies (*ibid.*: 7). The request for a more critical interdisciplinary approach to DS, one that is more related to the social model and its perspectives, began to emerge in the 21st century (Clear, 2000; Hahn, 2002). Barnes (2014) gives two very realistic arguments for the reasons behind the delay with which the social model was accepted in academic circles: (1) historically, universities have not been in favour of change, especially when it is underpinned by a political force for social change; and (2) medicine, sociology and psychology had all been well-established disciplines and bringing the social model into academia could prove problematic.

Barnes (*ibid.*) explains how DS is based on the relationships built between disabled people and academia, and underlines the dangers of incorporating and re-interpreting people's knowledge and experiences. The author describes three main types of position based on these relationships: 'outside out', 'inside out' and 'outside in' (*ibid.*: 20). The first position is understood as the most objective, as it is based on an understanding of the social world based on rational thought and natural sciences to interpret it objectively. Being the least 'dangerous' approach, it seems to have dominated academia (Barnes *et al.*, 2002), but it has been increasingly doubted since researchers and academics put themselves in a position to judge the quality of data that is based on disabled people's experiences, an approach that came about after a history of the misuse and misinterpretation of social data by politicians and the media (Barnes, 2014: 20).

The 'inside out' position is based on the perception that direct experience of phenomena is required for their analysis, which easily leads to the question of who the researcher is. If direct experience can only be genuine when it belongs to the person living with an impairment, then they are the only ones entitled to research the disability related to this impairment, which can lead to diverse exclusion, a phenomenon not uncommon in several disabled communities around the world. Apart from not being inclusive, this approach also rejects collective experience and puts a focus on individual or marginalised views of the world, usually based on impairments. In response to the individualisation and the medicalisation of experiential accounts of the past, as well as the reductionist approach of the 'inside out' position, disability advocates brought the 'outside in' approach, which is based on the idea originally expressed by the UPIAS (1976) and Finkelstein (1996) that "[d]isabled people's experiences of disabling barriers (inside) must be located within a political analysis (outside) of why these barriers exist and how to eradicate them" (Barnes, 2014: 21). Thomas (2007) suggests that academics should experience the barriers and then objectively report on them, which begs the question of what 'experience' entails in this case and how complete it can be.

Barnes (2014) points to the fact that a new wave of researchers from various disciplines seems to be going back to the 'inside out' approach in order to present research that focuses on aspects that are not crucial to the living conditions of disabled people, in an era when they should be prioritised, as disabled people are majorly affected by the recent economic crisis. This can be understood as a political view expressed within the disabled researchers' community, yet it cannot be undermined in that it stems from a need to address real problems. Failure to do so may have been the cause of an unstable nature of research in disability. Aiming to "challenge and transform the social relations of research production" (*ibid.*:37), Emancipatory

Disability Research, a term coined by Mike Oliver in 1992, gives priority to the concerns of the end user as opposed to the concerns of professional researchers. This type of research presupposes that the researcher is accountable to the recipients of their investigation, thus research of this type should be based on the social model of disablement, accept the reality of the oppressive role of society on disabled people, produce useful and practical output that aims to remove social barriers, consider personal experience, and adopt a non-restricted, standardised approach as to the type of data collected (Stone and Priestley, 1996). This approach to research on disability is adopted in the current thesis in accordance with the principles described in Chapter 1.

While a detailed discussion of the relationship between DS and Education is provided in Chapter 5, in this chapter I examine the relationship between DS and other academic disciplines, as well as the status of DS in academia. Although DS has developed into an academic discipline in the UK and the USA, this development is not very noticeable in other countries. Blume and Hiddinga (2010) explain how complex a task it is for a country to develop DS as a field, partly due to the fact that each country has a different history, different policies and its own unique education system. Söder (2009: 70) sets the example of Scandinavian countries, where “disabilities studies have been more closely linked to the welfare state than to radical disability movements. It has [sic], at least in Norway and Sweden, been getting its funding and legitimacy from evaluations of social reforms”. Such a situation creates a gap between the leading examples of the USA and the UK and the other countries that want to follow suit but cannot find their way. At the same time, other disciplines seem to ignore the existence of DS by returning to the medical model (for example, sociology) or by focusing merely on experience (for example, technology) without backing it up with a DS framework. A reason for this is that DS is being questioned as an academic field per se, very much like Audiovisual Translation in the past.

Be that as it may, DS has drawn upon a number of sources and influences and is now considered “an emergent field with intellectual roots in the social sciences, humanities and rehabilitation sciences” (Albrecht *et al.*, 2001: 2). As Oliver and Barnes (2012: 130) argue, “sociology cannot claim to be the parental discipline, as in recent years psychology, economics, history, cultural studies and humanities have all made significant contributions to the field”.

With a large number of courses designed along the lines of DS and, with DS at the core of academic curricula, it would be difficult to maintain that DS cannot stand as a field on its own. The academic landscape has been comprehensively described by Turner (1999: 276), in the following terms:

> The rise and fall of disciplinary regimes are consequences of powerful alliances which marshall the distribution of rewards within a field of academic practice. Disciplines are periodically fragmented and dispersed by internal intellectual studies and by external conflicts with adjacent disciplines. Some disciplines never get fully accepted into the academy, while certain area studies may disappear.

Although this has indeed been the situation in academia during the last two decades, and some deterioration has taken place in the last five years due to the economic downturn, DS has managed to survive for some solid reasons: DS accounts for real experiences and its value is not judged merely by its impact on the industry, but rather by its impact on society and it is based on political and social principles of equality, human rights and equal access to society, inspiring large organisations around the world. Even if this is not always acknowledged, DS has played a major role in the rise of professions and disciplines related to inclusion and accessibility. A tendency to industrialise anything practical has also been observed, leading to the marginalisation of DS as a field overall. Courses inspired by the needs expressed by the disability movement do not necessarily adhere to the principles that have justified their needs or, indeed, the way in which they are perceived by disabled people themselves. Mankoff *et al.* (2010) have also observed this and argue that Assistive Technology and DS have many goals in common but little communication with each other. By encouraging the continued development of theoretical and scholarly synergies between the two fields, the authors identify shared research methods in both fields and suggest common and collaborative practices. The *Center for Technology and Disability Studies* at the University of Washington is an inspirational example of such an implementation, although one that focuses heavily on the medical framework.

This research suggests that by implementing a theoretical background with disability at its core, accessibility can be achieved more effectively and realistically. Ignoring it altogether could jeopardise both the value of DS and the usefulness of the discipline in question. Inspired by Mankoff *et al.* (2010), and expanding this idea further so that it takes Audiovisual Translation into account, one of the aims of this research is to establish a strong connection across all the disciplines involved.

2.5. Accessibility and Inclusion

Access services, and accessibility itself, are two notions that need to be clearly defined within the scope of the present research. The term ‘accessibility’ can have a variety of meanings depending on the context in which it is used. For the purposes of this section, the basic terminology provided by dictionaries, which results purely from the etymology of the word, i.e. its rooting ‘access’ leading to various simplified meanings like “providing access” (Merriam-Webster, n.d), will not be discussed. Meanings related to ‘understanding’ as an essence of accessing will not be included in this analysis either, since they are mostly related to an individual’s mental capabilities and fall outside the scope of this research. However, it is useful to refer briefly to the origins of the word ‘access’, which according to the *Oxford Dictionary of Word History* (2002: 5) means the following:

> **access** [Middle English] The prime current meaning is ‘a means to gain entry’; this was first recorded in English in the early 17th century, but an access in early examples was used for ‘a sudden attack of illness’, from Latin accessus ‘way of approach’ (from the verb accedere ‘to approach’). The Latin elements ad- ‘to’ and cedere ‘to give way’, ‘yield’ form the base of other members of the same word family. The adjective accessible dates from late Middle English and is from late Latin accessibilitis.

We can see from this definition that the idea of making something ‘approachable’ has been part of the access word family from the beginning of its existence. As regards the provision of opportunities to access products/services/places, the term is mostly used to refer to making facilities of any kind available to everyone. There are, thus, at least three possible meanings lying behind the idea of availability.

The first meaning of the word ‘accessibility’ can be defined as the availability of physical facilities with special characteristics provided for disabled people (e.g. accessible entrances to buildings). This seems to be the most archaic meaning of the word, based on the fact that physical accessibility was considered a necessity long before sensory accessibility was even realised and services provided. The *Collins Cobuild Advanced Learner’s English Dictionary* (Cobuild, 2003: 7-8) includes this meaning in its definition of the words ‘access’ and ‘accessible’:

> **access** […] If you have access to a building or other place, you are able or allowed to go into it.
>
> **accessible** […] If a place or building is accessible to people, it is easy for them to reach it or get into it.

Physical access is directly relevant to the environment and its form. It can refer to access to the natural environment, the urban environment, the built environment and the structured environment. The natural environment is any area where the human has not intervened, while the urban, the built and the structured environment refer to areas where the human has intervened. The urban environment is the form of the environment in an area occupied by people and can refer to parking areas, pavements etc., the built environment refers to buildings and built facilities, and the structured environment refers to any environment that requires people to be functional within it, and that includes the urban and the built environment. The terms ‘structured’ and ‘built’ are often used interchangeably.

A second meaning of the word would include the more general notion of making products/services/places available to everyone. This second meaning includes all possible types of access – including physical access (not discussed in these pages – that can be provided to people and can be said to embody the essence of universal design. The concept was introduced by architect Ronald L. Mace and can be defined as follows: “the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life” (NC State University, 2008). Other entries found in dictionaries also underline this meaning, although they do not provide examples of access types and, on occasions, stress the idea of ‘having the right to access something’:

> **access** […] the method or possibility of approaching a place or person, or the right to use or look at something.
>
> **accessible** […] able to be reached or easily obtained.
>
> **accessibility** […] Two new roads are being built to increase accessibility to the town centre.
>
> (Cambridge Advanced Learner's Dictionary, 2003: 7)
>
> **access** […] the method or way of approaching a place or a person, or the right to use or look at something […] Access to something can also mean the opportunity or the ability to use it.
>
> Cambridge Dictionary of American English (Landau, 1999: 4)
>
> **access** […] a way of opportunity, approach or entrance […] to gain access to in any sense.
>
> (The Chambers Dictionary, 1998: 9)

A third meaning might describe accessibility from the point of view of the availability of products/services/places to people with impairments of any kind – physical, cognitive, mental, sensory, emotional, developmental or any combination of the above. This term is more inclusive than the first and more focused than the second, and it is the trigger for fast emerging discussions on physical, sensory and cognitive accessibility.

Based on the above, access services are clearly those that serve people with impairments. This research will revolve around sensory access services, which will often be referred to as access services alone. Their applications can vary and are elucidated with the added reference to 'on TV' or 'at the cinema' or with the use of expressions like 'Web access services'. Few dictionary entries make specific reference to the relationship between accessibility and impairments or disability. According to the online *Cambridge Dictionary* (n.d.: online), accessibility is "the quality or characteristic of something that makes it possible to approach, enter, or use it". The first example provided for this entry, "[t]ouch-screen voting machines meet the requirements for accessibility to people with disabilities", constitutes one of the few direct references to accessibility requirements for people with disabilities recorded in a dictionary.

Since the start of this research in 2011, a slight change in the definition of the terms has been observed, which could be attributed to the fact that accessibility has been gradually gaining ground in various disciplines and in society as a whole. Interesting examples include the definition of ‘access’ as a modifier “[d]enoting broadcasting produced by minority and specialist interest groups, rather than by professionals” (*English Oxford Living Dictionaries*, n.d.: online), and ‘accessibility’ as referring to “how easily a disabled person can negotiate part of a building or structure” (www.vocabulary.com, n.d.).

With the three main meanings of the term that are the most relevant to our discussion clarified, it is of note that the third has come to encompass the other two through the services provided for accessibility. Although traditionally – in fact, right up until the actual application of access services for people with sensory impairments –, accessibility has been largely thought of from the point of view of physical access, in recent years it has come to be perceived in a more encompassing and far reaching way. More closely related to disability and impairments than before, the concept now encapsulates practices that reach a large number of recipients and not only disabled people, which is hereby referred to as ‘reverse accessibility’. A case in point is subtitles for deaf and hard-of-hearing audiences (SDH). Although created to serve a particular demand, namely the need of access for deaf and hard-of-hearing audiences, the reality is that SDH is not only used and enjoyed by these, but can also be used for language learning purposes, for indexing and cataloguing audiovisual material, for understanding thick accents, or just for fun. Their use by other recipients will vary from country to country, depending on the level of development and awareness in the field. Still, it cannot be denied that, in the era of digital television, the provision of SDH is gaining great visibility as a tool that is helpful in enhancing TV experience. Along the same lines, buildings offering access to people with physical impairments serve other purposes too. Wheelchair-accessible constructions also serve the elderly and people having suffered accidents that affect their mobility, as well as mothers with prams. This idea is also supported by Zabalbeascoa (2010: 27), whose view is that:

> certain social groups may find useful applications of their systems for a wider population, just as certain types of sensory impairment may find useful alternative applications to communication systems developed for extreme

environmental conditions, including space travel, underwater exploration, or poverty.

Though such a view could be regarded as too ambitious, it is also equally justifiable if we take into consideration the rapid advances of technology. As it happens, targeted access services end up being used by wider sectors of the population and become useful tools against social exclusion.

Inclusion on equal terms is not only one of the main aims of accessibility, but it is also an important condition for its existence. Rather than providing means for specific purposes, it is based on the principle of transforming the existing restricted environments into open and inclusive places for all. This notion has been highly recognised and highlighted in the field of education, with the rise of 'inclusive education' in the sense of integration in the mainstream classroom. This topic is further analysed in Chapter 5, but it is interesting to briefly establish the connections among the main concepts introduced in this chapter with inclusion in mind. Much like human rights and discrimination, inclusion is a concept of the past that is closely linked to race, gender and ethnicity, and prevents exclusion from social activities as a result of discrimination and social barriers.

In the case of disability, a cry for inclusion has accompanied the social movement ever since its inception and constitutes a prevailing aim in the writings of DS scholars. Anti-discrimination legislation, equal-opportunity policies and programmes of positive action often have inclusion as their main aim. A telling example is the EU's Europe 2020 strategy, which "was launched in 2010 to create the conditions for smart, sustainable and inclusive growth" (Boni and Walker, 2016: 85). In order to better understand the full meaning of inclusion, it is important to compare it with segregation and integration. Based on the examples provided by The Alliance for Inclusive Education (n.d.: online), segregation tends to force disabled people to lead separate lives, and integration places disabled people in existing environments by means of forcing them to fit in with what is already provided, while inclusion comes with change and the removal of barriers to allow full participation.

Within the context of this research, the relationship between inclusion and accessibility could be described as bidirectional. The need for inclusion came with the requirement for more accessible environments, which has raised the need for the provision of the right access services that would make this possible. In other words, inclusion can be achieved through the use of access services that ensure accessibility. Of course, this does not mean that wherever the aim is inclusion, access services are present or act as a solution to the problem. This mostly applies in situations where access to a service, an environment, a product or a provision is restricted because their existing shape and manner of provision make its use impossible or restricted. It also indicates whether the term is appropriate for services that make audiovisual content accessible (e.g. SDH), thus promoting inclusion for people with sensory impairments. At the same time, tools for accessibility can become part of the discussion when access is provided through purely technological means, as in the case of a screen-reader that reads text aloud from an electronic device. This does not come without the necessity of inclusion though, since the form in which the text is provided is a prerequisite for it to become accessible, which is the second relationship that is identified between the two notions. The screen-reader may be able to get to the text in order to read it, but the text may be provided in a non-accessible form (e.g. an image) or it may have been written in a manner that does not take into account the various educational needs of the audience, both of which would have an impact on the end product.

All in all, accessibility and access services with the aim of inclusion depend very much on a holistically inclusive framework or context that will make them possible to start with. This is precisely the suggestion put forward in this research, which focuses on accessible Online Education. Indeed, full accessibility can only be achieved with inclusion in mind, which in turn means that environments need to have been designed with accessibility in mind, or are based on a universally inclusive design.

Chapter 3

Access Services and Audiovisual Translation

As already mentioned in the previous chapter, among the three possible meanings, the term ‘accessibility’ is defined in the current research as making products/services/places available to people with impairments, who would otherwise have limited access to them due to the lack of relevant provision. Thus, in this context, access services are understood as the means to achieve accessibility, i.e. to provide physical and sensory access. The present research investigates sensory access services in particular, with its main focus on subtitling for deaf and hard-of-hearing people (SDH) and audio description (AD) for people who are blind or have visual impairments.

The application of access services to aspects of life different to the ones they were initially intended for will also be touched on in this chapter. This highlights the idea of the dual nature of access services in the sense that their implementation fulfils a function not only in the accessibility context for which they were initially intended, but are also suited to other cultural environments and of benefit to a wider range of audiences, as further discussed in section 3.3. Compared with other areas like Translation Studies (TS) and Audiovisual Translation (AVT), accessibility with the aim of making (audiovisual) content available to people with sensory impairments is a fairly new, yet fast-evolving field of discussion in academic circles. Often referred to as Media Accessibility (Díaz Cintas *et al.*, 2010; Remael *et al.*, 2012) it does not only concern access to audiovisual material broadcast on TV, screened at the cinema or distributed on the web. Its applications have spread to other areas of the arts and society, and we can now enjoy accessibility in theatres, operas, museums, at exhibitions, in churches, and even in sports stadiums.

In the present research, accessibility is approached as part of the wider field known as Audiovisual Translation. Although the relationship between translation and accessibility has been questioned in the past (Díaz Cintas, 2005), AVT has come to be a more-or-less universal umbrella term that accommodates access practices (Orero, 2004). In order to build a solid theoretical background that can account for access services, their place within AVT – and by extension within Translation Studies – is revisited in this chapter by highlighting the characteristics linking the three areas. In addition to discussing the place occupied by access services within the field of AVT, this chapter deals with the nature and characteristics of AVT services in general, and SDH and AD in particular. It also offers an account of the history of the two main types of access service as well as giving an overview of the legislation that regulates their provision, thus establishing a socio-political foundation for the work and providing grounds for combining Disability Studies and access services in AVT in the context of a rights-based approach to accessibility. A discussion of the relevance of other research areas related to this field, such as Film Studies, along with an exploration of the status of access services in the industry, completes the picture of SDH and AD.

The aim in this chapter is to make a contribution to accessible Online Education (OE) by offering a basis for recognising the potential of SDH and AD as tools for accessibility in various educational contexts and providing ideas for future research. Its purpose is also to extend the scope of interdisciplinary research that focuses on the study of AVT services for the purposes of social inclusion by emphasising their value as tools providing access to different types of content and education, a subject that will be discussed in greater detail in Chapter 5.

3.1. AVT and Translation

Before discussing the place occupied by access services within the broader field of AVT, it is first necessary to refer to the relationship between AVT and Translation Studies in order to understand their joint development and relationship between them.

This will help identify the various AVT practices that provide access to people with sensory impairments and which can thus be studied with the aid of the heuristic tools already being utilised in the broader field of Translation Studies. An exploration of the links between the three areas (TS, AVT and accessibility) should be seen as an essential step facilitating the understanding of the multidisciplinary approach taken by the current research.

3.1.1. AVT and Translation Studies

As a branch that has gained its place within the field of TS since the 1990s, AVT "refers to the translation of products in which the verbal dimension is supplemented by elements in other media" (Díaz Cintas, 2005: 3). Orero (2004: vii) refers to the unstable terminology used to refer to AVT by pointing out a number of terms that have been used to describe it:

> The unsettled terminology of audiovisual translation is patent from the very denomination of the field, from *Traducción subordinada* or Constrained Translation (Titford 1982: 113, Mayoral 1984: 97 & 1993, Rabadán 1991: 172, Díaz Cintas 1998, Lorenzo & Pereira 2000 & 2001) to Film Translation (Snell-Hornby 1988), Film and TV Translation (Delabastita 1989), Screen Translation (Mason 1989), Media Translation (Eguíluz *et al*. 1994), Film Communication (Lecuona 1994), *Traducción Fílmica* (Díaz Cintas 1997), Audiovisual Translation (Luyken *et al.* 1991, Dries 1995, Shuttleworth & Cowie 1997, Baker and Hochel 1998), or (Multi)Media Translation (Gambier & Gottlieb 2001).

Nowadays, however, the term 'Audiovisual Translation' (abbreviated as AVT) is well-established and widely used in academic circles to refer to this field. The fact that films rely on both auditory and visual channels has made the inclusion of AVT in the field of TS challenging. Early researchers considered the multisemiotic nature of audiovisual productions as an obstacle in the way of its analysis due to the predominantly "linguistic and literary background" at the time and "the practical constraints of (printed) publications in two dimensions" (Gambier, 2008: 11) that did not permit the use of videos to illustrate some of the examples. The spatial and temporal limitations affecting translation along with the multimodality of audiovisual programmes have led to discussions as to whether AVT is a form of adaptation rather than translation (Díaz Cintas and Remael, 2007). In the past, this has often led to the realisation that “translation studies of all disciplines have been rather reluctant to include film translation among their subjects of study” (Delabastita, 1989: 213).

As Sokoli (2000) explains, one of the most popular types of AVT, subtitling, which implies a shift from speech to writing in the same or across different languages, has often been accused of a lack of ‘equivalence’ and ‘fidelity’ between the source and target texts. This view has been reinforced by discussions on equivalence in translation, which emerged in the late 1950s and 1960s, with theorists like Jakobson (1959/2000) and Nida (1964). Considering that every language is a code-unit, Jakobson (1959/2000: 114) argues that “there is ordinarily no equivalence between code-units” and translation involves the recoding and transmission of a message that is received by another cultural group, thus leading to the formulation of two equivalent messages in two different codes. In the case of AVT, equivalence becomes even more challenging, as spatial and temporal restrictions can affect the translation choices made.

For his part, Nida (1964) proposes a distinction between ‘formal’ (form and content equivalence) and ‘dynamic’ (equivalent effect) equivalence. Formal correspondence is understood as the closest equivalent translation of a source item, while dynamic correspondence involves an equivalent impact between the source and its translation, when a formal equivalent does not exist between two languages (Nida and Taber, 1982). It might therefore be argued that, due to the temporal and spatial limitations that characterise it, AVT generally aims to achieve a dynamic equivalence in the transmission of messages, retaining a particular standardised form within its context of application. This argument could be questioned in cases where dynamic equivalence has to be sacrificed to serve visual effectiveness. For example, a linguistic formulation in the target language that is deemed to fit the lip movements of the character on screen could be given priority over the dynamic effect of the actual content being dubbed. On the whole, the translation strategies applied both in traditional translation and AVT are similar, with some variations in terms of their nature and frequency. Indeed, because of the technical restrictions that apply in AVT, strategies like condensation, omission and reformulation tend to be applied more frequently than in other translation practices. This being said, it can be argued that all types of translation are subject to some restrictions, whether it is in terms of the space available for the translation or the layout to be followed.

Another obstacle when trying to place AVT within TS may stem from the traditional view that translation takes place within the same channel and thus retains the same semiotic nature as the original, for example a written book is translated into another written book. Of course, in this approach, it is difficult to accommodate the semiotic complexity of audiovisual productions where information is conveyed through different sign systems. According to Gottlieb (1994), both standard translation and interpreting are instances of mono-dimensional interlingual verbal transmission, where the linguistic transfer takes place from one language to another and within the same semiotic environment. For this scholar, this process makes translation and interpreting horizontal types of verbal transmission, as illustrated in Figure 3.1 below:

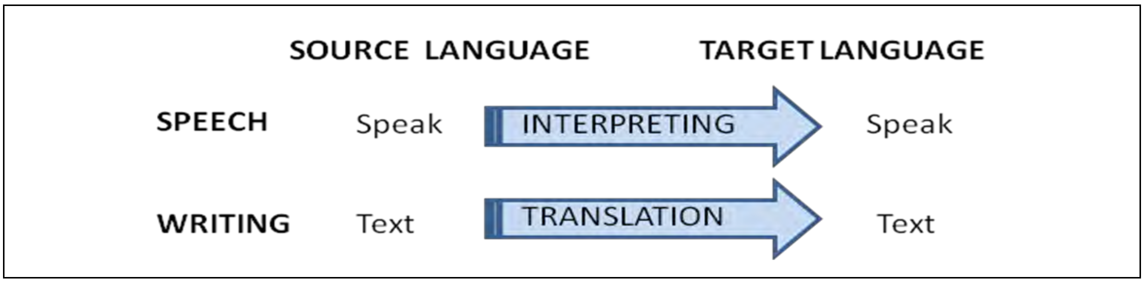


Figure 3.1: Gottlieb's (1994: 104) one-dimensional types of verbal transmission

In the case of subtitling, however, information is transferred across two modes, as the original oral dialogue becomes written text in the translated product. According to the language combination it serves, subtitling can be understood as a vertical process, when the language of the original and the subtitles coincides, or as a diagonal process, when the language of the original production and that of the subtitles is different, as shown in Figure 3.2:

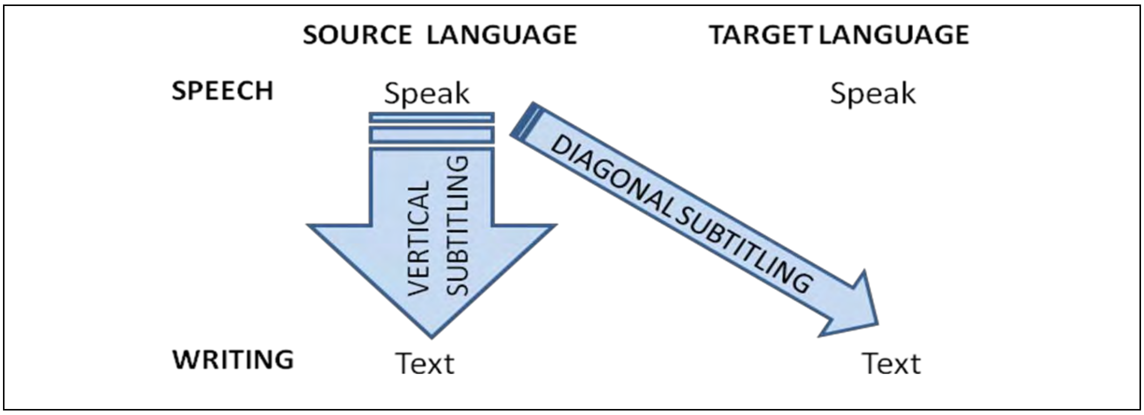


Figure 3.2: Gottlieb's (1994: 104) two-dimensional types of verbal transmission

Alternatively, these two types of subtitling are also referred to by the more common terms 'interlingual' and 'intralingual', originally used by Jakobson (1959/2000: 114) to qualify translation in general.

With regard to the complex, multisemiotic nature of the source material, Chuang (2006: 374) identifies "five semiotic modes that are most frequently represented in the film text: the spoken mode, the written mode, the mode of music, the mode of sound effects and the mode of moving images". With the exception of the written and the spoken modes, in traditional translation and interpreting the rest either do not exist or are not involved in the actual task of translation. These semiotic modes may be present in a variety of translation settings in the form of context that helps translators select the most successful equivalent, although their linguistic representation is, in most cases, not required. However, the multimodality that characterises audiovisual productions has to be borne in mind during the translation process as it affects the translation strategies applied. This multisemiotic nature can be seen as a variation on traditional translation, rather than an alienating factor, and its importance is further foregrounded when two additional factors enter the discussion, language and skopos, which will be discussed in section 3.2.

3.1.2. Types of AVT

This section covers the basic types of AVT, though we should not ignore the fact that combinations of various AVT services also exist and are mainly determined by technology, as for example the use of machine translation (MT) engines and speech recognition systems. Scholars have distinguished more than ten types of “multilingual transfer” (Díaz Cintas and Anderman, 2009). AVT types can be grouped into two main categories: revoicing and rewriting. The term ‘revoicing’ is generally used to refer to AVT modes which aim at full or partial substitution of the dialogue exchanges heard in the original product by others in a target language (*ibid.*). Based on this definition, revoicing includes the following types of AVT: respeaking, dubbing, voice-over, narration, commentary, audio description (AD) for blind and visually-impaired audiences, and audio subtitles.

In this context, as the opposite to ‘revoicing’, the term ‘rewriting’ refers to subtitling and other AVT modes that are closely related to it. Although within TS, the expression has been widely used to refer to the act of translation in general (Lefevere, 1992), scholars within AVT often use it to refer to subtitling (Díaz Cintas and Remael, 2007). As such, it includes subtitling, subtitling for deaf and hard-of-hearing people (SDH), also known as captioning in the USA, surtitling, fansubbing, intertitles, web captioning and live subtitling. In this fluid industry, new technology seems to be setting the ground for novel types of AVT such as audio subtitling, which shares the characteristics of subtitling, audio description and voice-over (Braun and Orero, 2010), thus cutting across both rewriting and revoicing. In the current thesis, audio subtitling is understood mostly as belonging to the revoicing category, since its final output is an oral rather than written text.

3.1.2.1. AVT: Revoicing

As mentioned earlier, revoicing is an umbrella term used to refer to the “replacement of the original voicetrack by another” (Luyken *et al.*, 1991: 7), and it incorporates dubbing, voice-over, narration and free commentary.

Dubbing:[1] Based on Ivarsson and Carroll's (1998) description, dubbing is a process through which translated versions of the original material – usually a film or TV series – are recorded and used in order to replace the initial dialogue soundtrack. This process includes the technique of lip-syncing, also known as lip-synchronisation, lip synchrony or phonetic synchrony, which "consists of adapting the translation to the articulatory movements of the on-screen characters, especially in close-ups and extreme close-ups" (Chaume, 2004: 45), so that the translated dialogue matches up the labial consonants and open vowels of the onscreen speakers' lips as faithfully as possible. Other factors that impinge on synchronisation and have to be taken into consideration are:

1. isochrony (*ibid.*), i.e. the matching of the beginning and end of a sentence to the sound produced;
2. kinetic synchrony (Whitman-Linsen, 1992), whereby facial expressions and gestures should be matched with the words being said; and
3. content synchrony (Mayoral *et al.*, 1988), which requires congruency between the story being told and shown in the original production and the one channelled through the translation.

Content synchrony is not exclusive to dubbing since it applies to all AVT modes, while academics may refer to synchrony using terminology differently as well as identifying characteristics that are more universal to translation in general. For example, Chaume (2004:44) identifies phonetic, character and content synchrony in dubbing, clarifying that content and character synchrony are common to other types of translation. On the whole, dubbing is a complex activity that involves not only translation but also acting and management of technical know-how (Chaume, 2012).

Voice-over:[2] This term has traditionally been used in Film Studies to describe "the action of voicing over the picture" and "the result of this action" (Pageon, 2007: 3). Through voice-over, a person would comment on a scene in order to fill the gap between "the viewers' inexperience at 'reading narrative images [and] the filmmakers'

[1] For more detailed information on dubbing, see Chaume (2012).
[2] For more details on voice-over, see Orero (2009) and Franco *et al.* (2010).

lack of skill in conveying temporal, spatial and narrative relationships”, as Franco *et al*. (2010: 17) explain quoting Kozloff (1988: 23-24). From an academic perspective, it started to be analysed in the 1980s, although it has existed as a professional practice since 1932 (Franco and Orero, 2005). Within the field of AVT, and in the current thesis, voice-over is a mode of translation realised “through the recording of the translation voice on top of the original voice, which remains audible” (Franco *et al*., 2010: 39). Compared to dubbing, voice-over allows the audience to listen to the original soundtrack while also receiving the voice-over audio, which is not necessarily delivered by actors, but rather has the form of recorded narration or interpreting, thus not requiring a match in terms of style, lipsynch and richness of the content.

Commentary and narration: These are two terms often associated with voice-over. Franco *et al*. (*ibid.*) refer to them as leftovers of Film Studies literature and differentiate them, with narration being mostly applied to fiction, while commentary is preferred for non-fiction programmes. However, within AVT, the two types encompass different practices. According to Chaume (2013: 7), a commentary (or free commentary) is “not a faithful reproduction of the original text”, but it is rather considered an adaptation for a new audience, with additions, clarifications, omissions and comments. Narration, as Chaume (*ibid.*: 108) explains, can refer to a summary of the original dialogue exchanges, that can often substitute the original soundtrack, so that it is often referred to as dubbing. Its tone is usually more formal than that of the commentary, which is used complementarily, rather than as a substitute for the original.

Audio Description:[3] can be defined as: “a precise and succinct aural translation of the visual aspects of a live or filmed performance, exhibition or sporting event for the benefit of visually-impaired and blind people. The description is interwoven into the silent intervals between dialogue, sound effect or commentary” (Hyks 2005: 6). Díaz Cintas (2005: 4) explains that AD falls under the category of intersemiotic translation, as he describes this practice as “the conversion of nonverbal signs into words”. More detailed information about AD is provided later in this chapter.

[3] For a complete account of AD, see Fryer (2016).

Audio Subtitling:[4] Audio subtitles are the spoken version of subtitles projected onto a screen and used as an aid to viewers who cannot read the subtitles. When dealing with foreign films that have been subtitled, audio subtitles facilitate the communication, as the subtitles in the target language are combined with the AD script so that blind viewers who do not understand the source language have access to the content (Braun and Orero, 2010). As Remael (2012) argues, this translation mode can also be beneficial to viewers with cognitive impairments.

3.1.2.2. AVT: Rewriting

This section covers the main types of rewriting practices, both interlingual and intralingual.

Subtitling:[5] Among the most comprehensive definitions of the term is that given by Díaz Cintas and Remael (2007: 8), who describe subtitling as:

> a translation practice that consists of presenting a written text, generally on the lower part of the screen, that endeavours to recount the original dialogue of the speakers, as well as the discursive elements that appear in the image (letters, inserts, graffiti, inscriptions, placards and the like), and the information that is contained on the soundtrack (songs, voices off).

Some of the areas that need to be taken into consideration for the production of successful subtitles are: synchronisation between the written subtitles and the dialogue soundtrack, correct positioning of the subtitles, proper line breaking and spotting of the written text, adherence to a given maximum number of characters that can appear per line, consistency in the typographic conventions used in the subtitles, respect for shot changes so that subtitles do not cross over them, and adherence to the maximum assumed reading speed of the viewers. Subtitling is a practice generally used for the translation of audiovisual productions distributed in cinema, TV, VHS, DVDs, Blu-ray and the internet.

[4] For an account of audio subtitling, see Braun and Orero (2010).
[5] For a more complete account of subtitling, see Díaz Cintas and Remael (2007).

From a linguistic perspective, subtitles can be intralingual and interlingual and, most commonly, monolingual. Díaz Cintas and Remael (2007) add also the notion of bilingual subtitles to refer to subtitles in which two different languages appear on screen simultaneously in order to serve bilingual communities, like Belgium or Finland, or for international events such as film festivals. When it comes to the time available for their production, scholars also distinguish between pre-prepared subtitles (or offline subtitling) and live or real-time subtitles (or online subtitles). Pre-prepared subtitles can take the form of complete or reduced sentences, while live or real-time subtitles can either be created by humans or constitute the result of machine translation or voice recognition, as in the case of respeaking, for example. Finally, subtitles can be open or closed according to whether they are burnt-in – i.e. intrinsically associated with the projected image – or standalone, i.e. easily disassociated from the image and thus providing the viewer with the choice of hiding or activating them.

Although in the United States the word ‘captions’ has also been used by the general public –mostly in the past – to refer to interlingual subtitles, both in Europe and in the USA it is nowadays clearly used to refer to intralingual subtitles aimed at deaf and hard-of-hearing communities (Georgakopoulou, 2010). In Europe, the term ‘caption’, along with the term ‘insert’, is also used to refer to burnt-in pieces of text added to the audiovisual material by the creators, rather than the subtitler. In the context of the present study, the term is used to refer to a form of subtitling that provides access to deaf and hard-of-hearing audiences, yet may or may not apply SDH conventions, thus not necessarily targeting specific audiences.

SDH:[6] Neves (2005: 21) defines SDH as “any type of subtitling that has been consciously devised to cater for the needs of viewers who are Deaf or hard-of-hearing”, featuring in audiovisual material which is either broadcasted on TV, watched at the cinema, or streamed on the internet. It also has a presence in theatres, museums and opera houses. SDH is gradually being seen in new areas of application such as video games and online learning platforms, often with an educational aim and addressing a wide audience.

[6] For a more complete account of SDH, see Neves (2005).

From a linguistic viewpoint, SDH can be both intralingual and interlingual. The more traditional intralingual SDH is performed within the same language – i.e. from Greek into Greek for deaf and hard-of-hearing – while interlingual SDH is the same process but takes place between one or more different languages – i.e. English into Greek for deaf and hard-of-hearing people – which is a rare practice, however. As Ivarsson and Carroll (1998) explain, SDH differs technically from standard interlingual subtitles mainly because they adhere to slightly different norms as far as reading speeds, use of colours and maximum number of lines are concerned, and they also include additional information to identify speakers, convey music and alert about sound effects, all of which will be discussed in greater detail later in this chapter and the next.

As already mentioned, another term mostly used to refer to the same service in the USA is ‘captioning’ or ‘closed captioning’ (CC). In this context, SDH subtitles are typically called ‘closed captions’ because they are hidden and activated at the viewer’s will. From a terminological perspective, the use of these terms when referring to captioning and subtitling in the USA and Europe can be quite ambiguous. According to Clark (2001), captioning, as used in the USA, has similar characteristics to SDH in the UK. To complicate matters further, the terms ‘captions’ and ‘captioning’ are also commonly used on the web to refer to subtitling provided in online environments, which is referred to as ‘web captioning’ in the current thesis. According to W3C (2019a: online), web captioning is “a text form of audio information in video and animations. This includes the words that are spoken, who is speaking when it is not evident, and important sounds like music, laughter, and noises”. In the present research, ‘closed captioning’ is only used to refer to the US market, ‘captioning’ is used to refer to standard subtitling in the USA, ‘SDH’ is used to refer to the subtitling service offered in Europe for deaf and hard-of-hearing people, and ‘web captioning’ is used to refer to subtitles prepared for use on the web.

Surtitling:[7] Surtitles, ‘supratitles’ (Gambier, 1994: 276) or ‘supertitles’, as they are also known in the USA, are a form of subtitling intended for live events at the theatre, the opera, concert halls, or conference venues. As Munday (2008: 185) notes, surtitles are “subtitles which are projected above the stage or on the seatbacks at the opera or

[7] For a more complete account of opera surtitling, see Orero and Matamala (2007).

theatre". In many venues, surtitles can be intralingual and/or interlingual and intended primarily for deaf and hard-of-hearing viewers as well as for those whose native language is not the original language of the performance.

Fansubbing:[8] Fansubs or amateur subtitles are those enjoyed by fans, who download them from the internet in order to watch movies or television broadcasts. Their quality is widely questioned, as they do not adhere to specific guidelines or rules and can thus be very creative and unconventional. Yet, as Massidda (2015) argues in the case of fansubbing in Italy, the quality of fansubs can influence professional subtitling and, in some cases, it can even be higher, particularly from a lexical point of view, thanks to the fans' dedication and knowledge of the source material. However, the quality levels depend on a variety of factors. Academics like Díaz Cintas and Muñoz Sánchez (2006) and Martínez García (2010) include variables such as the fansubbers' identity, the material being subtitled and the familiarity of the target culture with the phenomenon in question.

Intertitles:[9] This early form of subtitles, also called 'title cards', is "a piece of filmed, printed text that appears between scenes" (Díaz Cintas and Remael, 2007: 26) and was generally used in the past in silent movies to provide the viewers with additional information about the content of the film. Although intertitles could be considered part of the audiovisual material rather than a type of AVT per se, they are often mentioned as the first type of subtitle to occur (Gaudreault and Barnard, 2013), and they needed to be translated when the programmes were exhibited in other countries.

Live subtitling and respeaking:[10] Also known as real-time subtitling and simultaneous subtitling, live subtitling refers to the "insertion of subtitles into a television transmission the contents of which have not been scrutinized by a subtitler beforehand" (Marmelstein, 1985: 35). Live subtitles are mostly used for news broadcasts and sports events, as well as chat shows and live entertainment programmes (Ofcom, 2015), while 'semi-live' or 'as-live' subtitling is an alternative form

[8] For a detailed account of fansubbing, see Bold (2011) and Massidda (2015).

[9] For an account of intertitles and subtitling, see Gaudreault and Barnard (2013).

[10] For an account of real-time subtitling and respeaking, see Romero-Fresco (2011).

that involves some preparation with a script that has been provided to subtitlers beforehand (Orero, 2006). In the past, subtitlers used chord keyboards in order to be able to type syllables rather than letters which formed words with the help of the subtitling software used. Nowadays, dual keyboards, though gradually disappearing, and respeaking are the norm in this context. Still, live subtitles are rarely precisely synchronised with the audiovisual content.

At present, the most commonly used type of live subtitling is respeaking, which, according to Romero-Fresco (2011: 1), is:

> [A] technique in which a speaker listens to the original sound of a live programme or event and respeaks it, including punctuation marks and some specific features for the deaf and hard-of-hearing audience, to a speech recognition software, which turns the recognised utterances into subtitles displayed on the screen with the shortest possible delay.

Heavily reliant on technology, it is one of the most challenging types of AVT and it has largely facilitated the provision of live subtitles for deaf and hard-of-hearing audiences. Traditionally intralingual, interlingual live subtitling is fast becoming a reality and an area for investigation, an example of which is the ILSA (Interlingual Live Subtitling for Access, www.ilsaproject.eu) project, funded by the European Commission (section 3.5.2).

This short definition of the different AVT practices available in the industry and discussed in academia shows that they all facilitate access to audiovisual productions in the broader sense of the term. On the one hand, they provide material for education, entertainment and information to audiences that would otherwise not be able to access them because they lack the knowledge of the foreign source language. On the other hand, many of these modes also guarantee access to audiences with sensory impairments, which is the main research topic discussed in these pages. In this sense, the various AVT modes address not only audiences who do not know any foreign languages but also disabled people, the elderly, immigrants and people learning languages.

3.2. Access Services as a Form of (Audiovisual) Translation

Of the various types of AVT outlined above, the current research focuses on SDH and AD as instances of access services that are part of AVT. While originally based on Delabastita's (1989) Gottlieb's (1994) premises regarding two-dimensional verbal transmission and Jakobson's (1959/2000) tripartite categorisation of translation (section 3.1.2), the discussion also draws on the *Skopos* theory (Vermeer, 1978), which has been prominent in numerous discussions by translation scholars (section 3.2.1). The Skopos framework offers solid ground for a strong connection between the services and their purpose, and, by extension, the various possibilities for their implementation, while allowing for analyses that include a variety of factors affecting the makeup and provision of the services.

3.2.1. *Skopos* theory

According to the *Skopos* theory, every translational action has an aim, purpose and *skopos*, which is a transliteration of the Greek word "σκοπός", i.e. purpose. From the Skopotheorists' functionalist point of view, translation is not simply a process of transcoding, but rather a human action with its own purpose, which is determined by the translator and/or the commissioner of the translation (Schäffner, 1998; Hönig, 1998). Schäffner (1998) explains that, based on this approach, it is the target culture that determines the skopos according to the rules of coherence and fidelity put forward by Vermeer (1978). Under the *Skopos* theory the translation process is not determined by the source text, its original recipients or the functions assigned to it by its authors based on rules of equivalence, but it is rather influenced by the prospective *skopos* of the target text, which is determined by the initiator. The target text needs to be sufficiently coherent, so that the recipients can understand it within their situational circumstances and move smoothly from a text that is "part of a world continuum" written in the source language to a text that is part of a world continuum written in the target language. The rule of fidelity "stipulates merely that some relationship must remain between the two [texts] once the overriding principle of skopos and the rule of (intratextual) coherence have been satisfied" (Schäffner, 1998: 235).

The *Skopos* theory further evolved as part of the general translation theory put forward by Reiss and Vermeer (1984/1991). The authors define the source text as an offer of information from a specific culture and language that needs to be translated in a given target language. In this form of imitation between the target and the original text, the translator provides information about the source text according to the *skopos* that the target text is meant to fulfil in the target culture, as specified by the initiators of the translational action (*ibid.*). The translator must interpret the information of the source text through a selection of features that satisfy the requirements of the target situation in the most successful manner (Shuttleworth and Cowie, 1997). Based on this, the *skopos* of the source text may deviate from the *skopos* of the target text, which constitutes a change of function (Reiss and Vermeer, 1984/1991: 45), as opposed to functional consistency, which occurs when the *skopos* of the source and the target texts are the same. Furthermore, Vermeer (2000: 229) goes on to explain that the *skopos* of a translation is actually defined by the commission, i.e. “the instruction, given by oneself or by someone else, to carry out a given action”, which, if necessary, can be adjusted by the translator.

The *Skopos* theory has been criticised for being too open to overgeneralisations, mostly as a result of the notion of ‘information offer’, as it can refer to many different cases of text relations (Schreitmüller, 1994: 105). Furthermore, this theory could potentially imply a freedom of translation choices that is evident at linguistic level (Chesterman, 1998), as well as in terms of the richness of the meaning of the text (Newmark, 1991), when that is not necessarily prescribed by linguistic differences between the two languages, but rather emerges by the initiator as a form of adaptation. Schäffner (1998) also foregrounds the fact that the theory is not applicable to literary translation, since it reduces its potential interpretations and focuses only on its realisation by bringing the target text in focus as a standalone entity with its own identity.

Despite criticisms, the *Skopos* theory has been applied by scholars in AVT, in functionalist approaches to subtitling and dubbing (Karamitroglou, 2000; Hurtado de Mendoza Azaola, 2009; Fang and Au, 2009), as well as to access services for audiences with sensory impairments (Neves, 2005, 2008; Griesel, 2005). The *Skopos* theory is considered relevant in this study because of the dynamic relationship that it establishes between the text and the audience – i.e. people with sensory impairments –, which determine the nature of the access services and the way in which the target content is handled by the initiator, who has to bear the needs of the audience in mind.

3.2.2. The nature of SDH

As mentioned in section 3.1.2.1, subtitling can be vertical or diagonal, according to Gottlieb's (1994) two-dimensional categorisation of verbal transmission, i.e. within the same language or from one language into another. In other words, it can be both intralingual and interlingual, a characteristic that also applies to SDH.

Intralingual SDH is performed within the same language (from Greek into Greek), while interlingual SDH is the same process between one or more different languages (from English into Greek). However, intralingual standard subtitling is by no means the same as intralingual SDH, and interlingual subtitling is not the same as interlingual SDH, as SDH has different communicative objectives and addresses specific audiences. This explains why SDH can be considered separately from standard subtitling both in academic and practical terms. In the case of SDH, the initiator is a role played by the client, the language service provider or the subtitler, and the subtitling task will be done according to the guidelines, if any, provided by the particular client or, if none are forthcoming, the subtitling will be done in accordance to the subtitler's know-how and expertise. The guidelines are usually drafted with the assumed needs and expectations of the end receivers in mind, i.e. deaf and hard-of-hearing audiences.

More specifically, in the case of SDH, as discussed in the BBC Subtitling Guidelines (2008), the subtitler aims at verbatim subtitling, with an aim to give viewers as much access as possible to the original sound of the audiovisual content. By applying specific text editing techniques that will facilitate this purpose, i.e. even editing of the original script, preservation of obvious utterances and names, preservation of style, consideration of the lip-reading ability of the audience and more, subtitlers are expected to prepare subtitles that with substitute the audio channel and allow viewers to watch and understand the content, without feeling uncomfortable due to concerns of missing information. SDH involves the use of colours and symbols to identify speakers, labels for off-screen voices or irregular sound sources, descriptions of music and sound effects.

On account of its idiosyncratic characteristics, SDH deserves to be researched as a unique translation practice, clearly different from conventional subtitling, as shown in Figure 3.3:

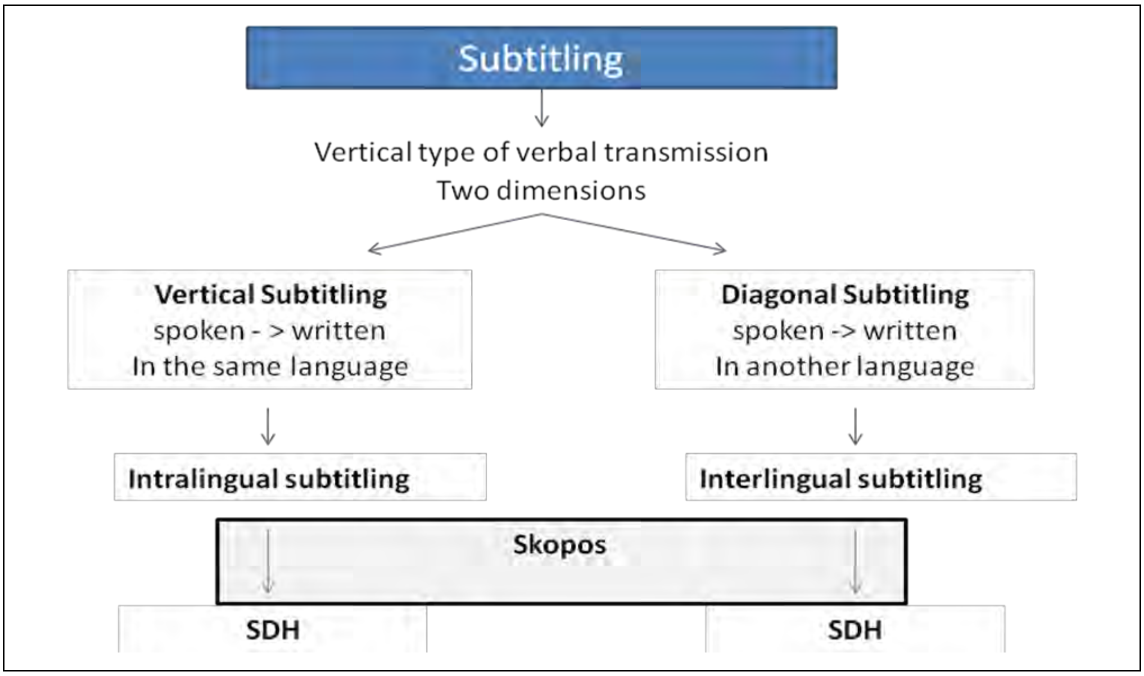


Figure 3.3: SDH based on Jakobson's (1959/2000) and Gottlieb's (1994) categorisations

In his categorisation, Jakobson (1959/2000) distinguishes between interlingual, intralingual and intersemiotic translation/transmutation, the latter being defined as "the transfer between semiotically different entities" (Gottlieb, 1994: 105). In this sense, transmutation is a concept that could help refine the nature of SDH, beyond the distinction between interlingual and intralingual. Indeed, we can then speak of intersemiotic interlingual SDH and intersemiotic intralingual SDH, since the description of sounds, tone of voice, non-verbal elements and the like involves the transfer of information across different communicative systems, i.e. sounds and verbal language.

In the case of SDH, the question that arises is whether the transcription of a text transferred from the oral to the written mode, while in the same language, can be considered to be a type of translation, which traditionally requires the transformation of the message from one source language into a target language.

Although both standard subtitling and SDH have the ultimate remit of granting access to the audience, they do so in different ways. In this sense, standard subtitling facilitates access to audiovisual materials that have been produced in a different language unknown to the target audience. In the case of SDH, however, the primary purpose is to grant access to audiovisual productions to people with sensory impairments. For this reason, it has to follow different rules and apply different conventions to standard subtitling, as it is not bridging a linguistic gap but a sensory one. In addition to their original functions, both practices can meet other needs, as for instance in the case of (foreign) language learning.

3.2.3. The nature of AD

The classification used in the case of SDH is not so clear-cut when it comes to AD, as the source text that is transferred into a target text is not language but mostly images with some sporadic occasions on which sound effects also need to be audio described. This has been recognised by professionals in the field, like Hyks (2005: 1), who defines AD as "a precise and succinct aural translation of the visual aspects of a live or filmed performance" as opposed to translation in its conventional sense, which traditionally transfers verbal items in written form. However, as Mills (2015: online) demonstrates, AD can imply much more than the description of images, for "[d]epending on the source medium, it can include the reading aloud of text; explanatory remarks on sound cues, noises, and musical themes; and descriptive narration about visual elements such as settings, actions, costumes, and facial expressions". In this way, the author highlights the fact that both verbal and non-verbal elements take part in this intersemiotic type of translation.

The adoption of this concept of intersemiotic translation permits to extend the range of action and the nature of the information that can be considered as part of the transfer, in that it contemplates the non-verbal signs (images) as well as the verbal signs (language). The translation can consist of verbal signs by using non-verbal systems and vice versa. If we adopt Peirce's view on the concept of translation, as

discussed by Jakobson (1980) and adapted by Marais and Kull (2016: 177), AD, as well as SDH, can be said to be instances of translation as this is understood as a process that can be applied “potentially to all semiotic systems”.
As Reviers (2011: 1) also explains, another characteristic of AD is that it originates as “a visual and aural text but generates a text that is only aural” for the intended target audience unlike SDH, which could be said to generate a target text that is only visual for the deaf members of the target audience. When working with a source video made up of images and sounds, SDH will transfer dialogue exchanges, sounds, music and some non-verbal elements following a number of conventions (Neves, 2005) and using certain symbols, while the audience will watch the images and read the text contained in the subtitles. On the other hand, AD will mainly transfer the images, but also some sounds and verbal signals as mentioned earlier, and blind audiences will solely have access to the audio. Drawing on a text typology proposed by Zabalbeascoa (2001, 2010), Reviers (2011) maintains that during the AD experience individuals also have access to non-verbal elements other than the AD script describing the images like the tone of the actors’ voices, which can be accessed directly from the source material. Seen as a multimodal text type that combines the audio verbal descriptions of visual elements in the source audiovisual production together with verbal and non-verbal aural elements of the target text, AD provides a text type unique in translation and radically different from SDH.

Figure 3.4 below is an attempt to visualise this signal transfer in AD. The audio of the source text is retained in the target text and can be both verbal and non-verbal, and the audio describer transfers it as such, with or without verbal additions, while the visual content is transferred through verbal means:

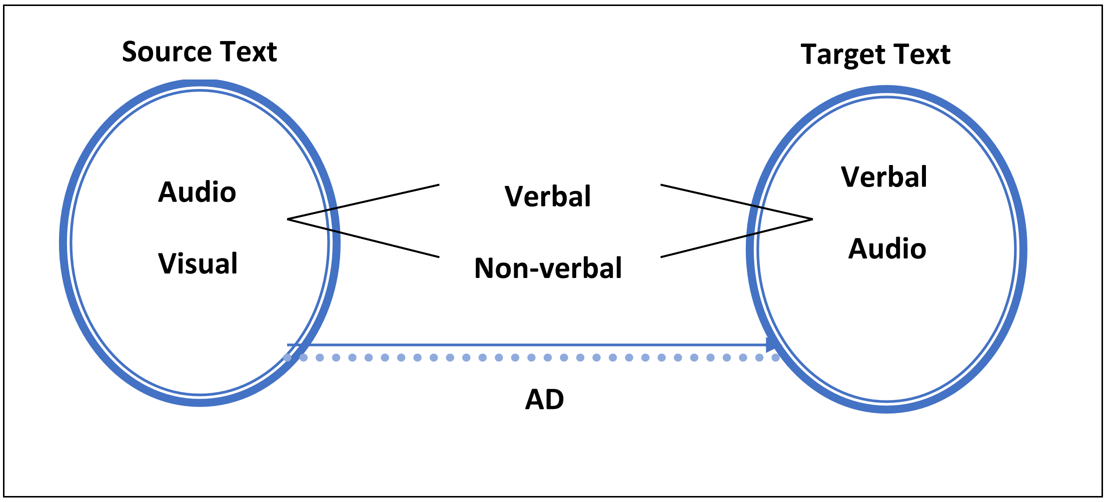


Figure 3.4: Signal transfer in AD

3.2.4. Placing SDH and AD within (Audiovisual) Translation

As mentioned earlier, access services seem to share similar limitations as other AVT modes when it comes to their inclusion within Translation Studies, though, based on the discussion above, it is clear that the practices carried out in audiovisual accessibility fall squarely within the remit of both AVT and TS when these are understood as interdisciplinary. In fact, many translation scholars have contributed to the visibility and development of the above practices with their publications. Of the many works available, the collective volumes edited by Díaz Cintas *et al.* (2007), Díaz Cintas *et al.* (2010) and Remael *et al.* (2012) offer a very useful insight into accessibility, covering aspects that span from history to areas of application, and also allowing for new ideas to be popularised for the further development of access services.

In addition to SDH and AD, Díaz Cintas (2005: 4) also argues that voice-over, interlingual subtitles and lip-sync can also be considered as accessibility practices, since they serve a similar goal:

> Whether the hurdle is a language or a sensorial barrier, the aim of the translation process is exactly the same: to facilitate the access to an otherwise hermetic source of information and entertainment. In this way, accessibility becomes a common denominator that underpins these practices.

Reinforcing the idea that access services for people with sensory impairments are part of the broader filed of AVT, Díaz Cintas *et al.* (2007: 13-14) summarise their views as follows: “accessibility is a form of translation and translation is a form of accessibility, uniting all population groups and ensuring that cultural events, in the broader sense of the word, can be enjoyed by all”. Only a few years later, Díaz Cintas *et al.* (2010: 14) define media accessibility as “a new research line which has been perfectly accommodated under the umbrella of AVT studies”, confirming that the place of access services within AVT is now firmly established.

In more practical terms, the professional practices and technical equipment used in the production and preparation of SDH and AD are very similar among themselves and also to those utilised when dealing with other types of AVT. SDH and AD require the use of specific software that allows the subtitler/audio describer to watch, time, edit, translate and, thus, make audiovisual content accessible. Their distribution is also similar to that of productions dubbed or containing conventional subtitling. In a similar way as standard subtitling, SDH can be open or closed, and AD is usually an additional soundtrack that accompanies the final programme and can be activated by the viewer. It could be argued that the provision of SDH is more demanding than that of AD in terms of hardware, since the subtitle files have to incorporate the right specifications that will allow for certain technical characteristics (such as use of colours and positioning) to be adequately displayed on screen depending on the device being used, whether TV, cinema, DVD, Blu-ray, PC, tablet or smartphone.

As previously discussed, it is our contention that media accessibility is an extension of conventional AVT practices with the added benefit of serving people with sensory impairments, i.e. satisfying an additional aim, without limiting it merely to that. Reinforcing this idea, Agulló *et al.* (2018: 195) argue that “access services should not be exclusively for persons with disabilities but also for other audiences” and that “testing should expand beyond an exclusive approach based on accessibility to a more general approach based on usability where users with diverse capabilities are considered”.

According to Reiss and Vermeer (1991: 76, in Schäffner, 1998: 236), “the translator offers information about certain aspects of the source-text-in-situation, according to the target text skopos specified by the initiator”. In the case of access services, the subtitler and the audio describer prepare the material ideally according to the guidelines provided by the body responsible for its broadcast, its exhibition in cinemas, or by any other client such as the language service provider. These guidelines should be drafted bearing the needs and expectations of the end receivers in mind so that the final product can be enjoyed by them.

From a practical perspective, if we consider the typical profiles of the various professionals involved in these practices, their skills and educational background, it becomes obvious that we are moving within the discipline of translation. Indeed, some of the required skills like those related to linguistic content management, timing, the use of specialised software and the creative reproduction of verbal signs are similar to the skills needed by professionals working in other AVT modes. Yet, this does not mean that all professionals working in SDH and AD have a translation background as they may have been trained in other fields and disciplines such as film studies, theatre, language related subjects and the like. Incidentally, such variation in the educational background of the work force is also frequently observed in other areas of translation and not only in AVT or accessibility.

In light of the above, I am in complete agreement with Díaz Cintas (2005), who suggests that the concept of translation needs to be constantly revisited in order to acknowledge the advances taking place in the field and to be able to accommodate any new practices rather than to disregard them outright. As a clear branch within Translation Studies, AVT is part of numerous translation courses being taught in Higher Education centres around the world and is a regular subject for academic theses and dissertations. At the same time, research in TS largely focuses on AVT practices, with numerous projects centred round subtitling, dubbing and access services. Regarding the latter, authors like Remael and Neves (2007: 21) argue that “[t]he wealth of possibilities [that accessibility] has in store for its users and researchers seems unlimited”. In this sense, the fact that AVT and access services have become popular as a field of studies and research proves their gained and established place in the academic field of Translation Studies. Yet, now that its affiliation within TS is generally acknowledged by most academics, some scholars like Greco (2016) have started to ponder whether Media Accessibility (MA) should not be identified and considered as an individual field of research, a discussion that is bound to shape future debates in academic circles.

In the specific case of Online Education, accessibility is a social tool that provides access services to people with sensory impairments and fits within the wider field of AVT. Indeed, access services make use of AVT practices to make audiovisual content available to sensory impaired audiences that would otherwise be deprived of access to material whether for education, entertainment, information and/or commercial purposes.

3.3. Access Services: Areas of Application

Through the years, with the help of access services, society has moved from television and cinema 'for some' to television and cinema 'for all'. Theatres and opera houses have also followed suit and gradually more and more live productions have become accessible to everyone, while many museums all around the world offer AD to provide equal opportunities to all their visitors. SDH and AD are very much developing areas, and their usefulness to society is slowly but steadily being recognised. As this discussion focuses on sensory accessibility to audiovisual productions through SDH and AD, an overview will be presented of some of the most important applications that have been technologically advanced in recent years, while also referring to some of the older ones originally developed for television and cinema. This overview takes a look at the most significant innovations in the field, which tend to go hand in hand with the technological advances that have gradually allowed for greater possibilities in the provision of access services in the media and have also contributed to the increase in demand. In this section, the most traditional uses of SDH and AD are discussed, while the provision of SDH and AD on the internet is further explored in Chapter 5, in relation to OE.

As already noted, one of the most important areas of application for SDH and AD is that of access to TV programmes. Both practices help to make broadcast content available to people with sensory impairments, whether auditory or visual. SDH is provided in the form of subtitles that identify the various speakers by resorting to different colours (Figure 3.5), as well as through the displacement of text or the use of labels. SDH subtitles also convey paralinguistic information with the addition of text, labels and symbols that elucidate the source of the sound, and display descriptions of the sounds that can be heard in the soundtrack as well as of details related to any accompanying music, with focus on those that are important to the plot.

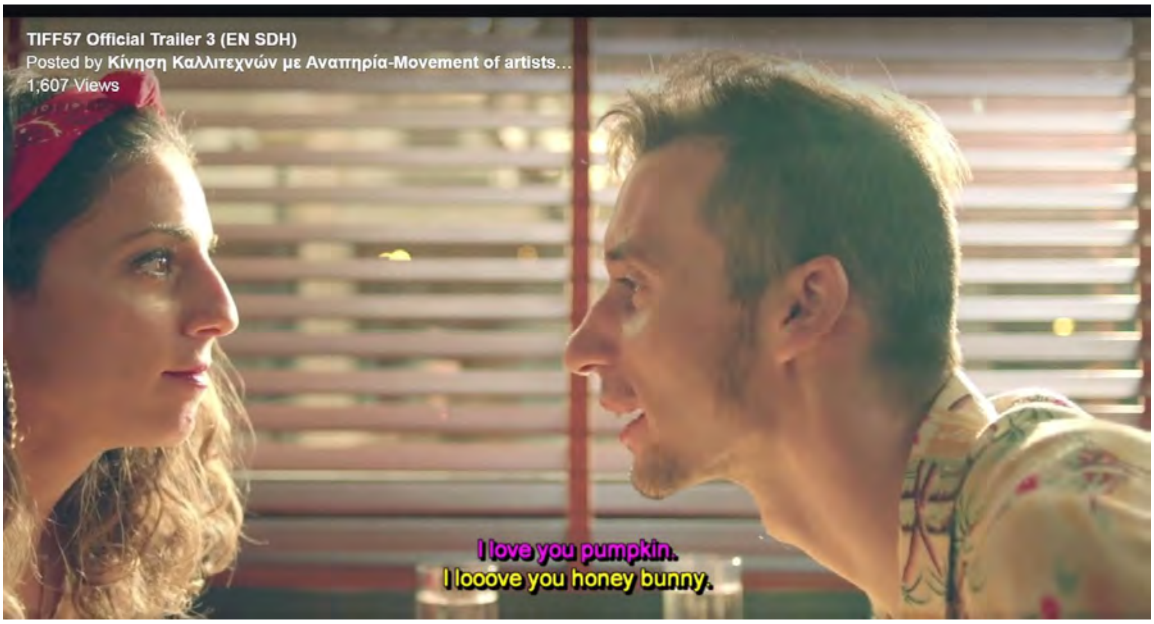


Figure 3.5: SDH from trailer of the 57th Thessaloniki International Film Festival
(Movement of Disabled Artists, 2016: online)

AD, on the other hand, provides descriptions of the setting as well as the actors' movements and any sounds that are related to the plot and are necessary for a visually-impaired audience to understand the broadcast.

Interestingly, SDH began to be provided mostly on pre-recorded material, while AD first emerged to give an account of live performances. Nowadays, live and semi-live SDH have become a standard feature of media broadcasting and are mainly delivered through respeaking, thanks to the affordances of speech recognition programs.

The provision of these services is differentiated according to whether it takes place through terrestrial or digital technology. On terrestrial TV, SDH is either provided in the form of burnt-in subtitles that cannot be hidden (open captions) or as Teletext closed captions for analogue or digital terrestrial television. With the transition from analogue to digital technology at the turn of the 21st century, Teletext captioning has virtually disappeared, although it is still used in some countries providing that reproduction of the vertical blanking interval data, in which Teletext is carried, is also possible through digital video broadcasting TV. One of the benefits of the new digital era is that it allows for the projection of subtitles onto the moving images in the form of a tagged image file or bitmap image file graphic, which then gives the option to the audience to activate the subtitles or not, as they wish. This approach of offering closed captions is also followed on DVDs, Blu-rays and streaming, where the end user can find a separate selection of subtitles in various languages, including SDH.

Recorded AD is usually provided as an additional audio file overlapping the original audio of the audiovisual material. In analogue television the two sound files were usually delivered through a two-channel stereo system, where the first channel transmitted the original soundtrack with the sound effects and the second included the original dialogue mixed with the added AD, what is also called the second audio programme. Orero (2007) explains that, in Spain, before this procedure was invented there was the option to use the radio in combination with the television. In these cases, the audience at home could receive the AD through the radio whilst having also access to the broadcast on TV. The same approach was also adopted in relation to films screened at the cinema, whereby the viewers that could not go to the cinema could enjoy their audio described versions through the radio. Nowadays, the system grants greater autonomy to the audience, who have access to multiple streams of audio, be it on DVD, Blu-ray or video on demand (VoD), or to a separate AD track in digital as well as hybrid broadcast broadband TV.

At the cinema, AD can be transmitted either open or closed. In the first case, the audience has no choice because everyone present has to listen to the AD. Closed AD, on the other hand, is usually pre-recorded and delivered in the form of an infrared signal of time-coded narration that is accessible to the audience through headphones, as illustrated in Figure 3.6 below. The same approach is often followed in the theatre, opera and ballet.

Figure 3.6: Closed AD delivery at the 22nd Athens International Film Festival
(© T. Markou, 2016)

In the case of the cinema, the most common forms of access service are open/burnt-in SDH and pre-recorded AD. Digital Cinema Packages (DCPs),[11] the same as Blu-ray and Audio Distribution equipment, are rather expensive devices for producers and theatre venues. Indeed, the cost of a DCP is one of the main factors that dissuades producers from offering a greater provision of assistive services.

In the case of theatre, ballet and the opera,[12] SDH is provided in the form of surtitles that are projected either on an LED screen above or next to the stage, on small screens fitted on the backseats (Figure 3.7), or, more recently, on special display screens (thin film transistors), handset devices with LED screens and personal smart phones and tablets.

[11] A set of digital files used to store and convey digital cinema audio, image, and data streams.

[12] Important publications on opera accessibility include Matamala and Orero (2007) and Cabeza i Cáceres (2010), while York (2007) focuses on AD for opera and ballet.

Figure 3.7: Example of surtitles on backseats

SDH and AD are also offered in museums and at art exhibitions, and whilst AD is normally accessible in the form of a recorded description of the exhibits, SDH is burnt in pre-recorded videos that can be watched in certain parts of the exhibitions. The two services are either provided on demand, thanks to special screens or pads featuring such options (e.g. multitouch tables), where visitors decide what they want to watch or hear and in what language/format, or through devices that operate with sensors and offer relevant information after tracking movement close to an exhibit.

AD and SDH are also common features at conferences. On these occasions, the audio describer acts as a kind of interpreter, providing a narration to several members of the audience at once or individually, while SDH takes the form of live subtitling, often with the use of respeaking and a voice recognition system or a steno typing keyboard. Another interesting development is the offer of AD in stadiums through the transmission of radio signals to radio devices. Video games have been relatively slow to make the most of access services, but the situation is gradually changing. With implementation at the stage of design, a substantial number of video games are these days accessible. As Mangiron (2012) explains, in order to make video games accessible for players with visual impairments, providers should not rely exclusively on traditional techniques and should also explore other strategies like the magnification of objects and text. For deaf and hard-of-hearing players, Mangiron (*ibid.*) suggests that video games can become more accessible through the implementation of 3D audio cues, different controls for different types of sound and the inclusion of intralingual subtitles for dialogue and labels to describe sounds.

Lastly, access services can be provided on the web to cater for the needs of users with sensory impairments. Given the high volume of entertainment and educational programmes circulating on the internet, as Díaz Cintas *et al.* (2007: 12) argue, “one technically unproblematic solution might be making the internet […] fully accessible”. Indeed, in his approach towards web accessibility in libraries, Craven (2008) uses the term ‘design for all’ to address the need for more accessible websites. Access to the web for sensory impaired users can be understood as ‘holistic’ or ‘partial’. The former implies making the whole website accessible, including any audiovisual material which would otherwise be impossible for certain users to follow, because they cannot hear it or see it. The latter involves selective access only to certain parts of the website, for example accessible audiovisual material provided on websites, i.e. online videos, but inaccessible webpages and vice versa.

When it comes to making the material on websites accessible to people with visual impairments (sound, text, signs, buttons), the emergence of some useful technologies has favoured the development of a number of software solutions, like screen readers that attempt to convey what people with standard eyesight see on a display to their users via non-visual means, like text-to-speech. As far as deaf and hard-of-hearing people are concerned, manufacturers working in the field of accessibility have mostly focused on developing hardware which offers speech-to-text solutions. However, the output material of speech-to-text (for deaf and hard-of-hearing people) and text-to-speech solutions (for blind people and people with visual impairments) can be of low quality, as it is normally not edited by humans. Issues related to the role of the human factor in the preparation, the revision and the delivery of the material provided through such applications as well as a discussion on the degree of efficiency of these applications, when it comes to granting access to audiovisual materials, are discussed in Chapter 4. It has to be underlined that, despite the (low) quality output of some of these applications, they still remain an easy and economical means of facilitating accessibility.

Nowadays, the number of TV channels providing SDH and AD has increased across the globe, as the new possibilities offered by digital television allow for their development and easy distribution. They also give users the opportunity to customise their experience by selecting the services they need through their digital decoders. SDH and AD have become readily available in a growing number of productions, across all media including broadcasting platforms, like the BBC's iPlayer, and video streaming websites like YouTube and Netflix. Their provision in theatres and at opera venues, cinemas and arts exhibitions is not as systematic as one would hope, but there seems to be an increasing demand for these access services by those who provide audiovisual material as well as by their audiences.

It is evident that AD and SDH are services that can greatly assist people with sensory impairments in a variety of contexts, and what the future holds for these and other modes of AVT that can serve as tools of access and might be developed in the years to come remains to be seen.

3.4. SDH and AD: History and Legislation

This section provides an overview of the history of SDH and AD until their place in academia became more widely established. It also outlines some of the most important legal acts and regulations that are closely related to the provision of these services. This analysis is by no means a detailed account, but rather focuses on some key milestones across the world. Although SDH and AD can be said to be relatively newcomers within AVT, a growing number of scholars have devoted some of their publications to offer an historical account, including Neves (2005), Orero (2007), Remael (2007), Snyder (2008) and Zárate (2014). These publications will form the basis for this diachronic discussion on the early history of the two practices, starting with SDH and following with AD.

3.4.1. Brief history of SDH

Although the official broadcasting of subtitled material for deaf and hard-of-hearing people did not begin until the 1970s, ideas had already been floated in the 1940s in the USA, and experimental attempts in deaf community centres and clubs were already a reality (Downey, 2008). With the creation of the Corporation of Public Broadcasting (CPB) by Congress in 1967 and the Public Broadcasting System by CPB two years later, the USA had prepared the ground for captioned television (*ibid.*). The first pilot programme, *The French Chef* (1962-1973), was broadcast in 1972. This development included a generator that created characters, which were then stored on a computer and transmitted along with the TV signal. These open captions, which appeared overlaid on the video, were automatically displayed and removed at the times indicated by the software. The next step was to 'hide' the captions in the analogue signal. After a series of experiments were conducted, including sending the captions separately from the TV signal "on a multiplexed FM [Frequency Modulation] audio channel" and using "two separate transmitters and two TV sets [or] a telephone connected to an electronic device inside a TV set" (*ibid.*: 69-70), the successful solution was proposed by the National Bureau of Standards, which suggested 'hiding' the signal in line-21 of the vertical blanking interval of the video signal. The main requirement for the users to be able to enjoy these captions was the need for a decoder to be purchased by the viewers. According to Neves (2005), in 1976, the idea of line-21 was abandoned by the Federal Communications Commission (FCC) but just a few years later, in 1980, and despite the decision of the FCC, several TV broadcasters started offering programmes with closed captions for the first time. Since then, the offer of SDH has been rising year on year and, after 1993, thanks to the Television Decoder Circuitry Act of 1990, all 13-inch or larger analogue TV sets manufactured in the USA were required by law to incorporate a built-in line 21 decoder (section 3.4.3).

In the early 1970s, Europe was introduced to what the Americans call 'closed captioning', with the UK leading the way. The BBC launched their Ceefax Teletext in 1972 and the application of SDH was considered in 1979 (Robson, 2004), while a number of projects ran by the Independent Broadcasting Authority and Oracle Teletext Limited between 1978 and 1981 tested the viability of producing SDH for TV (Baker, 1985). France developed its own Teletext system, Antiope, in 1976, following provisions made by the *Centre Commun d'Études de Télévision et Télécommunications.* According to Remael (2007), the 1970s was a starting point only in the UK, while Flemish speaking Belgium, Germany, Italy and the Netherlands started broadcasting SDH in the 1980s. Spain and Portugal followed suit in the late 1980s and early 1990s respectively.

The UK was thus one of the first countries in Europe to offer SDH in the 1970s to one of the most active European deaf communities by sending the Teletext signal through the vertical blanking interval. The difference with the 'closed captioning' system used in the USA was that "instead of resorting to line 21 alone, the Teletext system allowed for the concealment of information at the end of each of lines 6 to 22 and 318 to 335" (Neves, 2005: 91). With the Broadcasting Act of 1990, the UK increased the volume of subtitles offered on television, with the BBC reaching 80% of subtitled broadcasts in 2003 and 100% in 2008 (Ofcom, 2008). What is important about SDH in the UK is the introduction and increase in the quantity of SDH, both in public and on commercial TV channels, which, according to Remael (2007), may have led to reaching quantity targets but failing in quality standards. In more recent years, Ofcom (2015b) has gradually become more interested in offering high-quality subtitling access services, particularly in the case of live subtitling.

3.4.2. Brief history of AD

Audio description has been a significant part of the audiovisual media landscape for over three decades, and scholars like Orero (2007) trace some of the pioneering practices in Spain to the 1940s, when AD of films screened in cinemas was provided through the radio for everyone at home to enjoy, and not only those with visual impairments – a practice that continued until TV took over as the main means of audiovisual communication in the late 1950s. Nations like the UK and the USA have led developments in this field and have made AD on TV and in cultural and artistic life compulsory through legislation. Leung (2018) offers a most comprehensive overview of the provision of AD for media productions around the globe, including countries like the UK, the USA, Spain, Germany, Poland, Australia, Mainland China, Taiwan, Japan, South Korea, Thailand and Hong Kong.

While TV was the catalyst force for the mass provision of SDH, theatre venues were the first ones to embrace the provision of AD. In his article on AD, Snyder (2008) refers to the early attempts of Chet Avery, a deaf employee from the Department of Education in the USA, to promote the provision of AD for films back in 1964. Avery, in collaboration with a blind woman named Margaret Pfanstiehl, head of the not-profit organisation Metropolitan Washington Ear, organised the first audio described performances for the theatre in the United States in 1981. This date was crucial, as it coincides with the foundation of the AD Service, which rapidly promoted this service over 50 theatres by the end of the 1980's (ITC, 2000: 3). Snyder (2008) mentions a Master's thesis written by Gregory Frazier in the 1970s as the first academic work to focus solely on AD.

According to Hernández-Bartolomé and Mendiluce-Cabrera (2004), in the UK, in the mid-1980s, a small theatre in Nottinghamshire, the Robin Hood Theatre at Averham, staged a performance with AD, an event that inspired the Theatre Royal Windsor to offer AD more systematically from 1988.

Cinema has also played a crucial role in the development of AD with the British Chapter Arts Centre in Cardiff being the first to describe films using live script readers, followed by the French Association Valentin Haüy and its portable service (ITC, 2000: 3). At a European level, in 1991, the EU Audetel Project, whose main objective was to perform a thorough investigation into the technical, logistic and economic possibilities of providing a descriptive commentary of television productions, which would enhance programme enjoyment and comprehension for people with visual impairments, was a trigger for the wider provision of AD across the continent. One of the key deliverables of the project was the design and development of a software package for the preparation and recording of AD, manufactured by the British company Softel (Lodge *et al.,* 1994; Pettitt *et al.,* 1996).

During the same year, the Spanish audio descriptive project developed by ONCE (the Spanish Organisation for the Blind) and known as Audesc, had the main goal of enhancing the distribution of films with AD among members of the ONCE as well to boost the number of theatres plays with this assistive service (Hernández-Bartolomé and Mendiluce-Cabrera, 2004). Closed AD appeared on Spanish TV in 1995 and has been randomly provided ever since. The distribution of films with AD in Germany started in 1993, with the broadcast of several films on the Zweites Deutches Fernsehen and the projection of some films at the Munich Film Festival also in 1993. As for Portugal, AD made its first appearance in 2003 with the broadcast of a film on the Portuguese channel Rádio e Televisão de Portugal (RTP), which came accompanied by AD provided through the radio. With the advent of digital TV in 2004, Portuguese channels TV Cabo and Lusomundo Gallery were the first to provide AD through a digital set-box. The very same year, opera performances were made accessible at the Barcelona Opera House, Liceu, in a systematic way. In 2006, the Flemish public service broadcaster Vlaamse Radio en Televisie (VRT) began the provision of AD for a soap opera entitled *F.C. De Kampioenen* [*F.C. The Champions*].

Leung's (2018) review of the situation of AD provision in various countries around the world shows that Japan started the provision of AD on TV back in the 1980s while the UK, Spain and Germany did so in the 1990s and South Korea in the early 2000s.

3.4.3. Milestones in legislation

Legislation has played a pivotal role in the enhancement of the provision of SDH and AD and the enforcement of access services in general, resulting in better accessibility provision for people with sensory impairments. In many countries legislation already exists that regulates the provision of media access, both in the case of SDH and AD, and the percentages to promote the former are always more generous that in the case of AD. For the purposes of this research, the discussion in this section will focus on laws and acts passed in the USA and Europe, while reference to legislation relating to online accessibility will be kept brief, as this will be expounded in Chapter 4, in connection with the specific focus of this research.

Before referring to legislation relevant to access services, it is important to mention the two major regulations that are related to disability at an international and at a European level. The "Convention on the Rights of Persons with Disabilities" of the United Nations (2007) that entered into force in 2008 and is currently adopted by 161 signatories and 177 parties (United Nations, n.d: online), is "the first international legally binding instrument setting minimum standards for rights for people with disabilities, and the first human rights convention to which the EU has become a party” (European Commission, n.d.: online). The Council adopted the Decision for the conclusion of the Convention on 26 November 2009, while for the EU the Convention entered into force on 22 January 2011. The Communication entitled “Equality of Opportunity for People with Disabilities – A New European Community Disability Strategy” was issued in 1996 in order to determine best-practice procedures to promote and facilitate the full participation of disabled people in all aspects of life. In 2002, the European Commission adopted the Communication “Towards a Barrier-Free Europe for People with Disabilities”, which was intended as a framework for the improvement of access for disabled people in the workplace and beyond. More recent attempts to legislate accessibility in general in Europe include the European Accessibility Act of 2015, a proposal to work on the approximation of the laws, regulations and administrative provisions of the Member States as regards the accessibility requirements for products and services. According to the proposal:

> At present, economic operators are confronted with divergent, and often contradictory, national accessibility requirements preventing them from benefitting from the internal market potential.
>
> The proposed Directive supports Member States to achieve their national commitments as well as their obligations under the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) 1 regarding accessibility. (European Commission, 2015: online)

The European Parliament and the Council came to a provisional agreement on the Commission's proposal for a European Accessibility Act on 8 November 2018, while its final adoption was expected by April 2019 and aims “to improve the functioning of the internal market for accessible products and services by removing barriers created by divergent legislation”.

Television has been instrumental in the spreading and normalisation of access services. As Robson (2004) notes, although experiments started in the 1940s and closed captions were broadcast on TV on PBS as early as 1972, it was not until 1990 that the Television Decoder Circuitry Act became law in the USA, taking effect in 1993. According to this Act, all analogue television receivers with screens 13 inches or larger needed to have a built-in decoder circuitry in order to display closed captioning. The mid-1990's saw a milestone in legislation with the passing of the Telecommunications Act of 1996, which took effect in 1998, and required the Access Board and the FCC to develop accessibility guidelines for the production of telecommunication and customer premises equipment within 18 months. Requirements regarding the provision of closed captions for new English-language programmes by all broadcast networks started with 450 hours per quarter in 2000, reaching 900 hours per quarter in 2002 and 100% of all aired programmes in 2006. As Robson (2004) explains in his brief history of captioning, by 2008 a total of 75% of all 'old' English-language programmes had to be captioned, while the new requirements included 100% captioning of all 'new' Spanish-language programmes by 2010 and 75% of all 'old' Spanish-language programmes by 2012, based on the Telecomm Act.

As Remael (2007) notes, the UK has always been ahead of the rest of Europe in providing SDH in particular, and access services in general. This is partly due to the fact that the 1990 Broadcasting Act "determined that subtitling on analogue television should be gradually increased so as to attain 90% by 2010" (Neves, 2005: 114). Since 2008, the BBC has been providing SDH for 100% of its broadcast programmes, with other large public service TV providers, such as ITV and Channel 4, following this example.

European-wide guidelines regarding SDH are of great importance. The "Television without Frontiers Directive" of 1989, which was updated to become the Audiovisual Media Services Directive in 2007, has been the legal driving force for most countries in the European Union. Paragraphs 7, 32 and 64 of the reviewed version of 2007 clearly state that, with the application of stricter national rules, there is a need for legal certainty and that "the means to achieve accessibility should include, but need not be limited to, sign language, subtitling, audio-description and easily understandable menu navigation" (Directive 2007/65/EC). This directive was updated again in 2010 to include all audiovisual media services, both linear and non-linear, as well as video-on-demand. Article 46 of the Directive (*ibid.*) explains that "[t]he right of persons with a disability and of the elderly to participate and be integrated in the social and cultural life of the Union is inextricably linked to the provision of accessible audiovisual media services".

In terms of the impact of legislation on technologies that make audiovisual media accessible, Tiresias.org (2009: online) explains that:

> According to the Directive on Radio Equipment, Telecommunications Terminal Equipment and the Mutual Recognition of Their Conformity (99/5/EC), the Commission may decide that apparatuses within certain equipment classes or apparatuses of particular types shall be so constructed that they support certain features in order to facilitate their use by people with disabilities.

In this respect, the advances of technology, especially in the field of software engineering, as well as the presence of audiovisual programmes in the numerous sites of information, education, and entertainment that make up the world wide web, have made it easy for the distribution of accessible material on the internet. Legislation focusing on the promotion of accessibility on the web as a whole is still limited since this is a field that has only recently begun to develop. The USA seems to be leading the race with regard to web accessibility at a national level, with Section 508 of 2000, an amendment to the "Workforce Rehabilitation Act" of 1973, demanding that all websites be accessible and opening up the possibility of legal action against owners of inaccessible websites. However, following the FCC guidelines of 2016, internet videos are only required to have captions if the relevant programmes have been previously broadcast with captions on TV. As late as in 2018, new regulations in the UK were introduced on the existing Equality Act 2010, bringing web accessibility requirements forward and asking owners to comply with European standards, while subtitles are expected to be legally required on broadcasters' and OTT providers' on-demand content, such as iPlayer and Netflix, following the 2017 amendment to the Digital Economy Bill (Wilkinson-Jones, 2017). Promoting the usage of video captioning, the Communications and Video Accessibility Act (CVAA) of 2010 requires that all content delivered via broadband, digital and mobile technology should be accessible in the USA.

In Europe, the "Disability Discrimination Act" (DDA) of 1998 caters to the needs of blind and disabled users on the web, and in its Section III it refers to the provision of services and products for everyone, including accessible websites. In 2003, the European Commission stated the need for website creators, managers and owners to adhere to the "Authoring Tool Accessibility Guidelines" of the W3C. With the eAccessibility project of 2001, the eEurope Action Plan of 2002, the Communication "Towards an Accessible Information Society" of 2008 and the European i2010 Initiative on e-Inclusion (European Commission, 2010), the EU has aimed to make online material fully accessible. Moreover, legislation is pursuing more ambitious objectives in the interaction between technology and citizens and, according to the European Commission (2019: online) website, through the e-Inclusion policy, or Digital Inclusion as it was later renamed, the Commission supports initiatives for "the development of ICT that assists people with disabilities for enabling them to perform activities that they have not been able to do before and to interact better with technologies", although there is no explicit reference to people with sensory impairments. The eGovernment Action Plan of 2010, which was part of the i2010 initiative on employment and growth in the information society, made a major contribution to the Lisbon Agenda and other European Community policies by improving the openness and efficiency of the public sector. Since 2010, there has been an effort on the part of the European Union to make all their websites fully accessible by adhering to the Web Content Accessibility Guidelines (WCAG) 2.0.

Some of the legislative acts about AD provision on TV set a compulsory AD quota of around 10% of their on air time, such in the case of the most watched TV channels in the UK and Spain. In addition to these legislative measures, some TV broadcasters in the UK and Germany have led voluntary self-commitment and been providing 20% of their programming with AD. At a wider level, the European Parliament, which once suggested the possibility of imposing AD requirements on audiovisual products, seems to have changed its stance lately in what can be seen as a setback in this field. Indeed, according to one of the EU Legislation in Progress briefings (Katsarova, 2019: 10), focused on the *The Audiovisual Media Services Directive,* "[t]he provisions on accessibility are deleted with reference to the proposed European Accessibility Act which sets accessibility requirements for a wide range of products and services including AVMS".

A welcomed development has been the launch of the Media Accessibility Platform (www.mapaccess.org), which in its home page describes itself as "a unified atlas charting the worldwide landscape of research, policies, training and practices in [the] field [of accessibility]". Its main objective is to make audiovisual media accessible to all, regardless of any sensorial or linguistic barriers. One of its most salient features is the 'accessometer', as shown in Figure 3.8, which provides a world map of the legislation, standards and guidelines on media accessibility organised by countries:

Figure 3.8: Media Accessibility Platform's accessometer

3.5. Research in Access Services

To conduct fruitful research into this interdisciplinary field, the connection between accessibility and (audiovisual) translation in general is not the only one that needs to be established. Given the technological advances taking place in the field of ICT, individuals have radically changed the way in which they consume audiovisual programmes and access services cannot really be examined outside the scope of ICT.

Furthermore, access services serve social groups whose socio-cultural characteristics need to be fully considered in order to determine the best practices in their provision. As ICT mostly affects the technical means of provision and the sociological dimension mostly refers to the end recipients of the services, it can be argued that a research map could be completed with an interdisciplinary study of the context in which these services are provided. These three forces, i.e. technology, society, and context of provision, seem to affect research into access services, either simultaneously or partially.

3.5.1. Interdisciplinary approaches

Many scholars who have looked into research methodologies in AVT, including Chaume (2002), Bartrina (2004), Díaz Cintas (2004), Gambier (2013), Pérez-González (2014), have highlighted the fact that, just like in many other translation areas, AVT is a field that allows for interdisciplinary research. Researchers like Bassnett and Lefevere (1998), Toury (1995) and Wolf (2002) have discussed and illustrated the strong connection between language and culture within Translation Studies, while others, like Bowker (2002), Somers (2003), Olohan (2011) and O'Hagan (2013) have devoted their efforts to outline the strong relationship between translation and technology. The value of access services as an educational tool has already been researched from various angles, especially as a tool for second language learning, e.g. Palomo López (2008; 2010) in the case of AD, and Zárate (2008, 2010) and Lorenzo (2010) in the field of SDH.

As we have already seen, access services are very closely linked to technology, both in terms of the hardware required for their production and delivery and the software used in order to enjoy them. Scholars like Stephenson (2001) and Cornford and Pollock (2003) have focused on the connections that exist between technology, the internet and education, especially in terms of what is known as e-learning, and have advocated the need for a greater availability and diversity of educational materials on the internet. Haughey and Anderson (1998), Catherall (2005), and Goodfellow and Lea (2007) discuss ways in which the internet could be used to promote higher education practices for all people, while more recent studies look into innovative methods in online and distance education, including works by Etesse *et al.* (2015), Pacheco *et al.* (2018) and Brown *et al*. (2019).

One particularly interesting interdisciplinary approach that incorporates access services, and which is very similar to the one suggested in this research in terms of the role that access services can play in society and its reliance on the principles of universal design, is that of Accessible Filmmaking. The concept was introduced in AVT by Romero-Fresco (2013) in order to bridge the gap between AVT and Film Studies, with a view to increasing the quality of the former by including it as a parameter in the filmmaking process, as opposed to its consideration at a very late stage of (post-)production. Accessible Filmmaking and accessible Online Education, as proposed here, are based on a set of similar concepts. For example, within Accessible Filmmaking, research not only focuses on services that can make a film accessible, but rather looks at the film as a creative artefact with certain cinematographic characteristics, that should be borne in mind in conjunction with AVT services for accessibility. In the same sense, within accessible Online Education, this thesis looks at the whole context surrounding the provision of accessible educational audiovisual material, rather than concentrating simply on the technical dimension of SDH and AD.

Linguistics, Cultural Studies, Film Studies, ICT and Education are not an exhaustive list of the fields from which to draw ideas for a discussion on accessibility, as this is an area that is constantly evolving and branching into new directions. Reinforcing the connections that exist between accessibility, technology and the internet (Chapter 4) and accessibility and education (Chapter 5), always within the context of AVT, this research aims to put forward a theoretical model for the discussion of SDH and AD as practices that can be maximised in order to promote educational opportunities on the internet for deaf and blind students, as well as those with hearing loss or visual impairments, in a universal context that allows access to all. Although not strictly part of the aims of this research, it is expected that this investigation will also prove instrumental for other social groups, such as students and/or emigrants whose knowledge of the source language is not good enough to follow audiovisual material without further supportive tools.

3.5.2. Relevant research projects

The last two decades have seen a large number of national and EU-funded projects focusing on AVT and access services. A variety of institutions, universities, companies and organisations are partnering and collaborating on these projects, thus boosting the profile of the field both in education and in the industry. Descriptions of some of the international projects that have access services at their core are presented in the following paragraphs in chronological order.

Digital Television for All (2008-2011, www.psp-dtv4all.org) was the precursor of Hybrid Broadcast Broadband for All and aimed to facilitate the provision of access services on digital television in the EU. Another interesting research project in the area was SAVAS (2012-2014, www.fp7-savas.eu), which aimed to "collect, share and reuse audiovisual language resources from broadcasters and subtitling companies to develop large vocabulary continuous speech recognisers in specific domains and new languages, with the purpose of solving the automated subtitling needs of the media industry" (Del Pozo *et al.*, 2014). Following Digital Television for All, Hybrid Broadcast Broadband for All (2014-2016, www.hbbtv.org) adopted an user-centric approach and examined advanced solutions for HbbTV in Europe, accommodating various devices, multiple languages, sign language and more, always with the user in mind. The Audio Description: Lifelong Access for the Blind (ADLAB) project (2011-2014, www. adlabproject.eu) aimed to fund international higher education courses to train audio describers and design guidelines for high quality and consistent AD.

The EU BRIDGE project (2012-2015, www.eu-bridge.eu) focused on the creation of a streaming technology that could convert speech from lectures, meetings, and telephone conversations into text in another language. Accessible Culture and Training (ACT, 2015-2018, http://pagines.uab.cat/act) is another interesting EU-funded project that aimed specifically to determine the profile of the "Media Accessibility Expert/Manager for the Scenic Arts", as well as training people associated with this profession. The follow up of the ADLAB Project, Audio Description: A Laboratory for the Development of a New Professional Profile (ADLAB-Pro, www.adlabpro.eu), is a three-year (2016-2019) project also financed by the European Union, whose main aim is to create free-access, flexible, didactic materials of a modular and customisable nature, for the training and benefit of the audio describer. The already discussed Media Accessibility Platform (MAP, 2017-2019, https://mapaccess.uab.cat) is a platform that aims to collect all relevant media accessibility information related to research, policies, training and practices in this area.

The Understanding Media Accessibility Quality (UMAQ) project (2017-2019, http://pagines.uab.cat/umaq) focuses on establishing a comprehensive analysis of the notion of quality in Media Accessibility with the aim of drafting a unified theoretical framework to facilitate its understanding. The Immersive Accessibility project (ImAc, 2017-2020, www.imac-project.eu) is exploring potential integrations of access services with immersive media. Finally, two projects with related interests are the already mentioned Interlingual Live Subtitling for Access (ILSA, 2017-2021, www.ilsaproject.eu), whose main objective is "to identify the skills and profile of the interlingual live subtitler, develop, test and validate the first training course on interlingual live subtitling and provide a protocol for the implementation of this discipline in three real-life scenarios, namely TV, political/social settings and the classroom", and LiveTextAccess (LTA, 2018-2021, https://ltaproject.eu), a project that is focusing on the training of live subtitlers through respeaking and Velotype.

The projects mentioned in these pages are only an indication of the enormous interest that the field is attracting from various angles and in several different focal areas. Along with previous and ongoing research in the field, all these projects are proof of the usefulness, potential and interdisciplinarity of the area of access services and the field of Media Accessibility.

3.5.3. Access services and disability

Building on the background provided in Chapter 2, the aim of this section is to look at potential connections between access services and Disability Studies (DS). Although research is frequently conducted between DS and disciplines like Education, Sociology, Social Policy, Psychology, Social Care, Health, Human Rights and Politics, Deaf Studies, Law, and Rehabilitation and Assistive Technology, there are very few traces of the field in AVT research. Yet, investigation into access services within AVT often looks into the needs of the deaf and the hard-of-hearing population, when discussing SDH (Civera and Orero, 2010; Tamayo and Chaume, 2017; Szarkowska and Gerber-Morón, 2018), and blind people and people with visual impairments, when exploring AD (Ramos Caro, 2016; Ellis *et al.*, 2018; López *et al.*, 2018), and regards them as an important parameter in both descriptive and prescriptive studies.

The final output of access services is enjoyed by disabled people who may otherwise be excluded from educational, informative, political, commercial and entertaining content. As mentioned earlier, two of the main characteristics of these modes of AVT are their skopos (or purpose) and their target audience, the latter affecting the former. This is why the intended audience should be involved as much as possible in the study of access services, not only as the source of real, empirical experience, but also as an agent partaking in research efforts. In this respect, various research projects have been conducted on the reception of audiovisual materials by people with sensory impairments and many academic publications have also seen the light in recent years. One of the drawbacks is that Disability Studies as a discipline does not seem to have been taken into consideration when conducting research in AVT, except for some examples such as the works by Greco (2016), Agulló *et al.* (2018) and Leung (2018). This omission may have been caused by the fact that AVT research has been often carried out in the form of reception studies aimed at testing certain conditions, rather than focused on changing access service provisions on the basis of the end recipients' experience. At the same time, DS is very much part of society as a whole, although it is often cut off from technological trends and the industry, showing predilection for research topics like education (Ware, 2017; Derby, 2016), gender studies (Naples *et al.*, 2018), identity (Dunn *et al.*, 2015), sociology (Evans and Lee, 2017), literary studies (Grue, 2016), bioethics (Garland-Thomson, 2017) and law (Cameron *et al.*, 2018). This recognition by DS scholars of the interdisciplinary potential of the field comes with a word of caution by academics like Goodley (2016: 11), who has debated the issue of disabled people often finding themselves being treated as "objects of others' curiosity" by researchers rather than partners.

At a more pragmatic level, it can be argued that the two fields are already related, as in the example of activist groups and organisations that campaign to guarantee the provision and safeguarding of access services. A case in point is the action taken in the USA by the National Association of the Deaf (NAD, 2011), the Disability Rights Education and Defence Fund and the Western Massachusetts Association of the Deaf and Hearing-Impaired, who in 2011 openly attacked Netflix for the lack of access services in their productions, filing the first federal lawsuit against the company for their non-compliance with the Americans with Disabilities Act. Similar cases can be traced around the world, with one example being the multiple complaints launched by Greek Deaf activist groups against Greek National Television.

The current study is an attempt at enhancing interdisciplinarity in the field by exploring the synergies that can be established between DS and AVT, in particular the media accessibility practices of SDH and AD. For this approach to be successful, it has to be articulated around the following main pillars: (1) an understanding of disability and its relevant political and socio-cultural dimensions, and (2) a deep knowledge of the various AVT practices and access services. A solid background knowledge of the two areas should enable the researcher to make the appropriate decisions when it comes to the study of access services in specific contexts, without ignoring the social dimension of disability and with the ultimate goal of promoting products and services that are universally accessible.

After having provided an overview of the concepts of Disability (Chapter 2) and AVT (Chapter 3), Chapter 4 now concentrates on the technical means that make possible the offer of accessible audiovisual content, making special emphasis on the technology that can be used to this effect.

Chapter 4

AVT: Technology, Assistive Tools and the Web

Usually found under the umbrella of Humanities and Language Studies, AVT has always been very closely related to technology (section 3.5.1), to such an extent that it nowadays often defines its very nature, as in the case of respeaking with automatic speech recognition (ASR). It was not until the early 2000s that research in AVT fully expanded to include mechanical means that could facilitate the production and delivery of access services; a fact that has been enhanced by the role played by the web in everyday life to inform, entertain and communicate in general.

In an attempt to investigate the crucial role of technology, the first section of this chapter explores what is already available and what the future holds for SDH and AD in terms of the software and tools that are mainly used at the preparation stage. In this respect, the role of ICT and Computational Linguistics has been pivotal, providing semi- or fully-automated multilingual versions of the source material as well as output that facilitates the provision of access services. Although the inflow of solutions that automate part or all of the process is beneficial in many aspects, it also raises questions in terms of quality and naturalness of the final product.

The main aim of this section is to highlight the role of technology in the preparation and provision of the two services, by referring to the steps involved and the main challenges that experts come across, rather than discuss in detail specific choices of settings that affect the output. Nonetheless, decisions on technical and content-related aspects that are essential in the preparation process – e.g. determining the subtitle display rate and the maximum number of lines and characters per line in SDH, the choice between verbatim and edited subtitles also in SDH or between artificial and human voices in AD – will only be mentioned when describing the tasks of the subtitler and the audio describer and to underline the usefulness of the relevant technology in each of the stages. A more detailed discussion on decisions for determining these parameters is provided in Chapter 5, within the context of OE.

The role of the physical devices that grant users access to these assistive services is also significant and, unlike TV sets that users can touch, feel, and manage, the case of the web is different. Here, Assistive Technology (AT) is most important and this is why AT and AVT go hand in hand in the case of accessibility, as users have different needs. Indeed, a deaf user of the web, for example, may be able to turn a computer on and navigate to a video, where they expect to enjoy subtitles, whereas a blind user will need additional tools in order to operate the computer, surf the net, get to the video and then expect to enjoy AD.

This relationship is particularly important when it comes to locating research in its broader context and not just within the internal perimeter of audiovisual content. Of course, access to the environment is equally crucial and this is why the second section of this chapter focuses on assistive technology, including both software and hardware, and its links to AVT and access services. While the first section answers the question of 'what is offered and how is it done?', the second one addresses the question of 'how can we get there?'.

The last section of this chapter focuses on a related issue: provided that access services are available, 'how can users find what they are looking for?'. Accessibility becomes meaningless in environments that are themselves inaccessible, as when a wheelchair user cannot watch a film in the cinema when the building is out of boundaries, or a blind user cannot enjoy the AD of an online video if the website that hosts it is not accessible itself, or a deaf student cannot make use of an advanced accessible video tutorial on a given subject when the introductory video on the same topic has not been subtitled. Web accessibility is critical in the digital age and affects all types of content, which is why the third section concentrates on the most common standards and tools related to web access, with emphasis on the provision of audiovisual content.

Throughout this chapter, the aim is to add to the theoretical background of accessible online education, by focalising on the role played by AVT and, more particularly, access services, a topic rarely discussed in this context. The ultimate goal is to find synergies between AVT and ICT, in the intersection of access services and in the web ecosystem.

4.1. Technology in AVT and Access Services

The use of technology in AVT has been traditionally associated with the preparatory, production stages, before the shift of focus from standardised and default provision to automated and user-centred experience in the mid-2010s. This section offers an overview of current production practices and delivery modes, of software used for the preparation and editing of SDH and AD and of the technology available for exhibition.

At a professional level, the preparation of SDH and AD requires the use of dedicated software to implement all the required tasks for the production of the two services. With the ultimate aim to maximise productivity and reduce production costs, applications are constantly evolving to include an increasing number of features to help professionals work smoothly.

4.1.1. Preparing SDH

Specialist subtitling software have been in existence for decades to carry out the spotting of the text in synchrony with the soundtrack and the visual elements, to add colours and formatting, to decide on their position on the screen, and to add labels when necessary. These programs have an interface that includes a video player, a timecode function to carry out the cueing of the subtitles, and an editor where the subtitles can be added and edited, whether freeware (Figure 4.1) or commercial (Figure 4.2):

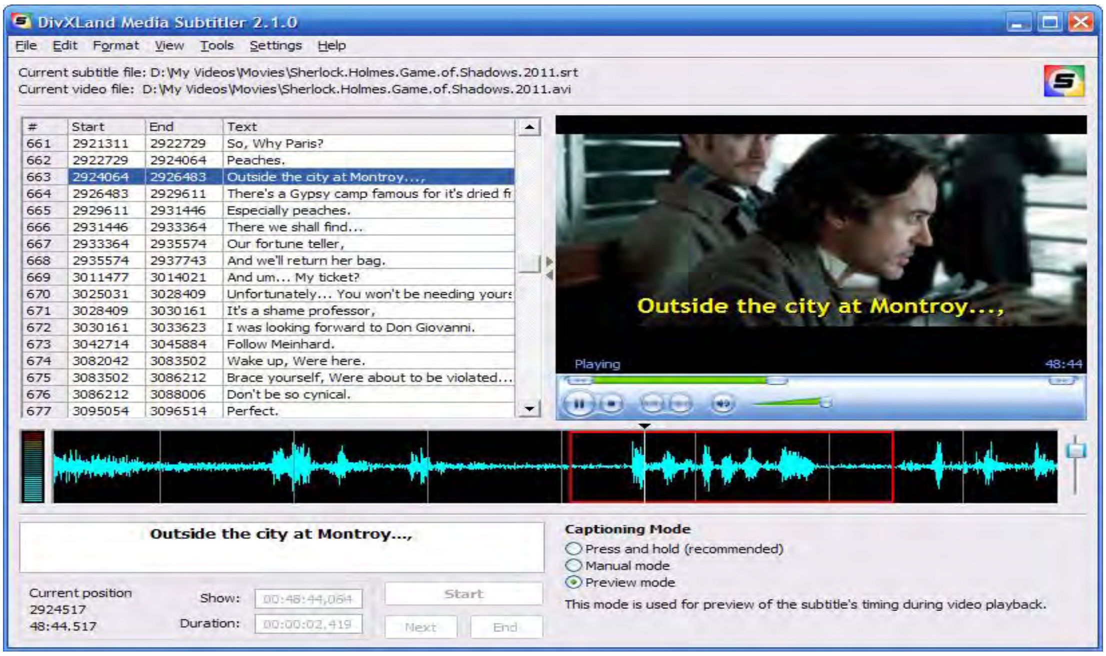


Figure 4.1: Media Subtitler 2.1.0 editing environment (DivXLand.org,n.d.)

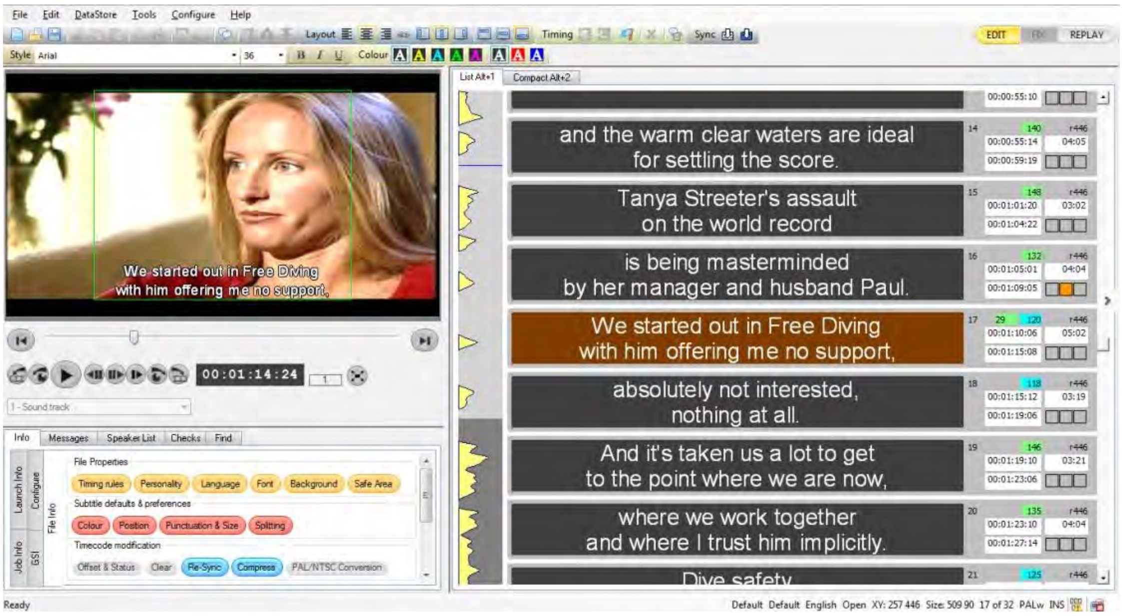


Figure 4.2: WinCaps Q4 editing environment (Screen Systems, 2015)

The range of available software is wide, from basic to more advanced, and from desktop to cloud-based more recently. In order to fully understand their functionality, the main stages of the subtitling process, with special emphasis on SDH, are discussed in the next sections.

4.1.1.1. Spotting subtitles

As Díaz Cintas and Remael (2007) explain, after receiving the original audiovisual material, the subtitler starts with a process known as ‘spotting’, ‘timing’, ‘cueing’, or ‘originating’, which refers to the precise determination of the time-in and time-out of the subtitles, i.e. the times at which each subtitle should appear on screen and disappear. This task is affected by various technical parameters, with the most important being reading speed, subtitle duration and synchronisation with the soundtrack and the images.

Reading speed refers to the maximum amount of text that a viewer can watch, measured in words per minute (wpm) or characters per second (cps). These values are usually determined by the company/client that assigns the subtitling task, as in the case of Netflix (https://partnerhelp.netflixstudios.com/hc/en-us/categories/202282037-SPECIFICATIONS-GUIDES) and the BBC (Williams, 2009), and tend to be mentioned in the relevant guidelines that are applied at national level, like the guides proposed by the Canadian Association of Broadcasters (2008/2012) or by AENOR (2012) in Spain.

Ability to read text on screen is not only related to language and age; it can also be affected by a variety of factors such as literacy level, visual density on screen and the level of complexity of the source script (De Linde, 1995). Subtitling software allows subtitlers to set a specific reading speed that will effectively calculate the number of characters that can fit in a timed subtitle, usually in words/characters per minute, i.e. how many words/characters can fit in a subtitle based on its duration. It also allows them to change the speed and apply it effectively to the whole file to address audiences with different characteristics.

Another technical parameter is the maximum and minimum duration of subtitles on screen, which is generally accepted as being between one and six seconds respectively, a rule that is based on the observation that “an average viewer can comfortably read in six seconds the text written on two full subtitle lines, when each line contains a maximum of some 37 characters, i.e. a total of 74 characters” (Díaz Cintas and Remael, 2007: 96). Considering the duration of a given subtitle, the maximum subtitle display rate and the maximum number of characters and lines per subtitle the software calculates how much content can be included in that subtitle and indicates it in the editing environment, as shown in Figure 4.3:

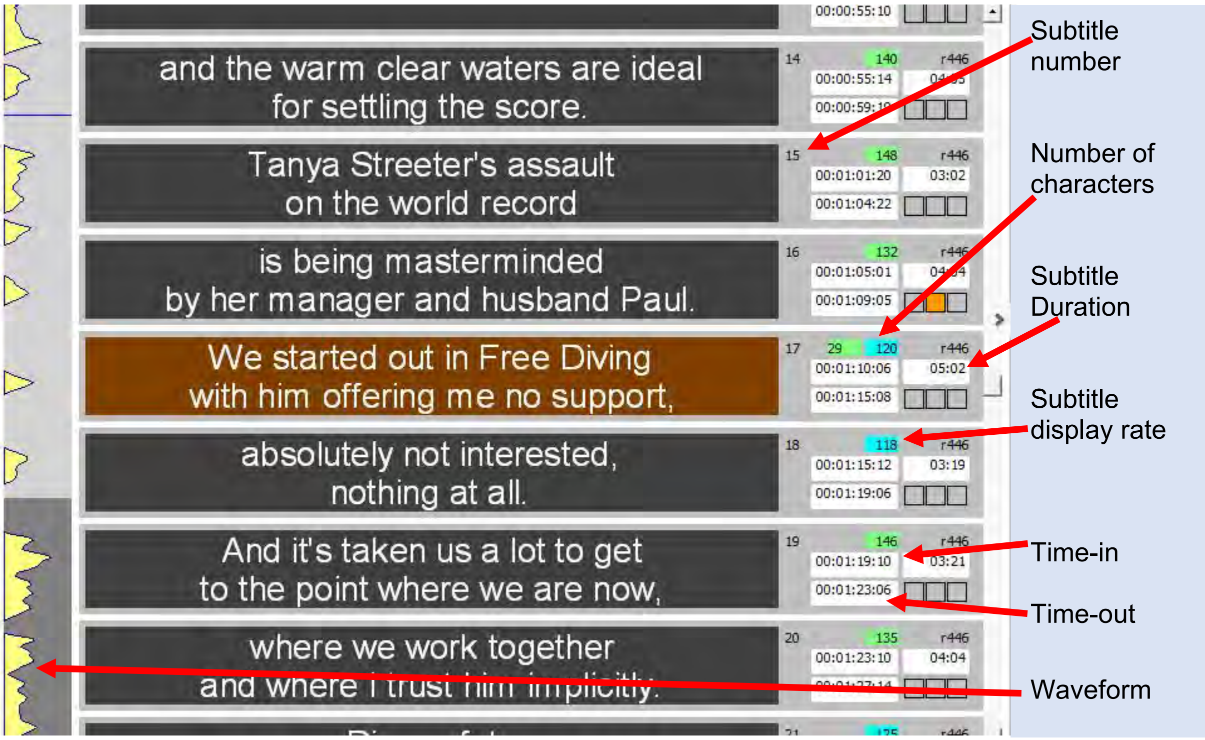


Figure 4.3: Wincaps Q4 interface

Spotting is a very critical task of the subtitling process that requires basic knowledge of film editing, as the subtitler needs to create subtitles that do not cause confusion to the viewer while respecting both the visuals and the audio of the original material, which is closely linked to the concept of synchronisation. This is one of the most important tasks of subtitling and arguably one of the most complicated, especially in the case of SDH. While essentially related to the soundtrack of the audiovisual material, visual elements also play a significant role in the way in which it is achieved. The subtitler needs to synchronise each subtitle carefully to the audio of the original material, taking all the technical parameters mentioned above into consideration and generally following the rule that a subtitle begins when a sound or voice is heard. Karamitroglou (1998: online) argues that a subtitle should appear on screen before the dialogue is actually heard as “tests have indicated that the brain needs 1/4 of a second to process the advent of spoken linguistic material and guide the eye towards the bottom of the screen anticipating a subtitle” and viewers need time to locate the speaker before they read the subtitle. According to more recent research by Romero-Fresco (2015), more than ¼ of a second is needed for viewers to react to subtitles, i.e. 348ms for hearing, 340ms for hard-of-hearing people and 309ms for deaf people. Some subtitling software provide a waveform of the sound, graphically representing the time when sound begins and stops, as shown in Figure 4.3 above. Such visual representation is particularly useful in SDH, where sound plays a crucial role for the audience's understanding. The importance of synchronisation has also been argued by Díaz Cintas and Remael (2007: 90), who explain that "[a]ccurate timing is crucial for optimal subtitling since it reinforces the internal cohesion of the translated programme and plays the essential role of helping the viewer identify who is saying what in the programme". However, perfect accuracy at this level is not always achievable, whether for spatial and temporal constraints or for the density of the dialogue. Subtitlers are expected to fit as much content as possible in the specified duration of a subtitle, often adding frames before the beginning and after the end of a sound to extend the duration of a subtitle and allow for a more comfortable reading experience.

Synchronisation is also visual and subtitlers are expected to respect shot changes and make sure that a subtitle does not cross over a shot change as this may confuse viewers (Cornu, 1996; Díaz Cintas and Remael, 2007; Krejtz *et al.*, 2013). Most current software has a function that alerts subtitlers of shot changes so that they can time their subtitles around them.

In SDH, spotting is generally more flexible than in standard subtitling because priority is given to the understanding of the content over perfect synchronisation, as foregrounded in the *BBC Online Subtitling Editorial Guidelines*, where "[i]t is permissible to slip out of sync when you have a sequence of subtitles for a single speaker, providing the subtitles are back in sync by the end of the sequence" (Williams, 2009: 12). Asynchrony between sound and subtitles in SDH is not of such great importance as it is in conventional subtitling because the soundtrack loses relevance for the target audience, who usually cannot hear it and relies on the visual channel, i.e. images and subtitles, to access all the auditory information (Neves, 2005). Yet, this varies substantially depending on the audiences' degree of hearing loss and can cause confusion among hard-of-hearing audiences, who receive part of the audio input directly from the source material.

The subtitle display rate is one of the main differences that can be found between interlingual subtitling and SDH, with the latter traditionally being lower on account of the different literacy levels and reading skills of hard-of-hearing audiences (Neves, 2005; Miquel Iriarte, 2014). While it is generally found that reading speed in pre-recorded programmes varies depending on the medium, with an average of 180 wpm in standard subtitling, in many cases it is suggested that lower reading speeds be applied in SDH, with the BBC proposing 140 wpm for subtitles that are provided online (Williams, 2009: 7), and Ofcom (2015a: 19) suggesting between 160 and 180 wpm for TV content. The rule of the six seconds for the maximum duration of subtitles is often ignored when it comes to SDH, where in some cases there is no specific limit to the duration (BBC, 2009: 27), while in others, as in the case of song lyrics, subtitles are usually left on screen for longer than six seconds.

Understanding subtitles does not mean simply having the time to read them, as viewers also need to comprehend and assimilate their meaning. In this respect, as highlighted by Neves (2005: 133), "readability will result from more than simply the subtitles themselves. It will be intimately related to the way in which those very subtitles interact with the intersemiotic whole", which will depend on the semantic density and can be facilitated by the layout of the subtitles.

4.1.1.2. Dealing with content

After setting the technical parameters mentioned above, subtitlers prepare the content of the subtitles with the help of the subtitling software. They may start by transcribing the source from scratch or they may use a dialogue list/script if one has been provided. More recently, this process is technically enhanced by features like automatic speech recognition that allow for automatic transcription of the speech contained in the soundtrack.

The various import and export options available in subtitling software make it easy for subtitlers to work on existing files, while limitations such as the maximum number of lines or characters per line that are allowed in each subtitle can be automatically enforced, as shown in Figure 4.4:

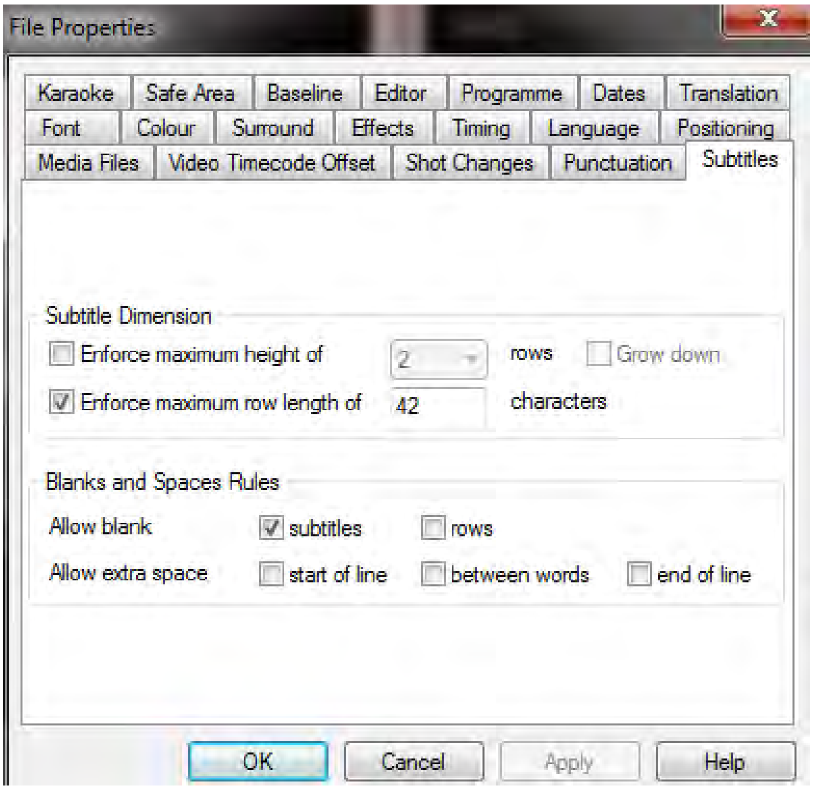


Figure 4.4: Wincaps – Subtitle settings

Spell-checkers and verification checks are also available to spot possible mistakes in terms of orthography and technical dimension. Search and replace options along with selection of a range of subtitles to apply specific subtitling choices are also useful functions, the same as the option to simulate the subtitled video as a finished product. Finally, exports of various types can be generated in order for subtitlers to check files externally and deliver them in alternative formats.

Deciding on the content that will make it onto the screen is not an easy task and specialist software can effectively enhance the process and save time. As in the case of conventional subtitling, SDH requires subtitlers to apply certain textual techniques to obtain the best possible results, among which text reduction, condensation and reformulation are critical. Often, the application of such strategies leads to an output that is mostly an adaptation rather than a verbatim transcription of the source. The issue between edited versus verbatim subtitles has been discussed by numerous scholars (Robson, 2004; Neves, 2008; Romero-Fresco, 2009; Szarkowska *et al.*, 2016) and is also a hot topic among the audience. Indeed, some of them demand verbatim subtitling because they see it as a more faithful representation of the dialogue, since subtitlers are not then in charge of deciding what information to transfer onto the subtitles or to eliminate. The situation is compounded in the case of lip readers, who can easily grasp what is being said on screen when the speaker's mouth is visible. In a case study testing the preference of the audience, Sancho-Aldridge (1996) discovered that 54% of the respondents favoured verbatim subtitles, but when asked about how easy they found reading them, the percentage dropped to 44%. As a matter of fact, the approach will vary depending on the delivery of the original dialogue and the subtitling software will help subtitlers in their tack by alerting them about the number of characters contained in each subtitle line and the reading speed.

Another important task is to make sure that line breaks, within and across subtitles, are done bearing in mind the syntax of the text. In this sense, a subtitle should contain a full sentence, when possible, and the lines should be broken at syntactic and semantic nodes, avoiding separating associated linguistic items such as articles and nouns.

When it comes to the makeup of the subtitles it is crucial that they convey the right information, such as source of the audio, speaker identification, paralinguistic elements, sound effects, music and the like. Speaker identification can be done by positioning the subtitle close to the actor on screen, by utilising descriptive labels or by allocating different colours to the various actors, which is easily done with the software, as illustrated in Figure 4.5:

Figure 4.5: Use of colours to identify speakers in Greek SDH

Specific symbols, like the musical notes ♪ or ♫, can be used to indicate song lyrics, while bold and italics can also be applied to format content in order to indicate tone of voice or intensity of speech.

4.1.2. Preparing AD

Arguably, AD is less technically challenging than SDH though it requires more creativity in terms of script-writing and the sound recording stage can be complex. The tasks that are relevant to translation (i.e. the transfer from the visual to the auditory channel) involve the timing and preparation of the script, which is then recorded by the script writer or a professional voice talent. An AD or scripting software typically includes a video player, an editing window and the timecode element, very much like subtitling software. Features are also available to help the voice talent understand how the description should be voiced. The Independent Television Commission (ITC, 2000: 9) *Guidance on Standards for Audio Description* include a description of the technology used for the preparation of AD:

> A work station normally consists of a number of items: a personal computer which acts as a word processor, time-code index, video edit controller, and prompting device for recording the description in the gaps between programme dialogue; a time-coded VHS or DVD player; an additional small monitor and associated loudspeakers (even if the PC has a video window); and a device which stores the descriptive audio.

> The workstation should be capable of associating the elements of the written script with the programme time-code.

The role of software during the three main stages of the AD process, i.e. spotting, script drafting and delivery of descriptions, is discussed in the following sections.

4.1.2.1. Spotting AD

When spotting in AD, the main parameters that need to be taken into consideration are synchronisation, speech rate and duration. To some extent, spotting in AD follows the opposite logic from that of SDH and subtitling in terms of synchronisation, as descriptions are usually inserted between pauses. Although it is almost inevitable to have overlays in parts where music and sounds are heard, dialogue and voices in off should never be covered by descriptions (Vercauteren, 2007). The person in charge of the spotting decides the in and out times of the periods that can be used to add the descriptions. Functions similar to the ones mentioned in section 4.1.1.1 are available in terms of video navigation and the duration available for the description also appears for each description box. Depending on the software, the describer can also see how many words or syllables they can still add to their description, calculated on the basis of the speech rate and the maximum and minimum duration specified in the settings area. The software interface is similar to that of subtitling programs, as illustrated in Figure 4.6, from Starfish Advantage Description (N.d.):

Figure 4.6: Starfish Advantage Description script editor

Duration in the case of AD depends on the silences of the source material and thus there are no standardised rules as to the standard duration of the description, although the professional should avoid long periods with no explanations as well as short periods with too much information as they can both cause confusion. When it comes to the speech rate, several attempts have been made to calculate it based on the listeners' comprehension skills, taking into account the duration of the description and the number of words that the audience is expected to understand in that period of time.

As Fryer (2006) explains, a number of studies that have been carried out on speech comprehension in several broadcasting contexts indicate a variation between 160 and 250 words per minute (Foulke 1968; Pimsleur *et al.*, 1977; Rodero, 2012). Snyder (2006) suggests an average speed of 160 words per minute, while Moos and Trouvain (2007) argue that blind people comprehend speech much faster and can accommodate up to 680 words per minute. Given the differences of opinion, Fryer (2016: 80) advises describers to make a decision based on the source material: "Rather than aiming for a specific speed, let your pace be dictated by the pace of the scene you are describing".

4.1.2.2. Drafting the script

While preparing the script, three main types of information need to be conveyed: (a) images, (b) sound effects that are difficult to identify, and (c) on-screen text such as signs, credits, and logos (Vercauteren, 2007). The audio describer needs to identify and describe specific prioritised information on where, when, who, how and what, i.e. the time and place of an action, who is the actor, what is the action and how it is performed. Priority on what to describe depends on the source material and the decision is often made by the describer, with the ultimate aim of describing all the essential information first (Clark, 2001). In the ADLAB *Audio Description Guidelines* (Remael *et al.*, 2014), the authors indicate the importance of describing characters, actions, spatial and temporal settings in narratological building blocks that constitute the description and are greatly affected by the genre of the source material. According to the *Audio Description Guidelines and Best Practices* published by the American Council of the Blind's Audio Description Project (Snyder, 2010), it is important to state the facts of who, what, when, where and how. In a previous work, Snyder (2008: 195) explains that the describer also needs to consider the way blind people build mental images:

> Describers must edit or cull from what they see, selecting what is most valid, what is most important, what is most critical to an understanding and appreciation of a visual image. In addition, choices are made based on an understanding of blindness and low vision – going from the general to the specific, use of colour, inclusion of directional information, and so on.

Word choice is particularly important as the describer should avoid ambiguity, use pronouns effectively, indicate verbal tenses precisely, determine the successful use of definite and indefinite articles with the audience in mind, use sound symbolism effectively based on the cognition of the audience, and retain the rhythm and rhyme determined by the source material. Generally, audio describers should make careful choices so that their descriptions are politically correct (i.e. avoid implying that any information is transferred through the visual channel), as informative as possible in order to satisfy a varying range of low vision individuals (e.g. colours might be useful to some people), and make use of simple structures with clear punctuation so that the content can be easily understood.

Software in the scripting process tends to be limited to the video player and the text editor, which allows for checks and the addition of notes and cues for the benefit of the describer or the voice talent (e.g. indicating a specific tone of voice). These notes can take the form of written text in parentheses or square brackets, or be indicated with the use of bold or different colours.

4.1.2.3. Delivery of descriptions

As opposed to subtitling, the delivery of AD is normally not performed by the audio describer but a voice talent. There are some exceptions, as in the case of instructive AD or slide presentations, where the person who prepares the script may also record the AD. One of the main features offered by AD software is the option to lower the volume of the original soundtrack so that a description can be added and rehearsed. The latter task, similar to simulation in subtitling, is very useful for describers who can thus check the final product and add any specific notes for the voice talent.

As Fryer (2016: 87) explains, “[t]he supra-linguistic aspects of speech convey meaning through stress, pitch, tempo, dynamic range and, especially, the way the words are segmented”. Accent, gender, emotion, tone, pitch, pace, pronunciation, fluency, stress and segmentation are some of the elements that she mentions as essential for the delivery of a successful AD. Software capabilities are limited with regard to this stage of AD, yet they offer support for pre-mix and post-mix audio transmission, by encoding audio mixing data, for example fading of the soundtrack in extended subtitle exchange format files. As explained in the datasheet of Swift ADePT, “[t]he pan and fade information, which allows audio description playout to be accurately mixed with the main program audio, is stored in a format that is readily understood by DVB infrastructure to provide accurate decoding at the end receiver” (Miranda Technologies Partnership, 2013: online).

The job of the audio describers may be circumscribed to the preparation of the description most of the time, yet software offers a working environment that allows them to control both sound and image. They can also make the most of some editing options in a flexible user interface that allows them to customise the layout based on their preferences.

4.1.3. Technological trends

As discussed, technology plays a key role in the SDH and AD preparation, scripting and rehearsing stages, including the possibility of importing and exporting files that can be used externally as well as managing not only text files but also sound and audio files. The following sections offer an exploration of some of the other tools available for professionals in this sector.

4.1.3.1. Translation tools and language resources

On occasions, subtitling files and scripts need to be translated into a target language, which is commonly done in the industry with the use of templates (section 4.1.4), where timecodes remain intact. Software that supports subtitle files and AD scripts, like SDL Trados Studio, Transit NXT and memoQ, has the benefit of allowing translators the use of certain components which are normally not found in specialist AVT software, such as translation memories and termbases, illustrated in Figure 4.7:

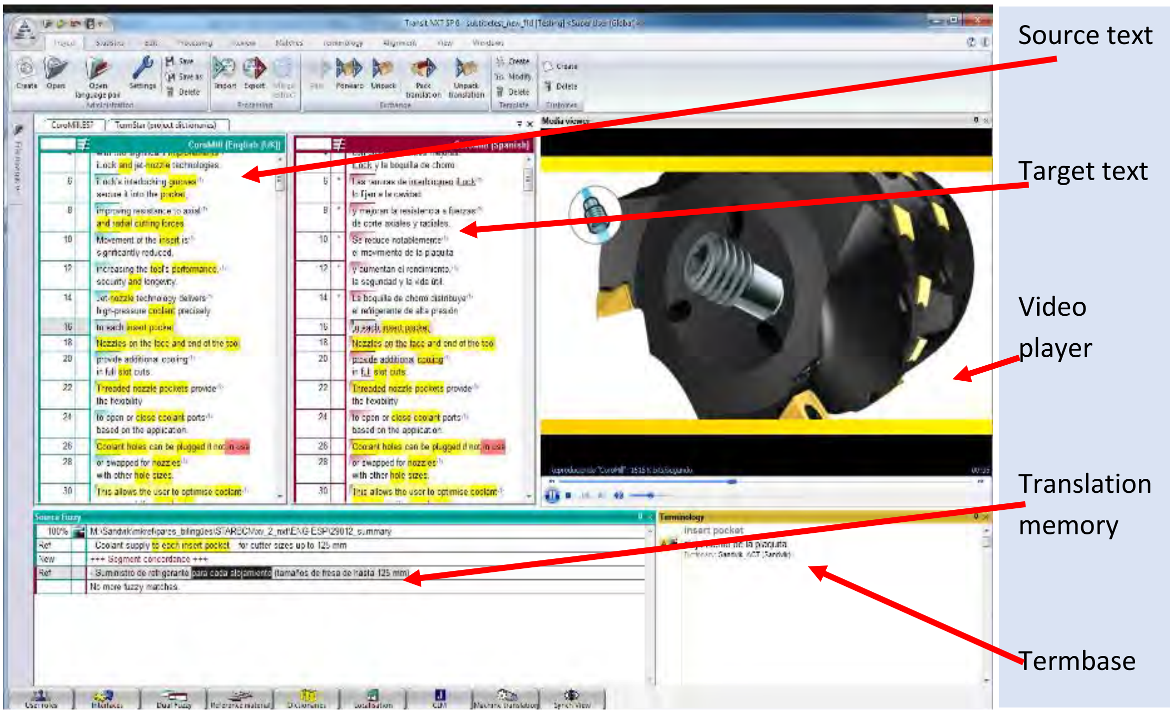


Figure 4.7: Use of Transit and TermStar NTX for subtitling purposes

These features can also be used individually, as supplementary tools, while using professional AVT software. Given the boom in the translation of audiovisual material, the integration of dedicated translation applications within specialist subtitling suites is a development that has attracted attention by software providers.

Corpora have also been regarded as useful in AVT and authors like Bartly and Taylor (2002: 57) have looked into the use of a multimodal corpus authoring system that identifies recurrent patterns in films and which “enables researchers, however imperfectly, to view short pieces of film and simultaneously to write multimodal descriptions of them”. Using an editing tool, films can be segmented into functional units, which can then be annotated with the semiotic resources they deploy and the functions they perform within the film.

A multimedia parallel corpus of English-Galician film subtitling has been compiled by Sotelo Dios and Gómez Guinovart (2012) in a translation memory exchange format that includes both audiovisual features and translation alignments. A large set of parallel subtitle corpora was also used in the SUMAT project, an Online Service for Subtitling by Machine Translation, with the aim to produce automatic subtitles (Bywood *et al.*, 2013). On a similar note, the TRACCE project aims at designing and developing the structure of an accessible audiovisual product database using film content and ADs with semantic tags that allowed partners to establish comparisons and patterns of equivalence at the levels of narratology, cinematography and grammar (Jiménez Hurtado and Seibel, 2012; Jiménez Hurtado and Soler Gallego, 2013).

Despite this interest at research level, the combination of some of the features mentioned above with the AVT processes remains restricted in terms of timecode editing. Implementations include, for the example, the Trados Studio Subtitling plugin for the most commonly used subtitle files (SRT, WebVTT, STL and SBV) and the MemoQ configuration filter for SubRip SRT subtitle files and the Video Preview tool. MemoQ also offers LiveDocs, a feature that allows translators to load monolingual scripts, align bilingual sets of files and use concordance to search in the data. However, being tools intended for translation, Trados Studio and MemoQ do not permit parallel editing of timecodes and makes no association with the video, which cannot even be integrated in the translation environment.

4.1.3.2. Other supplementary tools

A range of supplementary tools are being used in the production of subtitling and AD, in combination with AVT dedicated software, in order to improve efficiency. Software programs such as Wondershare and WinSubMux are often used to convert video files into formats supported by specific software. Some tools are used to add creative subtitles to the final film, like Adobe Premier Pro and Windows Movie Maker, while others help AVT professionals manage the timecode of their files individually, applying changes to part of it or to all of the segments included in the file, as SubShifter and MAGpie2.

Also available for audio describers are text and script-writing applications, like Scrivener and Celtx (Figure 4.8), which allow the addition of annotations and the formatting of the text based on the user's preferences:

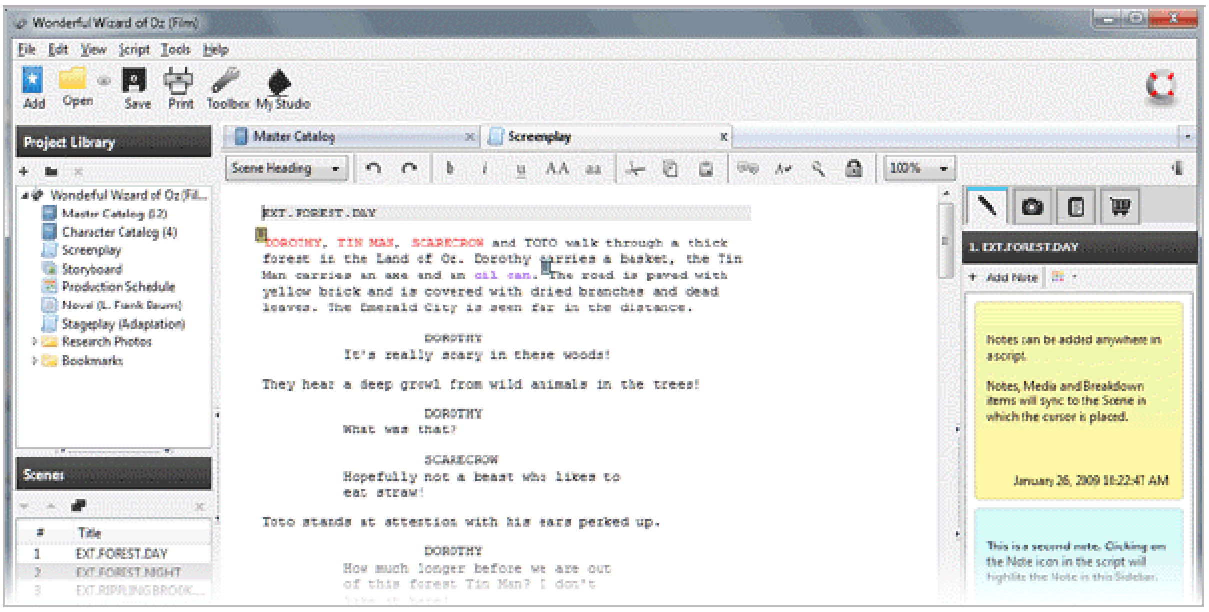


Figure 4.8: Example of script with formatting and notes in Celtx (N.d.)

When using such tools, describers usually record descriptions with the help of audio recording software, such as Audacity (Figure 4.9), that provide sound recognition in a waveform and can isolate the soundtrack from the video:

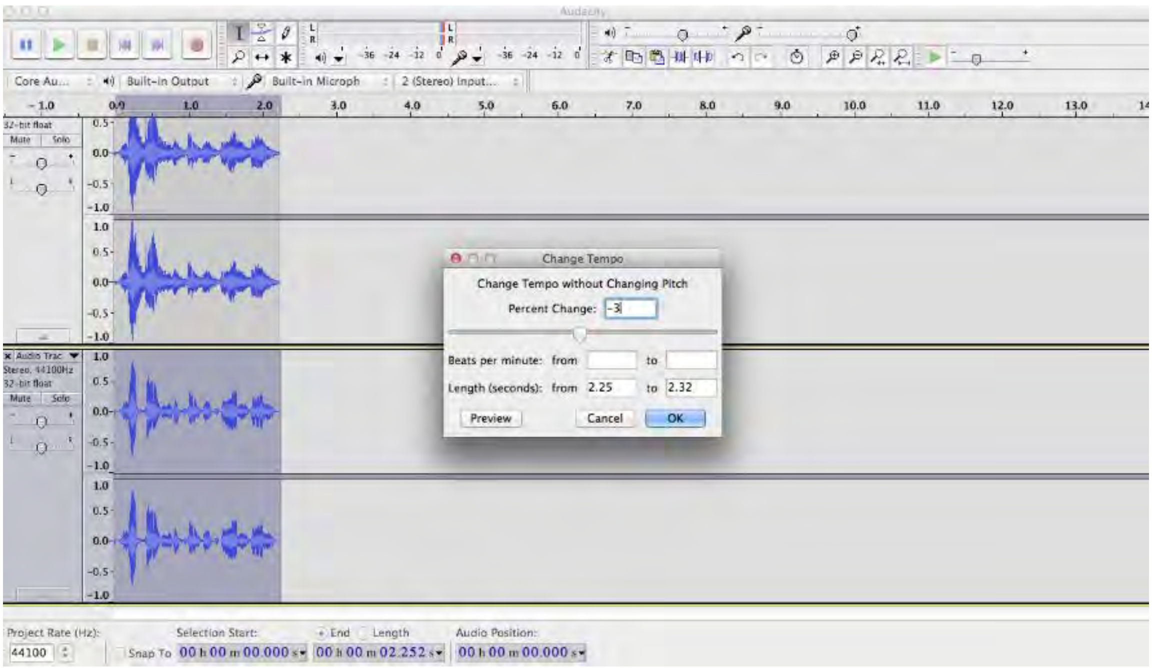


Figure 4.9: Example of voice recording in Audacity

These tools often offer voice management options and effects, including change of tone and spot-on corrections, and even change of gender.

Finally, tools that allow to merge the subtitle or audio file with the video, like HD Video Converter (Figure 4.10), have proved very helpful for small-scale projects, where clients would prefer to have a complete video delivered to them rather than a compilation of text, audio and video files:

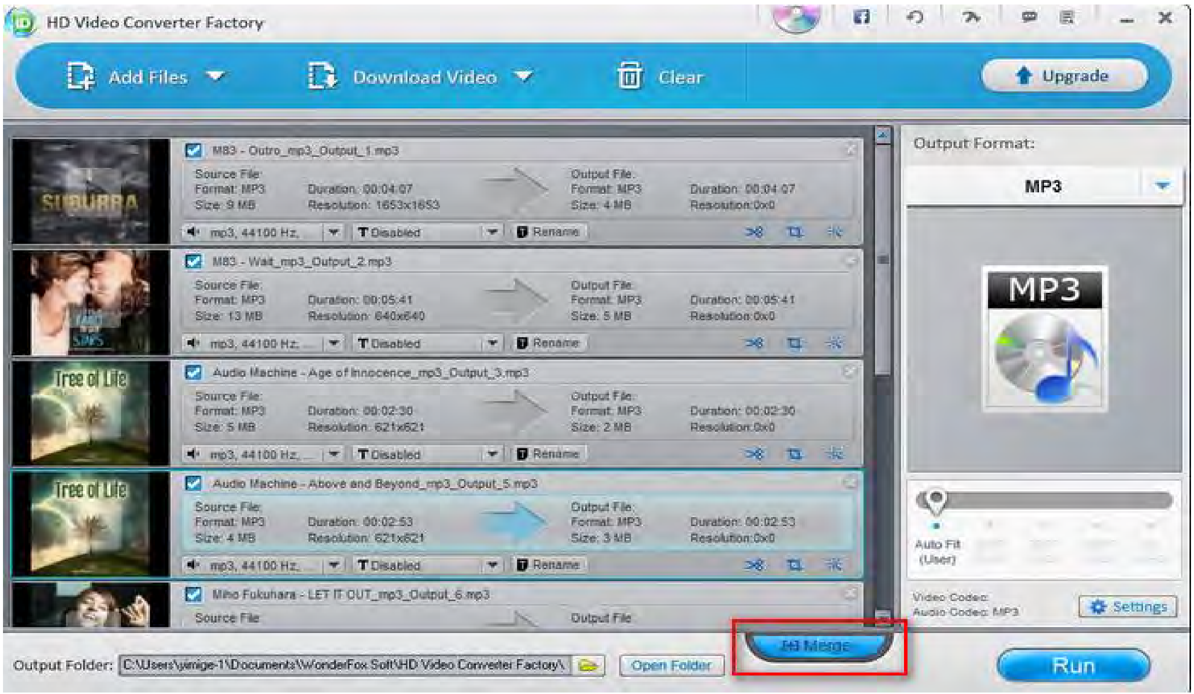


Figure 4.10: Merging of audio file with video in HD Video Converter

4.1.3.3. Technologies on the cloud

One of the trends that has gained ground in the translation industry very fast has been the cloud, a network of servers that guarantee access, storage and online services. In cloud computing, the service provider plays the role of a big server, serving multiple clients through the internet, and enabling the use of software, platforms and services based on hiring time of the product or the storage consumed. Cloud computing networks are built on three main components: a datacenter, distributed centres and client computers, as shown in Figure 4.11:

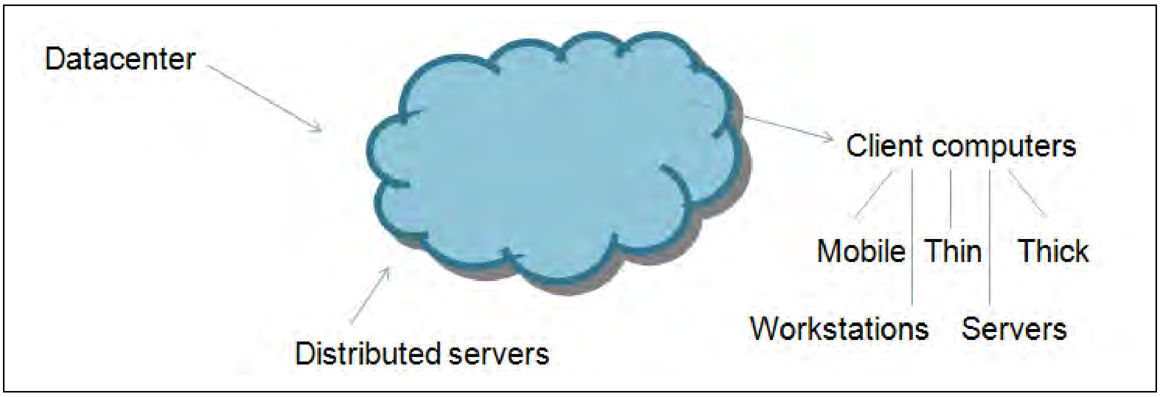


Figure 4.11: Main components of the cloud

Clients can access the cloud with mobiles, thin computers that operate through a server or thick standalone computers, while the datacenter is the collection of servers where the application to which the user subscribes is housed (Velte *et al.*, 2010). Servers of a cloud can be geographically distributed to cover a wider range of clients, though they still continue to operate as a single massive server. Some of the advantages of software on the cloud are: easy access to users with minimum technical effort, since it does not require installation, centralised data management and real-time collaboration.

Nowadays, translating on the cloud can include the use of multi-purpose-built software developed for the web, accompanied by community clouds of users, with the cloud being private, public or hybrid.[13] Translation platforms like Memsource, Smartling and XTM have rapidly gained in popularity, offering similar features to those of traditional desktop software, while at the same time providing additional options that allow subtitling on the cloud, by supporting subtitling files in a way that is similar to desktop-based software, sometimes with the integration of a video player. Transifex (Figure 4.12) and Smartling, for instance, can be used for translation, localisation and subtitling:

[13] Private clouds are typically owned by a single provider. Public clouds are open to the general public. Hybrid clouds are made of an internal privately managed cloud which relies on the public cloud.

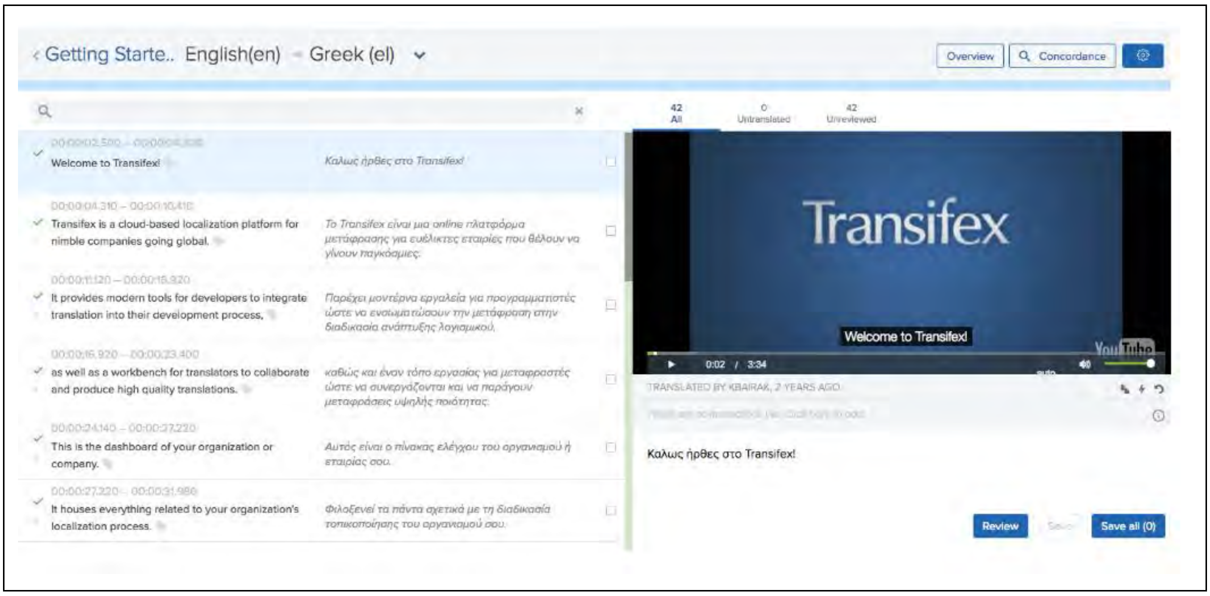


Figure 4.12: Transifex subtitling interface

AVT-dedicated cloud platforms have emerged in the last few years, either as free tools or as SaaS (Software as a Service), making use of the possibilities offered by cloud architectures, mostly in terms of instant collaboration among various parties involved in the production chain, who may be based in different geographical locations. As highlighted by Díaz Cintas (2015: 638):

> What cloud subtitling notably brings is the potential for closer monitoring on the part of clients themselves, the possibility of delivering the final product in different formats with greater ease, and the use of cloud-based applications and platforms that lower the cost of subtitling and post-production overall.

Free platforms like Amara are mostly used by fansubbers or for promotion purposes, and they have opened up new avenues for access services to be provided for free on the web. In the case of SaaS, subtitling in particular has been very-well accommodated in the cloud, with some of the most prominent examples of cloud subtitling platforms being ZOOsubs, iMediaTrans and Ooona. While replicating the tasks typical of the subtitling industry chain, they have the additional advantages of live monitoring of the workflow through a browser, internal conversion of files to the required format, internal quality control tools, storage of working files and automation of the delivery process at the finalisation stage, together with an editor that offers the main functions of desktop-based subtitling software for the creation of subtitles, quality assurance checks and simulation options (Figure 4.13):

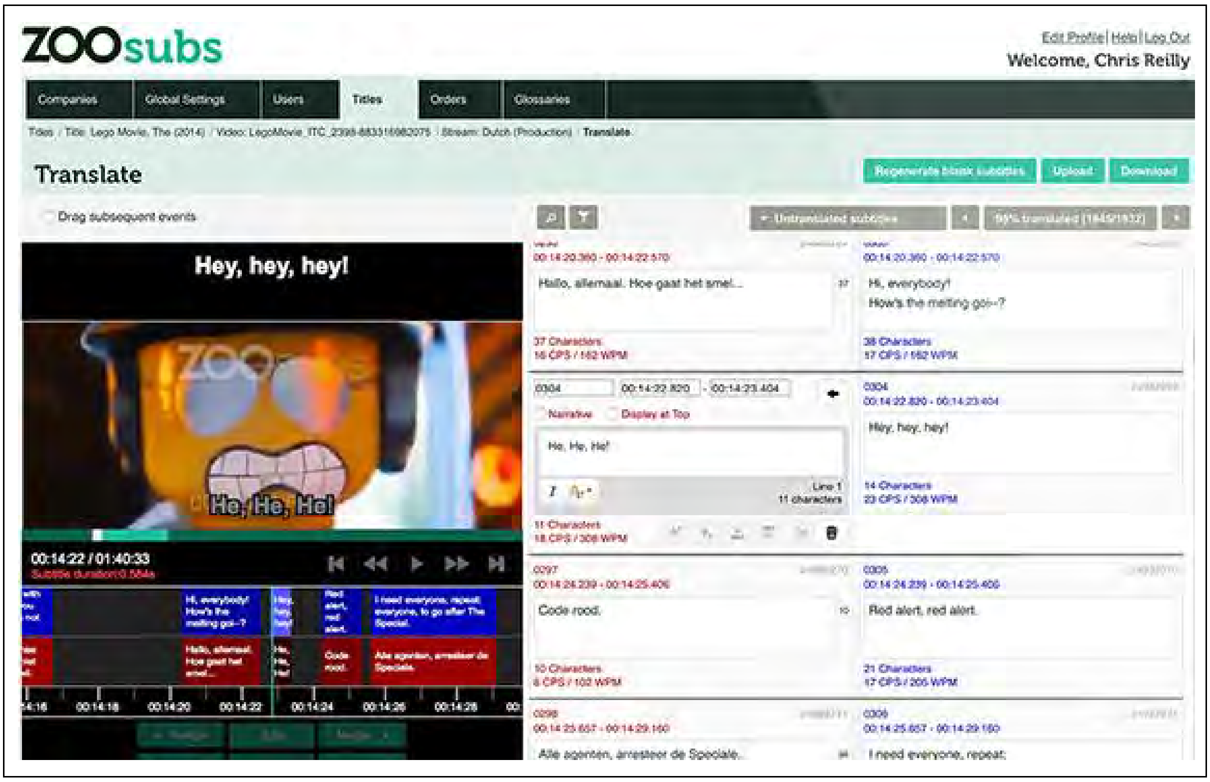


Figure 4.13: ZOOsubs editing interface

Given the speed at which communication takes place nowadays, the industry will continue to be interested in any developments that facilitate and improve the provision of AVT and access services.

4.1.3.4. Speech technologies and machine translation

Mechanisation has been a feature of translation for some decades now. With machine translation (MT) first making its entry as early as in the 1960s, automating all or part of the translation process is nowadays a reality in the industry. MT has been vastly applied in certain domains and in different forms through time, from the direct, dictionary-based approach that matched the ST to the TT, to rule-based systems involving the application of morphological, syntactic and/or semantic rules to analyse the ST and synthesise the TT, and the latest corpora-based systems that use linguistic information in a corpus of texts to create new translations and statistical MT systems based on the statistical analysis of data that is used to train the MT engine and then produces translations based on probabilities. In specific fields, mostly technical, where terminology and some linguistic structures are recurrent, human-aided MT is relatively common, where a first draft is provided by the MT engine and post-editors intervene at the last stage to make the quality of the output publishable. Yet, MT tends to be used as another aid for translators (i.e. machine-aided human translation) rather than as the main source of translation (i.e. human-aided machine translation).

The effectiveness of MT in the field of AVT has been researched lately by authors like Armstrong *et al*. (2006), who explore the automatic translation of subtitles using example-based MT, Flanagan (2009), who adopts a similar approach for DVD subtitles, and Hardmeier and Volk (2009), who investigate the use of linguistic annotations in statistical MT of film subtitles. The importance of subtitling corpora in the building of MT systems has also been studied with material from OpenSubtitles and TED talks (Müller and Volk, 2013). A more recent example of research in this direction is the already mentioned SUMAT project, whose aim was to increase the efficiency of professional subtitling through the introduction of statistical MT technology. According to the final report, "[r]esults were quite positive when measuring quality in terms of objective metrics and rating by professional users, with significant portions of MT output deemed of sufficient quality to reach professional standards through minimal to medium post-editing effort" (Del Pozo, 2014: 40).

MT has been a topic of discussion in the area of AD too. Fernández-Torné and Matamala (2016: 64) have compared MT-generated and post-edited descriptions against human scripts from English into Catalan, to find that "the objective post-editing effort is lower than creating it ex novo. However, the subjective effort is perceived to be higher". In another study, Fernández-Torné (2016) has investigated the inclusion of MT systems in the creation of AD, evaluating the output with eight different scores, to reach the same conclusion.

With the development of MT systems and the rise of neural MT, more is expected to come in the field of AVT, as neural MT seems to understand language mechanics much better than a statistical engine. From building on grammatical and syntactic rules and word sequences, neural MT translates whole sentences rather than parts that are later connected, thus using a broader context. Being a recent development, the mechanics of neural MT have not yet been fully explained by researchers but it can be briefly described as the process of an encode-decoder architecture that is based on a neural network and pays iterative attention to relevant parts of the source sentence by going back to previous outputs, very much like human translators do. For those interested in gaining greater knowledge on the topic, the tutorials by Cho (2015a, 2015b, 2015c) are an ideal starting point.

NMT opens a vast potential in the area of AD since, according to Cho (2015c: online), it can activate an attention-based encoder-decoder model that describes images "by replacing the encoder with a convolutional neural network", as displayed in Figure 4.14, borrowed from Fang *et al.* (2015: 1):

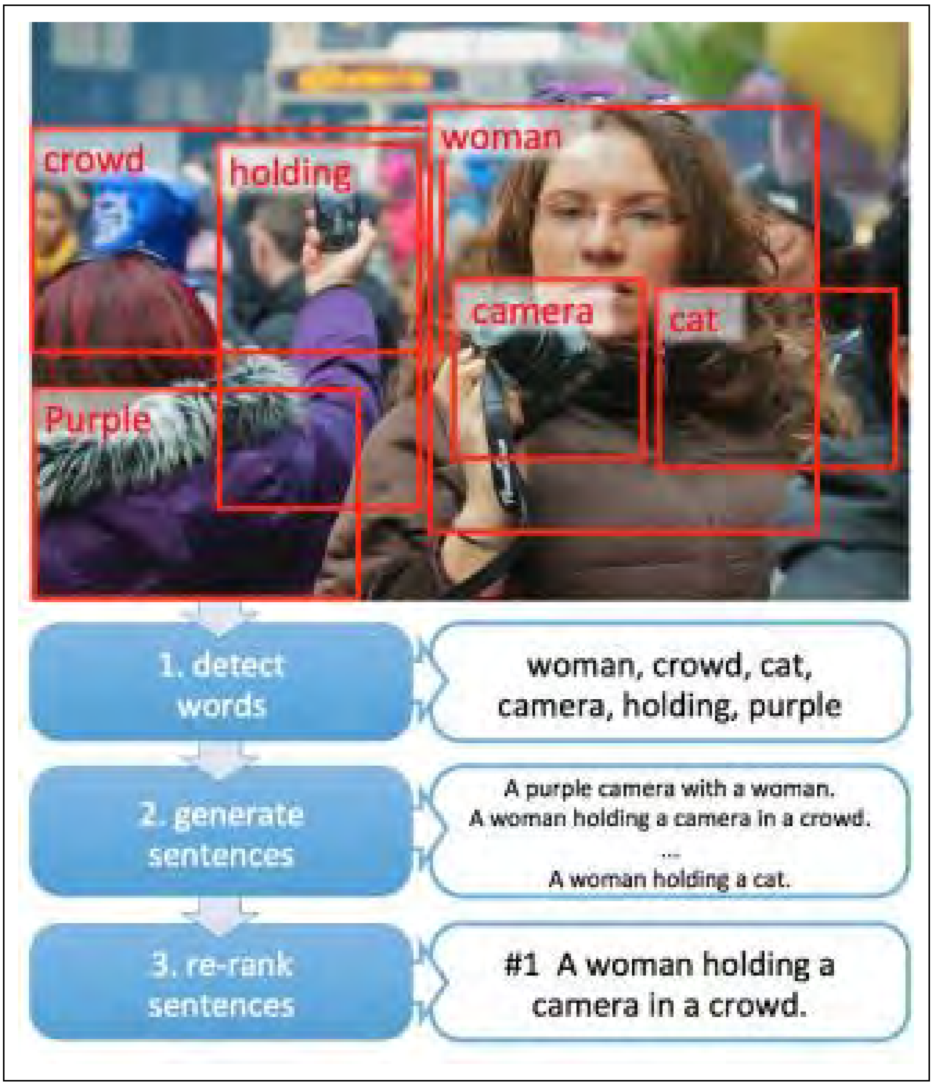


Figure 4.14: Microsoft Research caption generation system pipeline

Authors like Donahue *et al*. (2014), Karpathy and Li (2014), Kiros *et al.* (2014), Mao *et al.* (2014) and Fang *et al.* (2015), have all contributed to these developments and the opportunities for AD in instructional settings appear to be limitless. Yao *et al.* (2015) have integrated temporal structures of video on the decoder side and video description generation, used in IT to refer to automated AD that is created based on automatic detection, has also been proposed by Venugopalan *et al.* (2015). Apart from image captioning and video description, other applications of similar models include neural speech recognition (Hannun *et al.*, 2014), neural parsing of grammar (Vinyals *et al.*, 2014), and supervised memory networks (Sukhbaatar *et al.*, 2015).

The application of MT as an automation measure in access services is so far limited to interlingual practices. Yet, another aspect of language automation is most interesting when considering SDH and AD, i.e. the mechanical reproduction of content through different channels be it from speech to text or from text to speech. In the case of subtitling, speech-to-text technologies include speech recognition systems that convert human voice into text that can then be edited for subtitling or, in some cases, used directly as subtitles by automatically applying certain technical dimensions through the distribution system (e.g. automatic captions on YouTube).

Speech recognition is a time-saving method that has been mainly implemented in the subtitling of live programmes (Holter *et al.,* 2000), usually combined with respeaking (Romero-Fresco, 2011). In this scenario, a respeaker dictates the audio of the programme to a computer with speech recognition technology, which turns it into written text as subtitles. This activity is rather complex as the respeaker needs to be trained in SDH and also be able to reproduce language effectively through paraphrasing, adding or removing speech elements, simplifying complicated structures and generally aiming at producing a comprehensive subtitling flow for the audience (Imai *et al.*, 2002; Imai *et al.*, 2004). Some of the skills the respeaker needs to have resemble those of interpreters.

The combination of speech recognition and respeaking is a solution that makes many of the live programmes accessible in the UK nowadays, and although speech recognition systems require human intervention in order to generate understandable texts, this may change in the future with the development of speaker-independent recognition systems that are “intended to allow multiple users to access a system using voice input” (Beeks, 2007: online). Lambourne (2006), Baaring (2006) and Romero-Fresco (2012) are some of the scholars who have looked into the qualifications of professionals in the area, the typical errors that occur through the use of the services, and the potential of respeaking in online contexts.

The use of speech recognition technologies is not limited to written modes of AVT. One of the research projects that has looked into the potential of speech technologies (recognition and synthesis) and translation technologies (machine translation) is Linguistic and Sensorial Accessibility: Technologies for Voiceover and Audio Description (ALST), conducted between 2013 and 2015. Using OS resources, its main aim was to investigate the potential of certain technological solutions to provide access to audiovisual content to viewers who cannot hear the audio or see the visual content (Matamala 2016). Part of the testing assessed whether speech recognition could be used to automatically transcribe an AD narration in a source language for which no written script was available. This material was subsequently machine translated into a different language and then post-edited by a human agent to enhance the quality of the raw material. The results proved to be inconclusive and the authors call for further experiments with MT engines trained with specific corpora. The scholars’ second objective centred on appraising how visually-impaired users experienced text-to-speech synthetic voices as compared to natural ones when listening to an AD script and their findings corroborate previous research that show viewers’ acceptance of artificial voices, though natural voices are their preferred ones.

Speech synthesis has been discussed in connection with AD as a cost-effective alternative for the provision of AD (Szarkowska, 2011). Fernández-Torné and Matamala (2016) have presented results that show that although human voice is preferred by the end users, synthetic AD is also widely acceptable among visually-impaired audiences, thus opening new opportunities for the application of speech synthesis in instructional and educational settings. It can also be used to create audio subtitles, which, when combined with AD, can provide access to foreign productions for blind viewers (Braun and Orero, 2010).

4.1.4. Templates and fan communities

Being practices with wide social and professional ramifications, access services and AVT are subject to changes instigated by industry and society stakeholders and materialised through technological means. The role of templates and fan communities are explored in the following pages.

Templates, or timecoded master subtitles that are used for subtitling into a variety of languages, have been a common feature in the industry since the advent of the DVD and the search for globalisation (Georgakopoulou, 2012). When working with them, the subtitler receives a pre-timed file, either as a file that they can open within a subtitling program to edit the text or in a text format. The use of templates in subtitling has been a point of discussion in the field ever since their emergence in the late 1990s, because of their negative impact on the freedom of the professional subtitler to adjust the times of the subtitles according to the nature of the audiovisual production (Nikolić, 2015).

Despite these criticisms, templates are also used by some companies in the creation of SDH, giving rise to some challenges. Although SDH templates that have been created in a given language, usually English, may share some common characteristics with SDH in other languages, particularly when it comes to synchronisation, the differences can be substantial and subtitlers should be granted the freedom to add descriptions of sounds, music and any additional information that is transferred through the auditory channel, as well as change the positioning and the justification of the text; options that are not possible when subtitlers receive locked templates that do not allow them to edit the timecodes. Even in the case of AD, where templates can be very useful as they primarily specify silences between utterances and sounds, describers need to have the latitude to choose where to fade the soundtrack in order to add more information if necessary, depending on the characteristics of the audience and the target language. Although a cost-cutting solution, due attention needs to be paid to the use of templates in widely varying contexts as they can adversely affect the quality of the final product.

The phenomenon of fansubbing has been studied in the field of AVT from various angles and often within a particular culture (Díaz Cintas and Muñoz Sánchez, 2006; Zhang, 2013; Massidda, 2015; Orrego-Carmona and Lee, 2017). As highlighted by Díaz Cintas (2015: 637), fansubbers seem to continue to operate “within their own *ad hoc* groups, motivated by the ultimate belief in the free distribution on the net of subtitles made by fans for the consumption by fans”. Although often accused by professionals of unfair competition, in the specific case of access services, amateurs play an important role as they often work with material that has not been made accessible elsewhere and contribute to the promotion of these services, as in the case of the Movement of Disabled Artists in Greece. International platforms like Amara and YouDescribe offer the option to add subtitles and descriptions either on material that users upload and edit themselves, or on material for which others have requested SDH and AD.

4.1.5. What the future holds

Given the major technological advances experienced in the filed translation, it is a wonder how termbases and translation memories have not been fully integrated in professional AVT software. It can be argued that the challenges lie in (a) the different architecture of the text editors, (b) the multimodal nature of the audiovisual programme, (c) the absence of appropriate pairs of source and target files, and (d) the associative nature of timecodes and text. It would be interesting to see software that can alienate text from code, align it with the source script and feed it in a memory that can be later consulted through a concordance search. However, the architecture would need to follow a somewhat different logic from that of traditional translation tools, possibly allowing speech search. Also, parsing the source and the target files would require extra effort as it would include isolation of the timecode and definitely user intervention to correct misalignments and removal of unnecessary elements.

Research related to language automation and artificial intelligence offers unlimited opportunities in the way in which relevant solutions can be applied to the creation and distribution of SDH and AD. The evolution of speech synthesis and recognition adds to the value of the two services and to the range of applications they could have. However, these solutions should be implemented with care and without forgetting the instrumental role of the human, in order to make sure that quality is achieved. It is very easy to slip from targeted SDH to mere verbatim, intralingual subtitles and to come up with an unnatural voice in AD that risks negatively affecting the perception of the original material. These matters are discussed in further detail in Chapter 5, with particular focus on educational content.

A potential development, technically feasible though financially challenging, could be the provision of multiple types of SDH and AD, depending on the level of hearing or visual impairment. This would lead to a more user-centred approach to the provision of access services and AVT in general, which was one of the objectives of the HBB4ALL project (http://pagines.uab.cat/hbb4all). Focusing on services provided through Internet Protocol TV, the project explored the potential of user-centred services by offering alternatives for clean audio and AD, audio streams in various languages, customised subtitling services, automatic user interface adaptation, and sign language services.

All the changes taking place in the industry seem to address the same two challenges: the need to cope with the upsurge of access services and the key role that technological solutions can play in this equation. In this context, technology should be seen as an ally in the promotion of these services rather than a threat.

4.2. Assistive Technology

As mentioned in the introduction to this chapter, assistive technology is a means that often indirectly facilitates access to environments, although it also includes aids that are used for rehabilitation purposes. According to the National Institute of Child Health and Human Development (NICHD, 2018: online), rehabilitative technology is a term often used to refer to “aids used to help people recover their functioning after injury or illness”, while AT “may be as simple as a magnifying glass to improve visual perception or as complex as a computerized communication system”. In the context of the present research, AT is not viewed from a rehabilitation perspective and will focus specifically on making content accessible within the environment where it is provided. This section serves as an introduction to the technology and the field of AT in general, and for deaf, hard-of-hearing, blind and visually-impaired people in particular.

4.2.1. The nature and scope of AT

According to the Assistive Technology Industry Association (ATiA, n.d.: online), "assistive technology (AT) is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities", which can include low-tech (e.g. communication boards), high-tech (e.g. special-purpose/dedicated computers), hardware (e.g. positioning devices), computer hardware (e.g. typing tutors), and computer software solutions (e.g. speech recognition software), as well as learning materials and aids (e.g. mind mapping tools), specialised curricular software (e.g. reading software), and various devices (e.g. head trackers) (*ibid.*). In this research project, AT can include any type of software, hardware or aid that assists daily activities, including sense-related actions and skills that facilitate daily routine or work tasks, communication, learning, access to information and entertainment.

Another definition, provided within Section 508 of the Rehabilitation Act of 1973, and in particular the Assistive Technology Act of 1998, refers to AT as, "any item, piece of equipment, or system, whether acquired commercially, modified, or customised, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities" (United States Access Board, 2000: online), thus making a reference to the providers' obligations when producing such technologies for commercial purposes.

Although in the past AT was used to refer to any kind of technological invention that facilitated people's life, nowadays it is almost directly linked to the use of computers and smart or portable devices. Yet, aids like white canes and navigation systems belong to the same broad field of AT. Another point to bear in mind is that AT reaches out beyond its initial objectives and, although, for example, screen readers were originally invented to support blind computer users, they may also serve to improve children's reading skills (Stanberry and Raskind, 2009). As in the case of access services, ATs are constantly evolving and becoming more flexible, useful and widely applied.

Whether AT is part of Information Technology (IT) and/or Information Communication Technology (ICT) is often unclear. To facilitate the distinction between AT and IT, a definition of the latter by the United States Access Board (2000: online) may be useful:

> any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. Information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources.

According to this definition, an electronic tool, like a laptop, can be considered both IT and AT, depending on the context of use. IT and ICT are often used as synonyms, depending on the countries, even though their subject is quite different in essence. According to the online TechTerms dictionary (https://techterms.com), IT "refers to anything related to computing technology, such as networking, hardware, software, the internet, or the people that work with these technologies", while ICT "refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies". Based on these technical definitions, AT can be subsumed within IT and ICT, depending on whether the technology used aims at communication or not, as shown in Figure 4.15:

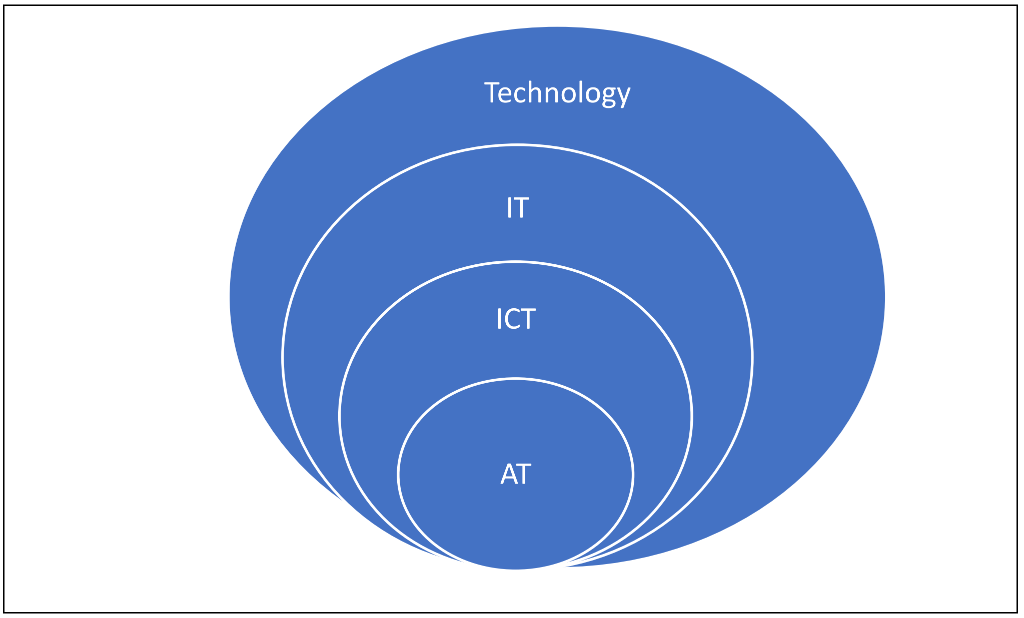


Figure 4.15: Relationship between IT, ICT and AT

For example, a scanner or a printer is IT hardware, while a web browser is ICT software because it is materialised through a communication medium, namely the internet. A screen reader is then AT and ICT, while a personal digital assistant (PDA)[14] used by a person with memory impairment is both AT and IT.

AT's close links to society and everyday life has been the force behind legislation and regulatory attempts to establish its provision in various contexts, especially in education. AT has also become a point of interest for researchers in Disability Studies (Mankoff *et al.*, 2010), and authors like Ravneberg and Söderstörm (2017) opine that AT should be approached under Disability Studies and Society, Technology and Science Studies, since it is closely related to disabled people's lives; a view shared in these pages.

4.2.2. Developments and legislation

The emergence of AT can be traced back to the 1870s with the invention of the audiphone amplifier (Berger, 1976), a hearing fan that operated by bone conduction. The first portable hearing aid was invented in 1876 (Howard, 1998) and significant advances led to the invention of transistor hearing aids in the 1940s, digital hearing

[14] A portable notetaker with speech output and/or refreshable braille displays.

aids and cochlear implants in the 1970s, and frequency modulation (FM) amplifiers in the 1990s.

The first braille typewriter was invented by Franklin Haven Hall in 1892, followed by the prototype of Perkins Brailler, which was first developed in 1941 and produced in 1951 (Seymour-Ford, 2009). In 1928, the American Foundation of the Blind started the distribution of radios to blind people (Edyburn, 2001). The invention of the first electrical synthesizer took place in 1922 (Klatt, 1987), with the first complete speech synthesizer, VODER (Voice Operating Demonstrator), being introduced in New York World's Fair 1939 (Flanagan, 1972; Klatt, 1987). The invention of Thomas Edison's phonograph in 1935 led to the production of the first talking books for blind people a few years later (Edyburn, 2001). Other significant devices were the first electric wheelchair by George Klein in 1950 and speech synthesis in computer operating systems for blind people in the 1990s. Interestingly, in his account on the history of AT, Ludwig (n.d.) makes explicit mention to the emergence of closed captions in the early 1970s.

The development of AT is closely linked to legislation. In the United States, federal legislation has been enacted to increase the access and provision of technology for disabled people since 1988, when the Technology-Related Assistance for Individuals with Disabilities Act was issued. It then became the Assistive Technology Act (Tech Act) of 1998, and was later amended in 2004. Along with the Americans with Disabilities Act (ADA) of 1990, the Rehabilitation Act of 1973, amended in 1992 and 1998, and the Individuals with Disabilities Education Act (IDEA) of 2004, they form the core legislative body of work that has promoted AT as part of the lives of disabled populations.

More specifically, ADA demands the removal of barriers to services that should be available to all and mandates easy access and accommodation requirements for public facilities, as well as employment, state and local government services, transportation, communication, privately owned transportation systems and stores. ADA attacks employment discrimination caused by disability and specifies that an employee who can perform a job with or without reasonable accommodations, including AT, is considered a qualified employee, unless such arrangements cause undue hardship for the employer.

Congress passed the Tech Act in 1998, to support and address the AT needs of disabled people, by offering funds to help states in producing consumer-responsive systems that would allow access to services, products and information through AT.

The Rehabilitation Act sees AT as one of the means to achieve employment and other rehabilitative goals whenever possible, along with training and other types of accommodation. The amended version of 1998 specifically requires that all federal agencies remove barriers to make electronic and information technology accessible, with Section 508 establishing requirements for accessible websites. This stipulation has been crucial, as it paved the way for massive improvements in website architecture.

Another important regulatory step in the USA was the Education for All Handicapped Children Act of 1975, later amended and renamed IDEA, whose aim was to ensure that all students have access to free and appropriate public education and that unique needs are identified and specific goals to meet them are implemented in the general education curriculum. Although not part of IDEA initially, AT was incorporated in the Act in 1990, within the framework of an Individualised Education Programme (IEP), which requires supplementary aids, services and assessment determined by students' needs.

On the whole, Europe has been much slower and reluctant to issue relevant laws and requirements. In 2010, the European Commission adopted the European Disability Strategy 2010-2020 based on the United Nations Convention on the Rights of People with Disabilities and the Disability Action Plan of 2004-2010, which eventually led to the European Accessibility Act of 2015. The European Action Plan aims to improve accessibility for all, following Council Directive 2000/78/EC of 27 November 2000, which established a general framework for equal treatment in employment and suggested ICT as a possible means to promote lifelong learning. The European Disability Strategy specifically set accessibility as one of its main areas of priority, with the aim to make goods and services accessible to disabled people and promote the

AT market. The European Accessibility Act of 2015 aims “to bring coherence between provisions applicable in US and EU rules, given the global character of some products and services” (European Commission, 2015: online) by setting a clear requirement for Member States to define accessibility at a national level within six years, by reference to the requirements of the Directive in the cases where EU law specifies obligations on accessibility. However, standardisation for the provision of AT in particular is still absent in the latest version of the Directive (*ibid.*):

> A number of accessibility standards are under development at European level following standardisation requests by the European Commission to the European standardisation organisations (ESO). These standardisation requests (non-legislative actions) invited ESOs to align the development of voluntary European standards to global developments. The requests relevant to accessibility are: M/376 (2005) on ICT which resulted in a European standard EN 301 549 adopted in February 2014; M/420 (2007) on built environment and M/473 on mainstreaming accessibility following a “design for all” approach in the European standardisation. These standardisation requests were issued after a positive opinion of the Member States in the Committee set up by Article 5 of Directive 98/34/EC and invite the ESOs to develop certain voluntary accessibility standards and to review, when possible, existing standards to give better guidance concerning “design for all” principles.

The European Standard EN 301 549 specifies the functional accessibility requirements applicable to ICT products and services, and describes test procedures and evaluation methodology for each accessibility requirement to use in public procurement within Europe, as well as in the private sector. However, “‘Standard’ means a technical specification, adopted by a recognised standardisation body, for repeated or continuous application, with which compliance is not compulsory as defined in Article 2(1) of Regulation (EU) No 1025/2012” (Council of the European Union, 2016: 28), and as such it needs to be part of the national legislation of the different Member States to have an effect. In a study carried out by Deloitte & Touche (2003) on access to AT in the EU a wide variation was observed among Member States. One of the most common challenges was the lack of user’s participation “in the process of selecting assistive devices, professionalism of prescribers and assessors, product evaluation, and financial rules that ensure that the most appropriate product is provided at an acceptable cost” (*ibid.*: 11). Quality, appropriateness and cost seem to have been the most important factors affecting the provision of AT.

Australia has been the first country outside the EU to announce the implementation of the Standard in public procurement (Cornmann, 2016) and, with the *Accessibility requirements suitable for public procurement of ICT products and services*, the Australian government aims to ensure that websites, software and digital devices are accessible according to EN 301 549.

Another interesting development has been the WHO global disability action plan of 2014-2020, whose objectives are to strengthen and extend AT from the point of view of habilitation and rehabilitation. WHO (2015: 15) identifies significant barriers in the provision of AT, including:

> the lack of prioritization; the lack of policies and plans; high costs and nonexistent or inadequate funding mechanisms; insufficient numbers of appropriately trained professionals; absence of facilities and equipment; and ineffective service models and lack of integration and decentralization of services.

The action plan includes a number of suggestions for international and national partners, including the provision of technical and financial support to Member States and support to identify technical and financial resources for such provision.

From the user's perspective, one of the main problems has been the cost of acquiring AT, which often results from the complexity of the market, as foregrounded by Pastor (2009: 11) in the case of Europe, and illustrated in Figure 4.16:

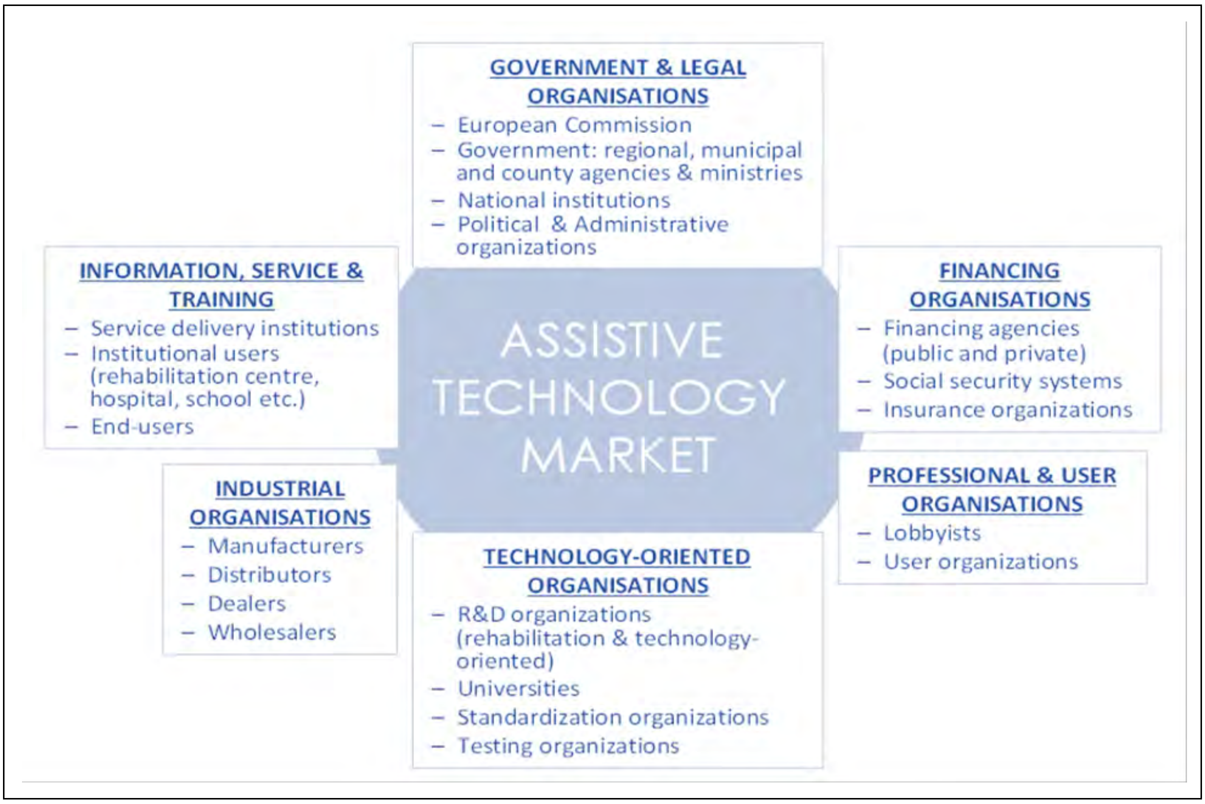


Figure 4.16: Actors of the AT market in Europe

The situation seems to be gradually improving and the greater awareness on AT has led to the free circulation of accessible products and services among markets, as specified in the Directive 2015/0278, thus improving the general availability of AT. At the same time, user-centred initiatives, like Microsoft's Ease of Access Center, allows individuals to set accessibility options for their operating system, without having to purchase dedicated tools, enhancing the provision of accessible solutions.

4.2.3. AT for hearing loss/deafness

People with hearing loss or deafness may use a variety of devices and software that facilitate daily tasks and helps them when communicating and exchanging information. These can be broadly categorised as hearing aids and alerting devices, communication aids, and SDH.

4.2.3.1. Hearing aids and alerting devices

Assistive hearing devices amplify sounds, especially in noisy environments, improving the auditory signal that reaches the user. These include hearing loop systems that rely on electromagnetic energy to transmit sound through a loop which is received by a hearing loop receiver or a telecoil, i.e. a miniature wireless receiver built in hearing aids and cochlear implants. FM systems are also used to transmit amplified sounds through radio signals, which are sent through a microphone, worn by the speaker, to the receiver through a transmitter, and are converted into magnetic signals that can also be received via a telecoil. Infrared systems work in a similar way, with the signal transmitted through infrared light. In this case, the transmitter converts sound into light and beams it to a receiver that reconverts it into sound. Personal amplifiers are also used to increase sound levels and reduce background noise, transmitting sound directly to the listener's receiver (e.g. headset). When the two ends are connected with a wire, the system formed is a one-to-one communicator between the source and the receiver (Heckendorf, 2009).

A variety of alarming devices can be found in the market, most of which provide amplified sound or other ways of access to information through vision and/or vibration, among which alarm clocks with flashers, strobes or vibrators, shake awake clocks, door beacons and chimes, smoke detectors with strobes or vibrators, loud phone ringers, phone flashers, sound signallers, blink receivers and call wireless alerting systems (Figure 4.17). Different versions are available depending on whether the device is for household or work usage, with the latter usually being more compact.

Figure 4.17: FM system, phone beacon, alarm clock with flasher

4.2.3.2. Communication aids

A range of augmentative and alternative communication devices can be used by deaf and hard-of-hearing people to communicate, including amplified phones with adjustable tone and volume, with or without flashers. Teletypewriters, also known as Telecommunication Devices for Deaf People (TDD), and teletype machines (TTY) are no longer widely used as they have been substituted by modern mobile devices like iPads and smartphones. They allow users to type their message, using a keyboard and a text screen, which is then transferred to the receiver in a TDD or through a relay service that converts text into sound when the receiving party is a hearing listener. Voice Carry Over (VCO) telephone was also used in the past by hard-of-hearing people who preferred to communicate using their voice and receive incoming messages in the form of text through a VCO device attached to different phones. Internet Protocol Relay Services offer a similar mode of communication that is materialised over the internet with a mediator, i.e. a communication assistant, who receives the message as text, replies to the calling party and transfers it to the intended recipient.

Nowadays, especially among young people, this technology has been substituted with various types of Video Relay Services (VRS) that allow for both the auditory and the visual channels to be passed through. This is achieved through web cameras and/or videophones so that the caller can also use sign language to communicate with the recipient. In some cases, an interpreter can act as the communication assistant when the recipient does not understand sign language. For continuous conversations with minimal delay, deaf people also use real-time text (RTT), which is used for conversational text, in collaborative settings, and in live captioning, replacing obsolete TDD and TTY systems of the past and allowing rapid message exchanges and even the use of captions that are sent concurrently with voice during phone calls, often with split screen chats. In these situations, real-time captioning provides verbatim representations of spoken discourse and can also be used to allow communication in public places with the help of a stenographer, or a closed captioner, and speech recognition systems. Known as Communication Access Real Time (CART) captioning, it is often found in court rooms, conferences and public events (Heckendorf, 2009). Figure 4.18 depicts some of the communication aids discussed:

Figure 4.18: CART system, TTY, VCO and smartphone

According to the results of a national survey carried out in the USA by Maiorana-Basas and Pagliaro (2014) on current trends in the use of AT, 71.6% of the 278 deaf and hard-of-hearing respondents use smartphones and computers on a daily basis, while TTY and TTD services were reported to be used very rarely. The most common purposes for the use of technology at home were: e-mail exchange (88.1%), text messaging (75.5%) and use of the internet (74.5%), while 40-50% use technology for the purpose of video conferencing (via Facetime, ooVoo, and Skype) and to prepare written documents.

4.2.3.3. SDH

SDH, also known as closed captioning in American English, has been used for many decades as a service to grant deaf and hard-of-hearing people access to audiovisual productions and live events. Yet, its relationship with technology is getting so closer that it can arguably be considered as a form of AT. This is the case of C-Print Pro software, a speech to text captioning technology and service that was developed at the National Technical Institute for the Deaf in the USA and can be used in educational environments, though not exclusively. The difference between this system and CART technology is the fact that the captioner has the additional role of presenting the spoken text on screen while also deciding on the information to be transferred, which usually is not verbatim. The text is then projected on a big screen or sent directly to personal devices.

In this environment, the captioner has to apply formatting to the text, identify speakers with labels, and edit the text, as shown in Figure 4.19. Additional features like message exchange add to the value of captioning in this context and make it more assistive and instructional:

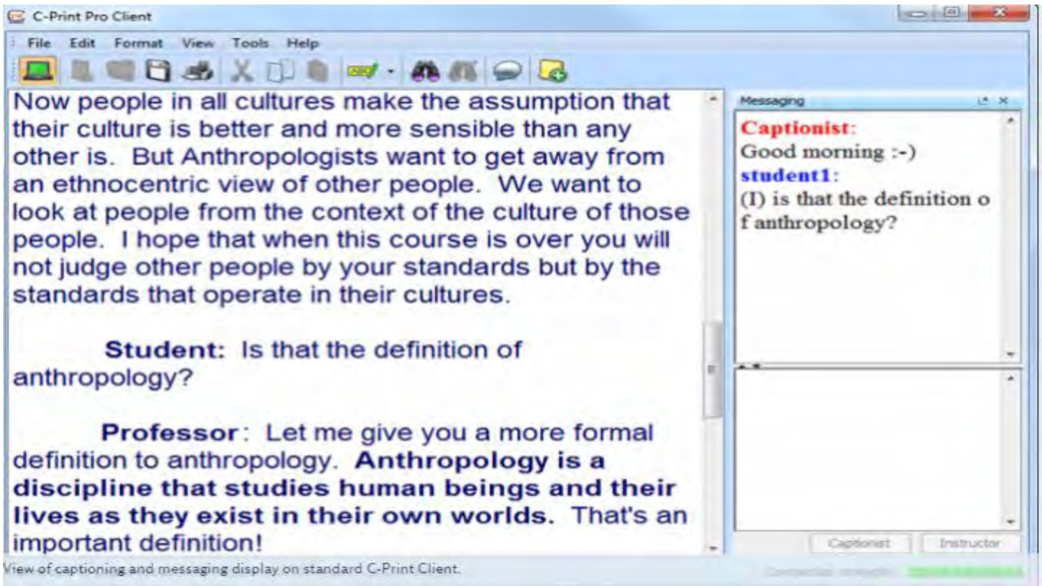


Figure 4.19: Captioner’s interface of the C-Print Pro system

4.2.4. AT for low vision/blindness

People with visual impairments or blindness also use a range of devices and software for the completion of daily tasks and for purposes of interaction. These can be generally categorised as visual and mobility aids, and computer aids,

4.2.4.1. Visual and mobility aids

Low vision or optical devices are often used in a household to help people with visual impairments by using either lenses or large print representations, while devices for blind people are mainly based on vibration, touch or sound signals to indicate a message. These include alerting indicators like alarm bed shakers, telephone and doorbell signallers, liquid level indicators, light detectors, mail alert devices, and motion sensor systems. Item identification tools, such as labellers and tactile markers, as well as colour identifiers, magnifiers and magnifying lamps are also found in the market. Other assistive devices include low vision calculators, clocks, scales, telephones, thermometers, timers, TV remote controls, and watches, as well as talking products, like calculators, clocks, dictionaries, watches, and money identifiers, as illustrated in Figure 4.20:

Figure 4.20: Calculator, folding cane, intensifiers, tactile markers, remote control and reading magnifier

The traditional white cane is also considered AT and various types can be found nowadays, including folding ones and canes with tips for different types of terrain. Obstacle warning devices and electronic travel aids, traditionally based on ultrasonic sensors and often built into modern canes, "send out acoustic waves in the frequency range beyond human hearing ability (typically from 20 kHz up to several gigaherz), and detect the signals bounced back by the obstacles" (Li, 2015), while optical sensing is also used as an indicator of obstacles and in order to facilitate orientation, including distance magnifiers, minifiers,[15] absorptive filters, and image intensifiers (National Research Council, 1986).

A turn in AT for blind people came with Braille in the 19th century. The Braille dot code offered a reading solution for blind people and has been implemented in devices such as tools of measurement, housewares, travel aids, signs, calendars and toys (Figure 4.21):

Figure 4.21: Braille toilet sign, braille key ring, Braille UNO cards

Braille writing and printing devices are widely used, along with Braille notetakers, which are particularly helpful in work environments, though voice recorders are also employed when notetaking is impossible.

A number of arrangements that are normally employed for motor impairments are also useful In the case of individuals with visual impairments. Ergonomic adjustments are generally related to the position of the user, the keyboard setup, the angle of the monitor to eye gaze, the angle of the elbows, the type of chair used, and the distance from the eyes to the monitor. Ergonomic workstations, like the ones shown in Figure 4.22, offer a number of the tools mentioned in this section, as well as accessories that make the use of the computer easier, for example, joysticks, keyboards with large print or high contrast, adjustable screen magnifiers, braille computing systems, and closed-circuit television (CCTV) or video magnifiers:

[15] Devices that help users concentrate on the remaining vision area in cases of central vision loss.

Figure 4.22: Library workstation at the Evgenides Foundation

Communication systems for deaf and hard-of-hearing users can also be made available in ergonomic workstations, including TTY and assistive listening devices.

Guides to make workstations ergonomic tend to address all computer users and cover topics like how to set up screens and peripherals, how to choose the right chair, and how to adjust light, as well as health and safety advice while using computers. They are generally issued by state bodies, educational institutions or employers (Department of Personnel Administration, 2002; Hedge, 2015; Middlesworth, N.d).

4.2.4.2. Computer aids

When it comes to the use of computers, a number of solutions are available, including screen magnifiers and braille embossers, i.e. impact printers that render text as tactile braille cells by means of braille translation software, providing hardcopy braille versions of text files. Optical character recognition (OCR) systems are also used to scan printed text and read it through synthesised voices. Although found as independent devices too, they are nowadays mostly used on computers in the form of software that extracts text from scanned files so that it can then be read by screen readers. The latter recognise text that needs to be read out and produce speech output using voice synthesizers. They are not only used for content retrieval from written text, such as files, books, and webpages, but also for navigation both in the computer environment and the software and tools used on the computer. Due to the nature of computer operating systems, which contain graphic elements and vary in design, screen readers that are installed on computers or provided as built-in elements of operating systems are used through key combinations and they can locate text with specific formatting, read pictures, icons and graphics labels, whilst they can also move and operate the cursor following user commands. An example of a screen reader is Microsoft Narrator, whose settings window is shown in Figure 4.23:

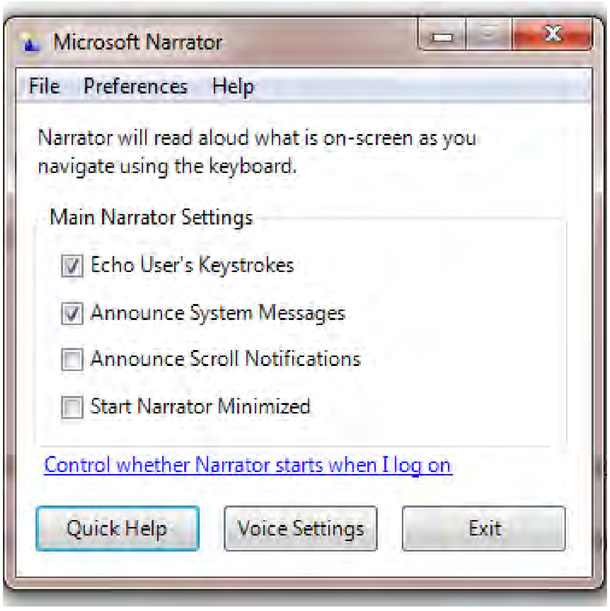


Figure 4.23: Microsoft Narrator settings window

In order to enhance these functionalities, developers like Microsoft apply certain programming standards that facilitate the smooth running of the screen readers. The Microsoft Active Accessibility programme for Windows, for example, offers a set of programming language enhancements and standards that set out reliable methods of user interface elements exposure (Microsoft, 2018). When it comes to the use of screen readers for navigation on the machine and/or the web, it is not always possible to rely on one solution for both (like JAWS and NVDA), because the structure of user interface elements on computers differs from the structure of web content code elements. This has led to the development of screen readers for web content, that work particularly well with certain browsers, as most of the time they are designed with browsers in mind, such as ChromeVox for Chrome and Fire Vox for Firefox.

Dictation with speech recognition is also most beneficial. By means of a speech recognition system, users can give verbal commands to the computer, saving time from using the keyboard and the mouse. Software like Dragon Dictation can also propose suggestions for words and offer the option of incorporating the dictated text directly into other applications like email or social media. Speech recognition software is also used to transcribe audio files so that they can be converted in braille text, a feature that is particularly useful for deaf-blind people.

4.3. Web Accessibility: Legislation

According to the World Wide Web Consortium (W3C, 2015/2019: online), web accessibility means that:

> websites, tools, and technologies are designed and developed so that people with disabilities can use them. More specifically, people can:
>
> - perceive, understand, navigate, and interact with the Web
> - contribute to the Web

Yet, it should not be understood as offering access only to disabled people, since "Web accessibility also benefits people *without disabilities*" (*ibid.*).

As already discussed, with the aim to provide equal access and opportunities to disabled people, the USA and the European Union have introduced relevant provisions in legislation (section 4.2.2). Australia issued *The Guide to Minimum Website Standards* in 2003 "to assist Australian Government departments and agencies to implement the Government's minimum Website standards" (Thatcher *et al.*, 2006: 548), while the first *Government of Canada Internet Guide* was published in 1995. The Ministry of Science, Technology and Innovation in Denmark introduced an IT Policy Plan in 1997 and Hong Kong adopted the Digital 21 Strategy in 2001. France (Law No 2005-102, Article 47), Germany (Federal Disabled Equalization Law of 2011), Ireland (The Disability Act of 2005), New Zealand (Human Rights Amendment Act of 2001), Spain (Law 34/2002 and Law 51/2003) and Italy (Stanca Law No. 4/2004) are some of the countries that have made provisions to facilitate access to information technology and web content for disabled people (Rogers, 2017). Based on the Equality

Act of 2010, all UK websites are required to provide equal access, and the list is expected to grow with the European Directive of 2015.

The results of a survey carried out by Rogers (*ibid*.) on government accessibility standards can be summarised as follows: (a) the latest version on the *Web Content Accessibility Standards* (WCAG 2.0) by W3C is gradually being adopted at a larger scale and becoming increasingly important; (b) the governments of Australia, Canada, France, Germany, Hong Kong, India, Italy, Ireland, Israel, Japan, Netherlands, New Zealand, Norway, Spain and the UK have already adopted WCAG 2.0; (c) in the USA, Section 508 is being refreshed to harmonise it with WCAG 2.0; and (d) the European Commission has drawn on WCAG 2.0 in order to produce a European government standard (EN 301 549).

4.3.1. Web accessibility standards

The following three main web accessibility standards are discussed in the following sections: (1) *Web Content Accessibility Guidelines* (WCAG) 2.0; (2) EN 301 549; and (3) Section 508. They have been chosen because of their legal grounding and their popularity and applicability among countries.

4.3.1.1. Web Content Accessibility Guidelines (WCAG) 2.0

W3C is an international community of developers and organisations, whose aim is to develop standards for web content and technology, with a vision of the web that "involves participation, sharing knowledge, and thereby building trust on a global scale" (W3C, 2017: online). The Consortium was formed in 2012 and adheres to the OpenStand Modern Paradigm for Standards,[16] with the main design principle of W3C being accessibility for all users on all devices, and based on the belief that the Web is a rich communication tool, a repository of data, a source of services and a source of interaction with others.

[16] An open model that aims to improve the development of new technologies for humanity based on the principles of cooperation among standards organisations, adherence to due process, broad consensus, transparency, balance and openness in standards development, commitment to technical merit, interoperability, competition, innovation and benefit to humanity, availability of standards to all, and voluntary adoption (Friedman and Hill, 2016).

The first guidelines, *Web Content Accessibility Guidelines 1.0*, were published in 1999 (W3C, 1999: online) and covered the following content:

- G1. Provide equivalent alternatives to auditory and visual content.
- G2. Don't rely on colour alone.
- G3. Use markup and style sheets and do so properly.
- G4. Clarify natural language usage.
- G5. Create tables that transform gracefully.
- G6. Ensure that pages featuring new technologies transform gracefully.
- G7. Ensure user control of time-sensitive content changes.
- G8. Ensure direct accessibility of embedded user interfaces.
- G9. Design for device-independence.
- G10. Use interim solutions.
- G11. Use W3C technologies and guidelines.
- G12. Provide context and orientation information.
- G13. Provide clear navigation mechanisms.
- G14. Ensure that documents are clear and simple.

Each of these aspects includes a list of checkpoints with assigned priorities, for which conformance is marked by satisfaction levels: A (all Priority 1 checkpoints are satisfied), AA (all Priority 1 and 2 checkpoints are satisfied), AAA (all Priority 1, 2, and 3 checkpoints are satisfied).

The second version, *Web Content Accessibility Guidelines (WCAG) 2.0,* was published in 2008 in order to broaden the range of recommendations to developers and make the web more accessible to a wider range of people with disabilities, including "blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these" (W3C, 2008: online). These guidelines also aim at presenting a harmonising set of international technical standards for accessibility to web content, web browsers, media players and authoring tools. To achieve this, WCAG 2.0 is organised around four main principles:

- *Perceivable* – Information and user interface components must be presentable to users in ways they can perceive.
- *Operable* - User interface components and navigation must be operable.
- *Understandable* - Information and the operation of user interface must be understandable.

- *Robust* - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

(W3C, 2016: online)

Within these principles, more specific guidelines are provided for accessible content:[17]

- G1.1. *Text Alternatives*: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
- G1.2. *Time-based Media*: Provide alternatives for time-based media.
- G1.3. *Adaptable*: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
- G1.4. *Distinguishable*: Make it easier for users to see and hear content including separating foreground from background.
- G2.1. *Keyboard Accessible*: Make all functionality available from a keyboard.
- G2.2. *Enough Time*: Provide users enough time to read and use content.
- G2.3. *Seizures*: Do not design content in a way that is known to cause seizures.
- G2.4. *Navigable*: Provide ways to help users navigate, find content, and determine where they are.
- G3.1. *Readable*: Make text content readable and understandable.
- G3.2. *Predictable*: Make Web pages appear and operate in predictable ways.
- G3.3. *Input Assistance*: Help users avoid and correct mistakes.
- G4.1. *Compatible*: Maximize compatibility with current and future user agents, including assistive technologies.

(*ibid.*)

A substantial part of these guidelines is dedicated to audio and visual means that can make visual and auditory content accessible, with captioning and AD playing a crucial role in this process. First of all, all non-text content is expected to be provided with a text alternative, and where that is not possible, descriptive identification of the content is necessary. Pre-recorded audio-only and video-only media are expected to be provided with captions and AD or media alternative text, presenting equal information to that of the source content in order to conform with Level A. When text is provided as an alternative to media, it needs to be clearly labelled as such. Live captions and AD are also expected to be provided for live audio content in synchronised media, and this is considered Level AA conformance. At AAA Level conformance, sign language should be provided for all pre-recorded audio content in synchronised media, while

[17] See Appendix 2a for the complete list of guidelines in the form of a checklist.

provisions are also made for extended AD, and equivalents for pre-recorded media and live audio-only content are also required.

Other checkpoints that facilitate access for users with sensory impairments include accessible representations of structure and relations between elements of web content, logical and meaningful sequences of content and alternative communication of characteristics that rely on sense reception, for example shape, orientation, visual location or sound. Colour should not be considered the sole visual means of conveying information, and audio should be controllable through mechanisms that allow independent management of volume and functionalities (e.g. start and pause actions). The colour contrast ratio should be at least 4.5:1, text should be resizable, and images of text should be accompanied by text that conveys equivalent information. Functionality should be made available from a keyboard and enough time should be allowed to read and use web content. Navigation recommendations aim at facilitating the smooth operation of screen readers. For example, titles, headings and labels are required to describe the purpose or topic, bypassing of repeated blocks of content is essential, focus order should follow sequential navigation and keyboard focus indicators should be considered in the design of the user interface. Provisions are also made in order for text content to be readable and understandable, and most importantly, programmatically determined, so that different user agents, including AT, can extract and present this information to users in different modalities. Predictable organisation of web content is also required for safe navigation, while input assistance for text is also recommended to avoid and correct mistakes. Finally, web content should be overall robust, i.e. interpretable by AT, by applying markup language correctly so that parsing is smooth, and all user interface components should have a name and a role that is programmatically determined.

4.3.1.2. EN 301 549

The European Standard on *Accessibility Requirements Suitable for Public Procurement of ICT Products and Services in Europe* was produced by the European Standardisation Organisations (ETSI, CEN and CENELEC) in response to a request from the European Commission (Mandate 376). The Standard, a result of collaboration among an international team of experts, representatives from the ICT industry and organisations representing consumers and disabled people, has as its primary objective to provide "a single source, detailed, practical and quantifiable functional accessibility requirements that take note of global initiatives in that field" (ETSI *et al.*, 2015: 15) and which are applicable to all ICT products and services identified in Phase I of the Mandate (TR 102 612) and usable in public procurement. The latest version of the Standards, EN 301 549 V1.1.2, was published in 2015 with some minor improvements on the previous one from 2014. The functional performance statements included in the guidelines are intended to describe the required performance that will enable users "to locate, identify, and operate ICT functions, and to access the information provided, regardless of physical, cognitive or sensory abilities" (*ibid.*: 21). These performance statements covered the following: (1) usage without vision, (2) usage with limited vision, (3) usage without perception of colour, (4) usage without hearing, (5) usage with limited hearing, (6) usage without vocal capability, (7) usage with limited manipulation or strength, (8) usage with limited reach, (9) minimize photosensitive seizure triggers, (10) usage with limited cognition, and (11) privacy (*ibid.*: 22-23).[18]

These general categories are applied collectively to hardware, software and the web in an attempt to satisfy the deaf and hard-of-hearing users as well as those who are blind or have low vision. More specifically, in cases of close functionality, i.e. functionality that is limited by characteristics that prevent a user from attaching, installing or using AT, non-visual access should be offered for visual information in an audio or tactile form. In this context, speech output should be controllable by the user and should provide information that is equivalent to the source content. Provisions are also made for private listening and speaker volume control options, while an important parameter is the requirement that speech output that is provided as non-visual access should be in the same language as the source content. Following the same logic, visual output should be made available where pre-recorded audio content is offered. When it comes to access to media on the web, the European Standard adopts the propositions put forward by the WCAG 2.0 guidelines.

[18] Appendix 2b offers the complete list guidelines in the form of a checklist.

As the guidance to enhance web accessibility is the same as in the WCAG 2.0, the added value of this set of standards lies in the recommendations made for the development of hardware and software, including media players, as well as non-web documents. These standards provide a complete list of considerations that can be implemented in the private and public sectors in order to achieve accessibility.

4.3.1.3. Section 508

The *Section 508 Standards for Electronic and Information Technology* of 2000 seeks to implement section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794d), requiring Federal agencies in the USA to grant equal access and opportunities to disabled employees. The guidelines include technical standards and functional performance criteria. The former apply to software applications and operating systems, web-based intranet and internet information and applications, telecommunications products, video and multimedia products, self-contained/standalone products and desktop and portable computers. The functional performance criteria, which are applied to all these categories, try to guarantee that modes of operation and information retrieval that require user vision, hearing, speech or fine motor control should be made available with at least one mode of operation that does not require them.

The technical standards for web accessibility include requirements for text equivalents for non-text elements, alternatives for media, non-exclusive expression through colour, clear and structured organisation of content, allowing smooth parsing by screen readers, and a number of additional requirements, all of which are included in the WCAG 2.0.[19]

4.3.2. Towards harmonisation

Looking at the three sets of standards, it can be said that WCAG 2.0 recommendations are much more explicit when it comes to web accessibility, whereas EN 301 549 is

[19] Appendix 2c offers the complete list of the guidelines in the form of checklists for functionality and websites and applications, as adopted by the US Department of Veterans Affairs.

more complete in terms of the types of technologies included in the analysis. Despite being the most up-to-date set of standards, its main focus is on procurement and thus provides less information and guidance on how to achieve accessibility by managing web content effectively, as opposed to WCAG 2.0, which contains ample guidance for developers.

Table 4.1 below offers a synoptic account of the main differences between the WCAG 2.0 and the 508 standards:

Proposed (WCAG 2.0 Success Criteria [Level])	Existing 508 Corresponding Provision	Summary	What would Change	Comment
1.1.1 Non-text Content [A]	1194.22(a)	Provides for text alternatives of images and other non-text content, including user interface components	Substantially Equivalent	Proposed standard provides additional detail for 8 common categories of non-text content.
1.2.1 Prerecorded Audio-only and Video-only [A]	1194.22(a)	Provides that prerecorded audio is available in a visible format and that silent animations are available in an audible format		
1.2.2 Captions (Prerecorded) [A]	1194.22(b) and .24(c)	Provides for synchronized captioning of prerecorded video and multimedia.	Substantially Equivalent	Proposed standard distinguishes between live and prerecorded media.
1.2.3 Audio Description or Media Alternative (Prerecorded) [A]	1194.22(b) and .24(d)	Provides for audio description of prerecorded video and multimedia		
1.2.4 Captions (Live) [AA]	1194.22(b) and .24(c)	Provides for captioning of live video and multimedia		
1.2.5 Audio Description (Prerecorded) [AA]	1194.22(b) and .24(d)	Provides for audio description of live video and multimedia		
1.3.1 Information and Relationships [A]	1194.22(e) through (h)	Provides that information, structure, and relationships conveyed visually are available to users of assistive technology Provides that semantic markup be used for headings, lists, emphasized or special text, and tabular data, including the association of data cells with their headers	Substantially Equivalent	Proposed standard is written broadly and is technology neutral, whereas existing standard is specific to HTML image maps and data tables.
1.3.2 Meaningful Sequence [A]	None	Provides for a reasonable and logical reading order when using assistive technology	New	

Proposed (WCAG 2.0 Success Criteria [Level])	Existing 508 Corresponding Provision	Summary	What would Change	Comment
1.3.3 Sensory Characteristics [A]	None	Provides that instructions are not conveyed only through sound, shape, size, or visual orientation	New	
1.4.1 Use of Color [A]	1194.21(i) and .22(c)	Provides that information and prompts are not conveyed only through color	Substantially Equivalent	No technical difference.
1.4.2 Audio Control [A]	None	Provides that there is a way to stop, pause, mute, or adjust volume with audio that plays automatically	New	
1.4.3 Contrast (Minimum) [AA]	None	Provides for specified contrast between foreground and background of text and images of text	New	
1.4.4 Resize Text [AA]	None	Provides tor content that remains readable and functional when the font size is doubled	New	
1.4.5 Images of Text [AA]	1194.21(f)	Provides for the use of text, as opposed to images of text	Substantially Equivalent	Proposed standard provides detail for two situations where images of text are permissible.
2.1.1 Keyboard [A]	1194.21(a)	Provides for functionality when using only the keyboard interface	Substantially Equivalent	Proposed standard clarifies the requirement by emphasizing the method of input, rather than the nature of the output.
2.1.2 No Keyboard Trap [A]	None	Provides that the keyboard focus is not trapped when the keyboard is used for navigation	New	
2.2.1 Timing Adjustable [A]	1194.22(p)	Provides for flexible time limits	Substantially Equivalent	Proposed standard provides additional options to the single approach specified in the existing provision (that the user "be alerted and given sufficient time to indicate more time is required").
2.2.2 Pause, Stop, Hide [A]	1194.21(h)	Provides for user control over moving, blinking, scrolling, and information that updates automatically	Substantially Equivalent	Proposed standard specifies options (pause, stop, hide, or control the frequency) instead of "displayable in at least one non-animated presentation mode", and allows for when animation "is part of an activity where it is essential" (for example, data that is being updated in real time).
2.3.1 Three Flashes or Below Threshold [A]	1194.21(k) and .22(j)	Provides that nothing flashes more than three times per second, unless the flash is very small and does not contain too much red	Substantially Equivalent	Proposed standard takes into consideration the size and hue of the flash.
2.4.1 Bypass Blocks [A]	1194.22(o)	Provides for a skip navigation link or other means to bypass repetitive content	Substantially Equivalent	Proposed standard uses the phrase "blocks of content that are repeated" instead of just "repetitive navigation links".

Proposed (WCAG 2.0 Success Criteria [Level])	Existing 508 Corresponding Provision	Summary	What would Change	Comment
2.4.2 Page Title [A]	1194.22(i)	Provides for descriptive and informative page titles	Substantially Equivalent	Proposed standard is for all types of content instead of just HTML frames.
2.4.3 Focus Order [A]	None	Provides for a keyboard-oriented navigation order that is reasonable and logical Provides that links, form elements, and other user interface controls and components have a reasonable and logical navigation order	New	
2.4.4 Link Purpose (In Context) [A]	None	Provides that the purpose of any link is understandable from its text or context	New	
2.4.5 Multiple Ways [AA]	None	Provides for two or more means to locate content	New	
2.4.6 Headings and Labels [AA]	None	Provides that headings and labels are descriptive	New	
2.4.7 Focus Visible [AA]	1194.21(c)	Provides that the keyboard focus is visually apparent when using the keyboard to navigate	Substantially Equivalent	Proposed standard uses the phrase "indicator is visible" instead of "well-defined on-screen indication".
3.1.1 Language of Page [A]	None	Provides that the default language of content is exposed to assistive technology	New	
3.1.2 Language of Parts [AA]	None	Provides that changes in language are exposed to assistive technology	New	
3.2.1 On Focus [A]	1194.21(l) and .22(n)	Provides that user interface components do not initiate a change of context when receiving focus	Substantially Equivalent	Proposed standard is explicit instead of having the requirement implicit in that "the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues."
3.2.2 On Input [A]	1194.21(l) and .22(n)	Provides that changing the setting of user interface components does not automatically cause a change of context		
3.2.3 Consistent Navigation [AA]	None	Provides that repeated navigational components occur in the same relative order each time they are encountered	New	
3.2.4 Consistent Identification [AA]	1194.21(e)	Provides that components having the same functionality are identified consistently	Substantially Equivalent	Proposed standard is for all types of content instead of just "bitmap images".
3.3.1 Error Identification [A]	1194.21(l) and .22(n)	Provides that automatically detected input errors are identified and described in text to the user	Substantially Equivalent	Proposed standard is explicit instead of having the requirement implicit in that "the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues."
3.3.2 Labels or Instructions [A]	1194.21(l) and .22(n)	Provides for labels or instructions when content requires user input		

Proposed (WCAG 2.0 Success Criteria [Level])	Existing 508 Corresponding Provision	Summary	What would Change	Comment
3.3.3 Error Suggestion [AA]	None	Provides that the system makes suggestions for correction when input errors are automatically detected and suggestions are available	New	
3.3.4 Error Prevention (Legal, Financial, Data) [AA]	None	Provides that when legal, financial, or test data can be changed or deleted the changes or deletions can be reversed, verified, or confirmed	New	
4.1.1 Parsing [A]	None	Provides that significant HTML/XHTML validation and parsing errors in source code are avoided	New	
4.1.2 Name, Role, Value [A]	1194.21(d)	Provides that sufficient information (including identity, operation, and state) about user interface components is available to assistive technology	Substantially Equivalent	Proposed standard uses the phrase "programmatically determined" instead of "available to assistive technology".

Table 4.1: Comparison between WCAG 2.0 and 508 standards (United States Access Board, n.d.:online)

Having considered the weaknesses of Section 508 standards, as compared to the other two sets, the United States Access Board (2015: online) proposed to revise and update, in a single document:

> both its standards for electronic and information technology developed, procured, maintained, or used by Federal agencies covered by section 508 of the Rehabilitation Act of 1973, and its guidelines for telecommunications equipment and customer premises equipment covered by Section 255 of the Communications Act of 1934.

The Board's opinion is that harmonisation with international standards and guidelines will create a larger marketplace for accessibility solutions and attract more offerings, while increasing commercial availability of accessible information and communication technology solutions. Such a tendency to harmonise standards for web accessibility is expected to have a positive effect on the users' web experience, following the conformance of providers and hosting parties, whether they are private or public.

4.3.3. Evaluating web accessibility

A number of tools is available to assist the task of evaluating websites as to their conformance with the various standards. Most of them are freely available on the web and they can be generally grouped under report-generating tools, step-by-step evaluators, in-page feedback evaluation tools, and page transformation tools (W3C, 2016).

Report-generating tools evaluate a page or a website and produce targeted reports on the requirements of the specified set of standards. A-Tester, for example, evaluates web pages in relation to their conformity with WCAG 2.0 and sorts them sequentially or by WCAG 2.0 success criteria, as shown in Figure 4.24 below:

Statements sorted according to WCAG 2.0 Level-AA Success Criteria

1.1.1 All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below. (Level A)

`img` elements have an `alt` attribute. [+] Not true: 3 instances	1.1.1
`img` elements that are the only contents of `a` elements have an `alt` attribute. [+] Not true: 1 instance	1.1.1, 2.4.4
`input` elements that have a `type` attribute set to the text value "search" have an `id` attribute set to a text value. [+] Not true: 1 instance	1.1.1, 1.3.1, 2.4.6, 3.3.2, 4.1.2
`img` elements, excluding those inside `a` elements, intended to display content which forms a standalone graphic that serves no other purpose but to convey a simple meaning have an `alt` attribute set to a text value which describes their meaning. [+] True, if uncontested by the user: 1 instance to be checked manually.	1.1.1
`img` elements, excluding those inside `a` elements, intended to display content which forms a standalone graphic that serves no other purpose but to convey a complex meaning have an `alt` attribute set to a text value which summarises their meaning. [+] True, if uncontested by the user: 1 instance to be checked manually.	1.1.1
`img` elements, excluding those inside `a` elements, intended to display content which forms a standalone graphic that serves a purpose other than being decorative or conveying meaning have an `alt` attribute set to a text value which describes their purpose e.g. tracking image, examination image, etc... [+] True, if uncontested by the user: 1 instance to be checked manually.	1.1.1
`img` elements, excluding those inside `a` elements, intended to display content which forms a standalone graphic that serves no other purpose but to convey a complex meaning are immediately followed by a sibling `a` element. [+] True, if uncontested by the user: 1 instance to be checked manually.	1.1.1

Figure 4.24: A-Tester report

Step-by-step evaluators do not only appraise web pages but they also provide guiding wizards that indicate the parts that require manual investigation. For instance, an image may carry alternative text that can only be reviewed by humans. In this respect, AccVerify is a tool that functions as a guide for users through the process of correcting content and repairing inaccessible elements.

In-page feedback evaluation tools, like WAVE, add markup and icons on the webpage in order to display important elements and identified errors, as depicted in Figure 4.25 below. The user can click on the icons to see warnings, which are usually ranked by severity. Information about errors is often followed by suggestions on how to fix them:

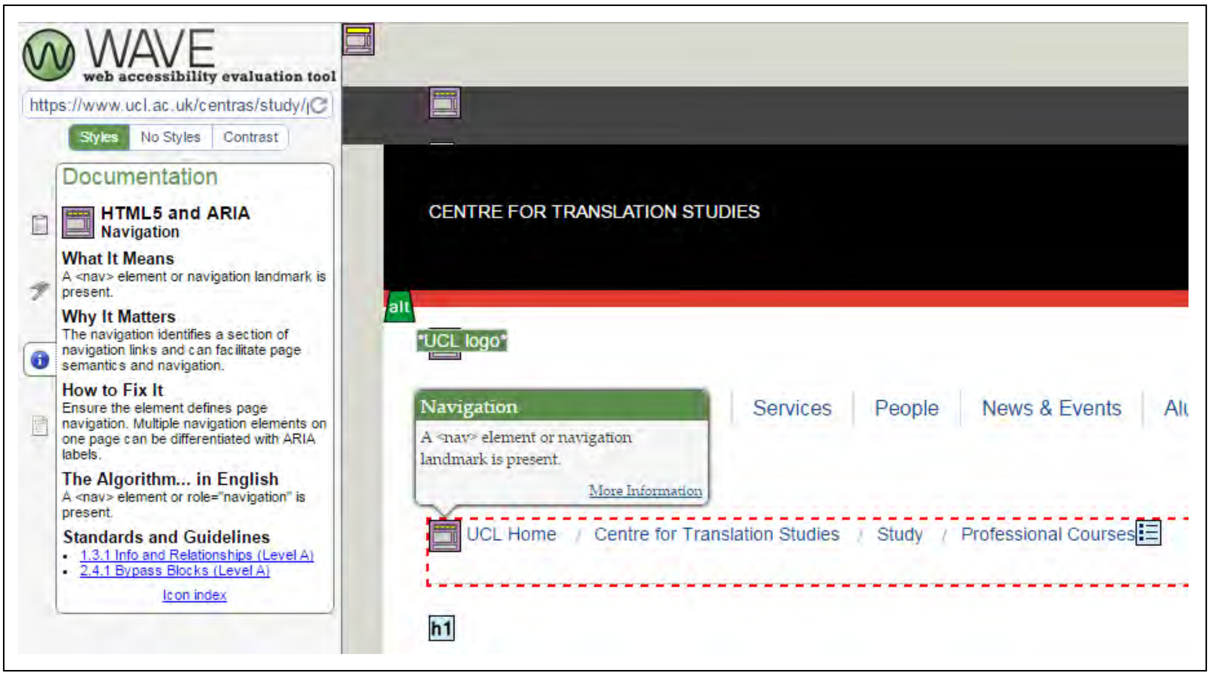


Figure 4.25: Example of WAVE markup

Finally, page transformation tools, like Visolve, allow users to change the display of their websites so as to identify conceptual design issues that make them inaccessible. These tools test websites by transforming them into text-only, as shown in Figure 4.26, or no colour versions and may apply internal screen rendering to check for potential parsing issues:

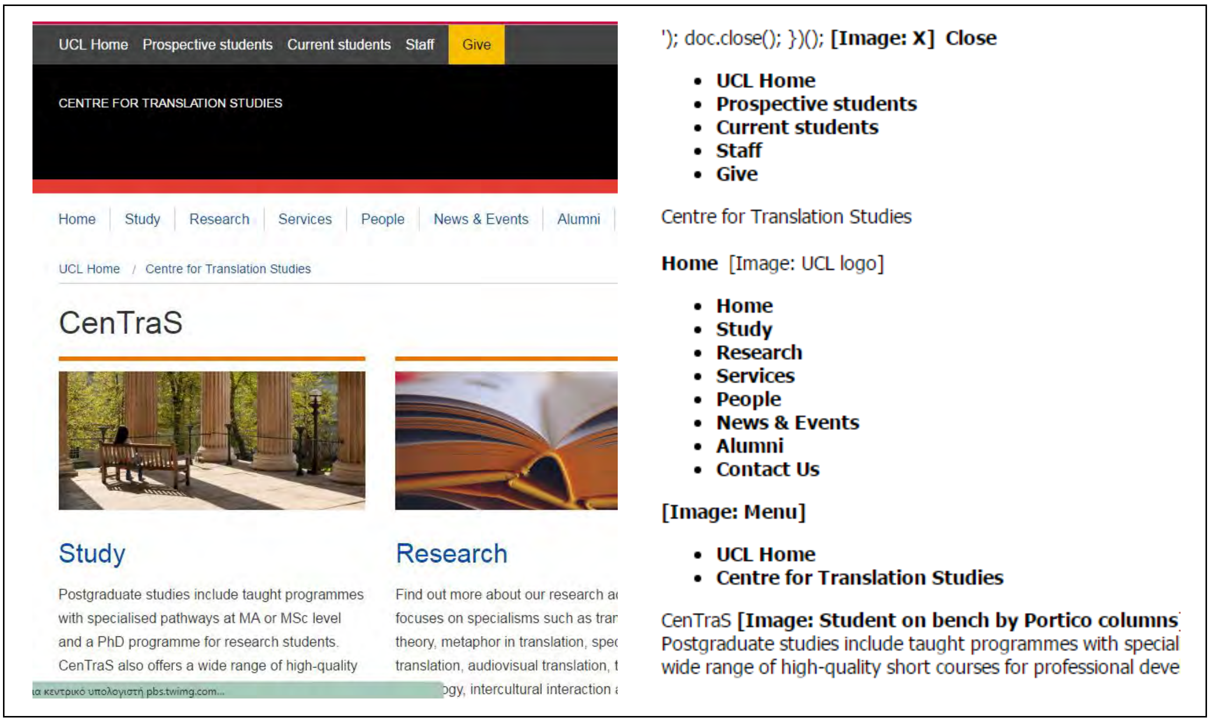


Figure 4.26: Original and text-only view of webpage

One of the issued on this front is the fact that most evaluation tools are not capable of identifying whether alternatives for video and audio media are provided. This process requires manual evaluation and so does the appraisal of the content and the quality of the alternatives. For instance, the website shown in Figure 4.27 claims to comply with WCAG 2.0:

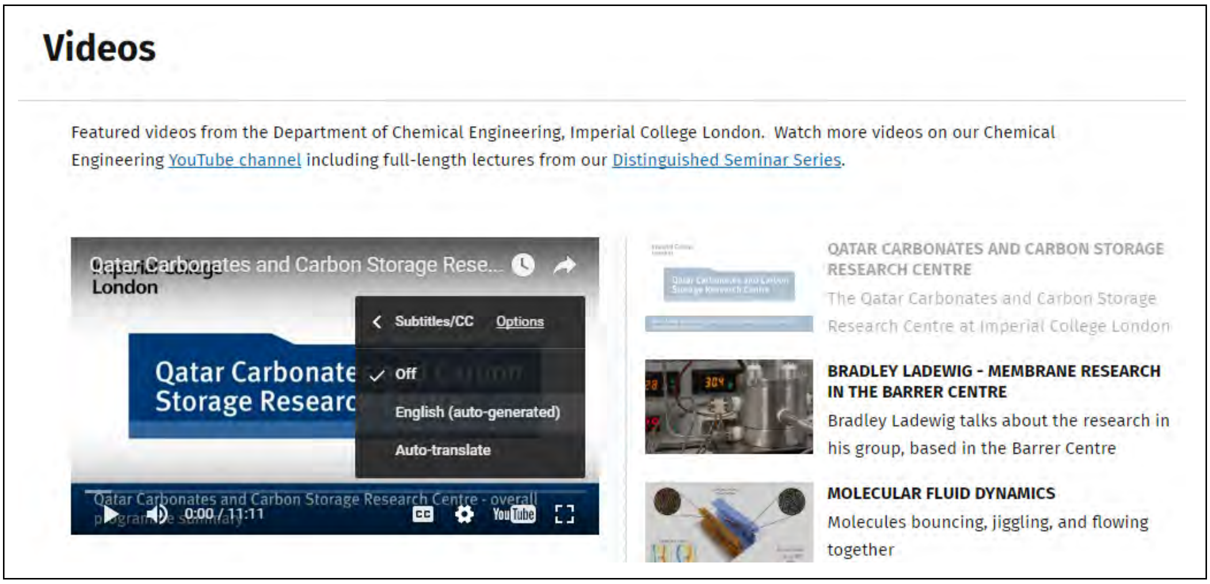


Figure 4.27: WCAG 2.0 compliant website with no alternative to media

According to the Accessibility Checklist provided by Elsevier (N.d.: online), minimum compliance to the Standards includes adherence to Guideline 1.2, whereby one of the points that should be checked is:

> 1.2.3 Provide alternatives for pre-recorded synchronized audio/video – Level A
>
> All video with an audio track should be made accessible to blind users, by providing descriptions of everything that happens.
>
> Descriptions can be provided either textually or as part of the audio track.
>
> **How to test:** Check if video is present. If so, check that textual or audio descriptions are available.

Three evaluation tools were used to check the above webpage, but none recognised the absence of AD to account for the clip. After watching the video and reading the text that follows it, it was concluded that the text could not be considered an alternative, because it does not convey the same information as the source.

Evaluation tools are useful not only for developers but also for end users, who can resort to them to ascertain whether the online services provided are accessible to them.

Chapter 5

Online Education and Universal Design

Now that we have examined access services and AT practices as a means of access in general, as well as the standards and the provisions for their implementation for Web accessibility, in this chapter we aim to bring them together in the light of Online Education and investigate their role in Universal Design for accessible online educational content.

To achieve this, the first section of this chapter will focus on the main characteristics and models of Online Education outlined in recent literature in both the US and the EU, as regions of focus as mentioned in Chapter 1. It is also particularly important for us to examine the modes used in the provision of e-learning on the Web in order to suggest a potential structure for the implementation of access services and AT. Learning theories will also be discussed and related to e-learning.

The second section will focus on disabled learners in particular as well as the characteristics of Online Education that might satisfy their needs. In order to make logical connections between AT and access services, we should ask the question: "How can Universal Design be applied in Online Education in order to accommodate the needs of learners with sensory impairments in particular?"

With the proposed INCLUDE framework outlined in the third section, we will set up a suggested approach to accessible Online Education, while determining the role of AT and access services in the online learning environment. We will then examine the most important and relevant patameters of Online Education and the way in which it can be transformed under the principles of Universal Design. A section will be dedicated to the value of audiovisual content as an educational tool as well as the additional role of access services as an instructional method, while also attempting to list a number of issues related to the provision of access services in this context, identifying conditions for their implementation and areas where standardisation is required.

5.1. Adult Online Education

With the ever-growing presence of the internet in people's lives, there are now many opportunities to reach an ever-increasing number of people across the globe. Indeed, the use of the internet has become a daily routine for many. In 2016, 46.1% of the world population were considered internet users, i.e. people who have access at home through any type of device (Internet Stats Live, 2016). According to Internet Stats Live (2016), in 1995 internet users amounted to less than 1% of the population, while the number increased tenfold between 1999 and 2013, and at the time of writing, it has reached 3,543,339,815 people.

Based on the Babson Survey Research (2015) for the United States, more than one in four students (28%) took at least one distance education course, i.e. a total of 5,828,826 students in 2015, while according to the National Center for Education Statistics (n.d.) of the US Department of Education, a total of 5,750,417 (28.5%) of post-secondary level students attended distance education courses in 2014. Eurostat (2016: online), reports that "[i]n 2015, the proportion of persons aged 25 to 64 in the EU-28 who participated in education or training was 10.7%", with Denmark, Sweden and Finland ahead of the other EU Member States. Finally, the European University Association has published the results of a 2013 mapping survey on e-learning, indicating that 91% of the universities surveyed use blended learning, and 82% claiming to offer online learning resources (Gaebel *et al.*, 2014: 7).

The statistics mentioned above can be used as an indicator of the prominent role played by Online Education in the current pedagogical map of the Western world. However, the various types of Online Education and e-learning that have been developed over the years, and their direct links to rapidly changing technologies that are implemented to enhance learning, make the process of the transfer of classroom-based learning into cyberspace all but simple and straightforward. With the origins of communication through computers dating back to the 1960s (Harasim *et al.*, 1995), the design of the first conference system to 1970 (Hiltz and Turoff, 1978) and the first bulletin boards to the 1970s, today we can see a whole range of technologies being applied in this context. Indeed, this specific type of education is flourishing due to the unlimited opportunities offered by computers and the Web. Harasim (2012) traces the first courses for adults to be delivered completely online to 1981, with undergraduate and graduate courses following in 1984 and 1985 respectively. She also identifies computer-mediated communication (CMC) as the initiating force for Online Education and playing a dual role. This proved to be an interesting emerging topic for students and soon became a field of study in itself, while at the same time developing into a pedagogical process, with students and professors communicating online. A brief account of the main points in the history of Online Education until it took its current shape is illustrated in Figure 5.1, according to Harasim (*ibid*.: 28):

Year	Technology	Online Educational Applications
1861	Telegraph is invented	
1876	Telephone is invented	
1969	ARPANET is invented	
1971/72	Email is invented; Computer Conferencing invented	
Mid 70's		First adjunct mode courses
Mid 70's		Online Communities of Practice (OCoP)
1981		First totally online courses (adult education)
1982		First online program (executive education)
1983		Networked classroom model emerges (Primary and secondary schools)
1984		First totally online undergraduate courses
1985		First totally online graduate courses
1989		First online degree program
1989	Internet launched	
1989		First large-scale online courses
1993	World Wide Web is made public	
1995		First state university adoption
1996		First large-scale online education field trials
1997		First industry-wide adoption
2004		Online education mainstreams

Figure 5.1: Chronology of the approaches to Online Education

5.1.1. Nature and characteristics of Online Education

With its gradual transformation into a global agent for change in education, e-learning has acquired a diverse form. 'Online Education' (OE), 'Web-based education' 'online learning', 'e-learning', 'virtual learning' and 'distance education' are all terms used in the same Web-based educational context, and used interchangeably. Because this represented a hurdle for OE practitioners and researchers, Moore *et al.* (2011) conducted a survey during an educational technology conference, gathering the views of the attendees on the various terminologies in the field. The results showed "great differences in the meaning of foundational terms that are used in the field, but also provide[d] implications internationally for the referencing, sharing, and the collaboration of results detailed in varying research studies" (*ibid.*: 134).

With this in mind, the terminology provided by the International Association for K-12 Online Learning (iNACOL, 2011: 15) will be used as a starting point for the discussion, according to which, 'distance education' is a "[g]eneral term for any type of educational activity in which the participants are at a distance from each other—in other words, are separated in space. They may or may not be separated in time (asynchronous vs. synchronous)". This definition also indicates that 'asynchronous' learning refers to learning that occurs in elapsed time, for example with discussions on online forums, while 'synchronous' learning essentially refers to real-time interaction. We will depart from the iNACOL definition of synchronous learning where physical presence is a prerequisite for its materialisation and adopt Moore and Kearsley (2012) definition as education delivered through interactive communication with no time delay.

According to iNACOL (2011: 7), 'e-learning', 'virtual learning' and 'online learning' are synonymous and refer to "[e]ducation in which instruction and content are delivered primarily over the Internet". However, in many cases, e-learning is understood as taking place completely online, while online learning encapsulates e-learning, as well as blended learning; and in others, online learning is seen as referring to education that is provided solely through the internet. The relevant literature demonstrates that what is often the determining parameter is the term itself. For example, Nichols (2003) defines e-learning as accessed using technological tools that are either Web-based, Web-distributed, or Web-capable, while Ellis (2004) considers more mediums of delivery as options in e-learning than solely the internet, including videotape, satellite broadcast and interactive TV. At the same time, online learning is also seen as an improved version of distance education (Benson, 2002) or as learning that is materialised completely online (Oblinger and Oblinger, 2005).

Based on experience and the definitions given above, for the purposes of this research Online Education will refer to teaching and learning that takes place on the Web, either completely or partially. The latter can also be understood as blended learning, without exclusively defining it, though, as it can also refer to institutional collaborative modes of delivery. The terms 'blended' or 'mixed-mode learning', will be used here to refer to cases where a significant portion of the traditional face-to-face classroom or distance education course is conducted online (Harasim, 2000). However, we would also like to include situations where the Web assists material dissemination in a traditional classroom course. In order to include this parameter in our definition of OE, we can summarise the meaning of the term throughout as follows:

- OE can be materialised completely or partially online.
- OE includes any type of educational practice, activity, assessment and/or material that is delivered fully or partially through the Web.

This type of education can include courses that run completely online with no face-to-face interaction with the tutor, whether via live conferencing or not, types of courses that are used as supplementary educational tools – for example Massive Open Online Courses (MOOCs) – and the use of space on the internet to provide supplementary material. The latter is also called "adjunct mode" (Harasim, 2012: 28). Our scenarios for the prototypes provided in Chapter 7 will therefore include: (a) a course that is provided solely online, (b) a course that is hosted online for the organisation and dissemination of content as supplement of on-site delivery, and (c) an massive open course with public access, aiming to cover all possible content provided online for educational purposes in the context of OE.

5.1.2. Learning theories and Online Education

Gillani (2003) argues that the development and design of online learning sites are based on an understanding of the way in which students learn. The first step in designing learning platforms is, therefore, to evaluate the personal needs and identities of the learners. In order to provide a comprehensive background for the learning theories that are most closely related to Online Education, we will be focusing on theories that are also influential in the field of instructive design. These theories will be presented in chronological order so as to show their evolution, concluding with the most recently developed model. Although designing the context of delivery is not frequently in educators' hands, the way that they organise and deliver their courses can be adapted to the specific needs of their learners and learning theories that are based on the type of course in question and the means of delivery.

5.1.2.1. Behaviourist learning theory

The behaviourist learning theory is mainly the outcome of three main forces that influenced development in the early 20^{th} century after a century of conventional formalised learning: modern science, new communication technologies and the Freudian theory. As a movement, behaviourism rose in opposition to the Freudian theory of unconsciousness by observing facts, and within this framework, learning is based on two simple elements: the stimulus and the response. This school of thought was primarily influenced by Thorndike (1913), Pavlov (1927) and Skinner (1974) and is based on the perception that observable behaviour is what indicates whether the learner has actually learned something and views learning as empirical, observable and measurable.

Due to its concurrence with positivism, in order to be considered a science, behaviourism had to reject subjectivity and embrace rigorous objectivity (Harasim, 2012). This school of thought sees the mind as a black box that is irrelevant to the learning process, so that a response to stimuli can be observed quantitatively, ignoring thought processes generated in the mind (Ally, 2004). Based on behaviourism, the three main characteristics of online learning are reward and punishment, behavioural instructional design and taxonomies of learning (Harasim, 2012: 37). Reward and punishment usually take the form of positive and negative reinforcement, while behavioural design is based on the predictability of the learning outcome by applying techniques that are based on observation. In order to provide a framework for an objective description of learners' behaviour, Bloom (1956) identified six categories of learning objectives by level of difficulty: knowledge, comprehension, application, analysis, synthesis and evaluation.

The first tools to be used in education indicate the way in which the behaviourist approach materialised in the 20^{th} century. The first testing and self-scoring/teaching devices, which were later substituted by computer-assisted instruction based on a drill-and-practice approach, and still in use today, were based on the logic of self-evaluation and correction.

5.1.2.2. Cognitivist learning theory

The weaknesses of the behaviourist approach to learning, i.e. its focus on observation and its inability to explain social behaviours that could not be quantitatively calculated and were thus not taken into consideration, gave rise to the cognitivist learning theory in the mid-20th century, putting the idea of stimulus and response in dispute. This theory embraced operations that take place between the stimulus and the response, which were traditionally rejected by behaviourists as they had strong bonds with cognitive operations, thus constituting non-observable data.

As Ally (2004: 21) explains, "[c]ognitivists see learning as an internal process that involves memory, thinking, reflection, abstraction, motivation, and metacognition". Information in this model is received through the senses and transferred to a sensory store where it stays for less than a second (Kalat, 2007) before it either moves to the temporary (short-term) memory or is completely lost (Figure 5.2):

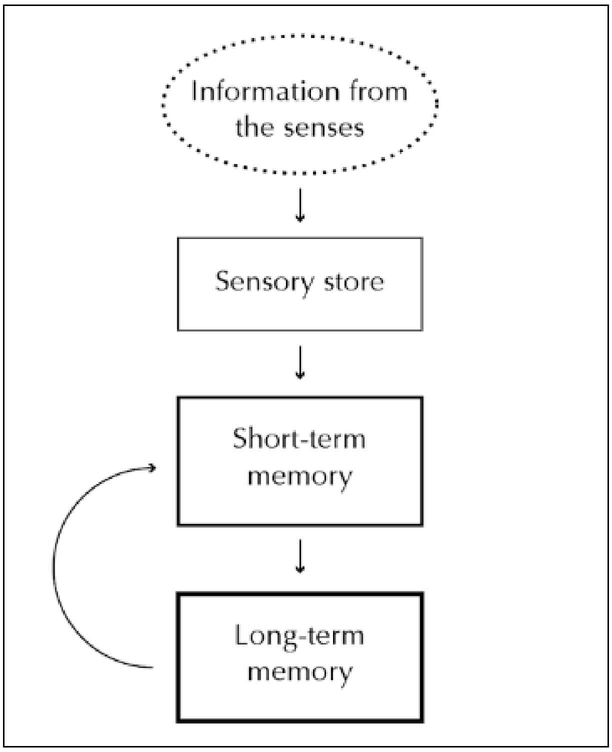


Figure 5.2: Cognitive process of information processing (Ally, 2004: 22)

In this model, the mind operates as a computer where information processing takes place by creating schemata, i.e. mental representations and structures of existing knowledge, in order to compare any new information and recognise concepts. The amount of information that is stored in the short-term memory depends on the attention given while receiving it. If not enough attention has been given, the information does not reach the long-term memory. This means that the existing cognitive structures of the mind are a source for instructional designers, indicating the preferred learning process (Ausubel, 1968).

According to Gagné and Medsker (1996), another characteristic of the cognitivist learning theory involves the taxonomies of learning outcomes that indicate conditions for learning. They identified five categories of learning outcomes, namely verbal information, intellectual skills, cognitive strategies, attitudes and motor skills, which were then translated into equivalent conditions for learning. Based on these, he suggested nine different methods and procedures to facilitate the specific learning processes in order to achieve the relevant learning outcomes: gaining attention, informing the learner of the objective, stimulating the recall of prior learning, presenting the stimulus, providing learning guidance, eliciting performance, providing feedback, assessing performance and enhancing retention and transfer. In this approach, all these factors determine the cognitivist instructional design, and by extension, the OE instructional design.

By the time the cognitivist school emerged, computers had gained wide recognition and thus played a crucial role as technology used for cognitivist learning. The two main technological advancements that Harasim (2012) identifies as having facilitated this approach are intelligent tutoring systems, i.e. tools that provide tutorial services that support learning, and artificial intelligence. With the rapid progress in the development of computer systems, computer-assisted instruction has gained increasingly complex branching capabilities, eventually assuming the form of intelligent tutoring systems that have focused on specific knowledge domains and have even been used in the US Army (Shute and Psotka, 1996). Artificial intelligence, which was based on the potential simulation of the human mind by computer programmes, was a popular topic in instructional design until the end of the 20th century. It was then that, due to technological problems as well as misunderstandings concerning the potential of computers and the very notion of computer intelligence, the cognitivist learning theory lost ground and was consequently substituted by a new European movement – constructivism.

5.1.2.3. Constructivist learning theory

The constructivist approach to education was ground breaking in Europe in the late 1960s, with Piaget (1969) claiming that it represents an epistemological stance, i.e. knowledge and how it is acquired. According to the constructivist learning theory, learners are active in the learning process and are the ones who determine knowledge after receiving and interpreting information. The essence of this approach is that "learners should be allowed to construct knowledge rather than being given knowledge through instruction" (Ally, 2004: 30). In this context, knowledge is seen as "dynamic and changing, constructed and negotiated socially, rather than something absolute and finite" (Harasim, 2012: 60). Another key element of the constructivist learning theory, which stood in opposition to Piaget's cognitive constructivism on an understanding of the world based on biological development, is social constructivism, in which, as Vygotsky (1962/1978) notes, the form taken by meanings is heavily affected by the social environment. For Vygotsky, it is culture that gives learners the cognitive tools needed for their development.

Combining the two stances taken by constructivism, Merizow (1991: 12) describes the learning process as "using prior interpretation to construe a new or revised interpretation of the meaning of one's experience in order to guide future action". He went on to call this type of learning transformational, since it includes reflectively transforming beliefs, opinions and reactions that constitute meaning schemes or transform one's perspectives.

Harasim (2012: 68) summarises the main principles of the constructivist theory of learning as follows: (a) active learning, (b) learning-by-doing, (c) scaffolded learning, and (d) collaborative learning. Active learning involves encouraging learners to participate actively in the learning process, rather than adopting a passive stance to receive information. Papert, the developer of the Logo computer programming language, applied a constructivist learning approach to creating educational software for children. He specifically indicated the difference between 'doing something' and ‘getting something done’ as instructed by a teacher (Logo Computer Systems Inc., 2002). Types of the learning-by-doing approach include problem-based learning, case-based learning and role-play simulation. The third principle of the constructivist theory of learning is scaffolding, based on which learners are supported by a more knowledgeable peer in order to construct knowledge. The knowledgeable peer passes on the necessary context, motivation and foundation to the learner, until he or she can demonstrate comprehension of that knowledge independently. This type of learning views the relationship between instructors and learners as a form of collaboration. However, collaboration, the fourth principle of this approach, can also mean collaboration among learners or with other members of a community, and includes participation and interaction with a common aim, rather than focusing on individual learning objectives. Ally (2004) partly expresses the idea of collaboration by means of interaction from a different point of view, identifying it as a key principle of constructivist learning to promote higher-level learning and social presence, as well as develop personal meaning, within a transformational learning approach. He maps interaction with relevant factors in OE, including collaboration among learners, between learners and instructors, as well as learners and experts in the area of studies, as shown in Figure 5.3:

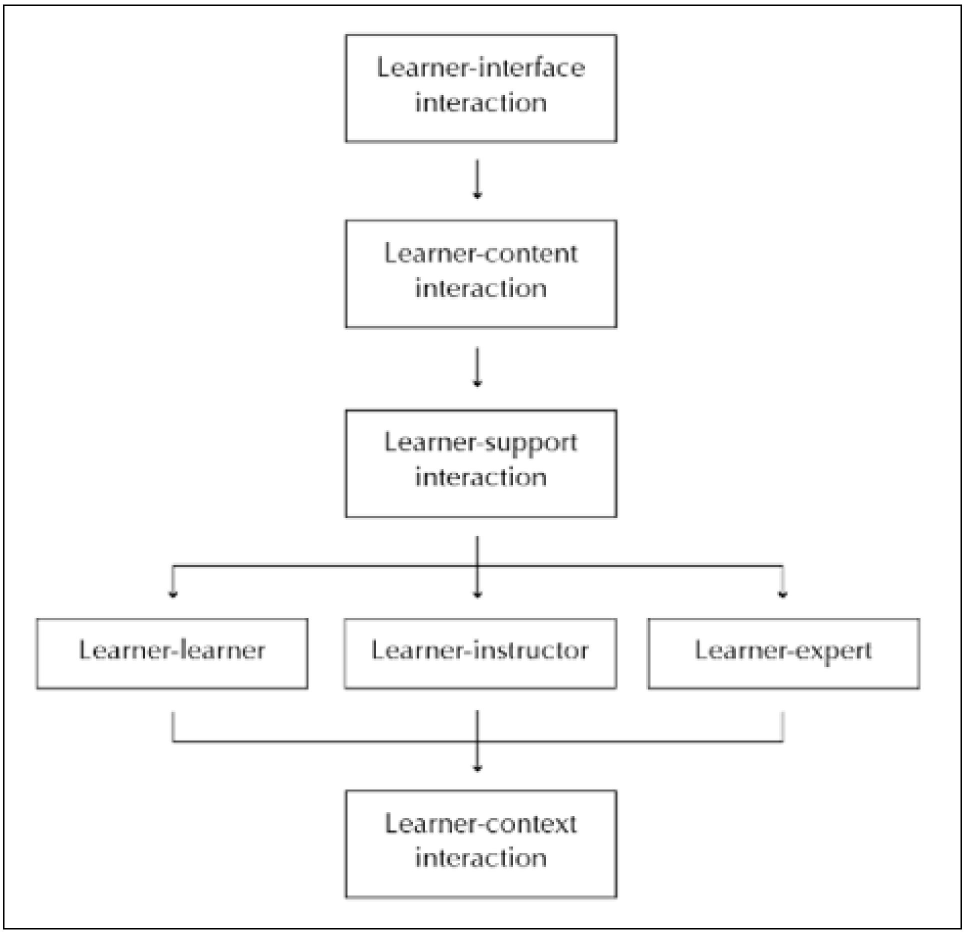


Figure 5.3: Levels of interaction in OE (Ally, 2004: 32)

The constructivist learning theory was accompanied by the development of learning environments or microworlds, i.e. software that allowed learners to link prior knowledge to new knowledge. Yet, the most important technological advance to emerge within the constructivist-learning framework was learning networks or telecollaboration (Harasim, 2012). This gradually led to the design and development of online learning platforms in the 1990s that gained popularity under various names, including ‘virtual learning environment’, ‘computer-supported collaborative system’, and ‘learning management system’.

5.1.2.4. Connectivist or collaborative learning theory

Learning platforms are in essence constructivist in the sense of environments that facilitate user-generated content. Yet, their particular nature gave rise to a new, more interpretive theory. According to Siemens (2004), it was both the advantages and risks of the digital age that brought about this new learning theory. The theory of connectivism proposed by Siemens focuses on networked environments where information and learning needs are constantly changing.

Harasim (2012: 81), however, proposes a more specific theory of Online Collaborative Learning (OCL) that focuses on "collaborative learning, knowledge building, and internet use as a means to reshape formal, nonformal and informal education for the Knowledge Age". Departing from the behaviourist, the cognitivist and the constructivist models that focused mainly on individual approaches to learning, OCL relies on a new mind-set to seek for better learning solutions. The author identifies three distinct models of OE that seem to coincide with our observations in the introduction of this chapter, i.e. Online Collaborative Learning (OCL), Online Distance Education (ODE) and Online Courseware (OC).

According to the Harasim (*ibid.*: 88), OCL:

> refers to educational applications that emphasise collaborative discourse and knowledge building mediated by the Internet; learners work together online to identify and advance issues of understanding, and to apply their new understanding and analytical terms and tools to solving problems, constructing plans or developing explanations for phenomena.

OCL is mostly asynchronous, while synchronous elements can also be offered, and it is also characterised by the use of multimedia. In this type of online learning, the instructor is not only the facilitator of the group discourse, but also the mediator for the course participants.

Online Distance Education – nowadays often used as a synonym to OCL – is based on rather different principles due to its correspondence with older learning methods, and is thus more instructional and less conversational. This distinction is not always clear-cut. Due to the fact that not enough background and/or frameworks are provided for the instructors in adult education, there is a tendency to apply principles of instructional design in collaborative online platforms, with the only change being that of the medium. Romiszowski and Ravitz (1997) distinguish between these two types of learning and argue that distance learning is an instructional paradigm that focuses on a self-instructional mode of asynchronous learning.

Finally, OC is defined by Harasim (2012: 89) as “the use of courseware (pre-packaged content) that a learner accesses online” through an individualised self-paced interaction with the course content. This reflects supplementary course material that is shared through the dedicated educational platform employed by an institution for more restricted purposes.

Now that we have examined the various learning methods that have influenced education in general and that can still be traced in OE regardless of the time when they were developed, we will now aim to link OE with the parameter of disability in order to identify the needs of these particular learners.

5.2. Online Education and Disability

OE can be seen as a tool that offers access to education in various scenarios without the limitations of the physical classroom. Based on a number of characteristics that are specific to OE, it could be said that user-centred approaches, alternative methods of assessment, independent learning, inclusiveness, virtual access and multimodality are aspects that make it a unique opportunity for disabled students, who can then overcome the difficulties encountered in the physical classroom. In 2009, the National Center on Education Statistics in the US estimated that up to 11% of students in higher education had a diagnosed disability, yet as many as 80% of all online instructors did not consider the needs of students with disabilities when designing or instructing their courses (GetEducated.com, n.d.). With the array of possibilities online and the specifications set by Web and ICT accessibility standards and the relevant legislation (section 4.3.1), it looks as though the needs of disabled people are being overlooked in online contexts, although the opposite might have been more logical based on the fact that online learning reduces the cost of accommodating a disabled student in a physical classroom.

5.2.1. Identifying disabled learners' needs

Bearing in mind the definition of disability outlined in Chapter 2, and with DS in mind, disabled students can be identified as students with physical, mental, cognitive, emotional or sensory impairments that are disabled by society in terms of their access to mainstream education. The main characteristics of OE, with factors that add value to it as an accessible educational mode, are user-centred design, flexible assessment, independent studying, virtual access and multimodality of content and delivery. This list is by no means exhaustive, yet we believe that it contains a number of essential factors, with those most relevant to the focus of the current study discussed below.

Independent studying

Independence or independent living, a concept with roots in the US in the 1970s and first expressed in the UK in the 1980s, is one of the most frequently discussed topics in the area of disability and refers to the same equality of choice, control and freedom as every other citizen. This philosophy of life, which is expressed by activists, forms the Independent Living Movement, which is based on the following assumptions, put forward by Morris (1993: 21):

- That all human life is valuable;
- That anyone, whatever their impairment, is capable of exercising choices;
- That people who are disabled by society's reaction to physical, intellectual and sensory impairment and to emotional distress have the right to assert control over their lives; and
- That disabled people have the right to fully participate in society.

Based on the principles of independent living, online courses and content should be designed to be used without the intervention of patrons. In some cases, personalised support may be made available for students to acquire the necessary technology and to learn how to use the technology required in specific OE settings.

Virtual access

The release from the need for physical presence is undoubtedly one of the reasons why OE is so popular worldwide. In the case of disabled students, though, it is of particular importance for a number of reasons. First, universities or other educational institutions do not necessarily provide the necessary technologies to assist learners to study at home. By bringing the classroom to learners' personal computers, they become more independent and receive better quality education. Also, the number of assistive technologies that are available online have simplified communication processes that used to be hardware-driven, for example the use of CCTV instead of live conferencing software, which can come with a number of accessibility options, especially if it is set up and personalised on a personal computer, thus making this mode of education more easily manageable in contexts where computer AT is required and when universities cannot provide complete AT support.

Multimodality

Another advantage of OE is that is supports the provision of material in various formats. Whether used fully or for coursework only, instructors can add alternative types of the same content, giving learners the option of using the one that suits their personal needs best. Apart from setting their own pace and following their own personal style of studying, learners are also relieved from the potential pressure of others not working at their particular speed. An example of multimodality is the delivery of a PowerPoint presentation in the form of slides, as well as an editable file that can be read by a screen reader and as a built-in lesson on the online platform used.

5.2.2. Identifying the needs of blind and deaf learners

Identifying the learning needs of blind and learners with limited vision, as well as deaf and hard-of-hearing learners, is a complex task due to the variations of the levels of visual impairment among people with visual impairments and hearing loss among hard-of-hearing people. It may be the main obstacle, but it is not the only one. Variations may also occur in their preferred way of communication, i.e. their knowledge of Braille and sign language, their competence with computers and their reading and writing skills.

The Virginia Department of Education Office of Special Education and Student Services (2010: 1) identifies the main needs of vision impaired students as being the need for experiential learning, development of alternative skills and learning to access information that is acquired casually and incidentally by sighted learners. In the case of deaf and hard-of-hearing students, the main challenge that educators face is communication and interaction, and, in this case, it is essential to provide all the information through the visual channel.

It is important that the educator aims to accommodate all his or her learners' needs in the classroom or in the online educational environment. Although courses need to be designed with a universal design in mind in order to satisfy all learners, information at an individual level is essential in case further provisions are required.

5.2.3. Rights, legislation and Web/ICT standards

Legislation that recognises human rights and equal participation in society, legislation that makes specific provisions for accessible education, as well as standards that are related to the way in which education is provided, have a dual role in OE. They can act as a useful guide for the design and delivery of accessible courses, but, at the same time, they offer information to users about what to expect from an accessible course in order to make informed decisions.

As we already mentioned in Chapter 4, the US has brought about federal legislation to increase the access and provision of technology for disabled people with the Technology-Related Assistance for Individuals with Disabilities Act of 1988, the Tech Act of 1998 (amended in 2004), the Americans With Disabilities Act (ADA) of 1990 and Section 508 of the Rehabilitation Act of 1973 (amended in 1992 and 1998). Of particular importance in the case of OE is the Individuals with Disabilities Education Act (IDEA) of 2004, which was originally enacted by Congress in 1975 to ensure that children with disabilities receive free appropriate public education. IDEA focuses essentially on transition services from school to further education with an

Individualized Education Program (IEP) team that will help the student to make the changes and requires schools to provide a Least Restrictive Environment (LRE) to obtain education. In that sense, disabled students cannot be denied access to education. At the same time, the provisions made through Section 508 (section 4.3) refer to any online environment, thus incorporating e-learning environments in its field of action too.

The EU Directive 2015/0278, which refers to the provision of digital products in accessible formats by incorporating the proposed EN 301 549 standards, includes all types of digital products that are nowadays used in education, and should thus be respected when determined by Member States at a national level. In terms of legislation, the EC has made several attempts to discuss the topic of OE, and the EU has also made recommendations in that direction, with the most recent publications being: (a) Recommendation 2006/962/EC on key competences for lifelong learning, where digital competence is one of the key points; (b) the EC Report on New modes of learning and teaching in higher education of 2014, where reference is made to OE and the fact that the EU needs to act because there is "an emergent expectation from society for easier access, better quality, more flexible approaches and greater online opportunities in higher education provision" (European Commission, 2014: 14); (c) the Council's conclusions on a strategic framework for European cooperation in education and training, where one of the six priorities set for 2016-2020 is "open and innovative education and training, including fully embracing the digital era" (European Union, 2016: online).

In addition to the legislation and the standards mentioned above, the 1948 Universal Declaration of Human Rights was the first international legal instrument to recognise education as a right. The UNESCO Convention against Discrimination in Education of 1960 expressed the fundamental principle of non-discrimination and equality of opportunity in education. The current UNESCO World Programme for Human Rights Education provides a collective framework for action based on human rights education principles agreed upon by the international community, with the aim of advancing the implementation of human rights education programmes in all sectors (Resolution 59/113A). The Right to Education Project, which was established in 2000 by the first UN Special Rapporteur on the right to education and re-launched in 2008 as a collaborative initiative, has a similar direction. Its essential aims, which include conducting research, sharing information, developing policy and monitoring tools, promoting online discussion, and building capacities on the right to education, are supported by such bodies as ActionAid International, Amnesty International, Global Campaign for Education, Save the Children and Human Rights Watch. The 1948 European Convention for the Protection of Human Rights and Fundamental Freedoms does not explicitly guarantee the right to education, but the right to education is recognised in Article 2 of Protocol 1 to the Convention. Finally, The EU Charter has assembled existing rights that were previously scattered over a range of sources including the European Convention on Human Rights and Fundamental Freedoms and other Council of Europe, United Nations and International Labour Organisation agreements. Its provision of the right to education (Article 14) includes the right to equal access to education and vocational training, as well as protecting the right to compulsory education and the freedom to found educational establishments.

5.3. Universal Design and Inclusion in Education

The notion of inclusion is of major importance in UK legislation, and is often seen as the opposite of ‘social exclusion’. It is a fundamental right of disabled people to be included in society and one that has been established in the UN Convention on the Rights for Persons with Disabilities (UN, 2007). The concept of inclusion draws on the social model of disability that was introduced by Oliver (1990a). Inclusion is seen as the opposite of integration and segregation, in that it is based on the idea of equal opportunities, rather than differentiation based on impairments. As opposed to segregation that refers to placement in any form of segregated educational environment that could lead to a separate life, and integration that refers to the placement of disabled learners in mainstream education with a number of adaptations (The Alliance for Inclusive Education, n.d.: online), “[i]nclusive education is part of a human rights approach to social relations and conditions. The intentions and values involved relate to a vision of the whole society of which education is a part” (Barton, 2010: 93).

Inclusion can be realised through a number of educational practices, among which are the application of effective construction, Universal Design for Learning (UDL), co-teaching, differentiated instruction, curricular accommodation, data-informed decision making and positive behaviour reports, which aim to provide educational outcomes for all, not just for disabled learners. The father of Universal Design (UD), Ronald Mace, came up with the term to refer to architecture and design that is free of barriers and obstacles. It was later adopted by the Disability Act 2005 to refer to:

> 1. The design and composition of an environment so that it may be accessed, understood and used
>   I. To the greatest possible extent
>   II. In the most independent and natural manner possible
>   III. In the widest possible range of situations
>   IV. Without the need for adaptation, modification, assistive devices or specialised solutions, by any persons of any age or size or having any particular physical, sensory, mental health or intellectual ability or disability, and
> 2. Means, in relation to electronic systems, any electronics-based process of creating products, services or systems so that they may be used by any person.
>
> (Centre for Excellence in Universal Design, 2014: online)

UD is based on seven core principles. The first is equitable use, meaning that the design is useful and marketable to people with diverse abilities. The second is flexibility of use, and accommodates a wide range of individual preferences and abilities. The third is simple and intuitive use, i.e. a design that is understandable regardless of a person's experience, knowledge, language skills or level of concentration. According to the fourth principle, the design needs to provide perceptible information, by means of communicating necessary information efficiently, regardless of ambient conditions or sensory abilities. The fifth principle is tolerance of error, and is based on the fact that the design should minimise the hazards and adverse consequences of accidental or unintended actions. The sixth is low physical cost, in the sense that the design can be used efficiently and comfortably and with a minimum of fatigue. Finally, the seventh is related to size and space for approach of use regardless of body size, posture or mobility.

5.3.1. Universal Design for Learning

The multiple applications of the term 'Universal Design for Learning' made it the centre of attention in education too. It was incorporated in the Higher Education Opportunity Act of 2008 and, within this context, it is defined as:

> [a] a scientifically valid framework for guiding educational practice that:
>
> A. provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and
> B. reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.
>
> (US Government, 2008: online)

Recognition, strategic and affective brain networks can constitute answers to the way in which the brain gathers facts and organises them based on the sensory input, plans and performs tasks, and becomes engaged and motivated. These are addressed by UDL by suggesting flexible goals, methods, materials, and assessments that empower educators to meet these varied needs. The main aim of UDL is not to address the average learner, but rather all learners through a flexible design that can be applied at the design stage of a course.

5.3.2 Principles of universal design for learning

Based on the definition provided in the previous section and the main principles of the social model of disability, UDL can effectively accommodate disabled people in educational contexts, with accessible education as its aim. Due to the fact that students differ in terms of learning styles and needs, in the way that they can navigate a learning environment and express their knowledge, as well as react to the stimuli that engage them in educational contexts, UDL is based on three main principles: a) the provision of multiple means of representation, b) the provision of multiple means of action and expression, and c) the provision of multiple means of engagement. The National Center on Universal Design for Learning offers an analytical guide for the implementation of UD in the form of lists of checkpoints (Appendix 3), as well as advice on the design of UD curricula, which is based on the determination of goals, methods, materials, and assessments, as mentioned earlier.

UDL principles have been discussed by Coombs (2010), who suggests that a faculty and staff should normally make decisions only at a course content level. The author identified the potential of the principles and analysed a number of types of content that would fall under the UDL reformation. Dell *et al.* (2015) also applied UDL to online courses by means of a simplified version of the guide, as provided by the University of Arkansas (n.d.) independently of accessibility standards. The simplified version of the guidelines is not a complete representation of the original guidelines found in the form in which they are available today (Figure 5.4), and is primarily based on perception:

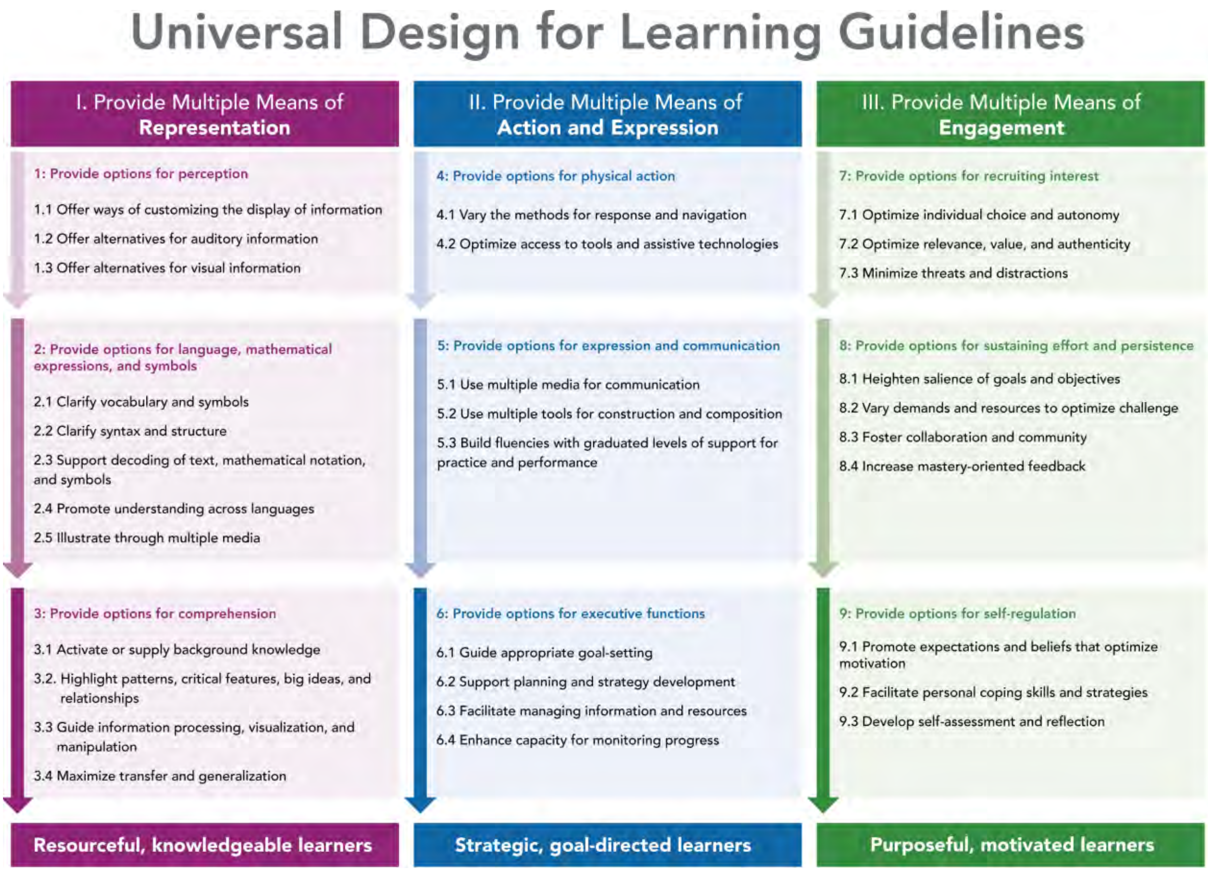


Figure 5.4: UDL guidelines (CAST, 2018)

5.4. Inclusive Universal Design for Accessible Online Content

In the light of the above, we would like to suggest that a combination of Web accessibility standards and the UDL guidelines could facilitate the provision of accessible online courses. Within this framework, an online course can be seen as a steady online environment/structure with content that changes and/or is updated regularly, which can be used with assistive technology and services, and that has a flexible learning methodology. UDL has clear connections with cognitivism, based on research that “has demonstrated that the capability to transform accessible information into useable knowledge is not a passive process but an active one” (CAST, 2009). However, we believe that the guidelines share more similarities with constructivism due to their transformational nature, as well as the fact that the main principles of constructivist learning are (a) active learning, (b) learning-by-doing, (c) scaffolded learning, and (d) collaborative learning.

The present framework is based on Section 508 so as to incorporate the concept of *assistive services*. The standards for Web accessibility applied are borrowed from WCAG 2.0. EN 301 549 V1.1.2 is chosen as the framework for the provision of *assistive tools* in the learning environment. The UDL guidelines will determine the *learning methodology* and the *format* of the course content. Since UDL as a framework has strong bonds with the principle of inclusion and the social model of disability, the current framework satisfies the goal of contextualisation of the outcome of this research in the interdisciplinary area of DS and AVT within the scope of Applied Research, since the framework combines all the necessary tools for accessibility. The UDL framework also satisfies one of the main aims of this research in terms of AVT and access services, as it proves the importance of access services at two levels: perception and comprehension, confirming their dual nature in the online context and allowing for new avenues of research in the field. The framework will hereby be called *INCLusive Universal DEsign for Accessible Online Content* (INCLUDE), and its main concepts will be analysed in section 5.4, with the exception of web accessibility standards and their connections to AT and access services, which have been covered in Chapter 4. Before we move on to the analysis, it is important to reiterate its main components:

a) Accessible educational platform
b) Disability/assistive services
c) Assistive tools
d) Learning methodology

A more detailed account of the proposed framework can be found in Chapter 6.

5.4.1. AT products and services for learning

As we have already mentioned in Section 4.2.1, AT is "any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities" (ATiA, n.d.: online). However, the relevant legislation also includes a definition for assistive technology services:

> The term "assistive technology service" means any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device. Such term includes—
>
> A. the evaluation of the assistive technology needs of an individual with a disability, including a functional evaluation of the impact of the provision of appropriate assistive technology and appropriate services to the individual in the customary environment of the individual;
> B. a service consisting of purchasing, leasing, or otherwise providing for the acquisition of assistive technology devices by individuals with disabilities;
> C. a service consisting of selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing, replacing, or donating assistive technology devices;
> D. coordination and use of necessary therapies, interventions, or services with assistive technology devices, such as therapies, interventions, or services associated with education and rehabilitation plans and programs;
> E. training or technical assistance for an individual with a disability or, where appropriate, the family members, guardians, advocates, or authorized representatives of such an individual;
> F. training or technical assistance for professionals (including individuals providing education and rehabilitation services and entities that manufacture or sell assistive technology devices), employers, providers of employment and training services, or other individuals who provide services to, employ, or are otherwise substantially involved in the major life functions of individuals with disabilities; and
> G. a service consisting of expanding the availability of access to technology, including electronic and information technology, to individuals with disabilities.
>
> (*ibid.*)

This definition highlights an important parameter with regard to AT – that of AT support, which includes everything that should be provided to learners noted above. It is the responsibility of the organisation/institution offering OE to provide AT solutions or guide learners to their acquisition. It is also expected that sufficient training and support be given to learners and the people close to them in order to use the technology successfully. At the same time, reading through the lines, we can see the identified responsibility of the organisation/institution to evaluate the needs of learners with regard to AT before they offer the necessary solutions or direct learners to them. What is interesting in this last case is that the provision of AT services could be considered an essential part of the preparation process on the instructor's side.

Looking at AT more closely for the purposes of education, Bryant and Brian (2012: 11) refer to instructional technology as "any technology that is used as part of the education of an individual", including the presentation of hardware and software, and is considered as a type of technology that can also be used to remediate academic weaknesses. Interestingly enough, the authors include anchoring instruction in the instructional technology category, based on the fact that it provides the educator with innovative ways of instructing in any context. Based on this categorisation of AT and instructional technology, we could possibly consider AD and SDH as forms of instructional technologies (or services) too, as their value as educational tools has been proved through relevant research, especially in second language learning (Palomo López, 2008, 2010; Zárate, 2008, 2010).

Another form of learning technology suggested by Bryant and Brian (2012: 11) is adaptations, i.e. "alterations that are made so that a person who does not possess the requisite abilities needed for task completion can accomplish a task". The authors suggest that AT is a type of adaptation. It could be said that this interpretation of adaptations, which are further categorised into 'remedial' when improving a skill or 'compensatory' when providing access, is not very straightforward, because adaptations seem to be facilities or temporary changes added to existing structures that have not been designed with accessibility in mind. They also argue that adaptations become AT when used for access, i.e. that compensatory adaptations are AT and AT is a type of adaptation, but in the context of rehabilitative adaptations, it is unclear whether they could stand as solutions if they are considered temporary case-based implementations. In brief, it is not clear why adaptations are differentiated from AT, and we suppose that the differentiation factor in this case is the frequency of availability, which seems to be on demand, based on an Adaptations Framework (*ibid.*: 37), which is a useful tool to determine individual requirements for learners. On the other hand, if adaptations were presented as alterations that do not fall under the category of AT but rather mean any type of alteration inclusive of AT, the definition would be more successful, but not necessarily constitute a learning technology.

5.4.2. Platforms for learning and content management

In the particular context of OE, Harasim (2012) makes a distinction between technology that is used as learning tools and technology in the form of learning environments. The author specifically determines tools in this context as being solely Web-based, generic to the use of the Web or education-specific. Within this categorisation, generic tools can be anything from browsers to search engines, while education-specific tools are websites or portals with relevant information and/or resources. Clear differentiation is made between tools and platforms, as the former does not refer to collaborative learning environments. The author argues that "[c]entral to collaborative learning and knowledge building is the need for a shared space for discourse and interaction. This shared space is the heart of an online learning environment that can support OCL" (*ibid.*: 98).

While basically in agreement with Harasim, we would suggest the addition of AT tools in the first category, whether they are functional or both functional and instructional. The weakness identified by the author is a shared view in this research. The need to integrate all technology in one environment is necessitated by the vast number of tools that have become available, as well as dictating the need for a customisable online learning environment that could potentially support different types of tools and resources. And while connecting online resources is programmatically simpler than embedding tools in existing platforms, the latter would admittedly be a revolution in the field.

Online learning environments are Web-based platforms, software or networks that are designed to facilitate learning activities as representations of the physical classroom.

They are often referred to as ‘lived environments’ where users “exercise their powers of perception, mobility and agency within the constraints imposed by the various technologies and learning theories and pedagogies” (Harasim, 2012: 98-99). Online learning environments typically involve dashboards, forums, and chat rooms, and nowadays a number of educational tools, including quizzes, document tools, built-in lessons, activities and more. Students are typically registered on the platforms and enrolled in their intended course. Live conferencing solutions and media players may also be available, while in some cases they also support the transmission of live lectures accompanied by synchronised media such as transcripts and live presentations. In order to examine the components of online learning platforms, we will take a look at two examples that are widely used by universities: Moodle and Blackboard. Our aim is not to compare them but rather to indicate their potential as learning platforms, in particular with regard to sensory access.

Moodle is an open source platform based on principles of constructionist pedagogy, used both in totally online education and in coursework exchange scenarios for facilitation of on-site education, and can support a large number of courses. It allows managers to assign roles to users and manage them effectively, generate reports, run assignments, use chat, polls and forums, create glossaries, lessons, quizzes, surveys, wikis, workshops and add different file formats, including media. An interesting feature of Moodle is its ability to integrate a number of external Web applications, and internal and external pages. Unfortunately, the platform does not offer AD and captioning options, but allows users to add descriptions for all of the added items, including alternative text for images. An accessibility block is available that allows users to change text size and apply different colour schemes. This block also integrates the ATbar (Figure 5.5), an accessibility bar developed by Southampton University, and offers a number of features, including a built-in screen reader.

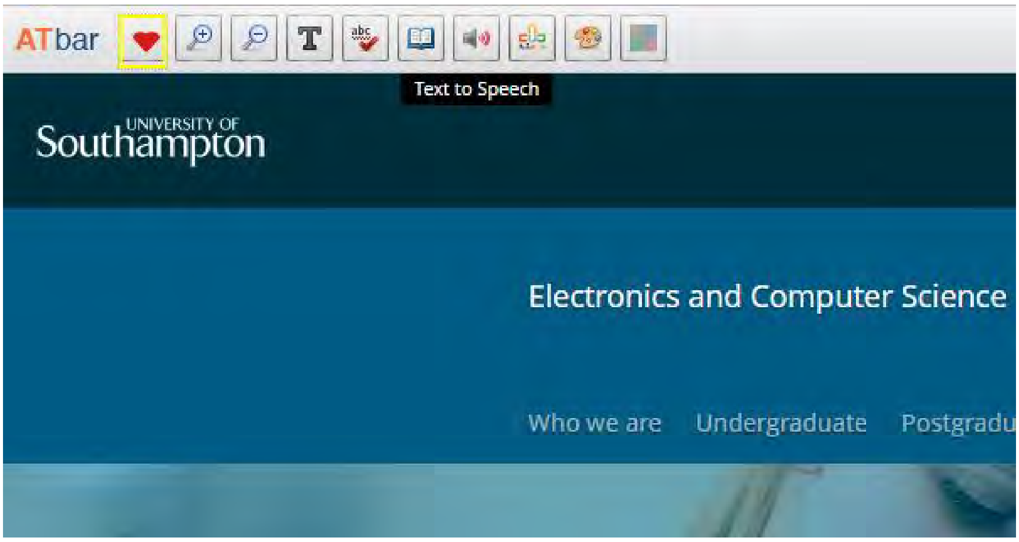


Figure 5.5: ATbar for accessibility by the University of Southampton

Another useful block for accessibility is the Big Blue Button, a media block that allows the recording and playback of live sessions. No blocks were found to the addition of AD and/or SDH/captions. The Content Pages block also allows the creation of content pages based on accessibility standards. Research by Calvo *et al.* (2014) indicated that Moodle was not fully compliant with the W3C accessibility standards, while relevant discussions in the Moodle Accessibility Collaboration Group did not offer relevant information. In 2015, the owners stated compliance with WCAG 2.0 explaining that:

> [t]he Moodle platform is a complex system with many parts. Its code is always evolving. Modules can be enabled and disabled. The interface can be heavily customised using themes and thousands of settings. Actual content can be produced by any teacher or any student. As such it is impossible to say with 100% certainty whether Moodle or any site based on Moodle is absolutely accessible or not. Accessibility is not a state, it is a process of continuous improvement in response to our users and the wider technical environment.
>
> Moodle (2015: online)

Blackboard, on the other hand, makes a clear statement that it is fully committed to delivering the highest accessibility standards. An additional component called Blackboard Ally was incorporated in Blackboard in October 2016. This component offers high levels of accessibility for digital course content, including graphics for positive sciences. Blackboard Collaborate allows users to record the voice in order to add instructions, annotation and commentary to their content and recorded assessments and evaluations. There is also an option to download a recording and upload subtitles for the video. It has a series of features for course content management, such as surveys, evaluations, student activity reports, group management, dynamic content, space on the Blackboard drive, assessment items and more. It comes in different versions, from the most simple Original Course to Ultra Experience, while there is an option to add a user as captioner in a live session for real-time subtitling, to add subtitles and AD to existing videos, audio messages, narrations for presentations, and more. It is, in fact, one of the most complete solutions available for OE.

5.4.3. AT and accessible learning environments

Now that we have examined the various types of AT in Chapter 4 as well as the examples of the platforms in OE in order to access the educational content of online courses, we shall turn to the role played by AT in this context. AT, which promotes the independence of its learners, cannot be regarded solely as an ergonomic and accessible workstation that students can access on campus, which is what used to happen before the advent of many different types of software. In the case of OE, it is usually the user who owns the technology and uses it to access content independently. However, in this scenario, access not only relies on technology, but is also very much linked to the environment itself. AT can only be functional in operable and perceivable environments, and this is the responsibility of the institution or the instructor in question. So, it could be said that AT functions according to the architecture of the platform. The types of AT that can be found on platforms are similar to those discussed in the previous chapter, with the most popular being magnifiers, STT and TTS systems and video conferencing tools. A range of additional tools is available according to the subject being studied, for example for mathematics (Obukowicz, 2009), shapes and Tait graphs, chemistry and data collection. Tools and software of this type have an added educational value, and are either implemented on platforms or used externally.

5.4.4. Access services and accessible learning environments

A number of products, most of which have been developed as a result of research projects in the field of ICT, have emerged in order to provide more inclusive solutions with regard to Online Education and AV material. We will be looking at some of these technologies here, as they tend to target learning contexts. Most of them seem to focus on assisting either deaf, hard-of-hearing and blind students or students with visual impairments. Among the most interesting we find ClassInFocus (2009), DELE (2012), SSTAT (2012), MVP (2011) and the Photonote system (2007). ClassInFocus provides in-class information on one screen, allowing deaf and hard-of-hearing students to engage in group work, catch up with the class to review any information they might have lost and observe sign language interpreters along with the instructor. This project focuses on users' ability to personalise their educational environment by bringing the necessary information to a single screen. DELE (Deaf-centered E-Learning Environment) provides a fully-iconic e-learning environment through which tutors can "define, generate and test e-learning courses for deaf people, which are automatically managed, published and served by the system itself" (Bottoni *et al.*, 2012). The SSTAT (Semantic and Syntactic Transcription Analysing Tool) is a tool that provides accurate lecture transcriptions by analysing and editing Automatic Speech Recognition-generated transcripts. Students can use the MVP (Multiple-View Platform) in class to edit lecture visuals through their own devices (smart phone cameras and tablets) and can also cooperate in groups. The Photonote system combines visual information in the same way in order to provide pre-recorded lectures for deaf and hard-of-hearing students.

Most of the research conducted in the field focuses on the provision of captioning for deaf students, and it seems that this is also the trend with regard to commercial solutions obtained by universities around the world. Among the most prominent commercial solutions in use are Panopto, Tegrity, MediaSite and Echo306. These are all systems which form learning environments that capture video and audio and screen activity with the use of hardware in class. They support captions, whether these are produced by people or machines (speech-to-text technologies) and offer users the opportunity to edit videos, make notes annotated to a video and to have access to further material provided by the instructor, e.g. PowerPoint presentations. Individual open-source solutions that allow providers to create accessible AV material through AD and captioning include Amara (captioning), YouTube (captioning), MAGpie (AD), CapScribe (AD) and LiveDescribe (AD). These are tools rather than learning solutions, which do in fact satisfy the needs of both blind and deaf students when combined by teachers accordingly. Finally, large-scale projects funded by the EU are gradually aiming towards educational solutions whereby AVT and other related practices can be used for language learning, for example ClipFlair (2011-2014) whose aim was to develop an online social network for the provision of material for learning languages through a series of access services (including captioning and re-voicing) and lesson plans that allow learners to practise their speaking, listening, reading and writing skills.

Platforms should always be checked for compliance and instructors should keep in mind that some of the features may not be recognised by automatic validations, thus requiring manual checks. This is also the case with multimedia, as well as with the quality of alternative content used to substitute the audio or the video channel, as we saw in Section 4.3.2.1. Finally, it is not the platform alone that should be accessible. By adding inaccessible content, the whole experience becomes invalid.

5.5. Online Education and Audio(/)visual Content

The value of AV material in education was recognised long before computers existed in class. With the use of video recorders and TV sets, students could watch video tapes with educational content. And, although technology would seem to promote the use of AV material in education, the paradox of different perceptions can be summarised in the following quotes:

> We know the importance of pedagogy in the use of audio-visual aids. We know that the training of good educators – in this case, good users of these didactic means – is a long and difficult matter. We know that we must think about the desperate problem of training teachers. But pedagogy itself is only a means whose end is education. And education, in the long run, is only a contribution – naturally, of capital importance – to the integration of the individual into a given society. It is in this perspective – from their production to their final use – that we must look at audio-visual aids and the various questions which they raise.
>
> (Lestage, 1959: online)

> Given the speed constraints of networks today and the lack of necessary hardware and software available to learners, we advise instructors to use multimedia resources sparingly.
>
> (Haughey and Anderson, 1998: 104-105)

The paradox is not limited to the fact that technology can enhance the use of other than the traditional teaching models. It is the time when these quotes were made that intrigues education specialists, as technology was seen as an aid rather than as an impediment in class in the 1990s. However, different provisions and contexts within educational institutions might have caused people to be discouraged to use audiovisual material, as well as advanced technologies in class. Nowadays, audiovisual material has a dominant position in education. A major factor that has contributed to this is the availability of such material on the Web, as well as new technologies (e.g. laptops, DVD players, etc.) that have made their use and reproduction much easier for educators. With the advent of podcasts, Webinars and video file hosting services online (e.g. TeacherTube), education has found an enormous resource both for students and teachers, whether this is used in class or not.

Buckingham and Scanlon (2003) argue that the value of multimedia as a learning resource that has been widely claimed is largely based on interactivity, as it is assumed to motivate and engage the learner, to provide a user-centred mode of delivery and to encourage autonomy and emancipation. This statement is of particular importance in the case of accessible OE within the parameters of DS, as it is largely based on the emancipation of disabled people in society. At the same time, according to the CPB (2004) research, multimedia have proven to reinforce reading and lecture material, aid the development of a common knowledge base among students, enhance student comprehension and discussion, provide greater accommodation of diverse learning styles and promote teacher effectiveness.

As a term, 'multimedia' can carry many meanings and cover a variety of applications and technologies, which can be found in different contexts. As Coombs (2010: 101) explains, multimedia implies "the simultaneous use of more than one medium, such as audio, text, visuals including images and video", which can have a crucial effect on sensory and other impairments. With regard to the usefulness of multimedia as educational tools on the web, Bailey (2001) and Shank (2005) have warned of its inappropriate uses, which may turn it from tools that can effectively enhance learning and recollection into distracting elements in educational contexts. With this in mind, Bailey (2001) has provided guidelines for its effective use. These guidelines can be summarised as follows: (a) reinforce images and videos with alternative text, (b) reveal information gradually and systematically, (c) avoid the use of animation or motion in the same context as other content. Coombs (2010: 113) suggests three main principles with regard to the use of multimedia in OE: simplicity, brevity and relevance.

5.5.1. The dual role of access services

The main 'problem' with multimedia in OE is the fact that it requires alternatives, i.e. subtitling, voice description, transcription, if it is to be enjoyed by all users. At the same time, for people with learning difficulties the content might be confusing, yet when provided simultaneously in two different modes, learners will maintain attention and focus more easily (Coombs, 2010: 104). The dual role that access services play in the context of OE is a) as AT tools for any kind of audio, visual or audiovisual content and b) as access services for audiovisual material. Having looked into its role as providing access services for Web content, we will now focus on its instructional value and the challenges of its use in this context.

5.5.1.1. Access services as instructional tools in OE

AVT has often been studied in terms of its potential in Education and has mostly been related to second language learning. However, and especially during the last decade, SDH and AD have been examined as tools for Education and have both been associated with Special Education in particular. While SDH and AD have already gained a firm foothold in entertainment, they are only gradually being discovered for people with sensory impairments from the angle of Education, as well as in second language acquisition. Palomo López (2008, 2010) explains that AD is a very useful tool for children's education, yet it is necessary to adjust it to the particular age and general needs of the intended audience. Snyder (2009) discusses the importance of described and captioned media in learning environments with the aim of raising literacy levels. Zárate (2008, 2010) demonstrates the functionality of SDH for deaf children. SDH is greatly valued as a service that advances learners' reading and writing skills in the same way that AD enhances their speaking and listening skills. At the same time – and from a more sociological point of view – SDH bridges the gap between pre-lingual and post-lingual deafness, since it provides a solution for those who use sign language as well as people who have lost their hearing at a later stage in their lives and in many cases prefer not to learn another language, but rather use written texts as a means of communication. Finally, just as SDH and AD have been designed for particular audiences and end up being used by wider groups of people (e.g. the elderly or illiterate), they can cater for more disabilities and learning difficulty-related problems, such as dyslexia and colour blindness.

5.5.1.2. Important decisions for access services

Although it is not the aim of the present research to investigate specific characteristics of the two services, but rather their usefulness as tools in OE, there are a number of other issues that should be discussed, which are closely related to the nature of SDH and AD and the professionals in the field.

According to version 2.0 of the W3C (2008) *Web Content Accessibility Guidelines*, developers need to provide alternatives for time-based media when they provide such material on their websites. These alternatives include equivalents for pre-recorded audio-only and video-only media, captions, conventional or extended/descriptive audio description for pre-recorded media, as well as live captions for live audio content in synchronised media. With this step, SDH and AD are establishing their role as access services in online contexts. Before that, SDH and AD were mostly present on the Web either in the form of amateur services provided by AVT enthusiasts (e.g. fansubbing) or as parts of pre-recorded material whenever providers decided to publish this material on the Web. The HTML5 development made the inclusion of forms of SDH and AD easier for developers. HTML5 is the outcome of the collaboration between the Web Hypertext Application Technology Working Group and W3C. It natively supports video without the need for third party plugins. Its <video> and <audio> elements can be inserted in a website's code for media playback while the <track> element allows authors to specify alternatives or, more correctly, support content for multimedia content.

These developments might seemingly favour SDH, AD and AT, although they have brought about big changes to the nature and preparatory process of the services. The first major change with regard to AT was the emergence of the “open source movement” (Heron *et al.*, 2013: 1), which is based on the general idea that software product distribution should go hand in hand with source code distribution for successful implementation. According to Heron *et al* (*ibid.*), this kind of software includes infrastructure technologies (Apache, MySQL), server and desktop operating systems (Linux), Web browsers (Chrome), desktop application software (OpenOffice) and Web applications (Mediawiki), but its implementation lacks long-term support or comprehensive user documentation and causes issues with regard to data sensitivity. It is also significant that once they are applied on the Web, access services and tools are nowadays picked up by other devices very fast, including smartphones and iPads, as well as other Web products, like the cloud and Web TV, which makes the task even more complex.

The provision of access services is typically based on specific standards that are determined by the audience, the mode of delivery and the existing regulations. While carrying out this research, we came across the issue of a lack of European guidelines that refer specifically to the provision of SDH and AD in higher education. The reason behind this is that although, for example, there are guidelines for the preparation of SDH and AD in the UK (Ofcom, 2017), no specific reference is made to online educational content. Williams (2009) has produced specific guidelines for online content on behalf of the BBC, yet OE is not one of the fields discussed. In the case of the USA, where captioning for educational purposes is widespread, as it is legally enforced, there are specific guidelines for Web captions and AD concerning their medium and content (DCMP, 2016). Yet, the differences between the two continents in the way that these services are provided do not allow for an overgeneralisation of this kind by adopting the US regulations without carrying out relevant reception studies. While the Timed Text Working Group is working to develop W3C Recommendations for media online captioning by developing and maintaining new versions of the Timed Text Markup Language (TTML) and WebVTT (Web Video Text Tracks) based on implementation experience and interoperability feedback, and the creation of semantic mappings between those languages, these guidelines are expected to specify technical aspects rather than subtitling practices for the Web. While it is not the aim in this research to evaluate and suggest best practices, our thoughts about the lack of coherent standards in access services on the Web and its characteristics can be summarised in the following points:

- The decision on the best SDH or AD practice in the case of OE should be determined by its skopos or purpose, i.e. access to educational material.
- Consideration of stylistic and technical parameters that might vary among countries is a prerequisite. But we need to remember that the Web is global and so is OE.
- Reception studies in the relevant context are necessary in order to reach conclusions with regard to the type of SDH and AD that should be offered.
- The incorporation of access services in OE should be in line with global Web accessibility standards.

Drawing on the aspects analysed in Chapter 3, the delay in standardising the way in which SDH and AD is offered on the Web, along with the developments mentioned above has led to the rise of crowd-sourcing, as well as mechanical and synthesised 'on demand' or real-time captioning and AD, two trends that are widely accused of threatening the quality of access services, especially in terms of accuracy and precision. Synthesised AD, STT narration, video description and annotation, are some of the latest developments in the field of synthesised speech and voice recognition that attempt to substitute audience-targeted and humanly produced SDH and AD. Their possibilities, especially with regard to AD, are many and include TTS narration for AD that has been initially produced by the script editor (Kobayashi *et al.*, 2010a) and annotation for the enrichment of videos (ACAV project) with the use of speech synthesis and earcons (i.e. nonverbal audio messages) (Encelle *et al.*, 2011). The process of enrichment involves two user groups: those who enrich videos (enrichment producers) and those who watch the videos (end users). In an attempt to evaluate synthesised video descriptions, Kobayashi *et al.* (2010b) conducted research in Japan and the USA and concluded that they are usually accepted regardless of their linguistic quality, but should be used where the aim is to inform rather that to entertain. This conclusion supports access services as seen within AVT, i.e. services provided for people with sensory impairments in order to satisfy their particular needs.

With regard to subtitling, crowdsourcing has become available through both simple and more sophisticated means. Open source software and platforms hosting audiovisual material, including MAGpie, YouTube and Amara (Universal Subtitles) offer users a simple working environment to create captions for their videos or to acquire captions that have been produced through machine translation and speech recognition. The open availability of subtitles for editing purposes, the lack of conventions that make them address deaf and hard-of-hearing audiences, as well as the lack of identification of their editors can often contribute to the questioning of their quality and effectiveness. At the same time, networks of crowdsourced subtitlers are being built in an attempt to produce fast real-time captioning with minimum latency and maximum precision with hybrid contributors, rather than solely humans. One indicative example of crowd-sourced subtitling is Legion: Scribe, a system that "captions speech on-demand and with less than 3 seconds latency", as the company claims, "by automatically merging the simultaneous input of multiple crowd workers" (Rochester Human Computer Interaction, n.d.: online).

Although these developments seem to undermine the importance of the human factor in the process of SDH and AD preparation, they have led to a number of positive developments and realisations. *It is worth noting here, by way of an aside, that* automatic captioning does not come close to proper SDH with regard to its skopos, since it does not include the conventions that make SDH subtitling for deaf people through the provision of acoustic information as well as the conventions used for the identification of speakers etc. AD is now also treated as a tool for navigation for blind and illiterate people, while new types of AD have made their appearance, adding value to the access service and attracting more researchers. Sade *et al.* (2012: 270) propose a new kind of 'enhanced AD' with the aim of attracting a wider audience, including viewers with visual impairments, and turning AD into a "revenue generation product widely adopted by production companies". Hong *et al.* (2010: 421) suggest a "dynamic captioning approach" with the implementation of a number of technologies, including visual saliency analysis and face detection, for the enhancement of AD with scripts to aid comprehension of the video material. A similar approach is that taken by the Smith-

Kettlewell Video Description Research and Development Center (VDRDC), which advanced video annotation methods for use in various educational settings.

Within this technological boom, the existence and importance of SDH and AD have spread to countries where the provision of access services is at a very low level. However, it is important to protect the purpose behind their use both during their generation and through their provision. It is crucial to differentiate between conventional captioning and SDH and, in the case of synthesised or crowd-sourced captioning, the realisation of the need for a human mediator so that captions can serve SDH purposes. This would play an important role when these methods are suggested for the provision of online educational material. The emergence of automated TTS and STT is affecting the field very much, due to the end users' direct access to these technologies, which are characterised by speed of delivery, yet often of low quality. The rapid expansion of the field makes the standardisation of practices urgent, as the audience's attitude to them is a factor determined by training in the services from a viewer's point of view.

Other important choices that need to be made with regard to SDH in particular are related to the length of the information that appears on screen, the duration of subtitles, the reading speed, the use of colours, positioning, labels and other conventions. Decisions also need to be made as to the fidelity of subtitles to the source in this particular context, i.e. whether subtitles should be edited or verbatim. The greatest challenge as far as AD is concerned appears to be the way in which technology can be implemented so that it retains its skopos and nature, as well as becoming more widely available in educational settings.

Chapter 6

Methodology

After discussing the theoretical background for accessible OE in Chapters 2 to 5, this chapter focuses on the description of the methodology applied in the collection and analysis of data acquired through an online survey, with the aim to gain further insight into the accessibility practices applied by some higher education institutions and the potential barriers to access for learners with sensory impairments. Before embarking on the presentation of the tools and the sample of the survey, it is important to summarise the overall research framework of the current thesis and link the content of this chapter with the theoretical and pragmatic analysis that has been carried out so far.

6.1. Research Methods and Approaches

According to the definitions provided by Gay *et al*. (2012: 7), who present different approaches to research in education, Educational Research is "the formal, systematic application of the scientific method to the study of educational problems". In their own words, scientific method is defined as "an orderly process entailing a number of steps: recognition and definition of a problem; formulation of hypotheses; collection of data; analysis of data; and statement of conclusions regarding confirmation or disconfirmation of the hypotheses" (*ibid*. 5). The authors explain that in the case of Educational Research, the aim is to describe, explain, predict, or control educational phenomena. Considering the extent of the potential practical impact of the results, Educational Research can be said to be formal or basic, which "is conducted solely for the purpose of developing or refining a theory", or applied, which "is conducted for the purpose of applying or testing a theory to determine its usefulness in solving practical problems" (*ibid.:* 16).

With this in mind, and as explained in Chapter 1, the current research falls under the broad field of Applied Education Research, since it recognises a gap in education, i.e. the lack of a theoretical framework to support the construction of holistically accessible online education environments and material, and is applied in that:

a) it does not rely on existing theory solely or aim merely to extend existing theories, but rather intends to build a new theoretical framework to solve the particular problem discussed, and
b) draws from existing paradigms and circumstances in an attempt to link them to a specific goal, with the aim to suggest practical solutions to the problem identified.

More specifically, as presented in Chapter 1, one of the main aims of this study is to investigate the role that subtitling for deaf and hard-of-hearing learners, and audio description for blind learners and those with visual impairments, can play in the provision of holistically accessible online content in higher education. By applying a rights-based approach to disability and UDL principles, this can be achieved by addressing the following objectives:

1. To explore and explain the connections among the various disciplines involved in the research, i.e. DS, AVT, OE, and ICT, as well as some of their most relevant developments and practices.
2. To build a solid theoretical framework that would account for the understanding and explanation of the various parameters that have an impact on accessible online education.
3. To explore empirically how higher education institutions approach accessibility, by conducting a survey distributed among a number of high-profile institutions that provide disability support.
4. To suggest possible routes to enhance accessible online education, based on the survey findings, the case studies and the theoretical conclusions.

One of the main challenges nowadays is the educational gap that derives from the lack of holistically accessible educational environments as well as materials. To try and close such a gap, the four relevant steps identified above need to be followed. Data of different nature, i.e. the relevant literature from each of the various identified fields as well as the information compiled via the survey, have been collected and analysed. The research is not based on a specific hypothesis – i.e. “does a theoretical background exist for the provision of holistically accessible online education? –, which would be too generic and easily answered – i.e. “no” – but rather on a set of questions which can be generated by interrogating the objectives, as listed below:

1. Are there any pragmatic synergies among DS, AVT, OE and ICT that could contribute towards the provision of accessible online education?
2. Can the various parameters of accessible online education identified in these pages be subsumed within a theoretical framework, stemming from the combination of the various fields involved in this research?
3. To what extent do universities apply a framework for accessibility, offer audiovisual translation services towards that end, and provide online courses?
4. Are there any potential routes to enhance accessible online education, based on the survey findings, the case studies and the theoretical conclusions?

Another defining feature of the present research, as also introduced in Chapter 1, is its interdisciplinary nature. Interdisciplinary research examines a topic from more than one angle, as it “draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective” (Klein and Newell 1998: 394). Aboelela *et al*. (2007: 341) describe interdisciplinary research as “any study or group of studies undertaken by scholars from two or more distinct scientific disciplines”. What is important here is the fact that researchers draw from two or more disciplines and link or integrate theoretical frameworks from them in order to build a comprehensive approach to the topic under exploration.

The broad disciplines from which the current research draws are DS, OE, AVT and IT. These knowledge areas are discussed in Chapters 2 to 5, where the focus is on the aspects more closely related to the topic under scrutiny. The ultimate objective is to gradually define a comprehensive approach to accessible online education. Although the original aim of the study was theoretical and limited itself to identifying the potential synergies among these areas and to looking into potential developments from each of them to enhance accessibility in online education, the results eventually led to an applied interdisciplinary output, namely the *Inclusive Universal Design for Accessible Online Content* (INCLUDE) framework, which has been presented briefly in Chapter 5 and is further analysed in Chapter 7.

More specifically, Chapters 2, 3, 4 and 5 focus individually on the disciplines mentioned above, particularly on the characteristics and developments that could be combined in order to construct a joint theoretical framework that could be implemented in studies centred on accessible online education. The conclusions obtained from the analysis of each of the fields together with the combination of principles, standards, outcomes and processes that have been put forward and/or applied within each discipline, have led to the conceptualisation of the INCLUDE framework. The framework, that is first presented in Chapter 5, is one of the outcomes of this theoretical analysis, which is later expanded on in Chapter 7 in the form of standards proposed to educators and institutions interested in providing accessible online education.

To enhance this analysis, it was considered that a number of higher education institutions would be approached in order to identify possible gaps in their provision of access services as well as to find out the kind of solutions being currently implemented. Towards this end, a survey was designed with the aim of collecting relevant information from the participants (section 6.2.1) but also to suggest to them, via some of the questions, solutions that could be applied to help improve the level of access to courses run by their universities.

In terms of research design, Creswell (2012: 541) distinguishes various types of mixed methods designs, as shown in Figure 6.1:

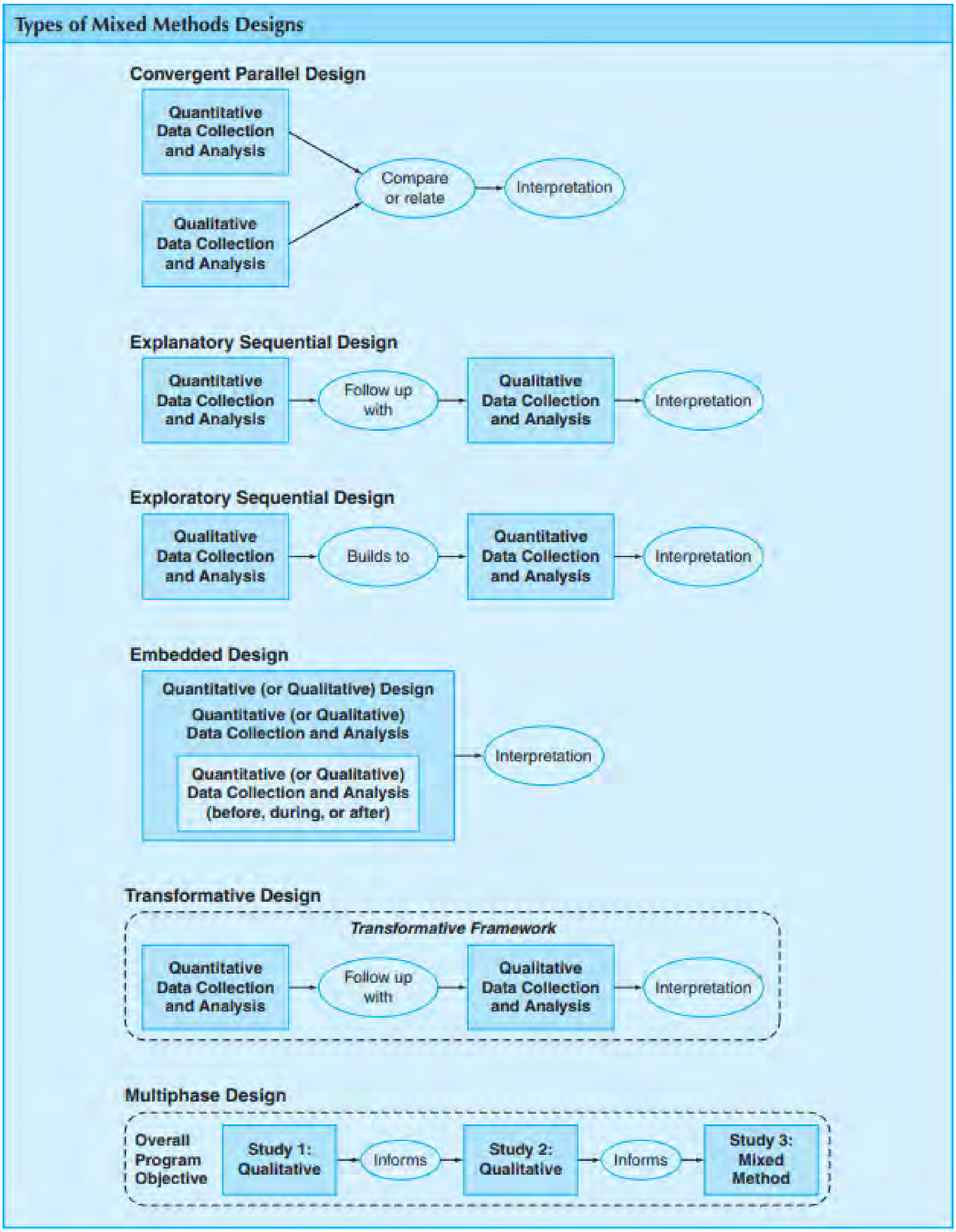


Figure 6.1 Types of mixed methodology designs (Creswell, 2012: 541)

Three basic types of mixed methods research designs are identified: (1) convergent, in which the researcher converges quantitative and qualitative data, (2) explanatory sequential, where quantitative research results are further explained using qualitative research, and (3) exploratory sequential, which is the reverse of explanatory sequential, since a qualitative analysis is followed by further quantitative data collection. These three basic models can be exploited in more advanced ways, namely embedded, transformative or multiphase designs. The embedded mixed methods design involves both mixed and sequential use of qualitative and quantitative data in types of research where data play a supplementary role. The main characteristic of the transformative mixed methods design is that it is carried out strictly on the basis of a theoretical perspective that draws from social justice of power. Given the principles at the base of the emancipatory research approach and the rights-based approach considered in the current thesis, this type of research design could prove also fruitful and will be considered in future research. Finally, the multiphase research design is optimal for the achievement of long-term goals, with both concurrent and sequential strategies applied in specified time contexts, usually characterised by long duration.

The mixed methods model used in these pages can be said to be based on an exploratory sequential design or QUAL-quan, which focuses on qualitative data collection and/or analysis at a first stage of the study. In this sense, qualitative data have priority over quantitative data. The latter can be used as supplementary material and is added at the second stage to interpret or support the findings of the first. When this happens, the model becomes an embedded mixed methods design, whose purpose, as Creswell (2012: 544) explains:

> is to collect quantitative and qualitative data simultaneously or sequentially, [and] to have one form of data play a supportive role to the other form of data. The reason for collecting the second form of data is that it augments or supports the primary form of data.

In addition to the bibliographical overview, the mixed methods approach followed in this study relies on two research tools: an online survey to universities (section 6.2) and a set of case studies (section 6.3). The survey is one of the main tools employed in this research to investigate existing solutions in accessible online education and to gauge the extent to which developments and policies related to accessibility are, either consciously or unconsciously, applied by higher education institutions.

The second research tool adopted in this thesis is a set of three different case studies, exploited here to help explain and concretise the INCLUDE framework and its parameters. Mesec (1998: 383, in Starman, 2013: 31) defines the case study as:

> a description and analysis of an individual matter or case […] with the purpose to identify variables, structures, forms and orders of interaction between the participants in the situation (theoretical purpose), or, in order to assess the performance of work in progress in development (practical purpose).

Case studies have been used in this research to evaluate the implementation of accessibility solutions in the educational online provision of three universities in the UK. Part of this assessment evaluates the actual practice of the chosen institutions against the prototypes suggested in this research, in order to look for practical ways in which access could be further improved. These prototypes, i.e. the preliminary versions of the INCLUDE framework (section 7.2), have resulted from modelling INCLUDE on three different scenarios of online education: (a) a fully online course, with a case study focused on Imperial College London, (b) supplementary material for a course that requires physical presence, tested on a case study from a course offered at University College London, and (c) an open source online course, case studied on one offered by the University of Southampton. The choice of universities and courses was based on the logic of highlighting improvements to courses and higher education institutions that usually cater for disabled students. Ultimately, the objective is not to show that no attempts or solutions are available, but rather to prove that a more complete and informed approach to the design and provision of accessible online courses would contribute to solving the problem of exclusion of disabled students from OE.

6.2. Survey on University Access Services

The aim of the survey was to ascertain the level of accessibility services offered by universities around the world. The objective was not simply to find out about the 'what', 'who' and 'where' provisions, but to pay special attention to the 'how' and 'why', as key dimensions for external validity. This means that, as explained in Chapter 1, the responses provided by the various participants are not analysed statistically since they are not treated as a satisfactory sample to reach any overgeneralisations. Instead, they have gone through a qualitative evaluation that allows the recognition of specific patterns, supported by quantitative data that act as indicators of tendencies in the implementation of access services and assistive technology tools in OE. In short, the analysis of the survey responses is qualitative and explanatory, with some statistical indicators (Chapter 7), since the size of the sample is too small to be able to indicate patterns in the provision of access services in online education, neither geographically nor by means of other parameters, such us the subjects being taught by these institutions. The qualitative analysis of the responses focuses on the 'how' and 'why' of such provisions, which ultimately has the potential of shedding more light on the topic.

6.2.1. Sample

At the preparatory stage, a list of potential universities that could be invited to take the survey was created based on the following three criteria: university ranking, accessibility provisions, and best practices applied. The rankings used to compile the list of relevant universities were the QS World University Rankings, the Center for World University Rankings and the Times Higher Education Rankings. The QS World University Rankings includes a filter on inclusiveness, which was applied during the selection process as an extra measure to define the candidates, with the proviso that inclusiveness refers here not only to accessibility but also to gender balance, low-income outreach and availability of bursaries and scholarships. No relevant filters specifying disability and accessibility were available in the Times Higher Education Rankings or the Center for World University Rankings.

A total of 400 universities were identified in this manner, though only 100 were invited to take part in the survey. These were the universities that, after manual inspection, were found to have a Disability Unit and were thus expected to provide meaningful information. When contacting the different potential participants, the survey was addressed to the Disability Advisory Services or, when known, to members of staff with knowledge of the field, who were clearly stated on the university website. Only complete responses were considered valid. Among the 50 responses received, only 23 provided sufficient information and were selected for the analysis. All respondents were offered a survey completion reward, i.e. a list of recommendations and suggestions that could help them improve accessibility in their university (Appendix 5).

6.2.2. Survey distribution

The survey was distributed in September 2016 and remained open for a period of three months, so that universities would have ample time to complete it. It was designed using QuestionPro, a cloud-based tool that supports the creation of various types of questions. The ultimate aim of the survey was to identify best access practices among top-ranking universities as well as to find out potential barriers in the way in which they provide access to disabled students. Although the survey consists of 28 questions, as described in section 6.2.3 below, the overarching questions to be answered by the survey can be summarised as follows:

1) To what extent do universities apply a framework for accessibility?
2) Do universities offer audiovisual translation access services to their students?
3) Do universities provide accessible online education?

In relation to these three study questions, the three propositions, or micro-hypotheses, which are tested and further analysed in Chapter 7, can be summarised as follows:

1) Top-ranking universities apply an accessibility framework as requested/proposed by legislation.
2) Universities offer (AVT) access services in a standard mode or upon request.
3) Universities provide accessible courses, either in the form of fully online learning courses or in adjunct modes.

A first email was sent on 28th September, with a short description of the survey, information about the context of the research and the researcher, as well as a link to the online survey. A reminder for the completion of the questionnaire was sent in early December. The email included the following information:

Dear sir/madam,

My name is Emmanouela Patiniotaki and I do research on Accessible Online Education. I am contacting you to give you access to an online survey that is being carried out in order to help map accessibility in higher education, with a focus on sensory impairments. Institutions have been selected from all over the world based on existing ranking for Top Universities and Top Online Universities. This means that your institution appears in one of the rankings or has been ranked for inclusiveness and accessibility and received a high score.

Link for the survey: http://www.questionpro.com/t/[PROTECTED]

The survey is short and should be easy to complete as it is targeted to people who hold positions related to disability in higher education institutions. If you believe that another colleague of yours is best suited to fill in the survey, please feel free to forward it to them. The areas covered include the use of assistive technology and audiovisual content as well as your e-learning platform. Some general questions about the overall accessibility of your institution are also included. A QR code is attached to this email for your reference.

We aim to share feedback with the participants once the survey is complete, in order to facilitate further research or to help your institution improve in terms of accessibility. You will also be sent suggestions based on prototypes for the provision of accessible courses. Please see the relevant information on the first page of the survey. Do note that this survey will close on 31st December and only participants who have answered by then will be included in the analysis.

There are comment boxes that you can use if you want to specify the situation in your institution for each of the questions that may require quantitative input.

I would like to thank you in advance for taking the time to fill in this questionnaire. I believe the outcome will be useful for the academic community. Please remember that no personal details, apart from your name and position, are required and these will remain confidential. If you prefer to reply on behalf of a unit/department, you can add the name of the department and the general email address of the department.

Kind Regards,
Emmanouela Patiniotaki
Imperial College London

While administering the survey, several limitations came to the fore. Approaching universities to collect this kind of data proved to be a very challenging task. The main problem identified in the early stages of distribution was the inability to reach individuals within the institutions who could be considered knowledgeable and reliable enough to complete the survey. Following the links offered on the website of the various universities, emails were usually received either by academics who did not seem to feel confident to reply to questions regarding the policies applied in their institution as a whole or by staff in the Disability Units who did not have granular information about course content. An additional downside is the fact that the survey could seem long and/or to specialised to participants with limited knowledge, who would have to dedicate time and effort in order to find answers to the questions.

In terms of distribution, another problem was the inability to track whether the sent introductory email about the survey was actually delivered to the intended mailbox. After direct contact with some of the institutions, it was found that, in some nations, emails coming from specific domains outside their country were routinely blocked by browser or email firewalls. Similar limitations seem to have caused problems with the delivery of the email with the survey invitation, which included the link to the site where the questionnaire could be found and contained the word ‘survey’ in the subject. Attempts were made to contact the relevant departments by phone in order to guide the respondents to the email and make sure that they had received it.

6.2.3. Survey sections and questions

The survey was divided into five sections with the aim to gain input in various aspects relating to accessibility measures in place in higher education centres to gain access to online provision. The types of questions used were multiple choice, open questions and a combination of the two, in order to allow respondents to explain any access provisions that may not have been captured in the given options, and to give them the opportunity to freely comment on some of the questions.

The first block of questions, called *Generic Section I*, contains Q1 to Q11 and provides an insight on the general level of accessibility offered in the participating universities. The questions refer to the wider accessibility framework applied by the institution, the existence of a disability support service, the on-campus equipment available, the status of the physical access to the structured environment, the accessibility status of the main institution website and any provisions in place relating to specific impairments, as well as the generic framework applied for making course content accessible. The eleven questions are listed below:

Generic Section I
This section includes questions at a general accessibility level.

Q1. Does your institution apply an accessibility framework for disabled students?
1. Yes
2. No
3. Partially
4. I don't know

Q2. Does your institution have a disability support service (i.e. a group of people in a specified location who offer advice, support and equipment to disabled students)?
1. Yes
2. No

Q3. Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?
1. Yes
2. No
3. The institution offers online education only

Q4. How would you rank accessibility in terms of physical access in your institution?
1. Fully accessible (e.g. we can accommodate rooms based on teaching needs so that all students can access them, and all functional areas are fully accessible)
2. Partially accessible (e.g. some of the rooms are accessible, but the entrance is not)
3. Inaccessible (e.g. there are no accessible rooms or toilets)
4. The institution offers online education only

You can add your comments here:

Q5. Does your institution apply a framework across courses/departments to provide course content in an accessible format?
1. Yes
2. No
3. I don't know

You can add your comments here:

Q6. Which of the following better describes the accessibility level of your institution's main website?
1. Compliant with W3C
2. Compliant with Section 508
3. Tested for accessibility by the institution
4. Has not been tested for accessibility or designed with accessibility in mind
5. I don't know

Please specify the provisions of your institution in the following areas in terms of accessibility/inclusion frameworks, supporting equipment and relevant solutions. Please refer to your provisions in general, e.g.

advice, free electronic tools, course content in a different format etc. If applicable, add "I don't know" or "None".

Q7. Provisions for blindness/visual impairments.

Q8. Provisions for motor disability.

Q9. Provisions for deafness/hearing impairments.

Q10. Provisions for speech impairments.

Q11. Provisions for learning difficulties (e.g. dyslexia, dyscalculia, dysgraphia, visual/auditory processing difficulties, attention/executive difficulties, mental impairments etc.)

The second block of questions focused on *Online Learning* (Q12-Q16) and enquired about the types of educational courses provided by the institution, the methods of delivery of the courses, the use of any dedicated e-learning platforms and the main characteristics of the platform. The five specific questions are listed below:

Online Learning

The following questions are focused on the provision of online education by your institution.

Q12. Which of the following better describes the courses offered by your institution? (you can select more than one)

1. Courses require physical presence at the campus
2. Courses are offered exclusively online
3. Courses are mixed (delivered partially online and partially offline)
4. Courses are delivered physically in class and are also made available online
5. Courses are delivered physically in class and the material used for or provided through the courses is also made available online
6. Some courses are delivered exclusively in class and some are delivered exclusively online

Please provide examples of the courses for each of the categories:

Q13. Which of the following describes the main method used by your institution to deliver course content online?

1. Through an e-Learning Platform
2. Through an online content sharing platform

3. Via E-mail

You can add your comments here.

Q14. Please name the e-learning/content sharing platform(s) used by your institution:

Q15. Which of the following apply to the platform you use? (you can select more than one)

1. The platform can be used by students with sensory impairments
2. The whole platform interface is accessible
3. The platform offers accessibility features/options
4. The platform is flexible in terms of design, so content can be arranged according to what is considered more user-friendly and easily accessible
5. None of the above

Q16. The e-learning platform that you use:

1. Allows different views of the content to facilitate visual needs (e.g. contrast)
2. Allows users to customise its appearance (e.g. magnify screen content)
3. Supports screen readers for navigation and course content
4. Offers a screen reader within the platform
5. Supports voice command (speech recognition) technologies for navigation and input
6. Offers an option for the use of voice commands within the platform
7. Supports live interaction sessions and/or teaching
8. Allows recording of live sessions
9. Supports speech recognition for live sessions
10. Supports speech recognition for recorded sessions and videos
11. Allows sharing of both text content and audiovisual content
12. Allows students to attend classes virtually
13. Allows students to download the content and use it offline

Please add any other accessibility features offered through your platform

The third block, Q17 to Q20, was made up of four questions centred on the provision of accessible audiovisual content for students with sensory impairments. Respondents were asked to elaborate on how audiovisual material is used in their institution and on whether they make that content available to students with the use of access services. The relevant questions are listed below:

<u>Audiovisual Content</u>

This section focuses on the use of audiovisual content and its accessibility.

Q17. Which of the following describes the use of audiovisual (AV) content in your institution?

1. We use AV content in the classroom

2. We use AV content in our online courses through various websites
3. We use AV content in our courses through our e-learning platform
4. Live and/or recorded teaching sessions are made available to our students
5. We do not use AV content
6. I don't know - It depends on the tutor and the course
7. We use something equivalent (please specify)

Q18. Which of the following better describes the way that you make AV content available to your students?

1. We provide audio description for blind students
2. We use audio description as an instructional method
3. We provide subtitles/captions for deaf students and/or for language learning purposes
4. We provide videos with text annotations
5. We provide videos with voice annotations
6. We provide text scripts for our videos
7. We do not provide any of the above
8. I don't know - It depends on the tutor and the course
9. We provide something else (please explain)

Q19. Which of the following better describe how you prepare your AV content?

1. We use a tool to prepare subtitles/captions
2. Our platform offers an option to prepare subtitles/captions
3. We use human subtitles/captions
4. We use automated speech-to-text/captioning technologies
5. We use a tool to prepare audio description
6. Our platform offers an option to prepare audio description
7. We use human audio description
8. We use automated text-to-speech/voice technologies
9. We simply prepare the video with no additional services
10. We do not use any of the above
11. I don't know - It depends on the tutor and the course
12. Please specify other means that you use to prepare your AV content

Q20. Do you use any instructions/guidelines for the preparation of the AV content and the services that make it accessible (if any)? Please specify.

The fourth section was made up of two questions, Q21 and Q22, and focused on the use of assistive technology. They requested information about the different types of assistive technology that might be used at the institution as well as the tools and devices provided to students, as presented below:

Assistive Technology
This section focuses on the use of assistive technology in your institution

Q21. Which of the following forms of Assistive Technology support does your institution offer?

1. We have a lab with software and hardware installed on the computers
2. We provide a list of tools on our website
3. We provide both
4. We do not provide Assistive Technology support
5. We provide support in another way (Please specify)

Q22. Which of the following does your institution provide to students through the platform or in the lab?

1. Mouse and/or keyboard aids
2. Text-to-speech applications (readers)
3. Speech-to-text applications (dictators, voice navigators)
4. Communication aids (e.g. chat, video etc.)
5. Accessibility toolbars
6. Screen management aids (e.g. magnifiers)
7. Accessible multimedia generation and management tools
8. Webcam navigation
9. Motion trackers/sensors
10. Braille conversion applications
11. Braille notetaking devices
12. Sound amplification devices
13. None of the above
14. We provide the following (Please add technologies that are not listed above)

The fifth and last block, *Generic Section II*, contained six questions (Q23-Q28) requesting a more evaluative stance by the respondents. These questions were intentionally separated from the first generic section, to allow respondents to answer them after having gone through the survey and having gained information through the previous questions about the various means that can be activated to facilitate access. In this manner, it was expected that at this stage participants would be inclined to provide a reliable evaluation of what might be missing in terms of access services at their institution. The questions included in this section are listed below:

Generic Section II

Here are some final general questions on the accessibility of your institution.

Q23. In addition to the aspects included in this survey so far, which of the following does your institution offer to disabled students?

1. Sign Language Interpreting services
2. Lip reading services
3. Consultancy and/or career advice
4. None of the above
5. Something that is not included here (Please specify)

Q24. How would you rank accessibility in terms of the content of the courses provided by your institution (text, sound, image)?

1. Fully accessible (all of the content is/can be accessible to students with sensory impairments)
2. Partially accessible (e.g. the text is always accessible, but our video content is not)
3. Inaccessible (e.g. the content is not provided in alternative formats)
4. I don't know - It depends on the tutor and the course
5. Other (Please specify)

Q25. Your institution offers courses on/related to the following areas:

1. Disability Studies
2. Assistive Technology
3. Audiovisual Translation
4. Inclusive Education
5. None of the above

Please mention relevant departments/courses/centres in your institution.

Q26. Your institution does research in/related to the following areas:

1. Disability Studies
2. Assistive Technology
3. Audiovisual Translation
4. Inclusive Education
5. None of the above

Please mention relevant departments/courses/centres in your institution.

Q27. Do you recognise any of the following as factors that limit the provision of such services in your institution?

1. Lack of funding
2. Lack of professional input and guidance
3. Lack of legislatory framework
4. Limited requirements from students
5. Other (Please specify)

Q28. What does the future hold?
Are you aware of any plans in your institution to improve accessibility and/or studies/research in the area?

By offering options in some of the questions in the form of a list of available solutions that are or can be provided to promote accessibility, respondents may become aware of some of the existing tools with which they were not familiar prior to the survey. The inclusion of multiple questions followed by comment areas allow respondents to express themselves freely and describe provisions outside the restriction of specific multiple-choice answers. Finally, respondents' input can be critically approached when comparing answers provided to seemingly different questions, which however may lead to useful conclusions. One such example is questions that are related to the accessibility of e-learning platforms, as analysed in section 7.1.2.

6.3. University Case Studies

As explained in section 6.1, case studies in this research have been used for two reasons: (a) to share good practice and show how accessibility services can improve with an aim to provide holistically accessible OE, and (b) to be used as examples for the implementation of the INCLUDE framework, by linking them to the three suggested prototypes. The choice of the three case studies on which to test the prototypes was based on personal observation and experience on the type of content offered by the universities and their educational platforms. Two other important parameters for the choice of the three case studies were the fact that they all claimed compliance of their website content with accessibility standards, and the existence of disability support services in those universities.

The theoretical construct behind the INCLUDE framework proposal can be found in Chapter 5. However, to use it as reference tool for the evaluation of the three case studies, a more concrete realisation of the proposal needed to be developed. Based on the different online education courses identified in Chapter 5, and in line with the questions included in the survey, three prototypes were produced for each type of course, namely (1) fully online course, (2) supplementary educational material, and (3) open source online course. As already mentioned, the case studies used for the testing of the three prototypes are: (1) fully online course, at Imperial College London, (2) supplementary material for a course that requires physical presence, at University College London, and (3) an open source online course at the University of Southampton.

Each of the three case studies was examined from the point of view of a specific course to which the author of this thesis had access. All the information shared is either material that was created by the author or material that is freely available by the universities. The examination of the case studies involved an analysis of the accessibility level provided at the external and internal perimeters (as introduced in Chapter 7), the core material of the course, and the navigation areas between the perimeters. In the case of full online courses, the external perimeter is considered to be the relevant university website, where information about the course can be found, while the internal perimeter is the platform used to access the course. In the case of supplementary material for a course, the external perimeter is considered to be the university campus environment where the course is delivered, while the internal perimeter is the online platform where supplementary material is hosted. Finally, in the case of an open source online course, the external perimeter is considered to be the website where the information about the course can be found, while the internal perimeter is the website or the platform where the course is actually hosted.

The outcome of the analysis of each case study is the evaluation of a set of accessibility aspects attached to the relevant prototype, as well as a list of weaknesses that need to be improved for better compliance with the framework, and ultimately for the provision of a more holistic educational experience.

Chapter 7

Findings and Proposed Framework

This chapter includes the survey findings as well as an analysis of three case studies. In the first part, the results of the survey are analysed with aggregation statistics by questionnaire section, following a presentation of the institutions that provided their responses. An investigation of the main study questions is also included, based on aggregation and correlation statistics, and a discussion follows on the various open-ended questions. The second part of the chapter includes a presentation of the *Inclusive Universal Design for Accessible Online Content* framework, which was introduced in Chapter 5, followed by three prototypes illustrated with examples in the form of case studies.

7.1. Part I: Survey Findings

Before presenting the survey findings, it is important to provide some demographic information about the institutions that took part in the survey. As discussed in Chapter 6, there are 23 sets of valid answers and these have been provided by representatives of the following institutions: Bath Spa University, Carleton University, European University of Cyprus, Flinders University of South Australia, Imperial College London, Jagiellonian University in Kraków, National and Kapodistrian University of Athens,Pacific University, Riga Technical University, St. Ambrose University, Universidad Nacional de Educación a Distancia in Madrid, Universitat Jaume I of Castellón, University College London, University of Edinburgh, University of Huddersfield, University of Leicester, University of Malta, University of New South

Wales, University of Technology Sydney, University of Tokyo, West Virginia Wesleyan College, Wollongong University and University of Otago. The geographical response distribution is graphically displayed in Figure 7.1 below:

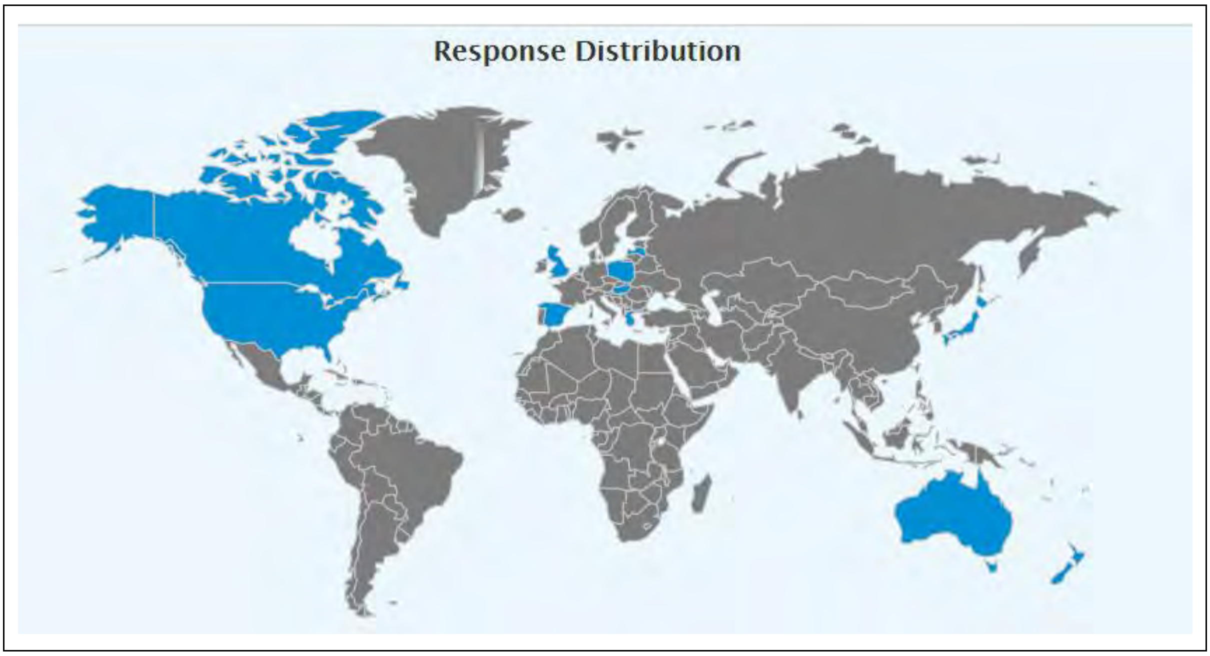


Figure 7.1: Geographical response distribution

Because of the small sample collected from each geographical area, it is not possible to draw conclusions per continent, though the wide spread of countries offers an insight into the practices applied in different parts of the world.

The respondents of the survey are in their majority members of staff of disability and learning services (see Figure 7.2). For reasons of protection of sensitive data, the names of the respondents are not released, yet all answers can be found in Appendix 4, with the names of respondents and institutions [PROTECTED], and the response ID revealed. Where URL links are used as reference to guides and policies, those are also [PROTECTED].

59543203	Assistant Director, Student Disability Service
59613794	Head of the Accessibility Unit for Students with Disabilities
59617421	ACCESS Disability Support Unit
59682563	Disability Information & Support Unit
59685980	Disability Advisor

59701994	Exam Room Officer
63792953	Lecturer
63796910	Learning Support Coordinator
63807024	Director of School of Social and Behavioral Sciences
63807802	Director Student Disability Services
63809097	Head of the Quality Management Unit
63825238	Learning Support Services (Disability Services) Director
63844604	Educational Developer
63962269	Department of Psychiatry
63982561	Computing & Library Services Department
64037300	Manager Student Support & Transition
64404824	Accessibility Consultant
64418330	Lecturer
64460938	Disability Officer
64510422	Director of Research Chair 'Technology and Accessibility'
64524216	Disability Advisor
65064236	Disability Support Service (Material Adaptation Coordinator)
95738058	Head of Student Support and Wellbeing

Figure 7.2: Survey respondents

The profile of the respondents is one of the strongest points of the survey, as they are directly responsible for the units that serve disabled students and tend to be up to date on governmental policies and guidelines for accessibility. It is also important to note that data has been obtained from another 27 different institutions, though this information has not been taken into account in the analysis, either because it was incomplete or because respondents dropped out of the survey before answering at least one third of the questions. Some of these responses will be discussed separately in Chapter 8, where the final conclusions on the research are drawn.

Participants were offered the option to update their responses. One respondent did so in 2017 and one institution provided a new, more informed entry. In the latter case, the first entry for that respondent was removed, and the latest was retained.

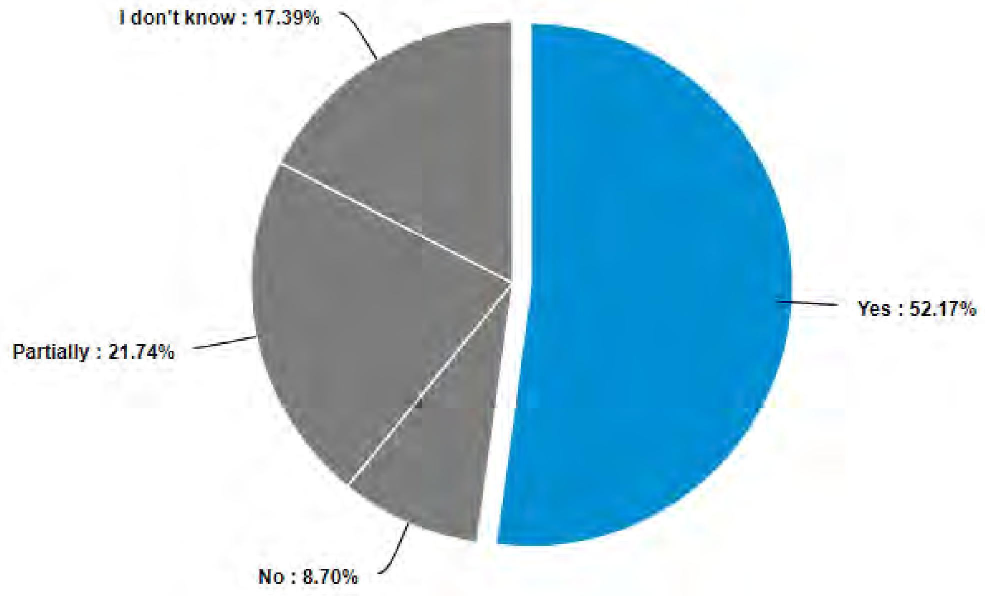
7.1.1. Aggregated analysis and discussion

In this section, an aggregated analysis of the data is provided per thematic section, in order to gain an insight into university provision. The sample is not enough to statistically generalise but each section includes a discussion that is based on the comments provided by the responders, thus utilising the quantitative output within a qualitative analysis. To avoid confusion in the analysis of questions with more than one answer, percentages have been calculated with n=23, where n indicates the sample size for the calculation, a practice that has been applied in all similar questions. For reference purposes, a screenshot of the relevant survey questions, 28 in total, as they appear in the editing area of QuestionPro, is provided for each thematic section. The various sections are marked with initials indicating their purpose and thematic area. More specifically, GS is used to refer to Generic Sections, OL refers to the Online Learning section, AV refers to the section related to the use of Audiovisual material and access services, AT is the section focusing on the use and provision of Assistive Technology, and PR refers to general Provisions of institutions in several areas of accessibility. Some of the questions (7-11, 20 and 23-27) do not call for an aggregation in this analysis, and are thus separately discussed in Chapter 8 or in section 7.1.3 as open-ended questions that offer additional information on provisions relevant to specific impairments, as well as plans of institutions to improve accessibility.

7.1.1.1. Generic Section I: Accessibility level

This section (GS I) includes six generic questions on the accessibility provided by the institutions participating in the survey.

The answers to Q1, “Does your institution apply an accessibility framework for disabled students?”, are somewhat positive as 12 institutions (52.17%) apply a specific framework for accessibility and 5 of them (21.74%) mention that they apply a framework partially, as illustrated in Figure 7.3:



Answer	Count	Percent
Yes	12	52.17%
No	2	8.7%
Partially	5	21.74%
I don't know	4	17.39%
Total	**23**	**100 %**

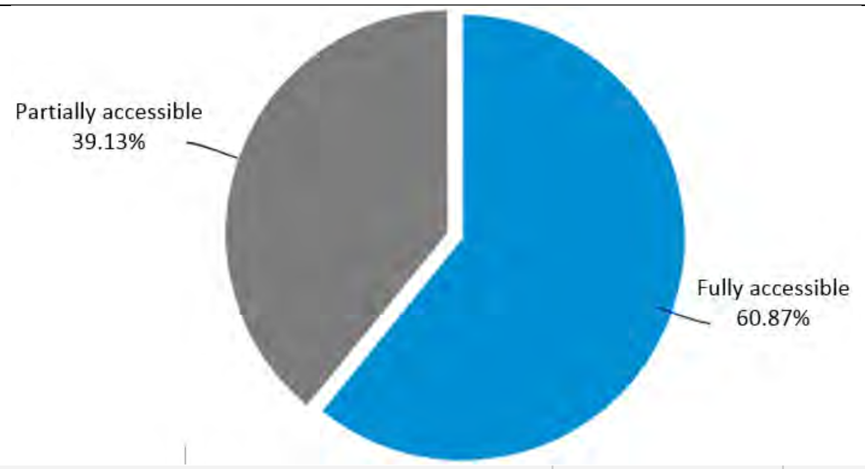
Figure 7.3: Q1 statistics

Most of the respondents explained in the comments that instead of a solid framework, their institution applied certain processes and policies for accessibility, though these might not be official. Two of the respondents mentioned that physical access on their campuses was partial. The responses indicate some lack of standardisation in terms of systematic processes that apply to the whole university.

Q2 asked participants “Does your institution have a disability support service (i.e. a group of people in a specified location who offer advice, support and equipment to disabled students)?”, to which the answer was overwhelmingly positive, with all 23 respondents (100%) selecting “Yes”.

In Q3, “Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?”, all 23 respondents (100%) replied positively, mentioning a wide range of services and equipment such as lifts, accessible toilets, wheelchairs for loan, furniture, ramps, automatic doors, assistive technology room, taxi transport, accessible labs, assistive software, accessible/modified accommodation, motorised scooters, ergo equipment, provision of technology to support learning, and so on.

Q4 asked participants “How would you rank accessibility in terms of physical access in your institution?”, and their answers show a certain degree of variation, as shown in Figure 7.4:

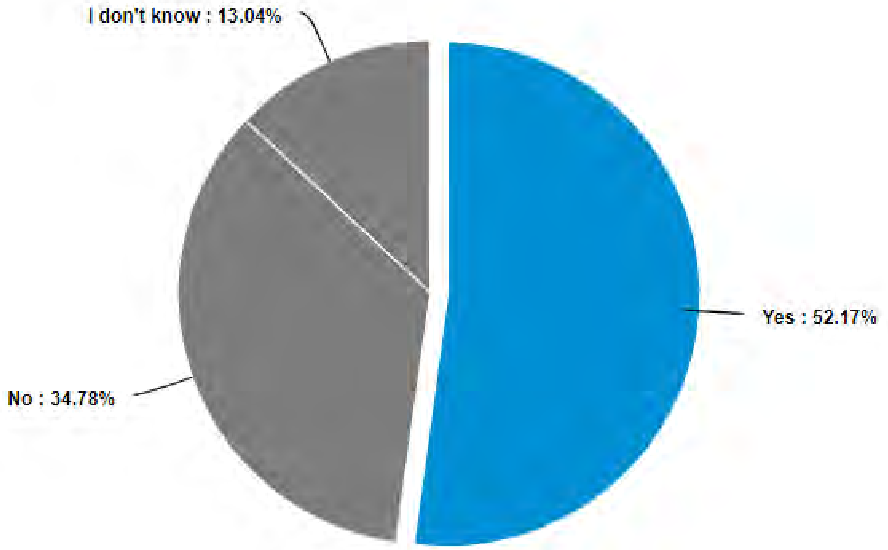


Answer	Count	Percent
Fully accessible (we can accommodate rooms based on teaching needs so that all students can access them and all functional areas are fully accessible)	14	60.87%
Partially accessible (e.g. some of the rooms are accessible, but the entrance is not)	9	39.13%
Inaccessible (e.g. there are no accessible rooms or toilets)	0	0%
The institution offers online education only	0	0%
Total	**23**	**100 %**

Figure 7.4: Q4 statistics

A total of 14 respondents (60.87%) stated that their institution is fully accessible, while 9 of them (39.13%) declared partial access. The latter institutions seem to have buildings that are not accessible or, if accessible, they may not have lifts. This can be described as an instance of ‘illogical access’, in which an accessible product/service is rendered inaccessible because of the surrounding environment, which eventually may not allow the user to access it.

With regard to Q5, “Does your institution apply a framework across courses/departments to provide course content in an accessible format?”, 12 of the respondents (52.17%) answered that their institution applies such a framework, 8 (34.78%) replied negatively, while 3 of them (13.4%) were not aware, as shown in Figure 7.5 below:



Answer	Count	Percent
Yes	12	52.17%
No	8	34.78%
I don't know	3	13.04%
Total	23	100 %

Figure 7.5: Q5 statistics

Of the 8 respondents (34.78%) that gave a negative answer, 4 commented on the fact that this is an area under development in their institution. The fact that 3 respondents chose “I don’t know” raises the issue of the lack of knowledge on the part of some respondents as to the remit that accessibility should cover, which tallies with the observation that in some institutions the focus tends to be placed on access to the built environment, with access to content plays a secondary role, if it is not overseen all together.

The last question in this category, Q6, aimed to collect information about the main university website: "Which of the following better describes the accessibility level of your institution's main website?". The answers are varied, with 8 participants claiming compliance with W3C guidelines, 6 mentioning that their website is or has been tested by the university in order to make sure it satisfies access needs, 3 declaring that the website has not been tested, and 8 stating that they do not have this information, as shown in Figure 7.6:

Answer	Count	Percent	20% 40%
Compliant with W3C	8	34.78%	
Compliant with Section 508	0	0%	
Tested for accessibility by the institution	6	26.09%	
Has not been tested for accessibility or designed with accessibility in mind	3	13.04%	
I don't know	8	34.78%	
Total	**25**	**n = 23**	

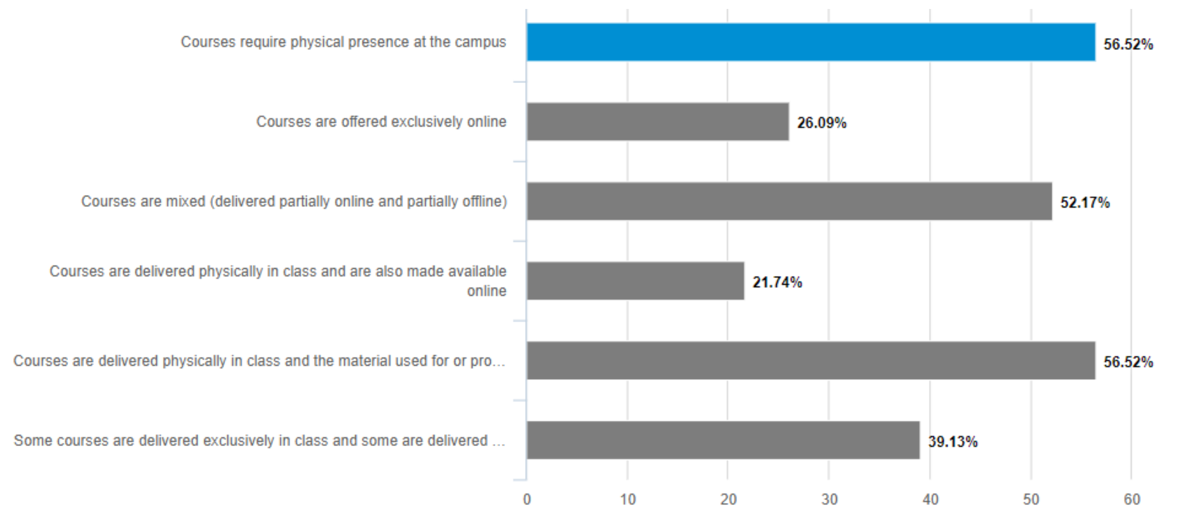
Figure 7.6: Q6 statistics

Two of the respondents picked more than one option, indicating that the website is compliant and it has also been tested for that purpose. Significantly, none of the US institutions that participated in the survey mentioned compliance with Section 508, thus revealing its lack of acceptance when it comes to web accessibility guidelines, as discussed in Chapter 4.

7.1.1.2. Online learning section

This section on Online Learning (OL) focuses on the collection of information related to the provision of online education by the institutions, and contains 5 questions: Q12 to Q16.

The first question of this section, Q12, asked participants: "Which of the following better describes the courses offered by your institution? (You can select more than one)”. As shown in Figure 7.7, 13 institutions (56.52%) provide courses that require physical access, while 12 of them (52.17%) offer mixed courses that are delivered partially online and partially offline. An indication of the importance of the online learning environment is the fact that 13 institutions (56.52%) provide on-campus courses with supplementary material shared online. Six universities (26.09%) offer courses exclusively online, 5 (21.74%) deliver them face-to-face in class as well as online, while 9 (39.13%) provide courses that are delivered exclusively in class as well as courses that are delivered exclusively online:

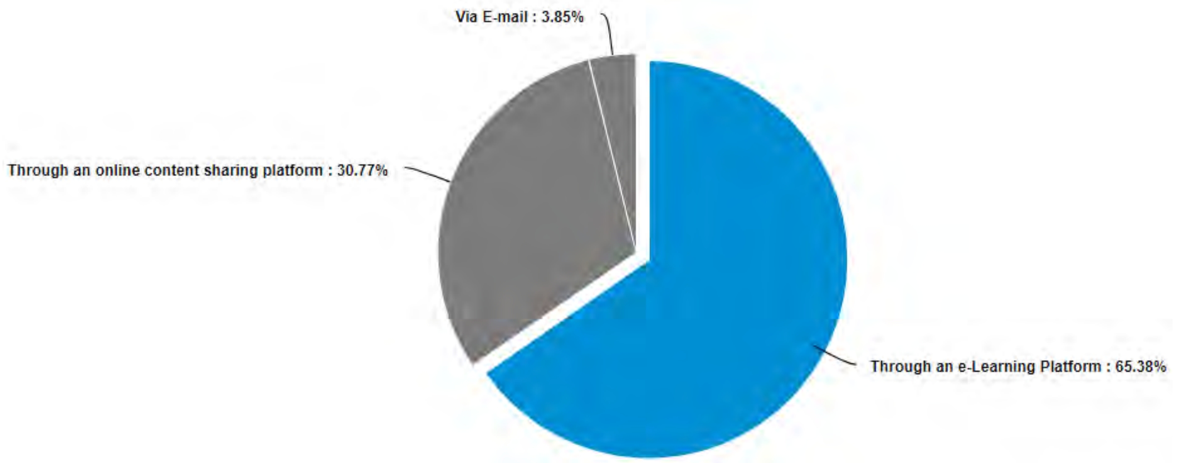


Answer	Count	Percent
Courses require physical presence at the campus	13	56.52%
Courses are offered exclusively online	6	26.09%
Courses are mixed (delivered partially online and partially offline)	12	52.17%
Courses are delivered physically in class and are also made available online	5	21.74%
Courses are delivered physically in class and the material used for or provided through the courses is also made available online	13	56.52%
Some courses are delivered exclusively in class and some are delivered exclusively online	9	39.13%
Total	58	n = 23

Figure 7.7: Q12 statistics

An important observation based on the distribution of the answers to this question is that, in one way or another, all institutions offer online learning, regardless of whether the way in which the teaching and learning are conducted can be considered as accessible.

As indicated in Q13, “Which of the following describes the main method used by your institution to deliver course content online?”, 17 institutions (65.38%) deliver course content online through an e-learning platform, while 8 (30.77%) use a platform that allows them to share content online, i.e. not necessarily a learning platform with the relevant tools. One respondent claimed to rely on email to distribute content, as shown in Figure 7.8, though the same institution also offers online courses and MOOCs. This inconsistency could indicate that there is either a misinterpretation or lack of understanding on the respondent’s side. It could also point to the fact that the university does not utilise the platform capabilities effectively to share the content of their online courses:

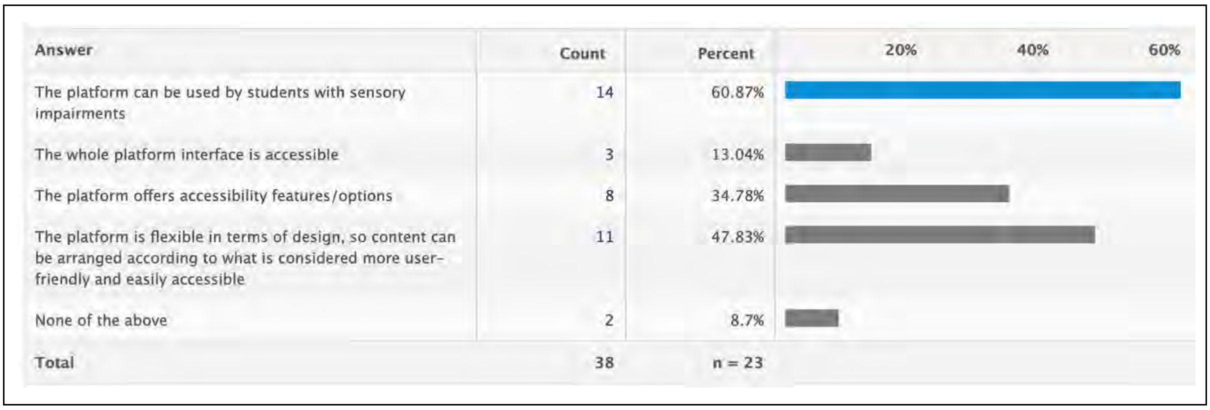


Answer	Count	Percent
Through an e-Learning Platform	17	65.38%
Through an online content sharing platform	8	30.77%
Via E-mail	1	3.85%
Total	**26**	**100 %**

Figure 7.8: Q13 statistics

The most popular platforms mentioned by the respondents are Moodle and Blackboard, as elucidated in the responses provided for Q14, in which they were prompted to “Please name the e-learning/content sharing platform(s) used by your institution”.

Based on the fact that nowadays many institutions use their own dedicated platforms in order to deliver courses and/or share material with students, two more questions were asked so as to collect further information about the characteristics of such platforms. In Q15, “Which of the following apply to the platform you use?”, 14 universities (60.87%) state that their platform can be used by students with sensory impairments; 11 (47.83%) claim that the platform is flexible in terms of design and allows for content to be arranged according to what is considered more user-friendly and easily accessible; 8 of them (34.78%) confirm that their platform offers accessibility features/options, while only 3 centres (13.04%) seem confident that the whole platform interface is accessible, as display in Figure 7.9:



Answer	Count	Percent
The platform can be used by students with sensory impairments	14	60.87%
The whole platform interface is accessible	3	13.04%
The platform offers accessibility features/options	8	34.78%
The platform is flexible in terms of design, so content can be arranged according to what is considered more user-friendly and easily accessible	11	47.83%
None of the above	2	8.7%
Total	38	n = 23

Figure 7.9: Q15 statistics

The last question of this section, Q16, was designed to obtain an idea, as complete as possible, of the functionality of the platforms used by the universities. To this aim, respondents were asked to outline the main characteristics of their e-learning platform, by choosing from a long list of accessibility features, as shown in Figure 7.10:

Answer	Count	Percent
Allows different views of the content to facilitate visual needs (e.g. contrast)	11	47.83%
Allows users to customise its appearance (e.g. magnify screen content)	13	56.52%
Supports screen readers for navigation and course content	14	60.87%
Offers a screen reader within the platform	0	0%
Supports voice command (speech recognition) technologies for navigation and input	5	21.74%
Offers an option for the use of voice commands within the platform	0	0%
Supports live interaction sessions and/or teaching	6	26.09%
Allows recording of live sessions	8	34.78%
Supports speech recognition for live sessions	2	8.7%
Supports speech recognition for recorded sessions and videos	2	8.7%
Allows sharing of both text content and audiovisual content	12	52.17%
Allows students to attend classes virtually	8	34.78%
Allows students to download the content and use it offline	13	56.52%
Total	94	n = 23

Figure 7.10: Q16 statistics

Based on the responses obtained, the three most popular features are: screen readers for navigation (14 respondents, 60.87%), ability to download content (13 respondents, 56.52%) and ability to customise the layout of the platform (13 respondents, 56.52%). Eleven participants (47.83%) claim that their platform allows the activation of different views of the content so as to accommodate to diverse visual needs, while 8 (34.78%) mention that their platform allows the recording of live sessions and another 8 (34.78%) say that the platform enables students to attend classes virtually. None of the platforms seems to offer an integrated screen reader or an option for the use of voice commands as an integrated part of the platform. This suggests that blind users are expected to rely on their own software for navigation, which seems to be supported by 5 institutions (21.74%). In this scenario, users need to have the reader installed on their computer and it has to be compatible with the platform, which cannot be fully guaranteed when two dynamic solutions, i.e. the platform and the screen reader, are not developed by the same manufacturer or linked internally so that they are both updated simultaneously.

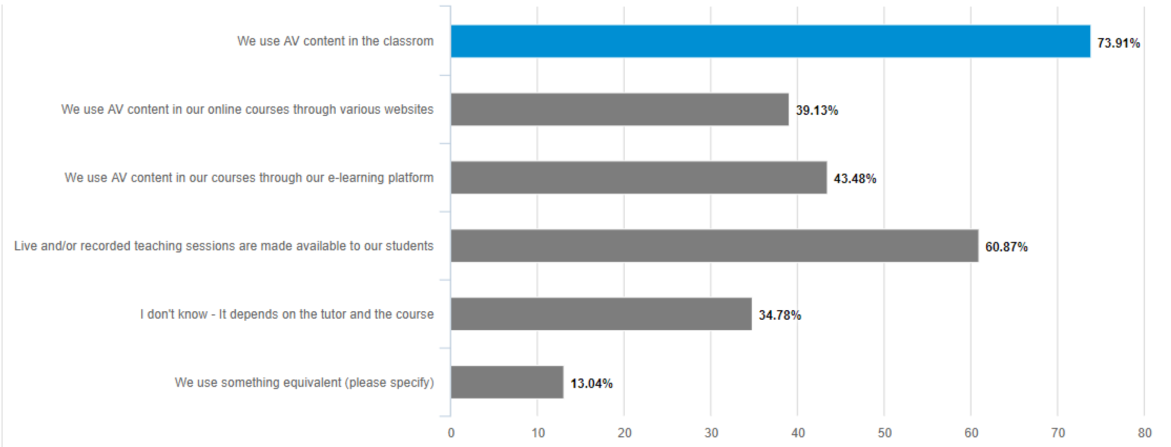
According to this feedback, it could be said that the level of access to the material can generally be characterised as medium to low, while access for users with sensory impairments seems to be particularly low. Although support for screen readers and customisation of layout is good (above 50%), interaction between users and technology does not seem to be well accommodated since voice input support and live interaction are limited.

Q16 gave respondents the opportunity to mention additional features, “Please add any other accessibility features offered through your platform”, but the uptake was very low, proving that many participants still have limited knowledge of the features and functionality of their platforms. Some confess that they do not have access to the platforms as they are not teaching staff, while others simply state that the platform is not fully accessible. One interesting feature mentioned by 4 respondents is lecture capturing, as either introduced already or in the process of being introduced.

7.1.1.3. Audiovisual content section

This section (AV) includes four questions, Q17-Q20, that revolve around the use of audiovisual material and the means by which it is made accessible to students with sensory disabilities.

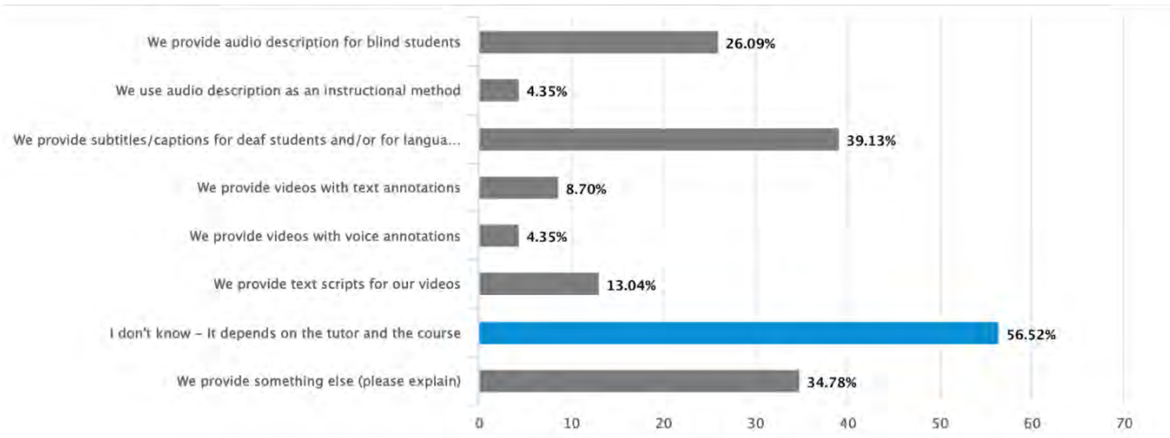
The first question in this section, Q17 “Which of the following describes the use of audiovisual (AV) content in your institution?”, aims to collect information as to the use of audiovisual material in the classroom. As shown in Figure 7.11, 17 participants (73.91%) declare that audiovisual content is used in the classroom, and 14 (60.87%) claim that live and/or recorded teaching sessions are made available to their students, thus highlighting the important role of audiovisual content in the educational process. Furthermore, 9 universities (39.13%) make use of audiovisual material in their online courses through various websites and 10 (43.48%) use such content through their e-learning platform. For 8 of them (34.78%), the use of material of this nature depends on the course and the tutor.



Answer	Count	Percent
We use AV content in the classrom	17	73.91%
We use AV content in our online courses through various websites	9	39.13%
We use AV content in our courses through our e-learning platform	10	43.48%
Live and/or recorded teaching sessions are made available to our students	14	60.87%
We do not use AV content	0	0%
I don't know - It depends on the tutor and the course	8	34.78%
We use something equivalent (please specify)	3	13.04%
Total	**61**	**n = 23**

Figure 7.11: Q17 statistics

Q18 asked respondents “Which of the following better describes the way that you make AV content available to your students?”, and Figure 7.12 illustrates their replies:

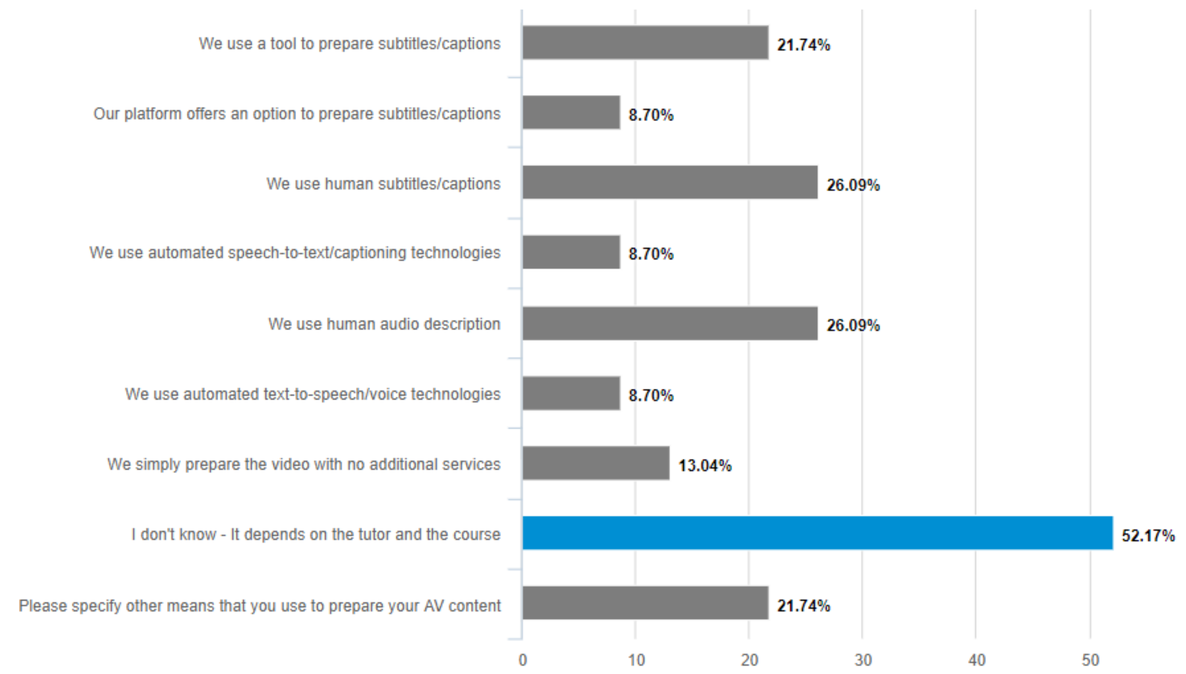


Answer	Count	Percent
We provide audio description for blind students	6	26.09%
We use audio description as an instructional method	1	4.35%
We provide subtitles/captions for deaf students and/or for language learning purposes	9	39.13%
We provide videos with text annotations	2	8.7%
We provide videos with voice annotations	1	4.35%
We provide text scripts for our videos	3	13.04%
We do not provide any of the above	0	0%
I don't know – It depends on the tutor and the course	13	56.52%
We provide something else (please explain)	8	34.78%
Total	43	n = 23

Figure 7.12: Q18 statistics

Based on their responses, it seems legitimate to state that the provision of accessible audiovisual material seems to be fluid though there is still room for improvement. Indeed, 9 participants (39.13%) offer subtitles/captions for deaf students and/or for language learning purposes, while 6 (26.09%) provide audio description for blind students. The provision of videos with text (2 institutions, 8.70%), voice annotations (1 institution, 4.35%) or text scripts (3 institutions, 13.04%) does not seem to be popular. According to the information contained in the comments, the various assistive services tend to be offered upon request in most of the cases, rather than being provided as a matter of fact.

In the case of Q19, the objective was to find out “Which of the following better describe how you prepare your AV content?”, as shown in Figure 7.13:



Answer	Count	Percent
We use a tool to prepare subtitles/captions	5	21.74%
Our platform offers an option to prepare subtitles/captions	2	8.7%
We use human subtitles/captions	6	26.09%
We use automated speech-to-text/captioning technologies	2	8.7%
We use a tool to prepare audio description	0	0%
Our platform offers an option to prepare audio description	0	0%
We use human audio description	6	26.09%
We use automated text-to-speech/voice technologies	2	8.7%
We simply prepare the video with no additional services	3	13.04%
We do not use any of the above	0	0%
I don't know - It depends on the tutor and the course	12	52.17%
Please specify other means that you use to prepare your AV content	5	21.74%
Total	43	n = 23

Figure 7.13: Q19 statistics

As in the case of Q18, the information obtained in Q19 seems to confirm that accessible AV material is only provided upon specific requests. Although the figures provided above do not offer a clear picture as to how systematic the provision of access services is, it is interesting to note that none of the participants chose “We do not use any of the above” in any of the two questions. Yet, this is clearly contradictory as 3 of them (13.04%) selected the option “We simply prepare the video with no additional services”. Considering that all respondents confirmed in Q17 that they make use of audiovisual material, such discrepancy can only be understood as some participants being too aware of the potential damage that some answers may inflict on their institution's reputation and thus providing information that avoids projecting a negative image of their universities.

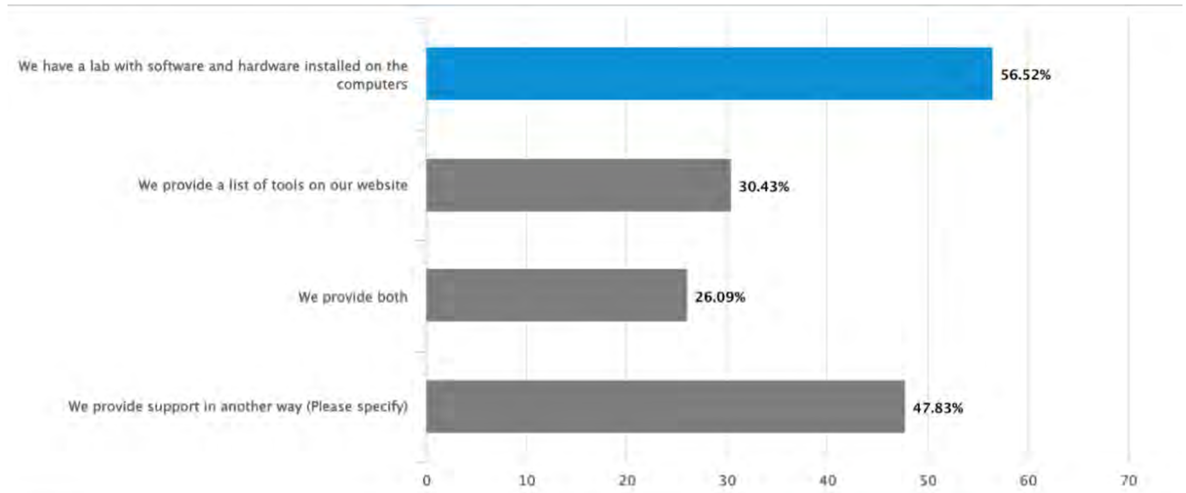
When it comes to the use of specialist technology for the provision of access services, it is telling that none of the participants chose the following options: "We use a tool to prepare audio description" and "Our platform offers an option to prepare audio description". Such finding is in clear contrast with the popularity of tools and platforms that allow the preparation of subtitles/captions, which is acknowledged by 5 (21.74%) and 2 respondents (8.70%) respectively.

Q20 gave respondents the opportunity to elaborate further on the topic, by asking them "Do you use any instructions/guidelines for the preparation of the AV content and the services that make it accessible?". The responses collected from this question are discussed in Chapter 8, as they provide data that is considered additional to the present study, and is mostly related to the approach of institutions to accessibility and to the training and material provided to tutors for this purpose.

7.1.1.4. Assistive technology section

This part of the survey includes two questions requesting information about the type of assistive technology (AST) being used and/or provided by the institutions.

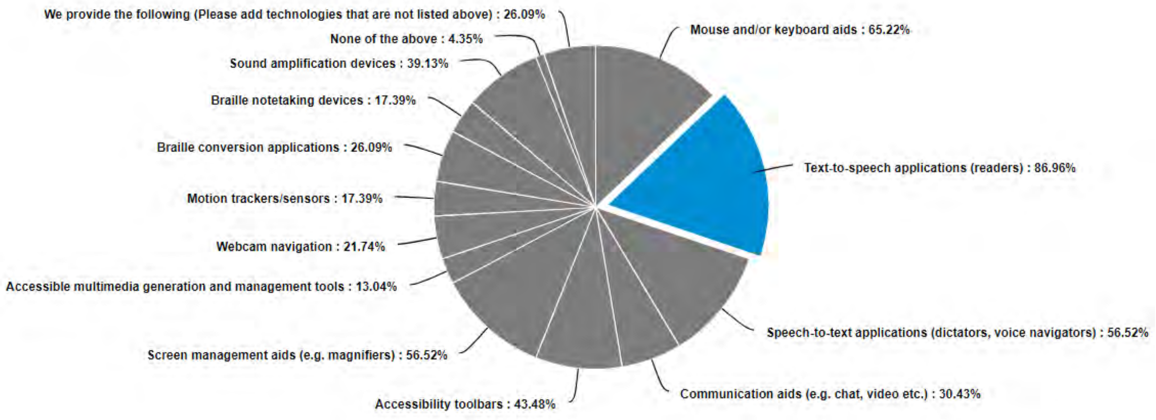
Q21 asked "Which of the following forms of Assistive Technology support does your institution offer?", thus allowing participants to state whether their institution provides a well-equipped lab for disabled students, a list of tools that they can use independently, or any other kind of support. As shown in Figure 7.14, 13 respondents (56.52%) declare that they provide a well-equipped lab with software and hardware and 7 (30.43%) provide a list of accessibility tools on their website, while 6 (26.09%) claim that they provide both. None of them selected the option stating that the university does not provide assistive technology support:



Answer	Count	Percent	20% 40% 60%
We have a lab with software and hardware installed on the computers	13	56.52%	
We provide a list of tools on our website	7	30.43%	
We provide both	6	26.09%	
We do not provide Assistive Technology support	0	0%	
We provide support in another way (Please specify)	11	47.83%	
Total	37	n = 23	

Figure 7.14: Q21 statistics

Eleven participants (47.83%) indicated that their institutions provide support in other ways, by resorting to the use of other assistive tools and by providing personal training and support. This feedback is offered in the responses given to Q22, according to which the following services and tools are also offered: text-to-speech applications (20 institutions, 86.96%), mouse/keyboard aids (15 institutions, 65.22%), speech-to-text applications (13 institutions, 56.52%), screen management aids (13 institutions, 56.52%), accessibility toolbars (10 institutions, 43.48%), sound amplification devices (9 institutions, 39.13%) and communication aids (7 institutions, 30.43%), as shown in Figure 7.15:



Answer	Count	Percent
Mouse and/or keyboard aids	15	65.22%
Text-to-speech applications (readers)	20	86.96%
Speech-to-text applications (dictators, voice navigators)	13	56.52%
Communication aids (e.g. chat, video etc.)	7	30.43%
Accessibility toolbars	10	43.48%
Screen management aids (e.g. magnifiers)	13	56.52%
Accessible multimedia generation and management tools	3	13.04%
Webcam navigation	5	21.74%
Motion trackers/sensors	4	17.39%
Braille conversion applications	6	26.09%
Braille notetaking devices	4	17.39%
Sound amplification devices	9	39.13%
None of the above	1	4.35%
We provide the following (Please add technologies that are not listed above)	6	26.09%
Total	**116**	**n = 23**

Figure 7.15: Q22 statistics

Surprisingly, only 3 universities (13.04%) offer accessible multimedia generation and management tools, which can be understood as an indication of the lack of financial and technical means to produce accessible audiovisual content.

The fact that the provision offered in the case of AT is far higher than in AV may be due to the popularity of the first and the fact that no expert training is needed to use them, whereas making audiovisual productions accessible is a more challenging endeavour that requires a higher degree of expertise on the topic.

7.1.2. Correlation analysis for study questions

The main goal of this section is to answer the research questions presented in Chapter 6:

1) On what level do universities apply a framework for accessibility?
2) Do universities offer audiovisual translation access services to students and, if so, to what extend?
3) Do universities provide accessible online courses/content?

These questions will be answered through a combination of the data presented in the previous section and correlation statistics produced by combining questions that are relevant to the topic of each of the research questions listed above. As already mentioned, the analysis of the data provided is mostly qualitative and statistics are used as supplementary data. However, given that the input analysed in the aggregation phase seems to provide useful insights, correlation can be also statistically applied to the data collected. Before embarking on such an analysis, it is important to explain the approach to correlation statistics implemented in this study.

Correlation analysis for the purposes of the current research is based on two types of statistics. The first one is the *Spearman Rank Correlation Coefficient*, a non-parametric measure of correlation, which uses ranks to calculate the correlation. The numerical value of the correlation coefficient, rs, ranges between -1 and +1. The correlation coefficient is the number indicating how the scores are relating. In general:

rs > 0 implies positive agreement among ranks

rs < 0 implies negative agreement (or agreement in the reverse direction)

rs = 0 implies no agreement.

The second set of statistics is provided by means of cross tabulation. Pearson's Chi-square statistic is used to determine the goodness of fit between the two questions being correlated. In order to measure this, a null hypothesis is needed. The null hypothesis measured with the cross-tab tool is that the two questions included in the cross-tab are correlated. If the Chi-square is higher than any of the critical values for any of the significance levels (p=.01, p=.05, p=.1), then the null hypothesis can be rejected. In other words, if the Chi-square value is higher than any of the other values shown for the 1%, 5%, or 10% significance levels, then the two questions being measured are not highly correlated. The p value is the level at which the two questions are considered highly correlated. The degree of freedom is the reference point for a Chi-square table. This is determined by calculating the number of observed responses versus the number of expected responses, and then subtracting 1 from that value.

The general standard confidence level used is p=.05, or the 95% confidence level. The cross-tab tool gives values at the 99% confidence level (p=.01), 95% confidence level (p=.05), and the 90% confidence level (p=.1). There are times when the Chi-square is less than or equal to the critical value at the 99% confidence level but not at the 95% confidence level. As suggested by QuestionPro statisticians, it is generally stronger to use the value at the 90% or 95% confidence level.

7.1.2.1. Research question 1

Input for the first research question, "On what level do universities apply a framework for accessibility?", comes mainly from the analysis of the answers provided in Generic Section I. Q1 and Q2 are straightforward in requesting a clear answer about whether institutions apply an accessibility framework and whether they have a Disability Support Unit. Respondents replied in the affirmative in both cases: 52.17% in Q1 and 100% in Q2, though a more objective picture can be drawn by looking at the answers given for Questions 3, 4, 5 and 6, which focus on the provision of equipment, physical access, course content and web accessibility accordingly. As shown in Figure 7.16 below, the correlation between these questions is low:[20]

Direct Correlation	Strength of Correlation
below 0.1	low
0.1 to 0.5	medium
above 0.5	high
False correlation	

	Q3: Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?	Q4: How would you rank accessibility in terms of physical access in your institution?	Q5: Does your institution apply a framework across courses/departments to provide course content in an accessible format?	Q6: Which of the following better describes the accessibility level of your institution's main website?
Q3: Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?	1	0.32	0.09	0.2
Q4: How would you rank accessibility in terms of physical access in your institution?	0.32	1	0.17	0.18
Q5: Does your institution apply a framework across courses/departments to provide course content in an accessible format?	0.09	0.17	1	0.1
Q6: Which of the following better describes the accessibility level of your institution's main website?	0.2	0.18	0.1	0.91

Figure 7.16: Correlation statistics on Questions 3-6

There is higher correlation between Questions 3 and 6 (0.2) and between Questions 3 and 4 (0.32), yet all correlations are below 0.8, with the exception of false correlations, i.e. correlations between the same questions. This outcome is considered a hint supporting the answers provided for these questions, as explained in this and the next paragraph. Overall, it can be said that the low direct correlation among the four questions actually confirms the responses obtained in Q1 about whether

[20] Green marks show the correlation between the first and the second question. The darker the colour, the stronger the correlation.

institutions apply an accessibility framework: “Yes” (52.17%), “Partially” (21.74%), “No” (8.7%), and “I don’t know” (17.39%). On the one hand, these percentages prove that not all universities apply an accessibility framework, ruling out any interpretations of responses to Q1 on the basis of lack of knowledge on frameworks. At the same time, it shows variation in the way in which respondents understand an accessibility framework and what it may include. If that was not true, then a correlation of around 0.5 should be found on most pairs of questions since 7 participants (52.17%) claim to apply such a framework in their institutions.

Looking at the answers provided to Q3, Q4, Q5 and Q6, in combination with the aggregation data, we can draw a number of conclusions. First of all, the 100% claimed existence of Disability Units in institutions does not necessarily mean the application of an accessibility framework. As some respondents explain, there may be individual policies and guidelines that the institution adheres to, yet not a standardised framework for the whole university. Equipment seems to be available for physical access in all 23 institutions (100%), yet physical access can be partial, as claimed by 9 respondents (39.13%), which results in irregular/inconsistent accessibility since the external perimeter of access becomes inaccessible. What is more, despite the Disability Units being in place, 8 respondents (34.78%) still claim to provide inaccessible content, while another 8 (34.78%) are not aware of whether the university website, i.e. the external perimeter to generic information on courses, is accessible.

These responses indicate two problematic areas. The first one is the application of accessibility frameworks in a way that captures both the content and the physical/structured environment. The second problematic area is that of satisfaction of access to the perimeters that allow users to get to services and products in these institutions. As previously discussed in Chapter 4, accessibility should not only be materialised in the internal perimeter, where content is provided in an accessible format, but within the whole context. The entire environment where the content is provided should be accessible, whether that is the physical or the online class, and so should the hosting environment, whether that is the physical campus or the website of the institution. Based on that, the fact that a framework for accessibility is in place does not mean that all the assistive services are enforced in the same way. Still, with 4 participants (17.39%) stating that they are not aware of the existence of an accessibility framework in their institutions and 2 (8.70%) stating that there is no such framework, there seems to be ample room for improvements in terms of accessibility procedures.

7.1.2.2. Research question 2

The second research question, i.e. “Do universities offer audiovisual translation access services to students and to what extend?”, can be answered with a careful look at Q18 and Q19 for cross-tabulation indicators, while a detailed analysis of the replies and the comments volunteered in Q18, Q19 and Q20 can offer valuable input.

Q18, “Which of the following better describes the way that you make AV content available to your students?”, was used as the pivot question and Q19 (“Which of the following better describe how you prepare your AV content?”) was used as the filter question in order to produce the cross tabulation data shown in Figure 7.17 and Figure 7.18 below:

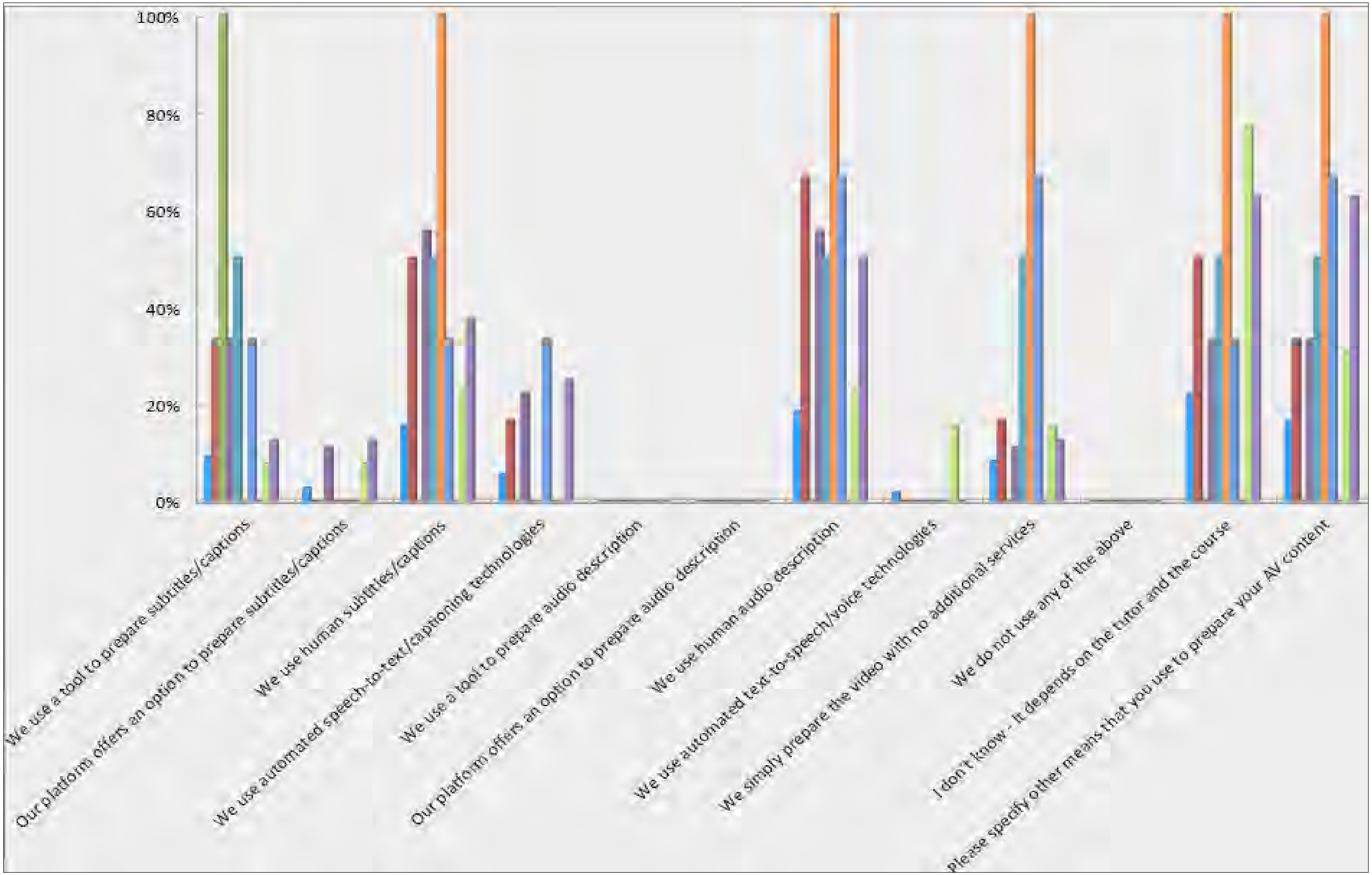


Figure 7.17: Column chart on cross tabulation for Q18 and Q19

Pivot	[18] Which of the following better describes the way that you make AV content available to your students?									
19. Which of the following better describe how you prepare your AV content?										
	Overall (Respondent Completed Percentage)	We provide audio description for blind students	We use audio description as an instructional method	We provide subtitles/ captions for deaf students and/or for language learning purposes	We provide videos with text annotations	We provide videos with voice annotations	We provide text scripts for our videos	We do not provide any of the above	I dont know - It depends on the tutor and the course	We provide something else (please explain)
We use a tool to prepare subtitles/captions	9%	33%	100%	33%	50%	0%	33%	0%	8%	13%
Our platform offers an option to prepare subtitles/captions	3%	0%	0%	11%	0%	0%	0%	0%	8%	13%
We use human subtitles/captions	16%	50%	0%	56%	50%	100%	33%	0%	23%	38%
We use automated speech-to-text/captioning technologies	6%	17%	0%	22%	0%	0%	33%	0%	0%	25%
We use a tool to prepare audio description	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Our platform offers an option to prepare audio description	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
We use human audio description	18%	67%	0%	56%	50%	100%	67%	0%	23%	50%
We use automated text-to-speech/voice technologies	2%	0%	0%	0%	0%	0%	0%	0%	15%	0%
We simply prepare the video with no additional services	8%	17%	0%	11%	50%	100%	67%	0%	15%	13%
We do not use any of the above	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
I don't know - It depends on the tutor and the course	22%	50%	0%	33%	50%	100%	33%	0%	77%	63%
Please specify other means that you use to prepare your AV content	17%	33%	0%	33%	50%	100%	67%	0%	31%	63%

Figure 7.18: Percentages from cross tabulation for Q18 and Q19

The relationships between the different variables in the cross tabulation shown in Figure 7.17 are characterised by variety, with higher concentration in middle parameters and lower in marginal ones. Percentages of the cross tabulation in this case can provide a more detailed view, as exemplified in Figure 7.18.

Based on the statistics presented in the column chart for the cross tabulation analysis (Figure 7.18), the institutions that use a tool to prepare subtitles also use audio description as an instructional method, yet not that often as an access service (33%). Furthermore, those providing human subtitles also offer videos with voice annotation, and human AD is normally provided in institutions that also offer videos with voice annotation and, in many cases (67%), with text scripts. Almost half of those providing human AD also provide SDH (56%) and videos with text annotations (50%), and the same is observed in institutions that use human subtitles and provide AD for blind students (50%).

As mentioned in the aggregation analysis for the AV Section of the survey, the co-existence of AD and subtitling as assistive services is not standardised in the institutions participating in this survey. However, a closer look at the preparation stage, as indicated in Q19, shows that the two seem to be valued equally, with human subtitles and human AD hitting 26.09% each with n=23 (see Figure 7.18). When it comes to the provision of these services to the students, subtitles reach 39.13% (9 institutions) and AD scores 26.09% (6 institutions) out of the 23 universities. The discrepancy between the two variables can be justified on the basis of the popularity of the services, the expertise required for their preparation, as well as the equipment and tools needed for their production, as discussed in section 7.1.1.3.

What is more significant in terms of the provision of these services is the fact that they do not see to be substituted by less elaborated methods of access to text and audio, such as automatically produced captions through speech recognition (e.g. via YouTube), as might be expected, considering that these institutions have Disability Units and most of them apply accessibility frameworks. Video annotations and the addition of text scripts seem to be alternative solutions (6 institutions, 26.09%), with the percentages of automated speech and captioning technologies at a low 8.70%, implemented by 2 institutions only. These indicate that automation may not necessarily be used as a solution to the problem of cost and expertise in the provision of these services.

This information does not allow to clearly identify the causes behind the low level of provision of these services. A closer look at the comments provided in Q18 may shed some light:

- *We provide the accommodations on demand*
- *We provide reasonable adjustments as required.*
- *It depends on the tutor.*
- *We recommend providing captions – however, we provide audio description more often as needed for students, as opposed to proactively*
- *We can provide audio descriptions and subtitles however this is a service the student with the disability would need to request via the special needs service rather than a practice adopted by the faculties as universal design.*

What these comments highlight is that these services are not usually included in the accessibility framework as compulsory components of the learning experience and they are only provided upon request, most likely to avoid incurring in costs and labour expenses.

7.1.2.3. Research question 3

To answer the last research question in relation to this study, “Do universities provide accessible online courses/content?”, a look at the aggregation analysis of Q12 is needed. According to it, 12 institutions (52.17%) offer mixed courses that are provided partially online and partially offline, 6 (26.09%) provide courses exclusively online, and 9 (39.13%) offer courses that are delivered exclusively in class and exclusively online. In order to get statistical data for this question, responses collected from the following three questions need to be combined:

a) Is the content of these courses provided through an educational platform?

Considering that flexibility is nowadays one of the key parameters when delivering online courses, any input that suggests lack of dynamism in the sharing and editing of content will not be considered as satisfying from the perspective of accessibility. Based on the responses provided under Q13, 17 institutions (65.38%) deliver course content online through an e-learning platform, and 8 (30.77%) use a platform that allows them to share content online, which does not necessarily mean they are learning platforms with accessibility tools. If Q12 and Q13 are combined with cross-tabulation, the relationship among variables of the two questions is depicted with significant differences, as shown in Figures 7.19 and 7.20 below:

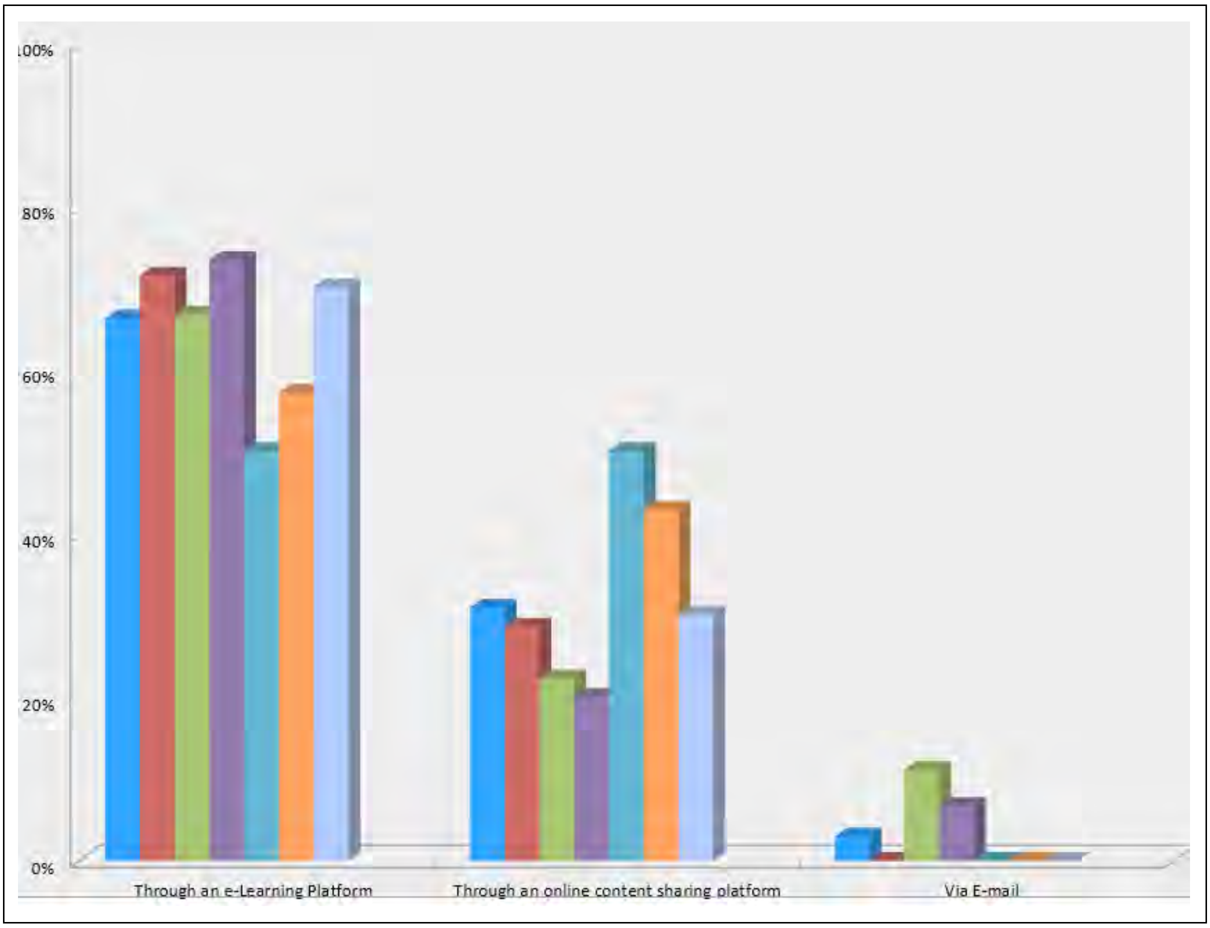


Figure 7.19: Column chart on Cross tabulation for Q12 and Q13

Pivot	[12] Which of the following better describes the courses offered by your institution? (you can select more than one)						
13. Which of the following describes the main method used by you institution to deliver course content online?							
	Overall (Cumulative Frequency)	Courses require physical presence at the campus	Courses are offered exclusively online	Courses are mixed (delivered partially online and partially offline)	Courses are delivered physically in class and are also made available online	Courses are delivered physically in class and the material used for or provided through the courses is also made available online	Some courses are delivered exclusively in class and some are delivered exclusively online
Through an e-Learning Platform	66%	71%	67%	73%	50%	57%	70%
Through an online content sharing platform	31%	29%	22%	20%	50%	43%	30%
Via E-mail	3%	0%	11%	7%	0%	0%	0%

Figure 7.20: Percentages from cross tabulation for Q12 and Q13

According to the cross-tabulation data, institutions that provide online content/courses use an e-learning platform or an online content sharing platform. The institutions that use an e-learning platform provide supplementary material for in-class courses through the platform (57%), deliver exclusively online courses (67%), offer mixed courses (73%), and share in-class courses online (50%), while the percentages are lower for those using an online content sharing platform. Still, only 3% of participants do not use an online platform.

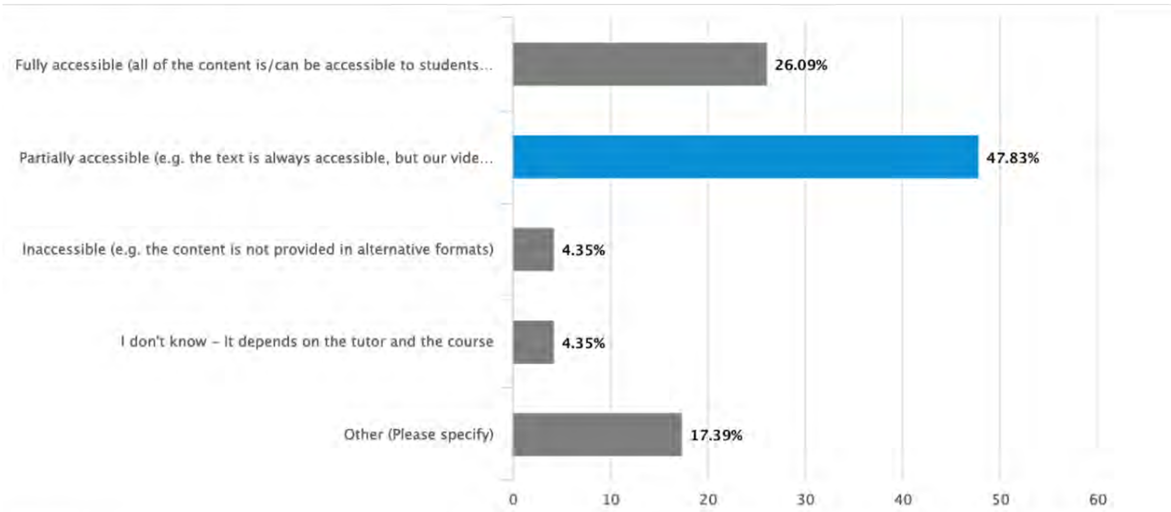
b) Is the platform accessible?

Judgements on this question will be made based on the respondents' replies as to the platform they use and its characteristics. According to the responses obtained in Q14, "Please name the e-learning/content sharing platform(s) used by your institution", 6 of them use Moodle, 10 use Blackboard, 3 did not know, and 4 use another platform. Furthermore, as gleaned from the responses to Q15, 14 (60.87%) state that the platform can be used by students with sensory impairments, 9 (39.13%) claim that the platform offers accessibility features/options, 12 (52.17%) declare that the platform is flexible in terms of design, allowing for content to be arranged according to what is considered more user-friendly and easily accessible, and only 2 (8.7%) replied that their platform is not accessible.

Without information about how platforms are used, about the kind of training given to members of staff and about the version of the platforms they use it is impossible to ascertain their level of accessibility. The only fact that can be safely assumed is that 21 out of 23 institutions, i.e. 91.3%, use a platform that is at least partially accessible.

c) Is the content of these courses accessible?

As shown from the previous analysis, it is not possible to reach a firm conclusion with regard to this question, as no systematic way for the provision of access services has been observed in any of the institutions. According to Q24, "How would you rank accessibility in terms of the content of the courses provided by your institution (text, sound, image)?", 11 universities (47.83%) claim to offer partially accessible content, while only 6 (26.09%) believe that the content of their courses is fully accessible:



Answer	Count	Percent
Fully accessible (all of the content is/can be accessible to students with sensory impairments)	6	26.09%
Partially accessible (e.g. the text is always accessible, but our video content is not)	11	47.83%
Inaccessible (e.g. the content is not provided in alternative formats)	1	4.35%
I don't know – It depends on the tutor and the course	1	4.35%
Other (Please specify)	4	17.39%
Total	23	100 %

Figure 7.21: Q24 statistics

Based on the data collected, it can be said that universities provide online courses whose degree of accessibility cannot be determined, due to lack of standardisation in the provision of accessible content, both online and offline.

7.1.3. Open-ended questions on relevant provisions

As mentioned in the introduction to this chapter, at the design stage of the survey, it was decided that some further questions should be included in order to amass information about university provision for disabled students. Though these questions may not contribute directly to the main aim of the thesis, they help to collect additional details and to get a more rounded picture of the state of accessibility in these universities. Those are questions 7-11 following Generic Section I (see Figure 7.29) and questions that belong to the last two sections of the questionnaire, i.e. Generic Section II (questions 23-27) and the section entitled “What the future holds”. In this section, we will focus on questions found under GS I, while areas examined through the questions included in GS II as well as future plans of the institutions involved in the survey will be discussed in Chapter 8.

The last section on Preparation (PR), asked participants to specify the provisions at their institutions in terms of accessibility/inclusion frameworks, supporting equipment and relevant solutions. They were instructed to refer to the provisions in general, e.g. advice, free electronic tools, course content in a different format, and the like, and to respond with ‘I don’t know’ or ‘No’ when applicable.

When asked about services for blindness/visual impairments (Q7), motor disability (Q8), deafness/hearing impairments (Q9), speech impairments (Q10) and learning difficulties such as dyslexia, dyscalculia, dysgraphia, visual/auditory processing difficulties, attention/executive difficulties and mental impairments (Q11), participants provided a long list of provisions, ranging from services to products, as compiled in Table 7.1 below:

Blindness/visual impairments	alternative formats, notetaking service, test and exam accommodations, assistive and adaptive technology, equipment loans, faculty liaison, assignment extensions, library access and support, peer tutoring/mentoring, navigation support, on campus access tours and orientation, transition support, learning support, electronic versions of printed materials, textual transcriptions of video-classes, audio-descriptions, special bursary, and more
Motor disability	advice, networked assistive technology, ability to purchase technology and equipment if needed, ability to access support workers, materials provided in alternative formats, alternative assessment, reasonable adjustments, elevators, accessible classrooms/washrooms/entrance, assistive technology, classwork support, note-taking, exam adjustments, motorised wheelchairs, mobility scooter, access to online materials (if unable to use paper books), campus orientation, negotiation with academics, and more

Deafness/hearing impairments	subtitled video-classes, specific adaptation of presential exams, hearing loops, other adjustments made as necessary e.g. buying specialist equipment, sign language/real time captioning/computerized note taking, fitted alarms, PC letter translation, support workers, such as BSL interpreters, personal learning support plans, equipment to support use of IT and appropriate software, and more
Speech impairments	advice, alternative assessment, reasonable adjustments, adaptations of the educational process, assistive technology software and hardware, other equipment, e.g. smart pen, alternate formats, transition support, learning support, peer mentoring, on campus access tours and orientation, additional lab technician support, alternative assessment to oral presentation, adjustments on field trips and placements, extensions, alternate exam arrangements, speech therapy clinic and more
Learning difficulties	accommodations regarding presentations, cue cards/calculators, textbooks and course content in a different format, extra time in exams, training for teachers, special sessions with teachers and parents, assessed work coversheets, library memos, software on the network (Read and Write Texthelp Gold and Inspiration) and support as required, support workers, dyslexia tutors, mental health professionals, autistic spectrum specialists, and more

Table 7.1: University provisions by type of impairment

The vast list of provisions proves that institutions can have the resources to offer a smooth learning environment to all students. It also proves staff’s greater knowledge of tools and equipment related to assistive technology than of the services that fall under the scope of AVT.

Although initially this part of the survey did not appear to be promising, some of the data collected can help nuance and complete some of the findings discussed in previous chapters.

7.2. Part II: Proposed Framework

Following the presentation and analysis of the data collected through the survey, the second part of this chapter proposes a framework that was briefly introduced in Chapter 5 as a result of the theoretical overview on the fields included in this research, i.e. DS, AVT, AT and OE. The discussion advocated the study of these fields from an interdisciplinary perspective, in order to facility a type of online education that could be truly accessible from all aspects.

More specifically, the theoretical analysis showed that a rights-based approach can enhance the provision of access services from the point of view of AVT, as well as enrich the way in which research is carried out in the field. Likewise, advances in AVT can be more effective when studied in close connection with the principles of DS. Developments in AT have traditionally ignored AVT, though the landscape seems to be changing, as more synergies are being found between the two disciplines. With OE gaining momentum and being delivered through a wide range of e-learning platforms, guidelines for accessibility on the web are starting to include references to the smooth inclusion of AVT services and AT tools in online contexts. Finally, legislation referring to the provision of AVT access services, AT tools, physical access and students' support is also enhancing the visibility of this area.

The findings from the survey show that the existence of Disability Units in higher education institutions does not necessarily imply that a framework for accessibility exists in all universities, though some guidelines and policies may be in place. The answers also indicate that physical access seems to be favoured over sensory access for reasons that were discussed in Part 1 and will be further analysed in Chapter 8. At the same time, universities do not seem to be making the most of technological developments in order to enhance the provision of such services. These observations support the need to strengthen collaboration across the various knowledge fields involved in this research.

The proposed framework is an attempt to exploit the results of this research as effectively as possible, and in a manner that will help readers evaluate, utilise, and potentially reconfigure it, based on their needs. This framework could be useful both for individual educators and for institutions and should be understood as a suggestion, a proposal that seeks the promotion of accessible education. In doing this, it opens new avenues for further analysis, investigation, testing, and adaption according to the country, the educational context, the level of education, the types of courses, and other socio-cultural and political parameters that affect the provision of educational content and courses.

Before moving on to the description of the framework and the suggested modes of implementation of the selected parameters, it is important to clarify the terminology used in these pages and to explain how the selected case studies help to realise its potential. First of all, the term 'framework' is used to refer to a theoretical and conceptual construct that I propose as a possible standard for the provision of accessible online content. This *Inclusive Universal Design for Accessible Online Content* framework is the result of a given research project and, as such, one of its main characteristics is that it suggests some kind of action, which is why is known as "action framework" or "knowledge-to-action framework" (Graham *et al.*, 2006). As Crockett (2017: online) explains, the knowledge-to-action framework "assumes a systems perspective and situates knowledge producers and users within a system of knowledge that is responsive, adaptive, and unpredictable. As such, the process of moving evidence to action is iterative, dynamic, and complex". For a framework of this kind to be considered finalised, it needs to go through a full action cycle in order to generate feedback that will inform new knowledge creation, as shown in Figure 7.22 below, adapted by Crockett (2017: online), from Graham *et al*. (2006):

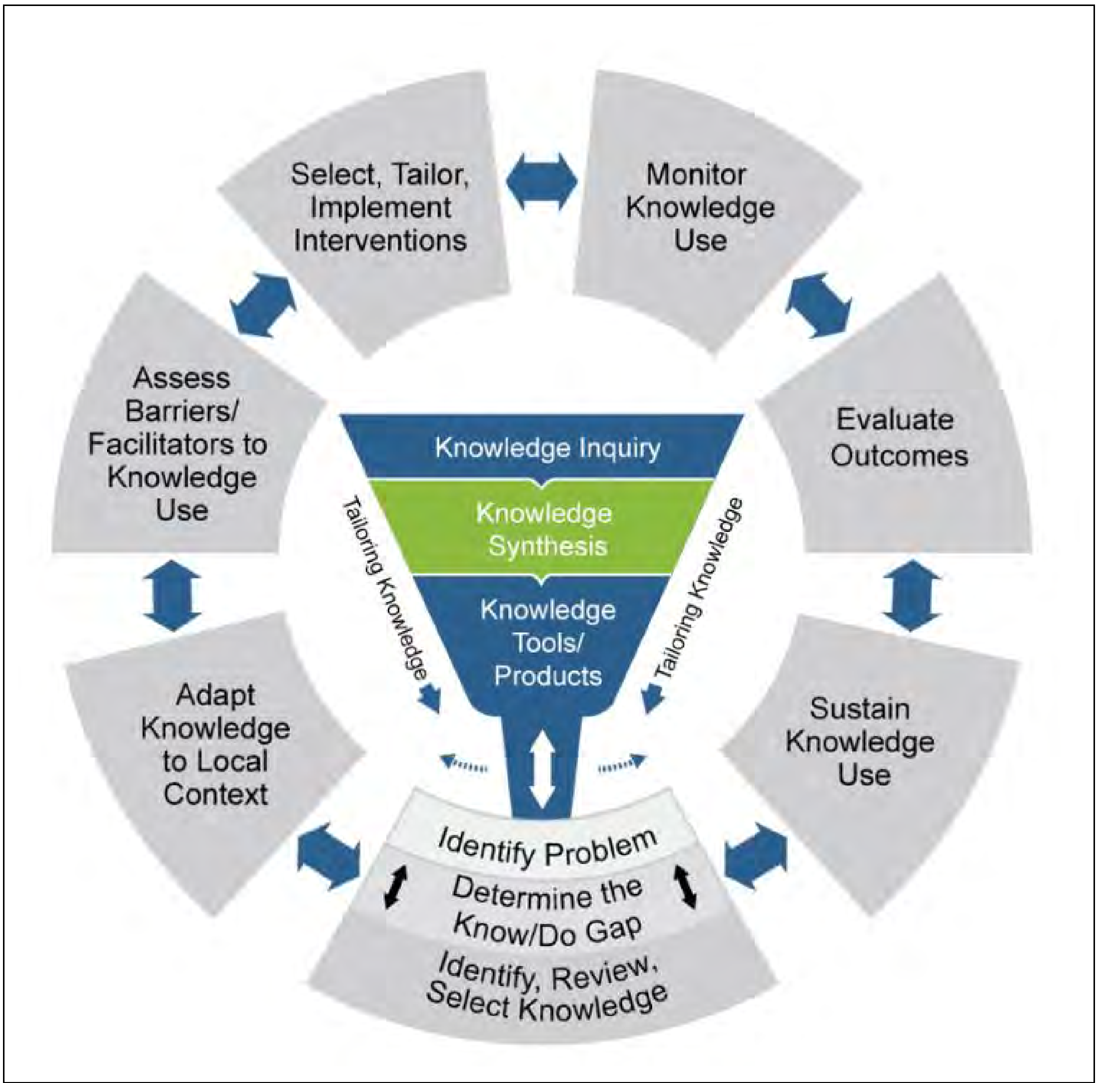


Figure 7.22: Knowledge-to-Action framework components

To test its validity, I have produced three prototypes and linked them to three case studies. Frixione and Lieto (2012: 131) have discussed the problem of the representation of “non-classical” concepts, “i.e. concepts that do not admit a definition in terms of necessary and sufficient conditions”, and refer to prototypical views as a means of computational representation. Although mostly used in the industry to refer to product drafts at the stage of approval, examination, testing and evaluation, i.e. before product development (Lauff *et al*., 2018), the term can also be used more broadly to refer to other types of provisions, e.g. services. In the present research, we use the term to refer to the preliminary version of a set of guidelines from which other forms can be developed.

The prototypes produced are suggested case-specific applications of the framework and focus on the following three main online learning settings provided nowadays: (a) fully online courses, (b) supplementary material for courses that require physical attendance, (c) open source online courses. The prototypes are not only presented but they are also linked to three case studies, which have been used for the following reasons: (a) to show that the task of applying the conditions specified by the framework is possible as it is already done in some form, (b) to illustrate best practice by institutions that either consciously or unconsciously apply some of the conditions of the framework, (c) to suggest how compliance with the framework can be gauged with the analysis of the case studies as an example of such an evaluation. The selection of these case studies was not random, but instead led by the aim to use material that is considered best practice. The focus is placed on different aspects in each case study, depending on the level of access and the information available with regard to each of the parameters included in the prototype guidelines.

7.2.1. Inclusive Universal Design for Accessible Online Content v.1

The aim of the proposed *INCLusive Universal DEsign for Accessible Online Content* (INCLUDE) is to combine web accessibility standards and the UDL guidelines to facilitate the provision of accessible online courses, with AVT and AT developments included as tools that enhance accessibility, and with a rights-based approach that stems from the principles of DS and inform the framework design.

Access is determined in terms of perimeters, whereby the external perimeter is the institution's main website and the internal perimeter (i.e. provider's perimeters) is the e-learning platform used by the institution and where material/courses are hosted. This means that the two perimeters are mainly associated with web content access, though access to the devices used as well as to the web itself is also considered. Drawing on Section 508 guidelines for assistive services, this is referred to as the "user's external perimeter". An illustration of perimeters can be found in Figure 7.23.

Although the framework is based on Section 508, in order to accommodate the concept of assistive services, the standards for web accessibility are borrowed from WCAG 2.0. Finally, EN 301 549 V1.1.2 has been chosen as the most relevant and complete set of guidelines for the provision of assistive tools in the learning environment. Reference material to the parts of these standards that are implemented in the framework can be found in the appendices: Appendix 2a provides a list of checkpoints for compliance with WCAG 2.0, Appendix 2b presents a list of checkpoints for compliance with EN 301 549, while Appendix 2c includes a Section 508 conformance checklist.

Access is also examined from the point of view of accessible content for students with sensory impairments, with a focus on audiovisual material, where a combination of AVT access services and AT tools are deemed necessary for their successful provision. When it comes to AVT, the guidelines provided by ITC (1999) and BBC (2018) are optimal for the preparation of SDH for educational videos. Both providers include a section on SDH for children and make reference to digital and online SDH. With regard to AD, useful references include the ITC (2000) guide on AD, with sections on dealing with children as well as foreign language material, and the very complete ADLAB guidelines (Remael *et al.,* 2015).

As for content design and provision, in addition to sensory access, reference is made to UDL in order to link its guidelines with the learning methodology, the curriculum and the course content, the three main areas when conducting research on online learning. As discussed in Chapter 5, the UDL guidelines are based on three main principles: (a) the provision of multiple means of representation, (b) the provision of multiple means of action and expression, and (c) the provision of multiple means of engagement. The most recent UDL guidelines, version 2.2, provided by CAST (2018), delineate specific guidelines for each of the three principles, so that they can be achieved at three levels: (1) access, (2) build, and (3) internalisation. They are presented below as they appear in the list of guidelines under each of the principles, as provided by CAST (2018: online):

> **GUIDELINE 1: Provide options for perception**
> Checkpoint 1.1 – Offer ways of customizing the display of information
> Checkpoint 1.2 – Offer alternatives for auditory information
> Checkpoint 1.3 – Offer alternatives for visual information
>
> **GUIDELINE 2: Provide options for language, mathematical expressions, and symbols**
> Checkpoint 2.1 – Clarify vocabulary and symbols

Checkpoint 2.2 – Clarify syntax and structure
Checkpoint 2.3 – Support decoding of text, mathematical notation, and symbols
Checkpoint 2.4 – Promote understanding across languages
Checkpoint 2.5 – Illustrate through multiple media

GUIDELINE 3: Provide options for comprehension
Checkpoint 3.1 – Activate or supply background knowledge
Checkpoint 3.2 – Highlight patterns, critical features, big ideas, and relationships
Checkpoint 3.3 – Guide information processing, visualization, and manipulation
Checkpoint 3.4 – Maximize transfer and generalization

GUIDELINE 4: Provide options for physical action
Checkpoint 4.1 – Vary the methods for response and navigation
Checkpoint 4.2 – Optimize access to tools and assistive technologies

GUIDELINE 5: Provide options for expression and communication
Checkpoint 5.1 – Use multiple media for communication
Checkpoint 5.2 – Use multiple tools for construction and composition
Checkpoint 5.3 – Build fluencies with graduated levels of support for practice and performance

GUIDELINE 6: Provide options for executive functions
Checkpoint 6.1 – Guide appropriate goal-setting
Checkpoint 6.2 – Support planning and strategy development
Checkpoint 6.3 – Facilitate managing information and resources
Checkpoint 6.4 – Enhance capacity for monitoring progress

GUIDELINE 7: Provide options for recruiting interest
Checkpoint 7.1 – Optimize individual choice and autonomy
Checkpoint 7.2 – Optimize relevance, value, and authenticity
Checkpoint 7.3 – Minimize threats and distractions

GUIDELINE 8: Provide options for sustaining effort and persistence
Checkpoint 8.1 – Heighten salience of goals and objectives
Checkpoint 8.2 – Vary demands and resources to optimize challenge
Checkpoint 8.3 – Foster collaboration and community
Checkpoint 8.4 – Increase mastery-oriented feedback

GUIDELINE 9: Provide options for self-regulation
Checkpoint 9.1 – Promote expectations and beliefs that optimize motivation

A checklist for the UDL guidelines with more specific instructions can be found in Appendix 3. Other suggested standards that cater for content design include the W3C (2018) guide for accessible presentations and the W3C (2016) guide on Multimedia Accessibility. Useful resources for the creation and use of alternative formats of educational content include the website of the National Center on Accessible Educational Materials as well as the online resources provided by the National Center on Disability and Access to Education (see the list provided in the Appendix 7).

The suggested standards and guidelines of the proposal can be summarised as follows:

Provider's external perimeter (Web presence)
WCAG 2.0 on *Web Accessibility*

User's external perimeter (computer/other device access)
Section 508 on *Assistive services*

Provider's internal perimeter (platform access)
EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*

User's internal perimeter (assistive technology)
Section 508 on *Assistive services* and *tools*

Learning methodology and course curriculum
UDL guidelines

Course content
UDL guidelines and WCAG 2.0

A graphical representation follows in Figure 7.23 below:

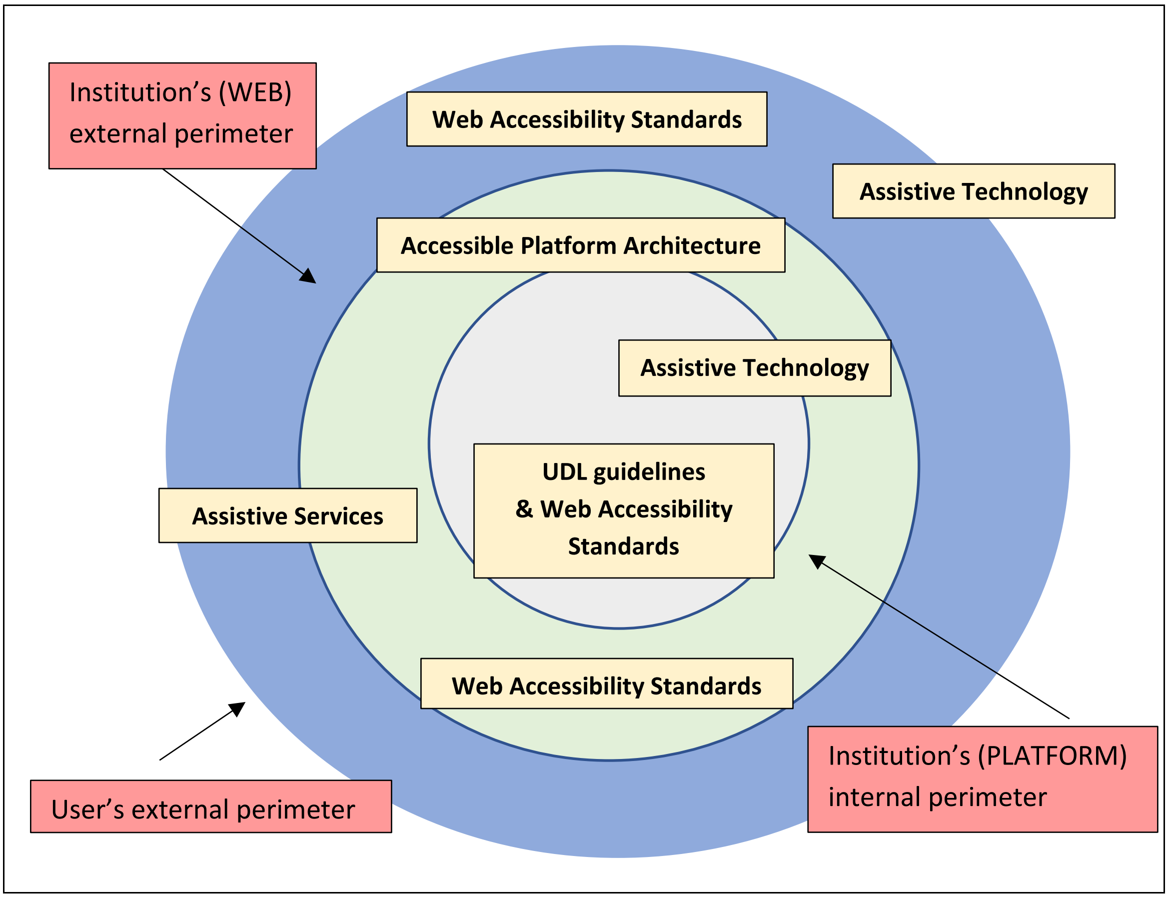


Figure 7.23: Standards and guidelines used in INCLUDE perimeters

7.2.2. INCLUDE prototypes

In this section, each of the suggested prototypes will be presented and discussed. As mentioned earlier, the three prototypes represent the three different types of online education as identified in Chapter 5, i.e. (1) a fully online interactive course, (2) supplementary material for an on-campus course, and (3) an open source distance learning course. As examples of courses that are both popular and could potentially satisfy accessibility requirements, the following have been chosen: (1) an online course offered by Imperial College London, (2) an on-campus module with supplementary material provided online by University College London and (3) a MOOC course delivered by the University of Southampton. The parameters that determined the choice of each university and each course will be presented in the introduction of each case study, while it should be noted that online pages were last accessed on the 20th of April 2019.

7.2.2.1. Prototype 1: fully online interactive course

A fully online course is a course delivered through an e-learning platform and does not require physical presence on campus. All the material is expected to be provided online. The design process of the course and the curriculum, as well as the manner of provision of the course content, should follow the principles of UDL. The steps to follow in the implementation of the framework are listed in Figure 7.2 below:

1) Preparation	a. Validate internal perimeter – EN 301 549 V1.1.2 b. Validate hosting (external) perimeter – WCAG 2.0
2) Course drafting	a. Design curriculum with inclusion in mind, based on UDL guidelines on curriculum b. Decide on learning methodology, depending on the topic, the mode of delivery and UDL guidelines on curriculum
3) Design	a. Design course with accessibility in mind – EN 301 549 V1.1.2 b. Prepare content – UDL guidelines on design and WCAG 2.0 c. Add useful tools to internal perimeter to enhance access – EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*
4) Enrolment and support	a. Make sure sufficient means to access the course are available by providing assistive services – Section 508 b. Support and direct users in the acquisition of assistive tools – Section 508
5) Maintenance	a. Make sure accessibility is an integral part of the maintenance process
Note: Where steps of this process require collaboration, the instructor or course designer will need to take a monitoring role.	

Table 7.2: Steps in the implementation of INCLUDE – Prototype 1

In this prototype, we consider the main website of the institution as the external perimeter of the course, while the e-learning platform is the internal perimeter, as shown in Figure 7.24:

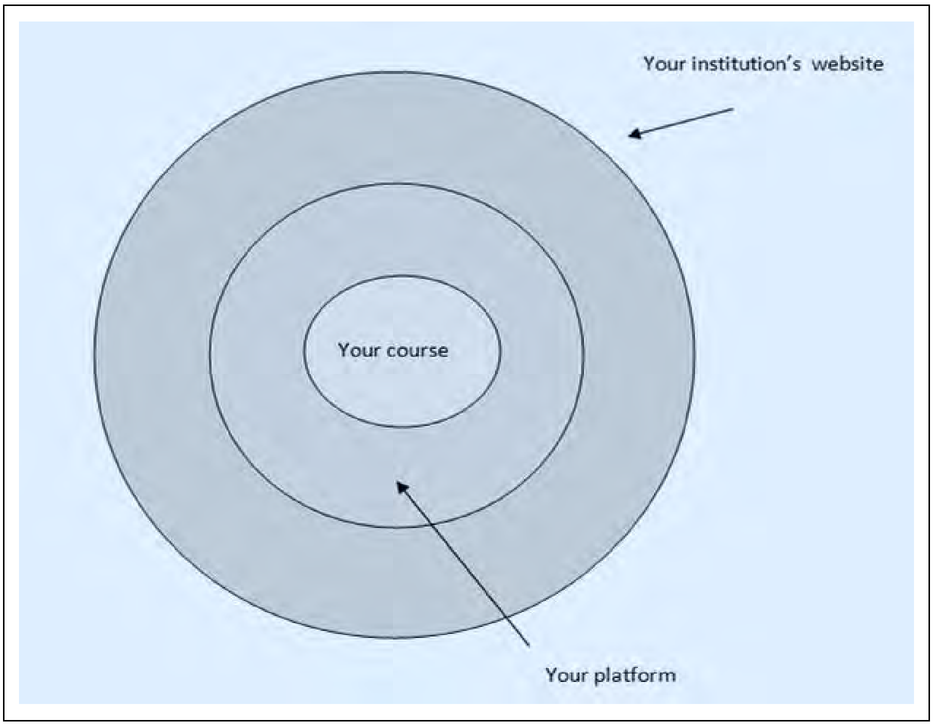


Figure 7.24: INCLUDE prototype 1

For the website to be fully accessible, the web development team of the institution should follow the WCAG 2.0 guidelines on web content accessibility. It is important to guarantee that all the information about the relevant course is provided in a form that can be accessed in alternative ways and is accessible to deaf and blind users (guideline 1). Where videos are used, they should be accessible with subtitles or scripts and AD (guideline 1). In addition, the whole website should satisfy the relevant guidelines in terms of its layout and architecture, and be operable and robust (guidelines 2, 3 and 4). The content provided to describe the course should follow the recommendations of UDL guidelines for comprehension, so that potential participants have all the information they need to make an informed decision about their enrolment. Exploiting assistive tools within the website can boost easy navigation and usage, while allowing for the streamlining of quality of access from the inside.

Moving to the internal perimeter, institutions should apply the EN 301 549 guidelines on platform software design and accessibility service support for web content as well as platform accessibility service support for software that requires a user, and the use of assistive technology (requirements 9 and 11). The requirements and guidelines mentioned for the two perimeters also affect the modes of provision of the course content, i.e. the design stage. Course content creators should work closely with developers or staff in charge of the operational part of the platform, to ensure that: (a) both the course entry on the platform and the content are fully accessible, and (b) the content is compliant with the formats supported by the platform. Finally, the people in charge of the platform should make sure that assistive tools are available within the platform in order to enhance easy access to the content and to secure a smooth user experience.

To comply with the requirements considered essential in the UDL guidelines, with regard to accessibility of the external and internal perimeters, instructors will have to generate alternative formats of the course content. They should make sure that the content is designed in a way that will ideally satisfy purposeful and motivated, resourceful and knowledgeable, strategic and goal-directed users. To achieve this goal, instructors should structure the course in a way that enhances interest, perception and physical action, according to the relevant guidelines (7, 1 and 4 respectively). They should also design material that stimulates effort and persistence (guideline 8), provides options for language, mathematical expressions and symbols (guideline 2), as well as for expression and communication (guideline 5). Finally, they need to make sure that the knowledge acquisition process is enhanced in terms of internalisation, by providing options for self-regulation, comprehension and executive functions, as foregrounded in guidelines 9, 3 and 6.

The process of enrolment to the course should be considered at the creation stage as well as the ways in which the course can be made available to participants. Inconsistencies can happen, especially when there is no collaboration between the course designer and the various administration teams of the institution. In this respect, Section 508 can guide institutions in how to provide information as well as accessibility support and assistance in a way that guarantees equal access to information for all interested parties, which can be achieved with the provision of assistive services and tools. Maintenance, another important part of the process, requires constant evaluation of all the course components. Communication and co-operation among all professionals in charge of the maintenance of the web, the platform and the course content are essential to ensure full access to the course as well as the relevance of the content provided.

7.2.2.1.1. Case study 1: Imperial College London

As previously mentioned, each case study will focus on a different area and this one centres on access to information, enrolment, support and accessibility of the relevant web content.

Imperial College London, a UK university ranked eighth in the QS World University Rankings of 2019, offers undergraduate, postgraduate and research programmes. The institution has a Disability Advisory Service that provides support for disabled students. There are also disability officers for each of the departments and the Library Services webpage includes a list of tips for assistance in various matters, e.g. inclusive technology, resources for self-study and the like. A web search for any disability or accessibility policy in place at the university does not show any results and the Disability Advisory Services webpage declares that it “doesn't automatically put support arrangements in place, even for students who have declared their disability to the College as part of their UCAS application” (Imperial College, n.d.: online). This seems to indicate that specific adjustments are made only after students contact the Services to declare their needs.

With regard to the main university website, i.e. the university’s external perimeter, a dedicated webpage mentions that the site conforms to WAI-ARIA 1.0, i.e. the Accessible Rich Internet Applications Suite, which includes recommendations that are mostly related to operability and functionality. Elements of WCAG 2.0 that enhance access to educational content, such as alternative formats of audiovisual material, are not included in the recommendations. Thus, the chosen conformity is not considered sufficient for sensory access.

When it comes to support for tutors, the Educational Development Unit offers guidance on inclusive learning and teaching, including information about inclusive educational design, management of inclusive learning environments, inclusive assessment and feedback, and a substantive number of resources that can be valuable for instructors who design new accessible courses or for those who would like to make their existing courses more accessible in terms of content drafting and design. It also provides online courses on specific topics for staff.

Other e-learning services offered by the university include Blackboard as a virtual learning environment, Panopto for lecture recording, electronic testing and assessment tools, which are all maintained by the university's ICT department. Free online courses in the form of MOOCs are hosted externally by the edX platform, which adheres to accessibility policy and complies with WCAG 2.0 AA, and video transcripts for audiovisual material are also fostered. Other courses were found on Coursera, evincing that Imperial College does not only host online courses internally.

The Business School al Imperial College have their own purpose-built virtual learning platform, The Hub, from where the course for this study has been selected: MSc in Business Analytics,[21] a two-year, part-time course modelled on the full-time on-campus programme provided also by Imperial College.

The external perimeter tested for this case study includes three samples: (a) the Imperial College main website welcome page, (b) the Business School programme overview page, and (c) the Business School website welcome page, as illustrated in Figures 7.25, 7.26 and 7.27, respectively:

[21] Information about the course can be found on: www.imperial.ac.uk/business-school/programmes/msc-business-analytics/study-mode-online

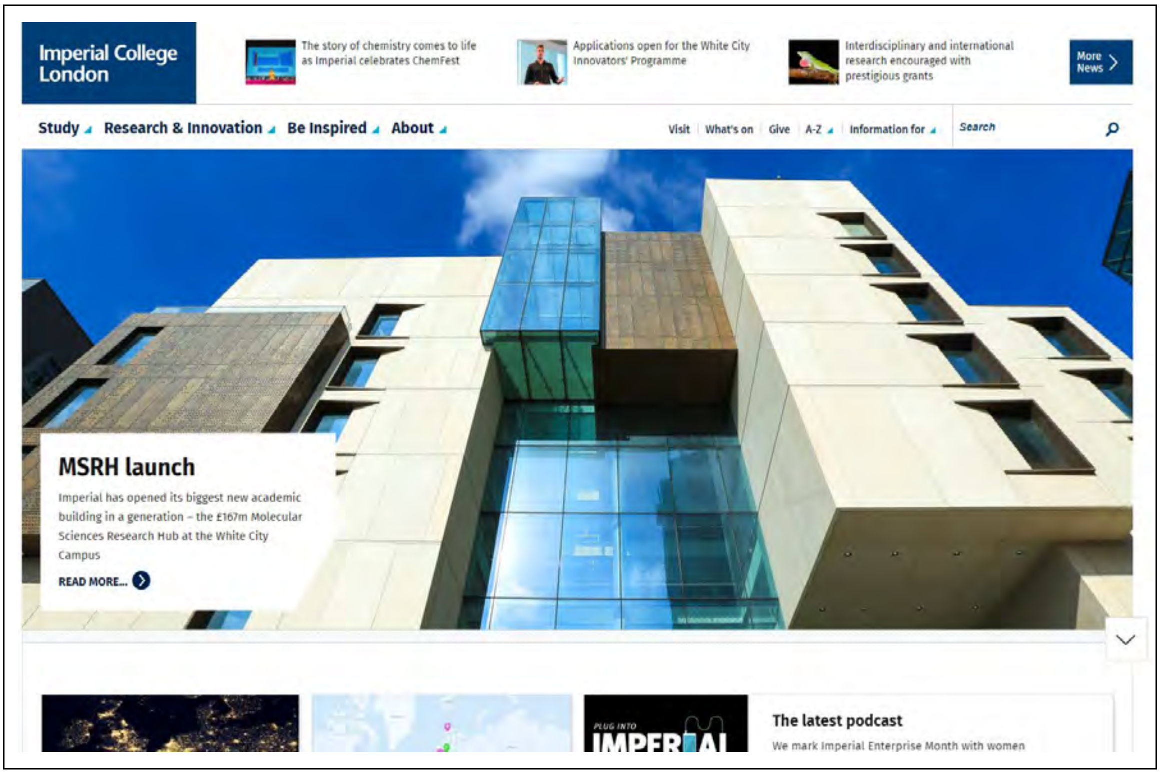


Figure 7.25: Imperial College website welcome page

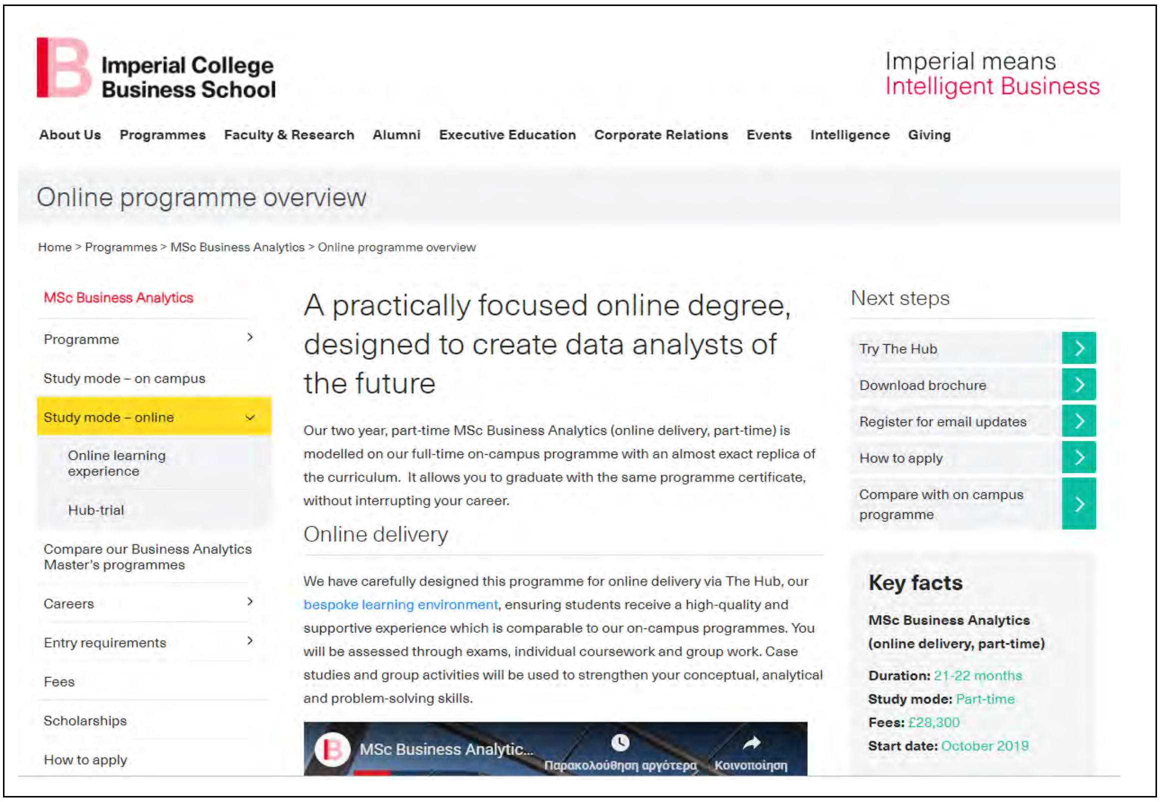


Figure 7.26: Imperial College Business School programme page

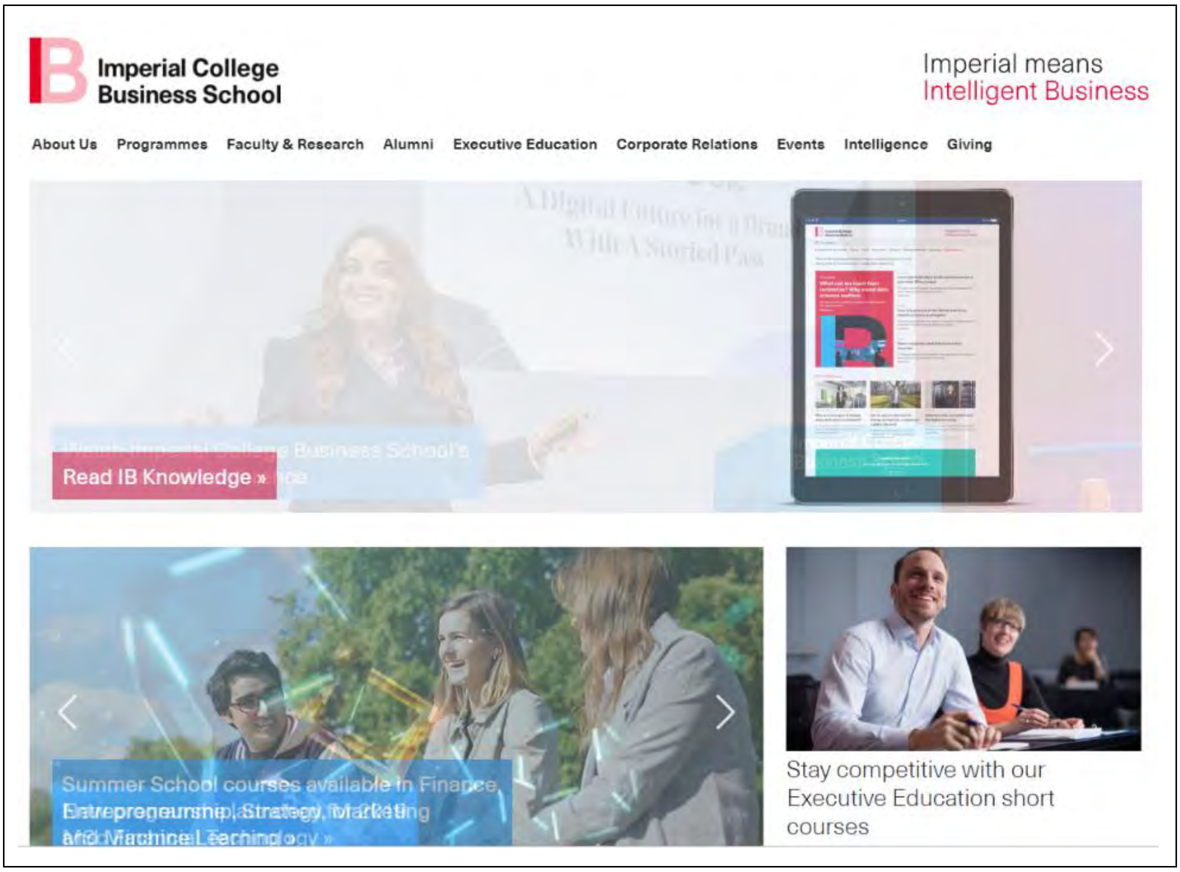


Figure 7.27: Imperial College Business School website welcome page

To gauge the access level at the external perimeter, the W3C Validation Service was used, followed by human inspection. The Service showed no errors for the main Imperial College webpage, but it showed two errors in architecture of the Business School website, as shown in Figure 7.28:

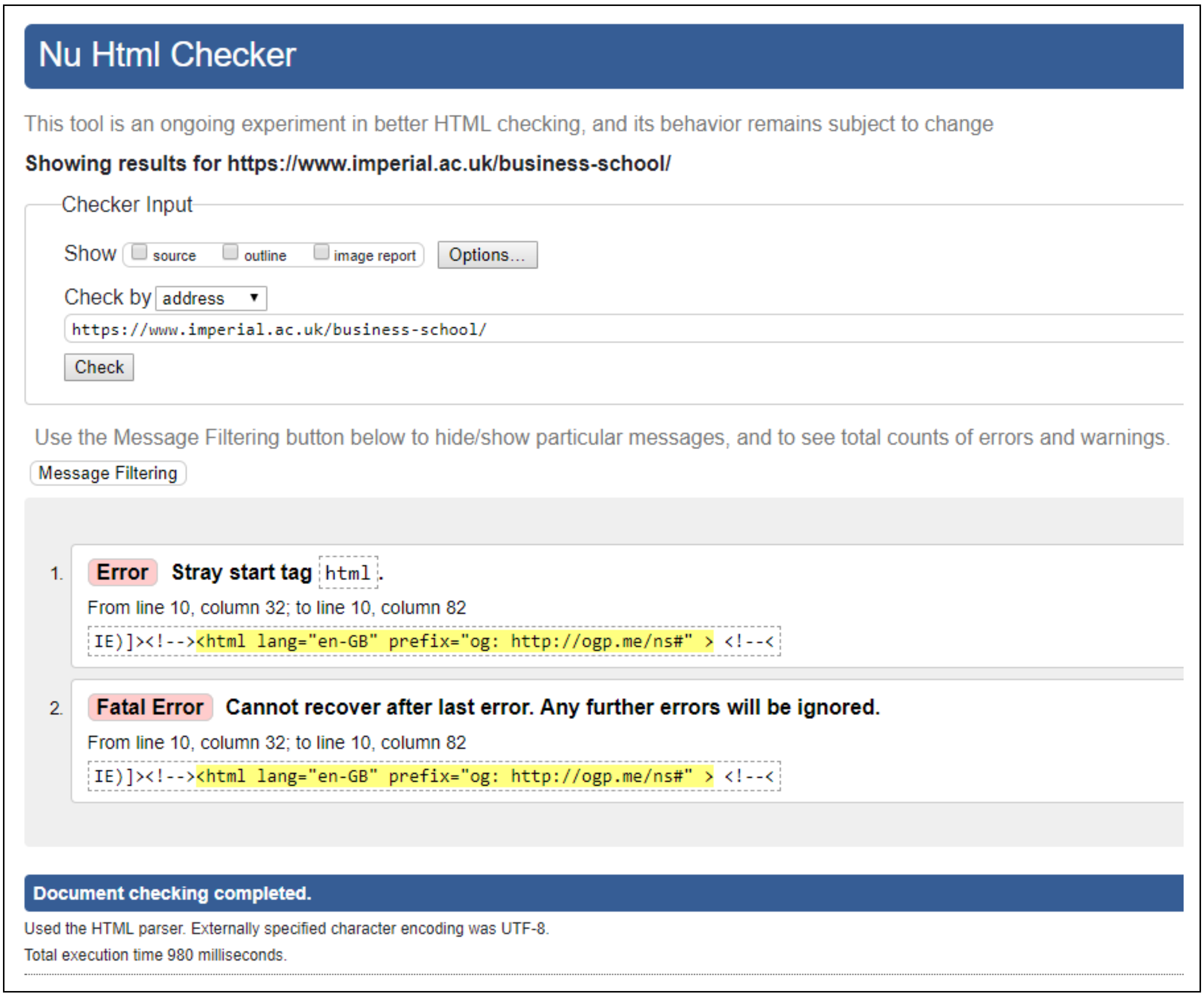


Figure 7.28: Imperial College webpage W3C validation service report

The full reports from a second tool, the WCAG Accessibility Audit 2.1.2.1, are included in Appendix 6 for reference. They show 2 fail rules in the main webpage, 7 fail rules for the main Business School webpage, and 7 fail rules for the course page, all of which are related to the architecture of the pages and some elements that affect their accessibility level. An example of a severe error in the course page includes the erroneous structure of an element's ID that must be unique in the Document Object Model (DOM),[22] as shown in Figure 7.29:

[22] DOM is an interface to webpages that allows programs to read and manipulate content, structure, and styles.

WCAG AccessAudit Report

Online programme overview | Imperial College Business School
https://www.imperial.ac.uk/business-school/programmes/msc-business-analytics/study-mode-online/

There are 7 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

1 Severe:

Any ID referred to via an IDREF must be unique in the DOM
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

2 elements break this rule:

1. id("searchForm")/input[@id="query"]
2. id("cd-primary-nav")/li[@class="search-mobile"]/a[1]/form[@class="gtm-ignore-generic-submission"]/input[@id="query"]

6 Warning:

These elements are focusable but either invisible or obscured by another element
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

9 elements break this rule:

1. id("Header")/div[@class="container"]/div[@class="column one"]/a[@class="screen-reader-text skip-link"]
2. id("menu-item-394804")/a[1]
3. id("menu-item-24352")/a[1]
4. id("menu-item-24355")/a[1]
5. id("menu-item-24354")/a[1]
6. id("menu-item-37390")/a[1]
7. id("menu-item-527527")/a[1]
8. id("menu-item-49151")/a[1]
9. id("menu-item-230205")/a[1]

Images should have a text alternative or presentational role
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

2 elements break this rule:

1. id("searchForm")/img[@class="scale-with-grid magn-glass"]
2. id("Footer-Logo")/a[1]/img[1]

The purpose of each link should be clear from the link text
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

6 elements break this rule:

1. id("menu-item-24344")/a[1]/div[@class="sub-menu-icon"]/a[1]
2. id("menu-item-394822")/a[1]/div[@class="sub-menu-icon"]/a[1]
3. id("menu-item-37393")/a[1]/div[@class="sub-menu-icon"]/a[1]

Figure 7.29: Imperial College webpage WCAG accessibility audit report

The tool provides links to support pages where the developer can see what the element ID should look like, for example:

```
<!-- Good: each id is unique -->
<input type="radio" id="trout1" name="trout" value="rainbow"/>
<input type="radio" id="trout2" name="trout" value="brook"/>
<input type="radio" id="trout3" name="trout" value="lake"/>
<!-- Bad: the id 'trout' should only occur once in the "page" -->
<input type="radio" id="trout" name="trout" value="rainbow"/>
<input type="radio" id="trout" name="trout" value="brook"/>
<input type="radio" id="trout" name="trout" value="lake"/>
```

After manual user testing, it was found that the videos used in the course pages were inaccessible as they did not have subtitles or audio description, nor were they accompanied by annotations or scripts. Although some of them were hosted on YouTube, whose media player offers the option to add automatically created subtitles, a quick check showed that the quality of the subtitles was very poor: missing punctuation, lack of speakers' identification, mistakes in transcription and problems with segmentation are just a few of the mistakes observed. On the other hand, the main Business School webpage did contain a video with subtitles (see Figure 7.30), which was also hosted on YouTube and for which the subtitles had been added by the owner on the original material, thus proving that there is no consistency in the School's approach to the accessibility of the audiovisual material used on their website:

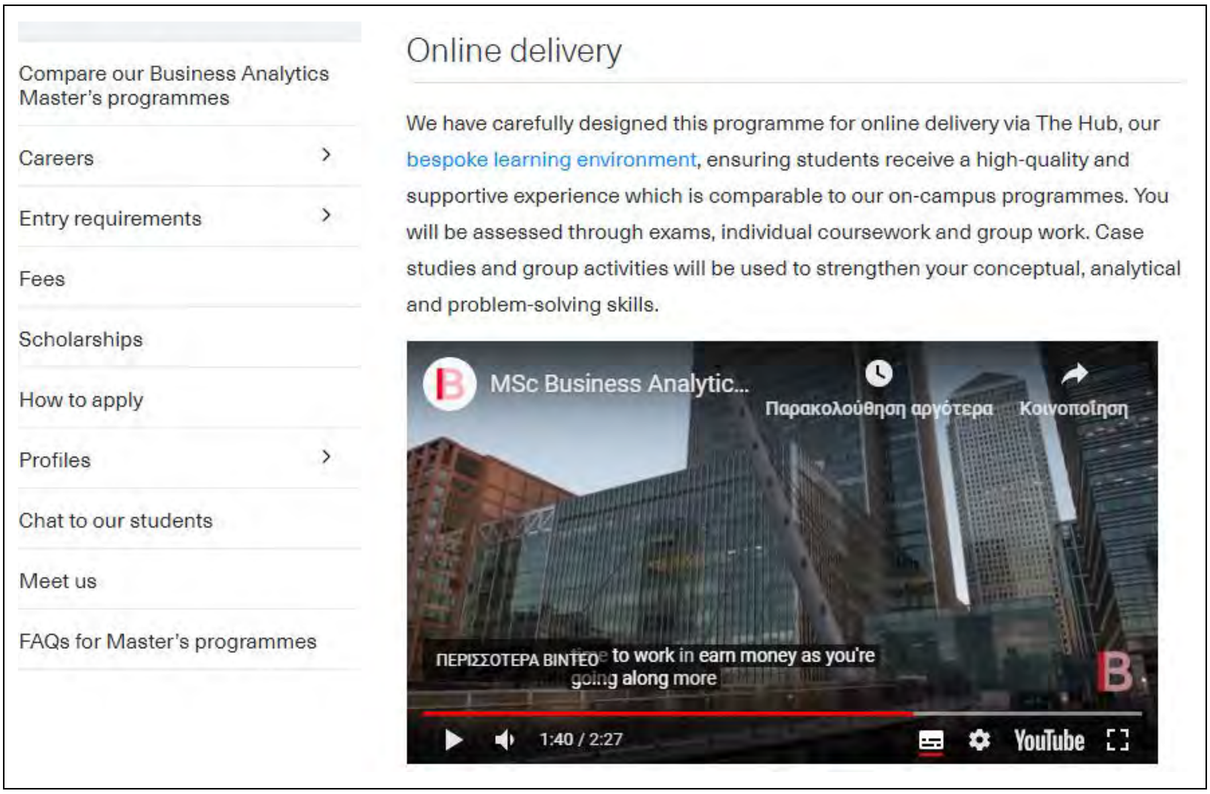


Figure 7.30: Business School programme webpage video subtitles

When it comes to enrolment and support, and according to the university's provisions mentioned earlier in this section, disabled students have to contact Disability Advisory Services directly to state their needs and request support for their studies. It looks like although students are asked to register any needs they may have when they first enrol, the information is not used to contact them and offer them support. On the one hand, it can be argued that this approach shows discretion in the way in which their personal information is handled. On the other hand, if access to general information is not equally available to all students and some of them have to request it from the university, it could be seen as an instance of unequal treatment that can potentially put disabled students in an uncomfortable situation, as further discussed in Chapter 8. On the bright side, users visiting the main page of the online course and the Business School website are immediately given information on how to contact staff for support and guidance as well as on how to get access to assistive technology.

To recap, this small case study highlights two important matters. First, automated checks are not sufficient in order to judge the accessibility level of a website. Second, equal access is clearly not achieved when the institution, which should be responsible for providing it, instead transfers the onus onto the potential users, who have to get in touch with staff to ask for access.

7.2.2.2. Prototype 2: supplementary material for an on-campus course

In this prototype, the focus in on a university's e-learning platform being used for the provision of supplementary material for students who can access it either from home or within the institution. The preparation and offer of material should be performed in the following stages:

1) Preparation	a. Validate e-learning platform/content management system – EN 301 549 V1.1.2 b. Validate website – WCAG 2.0
2) Design	a. Prepare content – UDL guidelines on design and WCAG 2.0 b. Add useful tools to platform to enhance access – EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*

3) Enrolment and support	a. Make sure sufficient means to access the course are available by providing assistive services – Section 508 b. Support and direct users in the acquisition of assistive tools – Section 508
4) Maintenance	a. Make sure accessibility is an integral part of the maintenance process
Note: Where steps of this process require collaboration, the instructor or course designer will need to take a monitoring role.	

Table 7.3: Steps in the implementation of INCLUDE – Prototype 2

In this particular scenario, it is essential that the institution be accessible in terms of structured environments, i.e. access to buildings, labs, assistive technology software and hardware. Since the course is on-campus, the external perimeter refers to the working location, whereas the e-learning platform becomes the internal perimeter, as depicted in Figure 7.31:

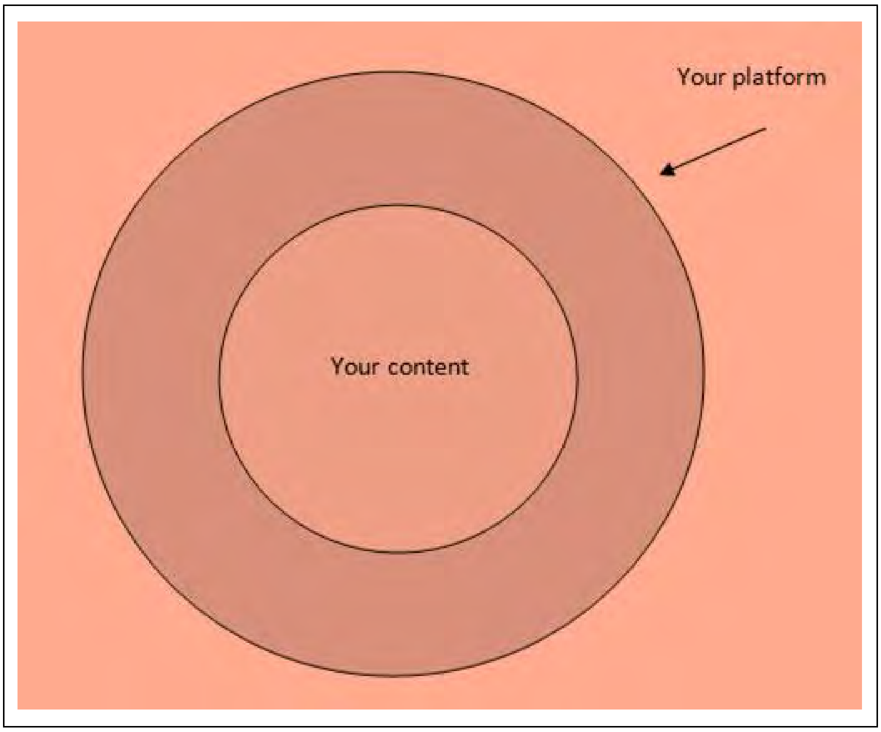


Figure 7.31: INCLUDE prototype 2

If the platform is accessed via the main university website, the suggestions provided under Prototype 1 regarding the external perimeter also apply here. The instructions provided for an accessible internal perimeter are the same and so are the instructions related to the course content design and provision. The latter have not been included in the list of requirements as they are expected to be part of the main course design that is delivered on campus. Yet, despite being delivered in class and not online, the content of the course should be drafted with UDL guidelines in mind. Since the framework is relevant to the format of the online content, course drafting should not take place on the platform as it is expected to be delivered on campus, to resort to various types of content and to make use of different educational tools. However, it is advisable that when drafting the material instructors bear accessibility and UDL guidelines in mind.

Enrolment and support are important in this prototype, as it is essential to make sure that students can access the supplementary material with the help of access services and tools provided by the institution. Maintenance is also crucial and requires constant evaluation of the material and the course overall. Communication and co-operation are required between all the stakeholders involved in platform maintenance, course maintenance and course instruction.

7.2.2.2.1. Case study 2: UCL

The case study for this prototype, supplementary material for an on-campus MSc at University College London (UCL), focuses on access to course content in the internal perimeter, on the preparation and provision of content in multiple formats as well as on the course drafting and design. UCL is placed seven in the QS World University Rankings and it offers courses at undergraduate, postgraduate and research level. Their disability support is channelled through the Student Support and Wellbeing service, whose webpage directs students to a number of resources, including assistive tools, guides and videos on study resources, guides for physical access to campus, and information on IT support on campus and to access electronic content. The university has published a disability support policy for students and has also promoted the creation of Equality, Diversity and Inclusion networks, which offer support to staff and students.

A declaration on the UCL website vouches compatibility with WCAG 2.0, and a quick check on the main disability- and inclusion-related pages of the UCL website shows that it is fully accessible in terms of operation and functionality. Most videos are presented with subtitles, as seen in Figure 7.32, although audio description is still not available:

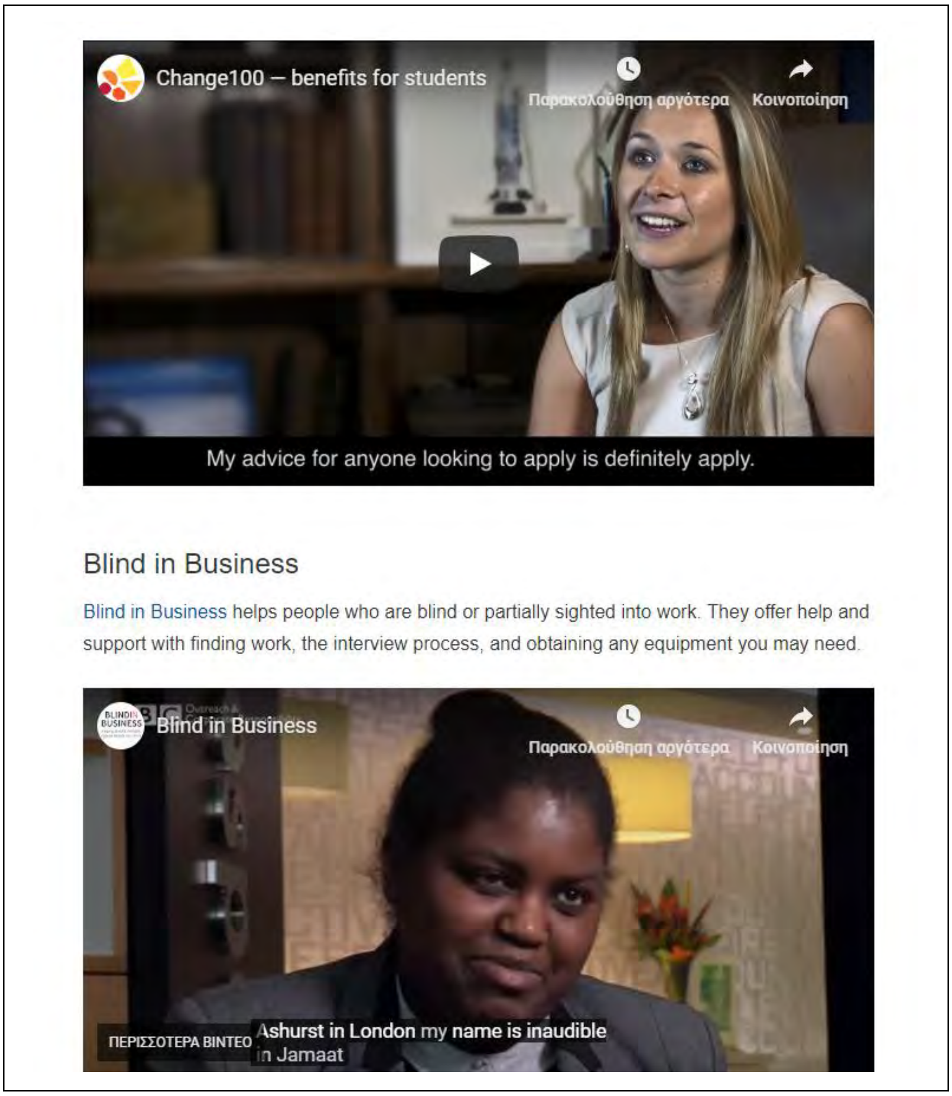


Figure 7.32: UCL Disability Support website – subtitled videos

UCL offers MOOCs hosted by FutureLearn, which applies an accessibility and inclusion policy that, among others, makes reference to the use of alternative text to ensure information and functionality. The university also resorts to Moodle for hosting supplementary on-campus course material, as well as for online courses. As part of their Accessible Moodle project launched in 2017, the university migrated to a new, more accessible version of Moodle in 2018. The material evaluated in this case study comes from the Medical Translation module of the MSc in Specialised Translation offered by UCL's Centre for Translation Studies (CenTraS).

The external perimeters of the course are the main university website and the pages of the website that lead users to the information about the course. The CenTraS webpage, which is part of the UCL website, is found to provide adequate information for courses, although links to contact the CenTraS team for information about the courses are only available after a long thread of pages. Following checks on the two pages, i.e. the main UCL webpage and the main CenTraS webpage (Appendix 6), there is there is one severe fail rule, which is the same in both pages, namely, the missing label from the search box at the right top of the webpage, as shown in Figure 7.33:

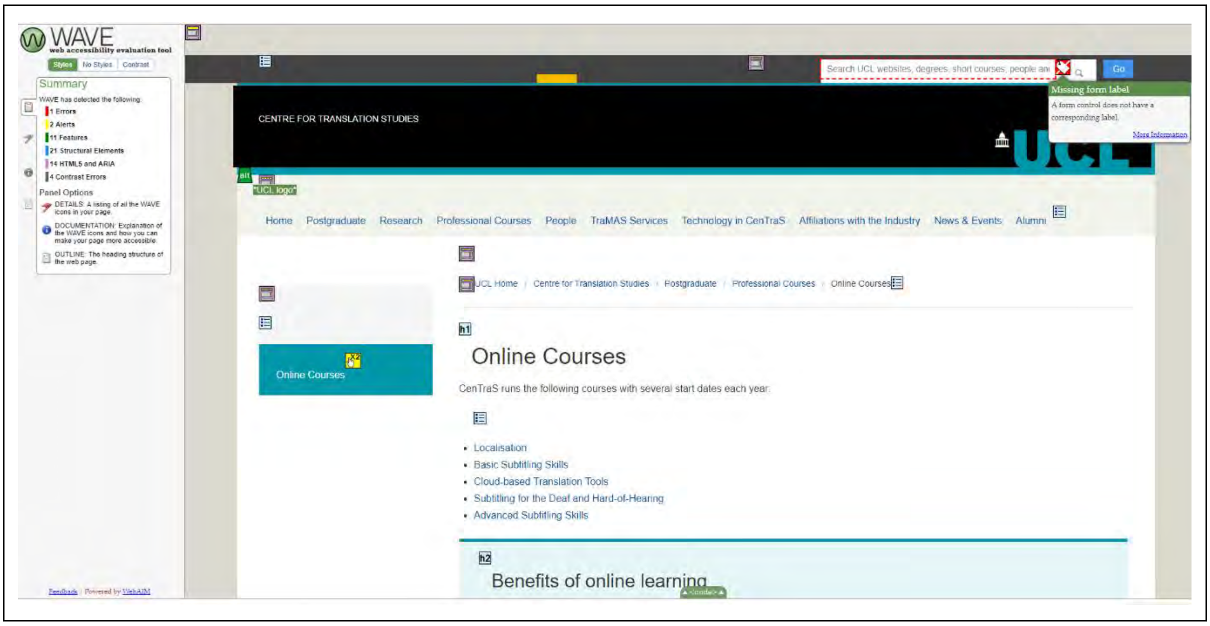


Figure 7.33: UCL Online Courses webpage WAVE check

According to the WCAG Accessibility Audit tool, the internal perimeter of this course, i.e. the relevant page on the Moodle platform, shows three severe rule fails related to the architecture of attributes and elements, while the WAVE tool throws up 12 errors (four of them appeared in red icons in Figure 7.34), foregrounding lack of compliance with requirement 9 of the EN 301 549 standards on matters related to web content.

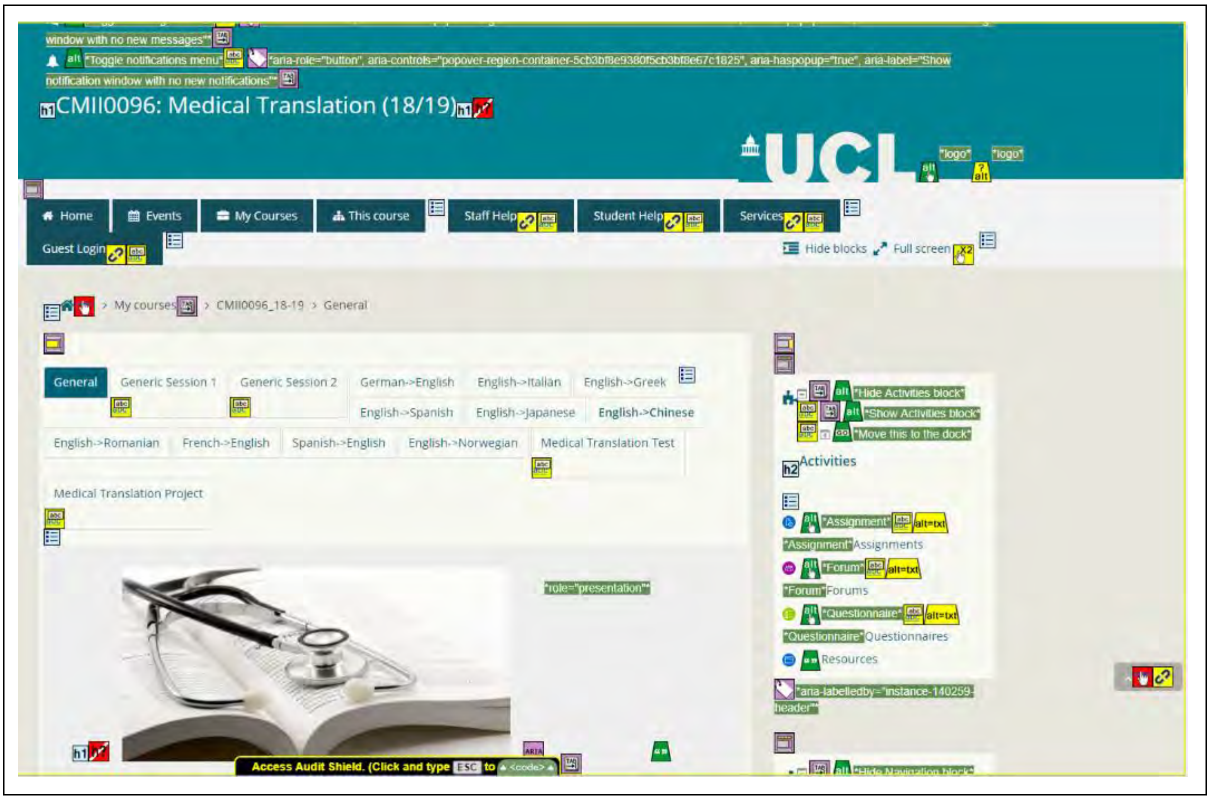
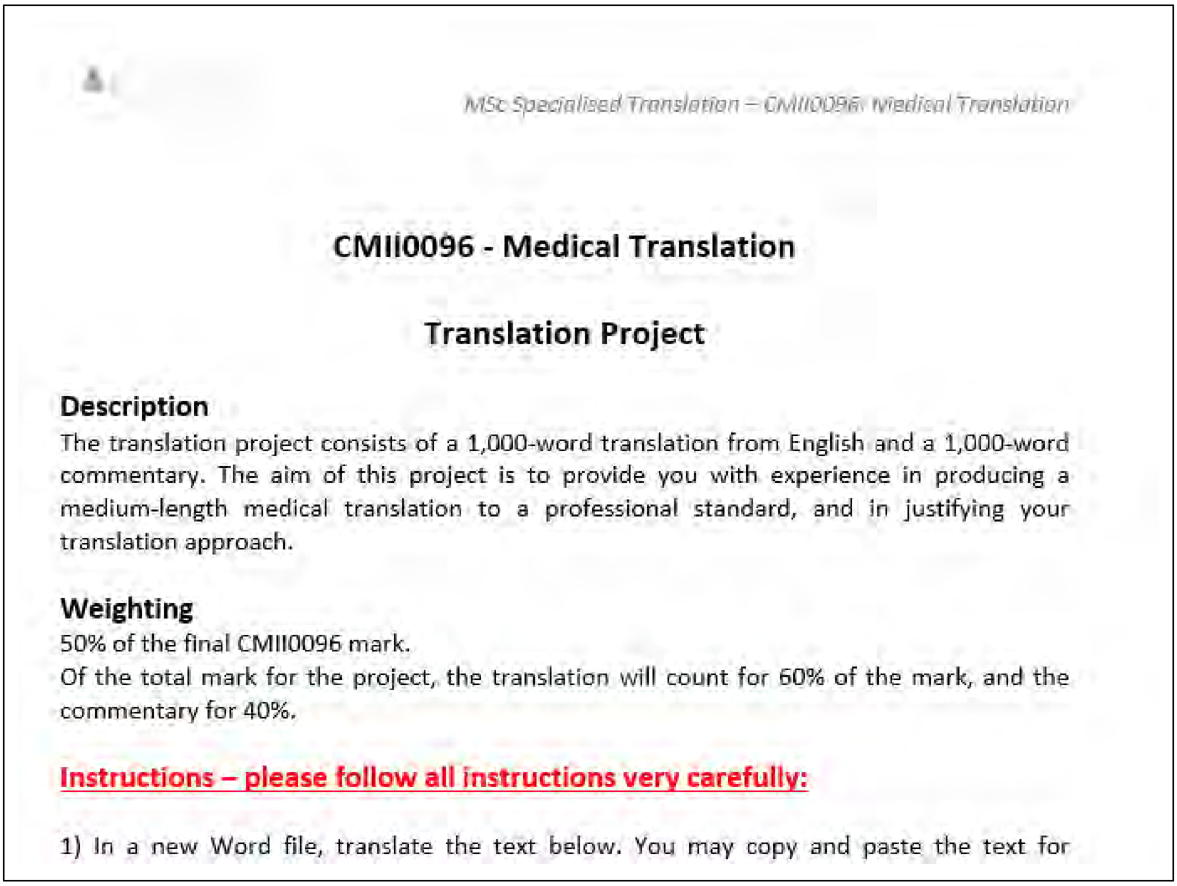


Figure 7.34: WAVE check of Medical Translation course on Moodle

The actual content of the course is provided in accessible formats that can be read by screen readers and some explanations about the module are found as well as guidance on examination and assessment procedures. For the present analysis, the focus is on the Medical Translation project guidelines and on the material uploaded for students.

The project guidelines include information about the deadline, the marking criteria, the submission process and similar (see Figure 7.35) and they are discussed in class and uploaded onto the platform:



MSc Specialised Translation – CMII0096: Medical Translation

CMII0096 - Medical Translation

Translation Project

Description

The translation project consists of a 1,000-word translation from English and a 1,000-word commentary. The aim of this project is to provide you with experience in producing a medium-length medical translation to a professional standard, and in justifying your translation approach.

Weighting

50% of the final CMII0096 mark.

Of the total mark for the project, the translation will count for 60% of the mark, and the commentary for 40%.

Instructions – please follow all instructions very carefully:

1) In a new Word file, translate the text below. You may copy and paste the text for

Figure 7.35: Course project guidelines

They come accompanied by an example of a medical translation project, as well as a forum where students can interact and ask questions about the project. All files are accessible Microsoft Word or PDF files. The deadline for the submission of the project is clearly indicated in the instructions files and in the relevant area on Moodle.

The course is provided in an accessible format, which means that the tutor needs to ensure that content is always uploaded in the form of downloadable files that do not surprise the user. Ideally, this process should follow a steady pattern, warning students that new material has been uploaded without automating any actions, as suggested by WCAG 2.0. Instead of forcing the download of the file or allowing the automatic behaviour of elements (see Figure 7.36), the tutor needs to select an option that adheres to the web accessibility guidelines, e.g. display the file in a new window:

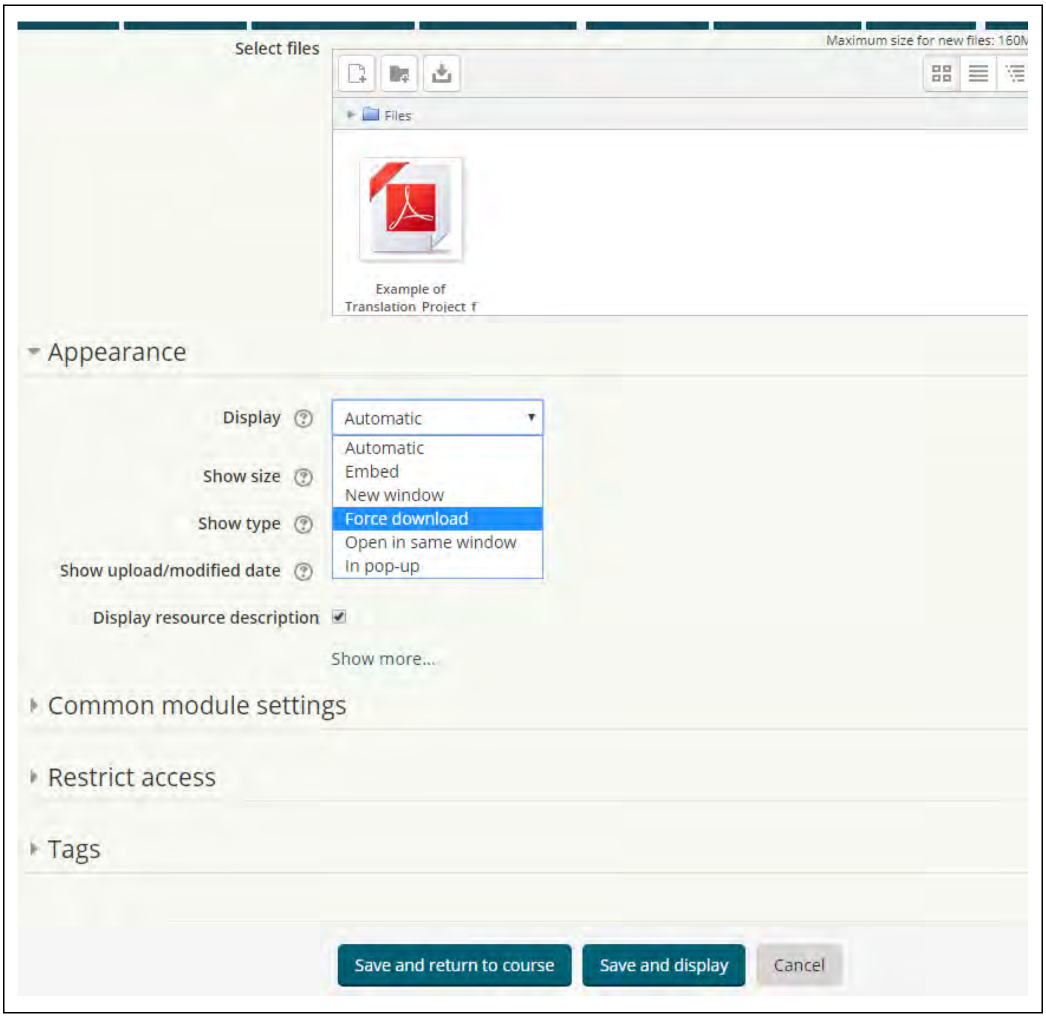


Figure 7.36: Course project guidelines display options

Similar decisions to control the behaviour of the platform need to be made when creating other components like lessons, forums, chat rooms, etc., which is why knowledge of the mechanics of the internal perimeter is considered necessary for tutors. To this effect, UCL offers guides and training for members of staff who would like to exploit the platform effectively.

One of the supplementary activities offered to students was an online session to discuss additional guidance on how to write a translation commentary. The session was organised by the tutor and delivered via YouTube in the form of a live session. The information covered during this session was also provided afterwards, in the form of notes, as shown in Figure 7.37:

Notes from Live Streaming

by Emmanouela Patiniotaki - Friday, 8 February 2019, 11:00 AM

Questions raised:

- Does the bibliography count against the word count?

A: No, it doesn't. But references in your commentary, i.e. Patiniotaki (2008), do count.

- Do footnotes count against the word count?

A: No, the don't. But please do not make excessive and unnecessary use. Appendices are also excluded.

- Shall we include dictionaries in the References area?

A: Yes, if you use them as references in your commentary. But you do not need to reference every single resource that you used during the translation. Only those used to support your arguments in the commentary.

- Can we add translator's notes? Do those count?

A: You can only add translator's notes in your translation, which is very rare and a practice only applied when absolutely necessary. I would suggest that you consult your language-specific tutors and ask them before you do that.

Translator's notes should not be used in your commentary. Use footnotes instead, because as soon as you pass from the translator's task to the commentary, you become the author of an academic piece of work. So they are just notes, i.e. footnotes.

I will come back with a list of DOs and DONTs in a while :)

Figure 7.37: Course project live session notes

The session was recorded and made available to students who could not attend. It was also made accessible with subtitles and a video description, i.e. a low-quality alternative to AD, as displayed in Figure 7.38:

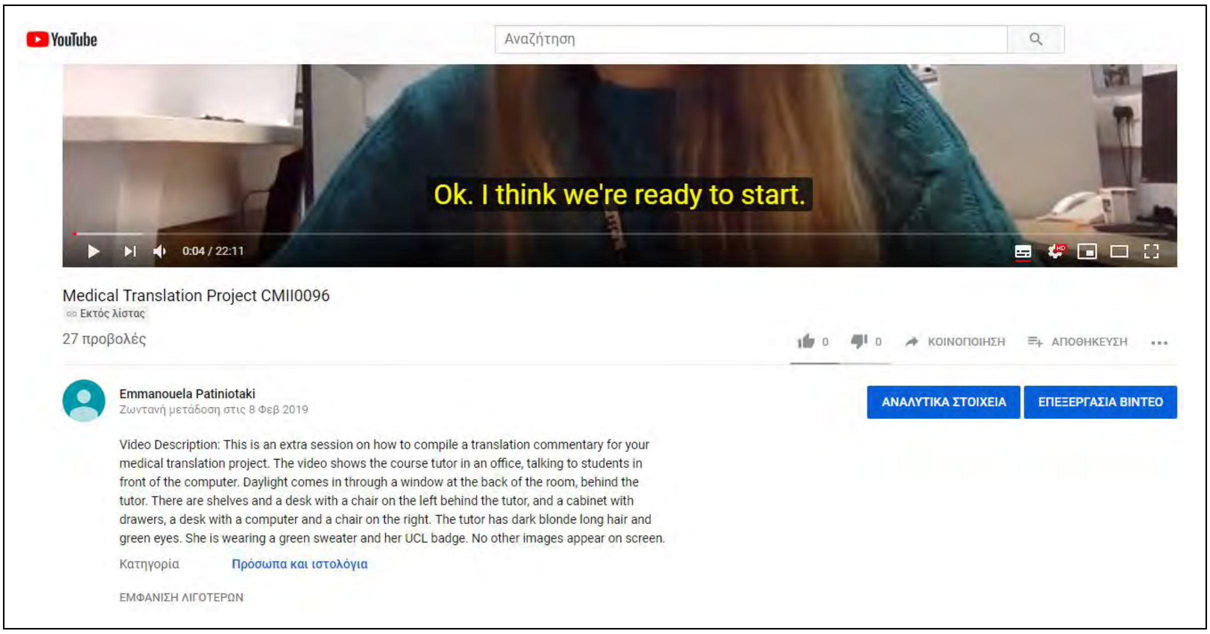


Figure 7.38: Course project live session accessibility

The various accessible material formats, as well as the alternative ways of access to live and electronic material make this course a good case study for online supplementary material for an on-campus course.

In the first instance, staff training is required in order for the internal perimeter to be used effectively. Furthermore, rather than simply making the recorded live session accessible a posteriori, it would be much better to be able to run and record videos through the platform, as well as use a player through Moodle that would allow tutors to add SDH and AD. The university platform is linked to Lecturecast Echo 360, which can be used for recording on-campus lectures. The video used in this example is instructional and thus considered an ‘easy’ type of content for AD, since there is no onscreen action that may affect understanding of the content. SDH is also relatively straightforward compared to other material, as there is only one speaker. One of the downsides is that the only text that seems to be supported on Moodle to accompany videos is transcripts and notes, while AD is not an option. As for SDH, the Information Services Division can grant access to Echo360 to tutors who want to upload subtitles to their videos as long as they have been recorded with Lecturecast, which means that sessions that are not recorded in the classroom, i.e. web camera and screen recordings for online courses, cannot be subtitled in this way.

As for the design of the material used in this medical translation project, the content and the provision seem to satisfy the UDL guidelines. First of all, students can customise the display of information on Moodle, alternatives to auditory information are provided, and the video description helps capture visual information, thus satisfying guideline 1 on Perception. The vocabulary chosen for the instructions is considered simple, and so is the structure of the text and the conventions and formatting used in the presentation of the information, while homework, tasks in class, presentations, forums and videos can be considered as multiple media for the illustration of the same material, satisfying guideline 2 on Language and Symbols. Notes on potentially unclear aspects of the project as well as the highlighting of important information, such as deadlines, ensure Comprehension (guideline 3). As the material is designed, organised and provided with accessibility in mind, both in terms of format and with regard to Moodle options, guideline 4 on Physical Action is also satisfied.

The various ways of interaction offered, e.g. through the platform, via email, through forums, during the online session (either with a microphone or with the chat box), adhere to guideline 5 on the provision of options for Expression and Communication. Provisions for Executive Functions (guideline 6) are also met, as the project goals are clearly specified in all available content formats and a list of references and resources to help students complete the project is offered. Students are encouraged to comment on their own translation choices and to use their work in their future portfolios, which enhances their interest in the project (guideline 7) and helps sustain their effort and persistence (guideline 8). Students were given feedback and the chance to discuss it with their language-specific tutors (guideline 9), while they were also seen collaborating and advising each other in the CenTraS Translation Lab.

It can be said that the main requirements of the framework are fulfilled, especially in terms of content and access to the perimeters, although some errors need to be fixed with regard to the web content. In this respect, requirement 11.3.2 of the EN 301 549 standards should always be taken into consideration to ensure smooth interoperability between users' assistive technology and the platform.

7.2.2.3. Prototype 3: open source distance learning course

The third and last prototype tested in these pages concerns open source courses that are usually intended for self-study with little or no interaction with instructors. These courses are usually hosted on the website of an educational institution or on a dedicated platform for courses of this type, though on occasions they are found on websites that were not designed with the original aim to offer learning content. The stages of the INCLUDE framework for this prototype are listed in Table 7.4:

1) Preparation	a. Validate e-learning platform – EN 301 549 V1.1.2 b. Validate website – WCAG 2.0
2) Course drafting	a. Design curriculum with inclusion in mind, based on UDL guidelines on curriculum b. Decide on learning methodology, depending on the topic, the mode of delivery and UDL guidelines on curriculum
3) Design	a. Design course with accessibility in mind – EN 301 549 V1.1.2 b. Prepare content – UDL guidelines on design and WCAG 2.0 c. Add useful tools to platform to enhance access – EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*
4) Enrolment and support	a. Make sure sufficient means to access the course are available by providing assistive services – Section 508 b. Support and direct users in the acquisition of assistive tools – Section 508
5) Maintenance	a. Make sure accessibility is an integral part of the maintenance process
Note: Where steps of this process require collaboration, the instructor or course designer will need to take a monitoring role.	

Table 7.4: Steps in the implementation of INCLUDE – Prototype 3

In this prototype (see Figure 7.39), responsibility for access to the external as well as the internal perimeters lies with the people in charge of the maintenance and operation of the website. However, the instructor/course designer should check the accessibility and access options of the hosting environment and accompany the course content with instructions, guidance and material that would guarantee that all participants have equal access to the course. When possible, accessibility issues should be discussed and resolved in collaboration with the hosting and maintenance team, though instructors/course designers should be able to provide alternative solutions when that collaboration is not in place. The relevant guidelines for accessible external and internal perimeters are the same as those suggested in Prototypes 1 and 2.

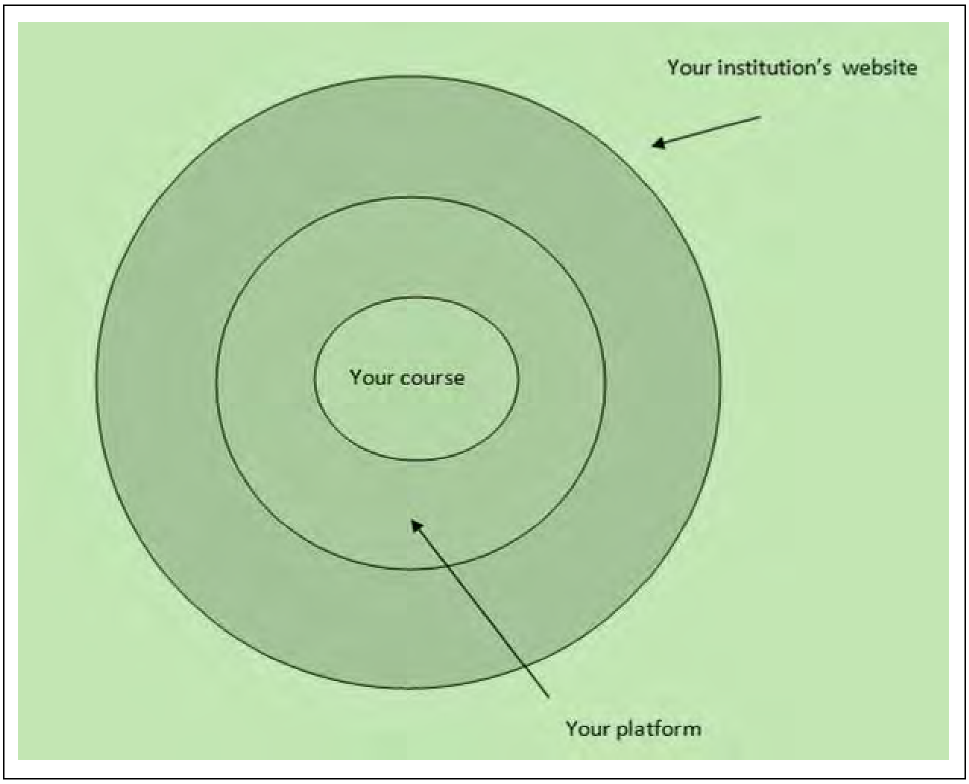


Figure 7.39: INCLUDE Prototype 3

When it comes to the content, instructors should make sure that the course content is designed in a way that justifies the goal of the UDL guidelines, as discussed in Prototype 1, and that they provide tools and/or alternative formats when that is not possible through the external and internal perimeters. To ensure an equal and smooth enrolment process is crucial in this prototype too, and close collaboration among the various stakeholders is recommended as this step is usually beyond the control of the instructor/course designer. Given the large number of students taking this type of course, it is better to ensure that the whole enrolment process is accessible from the beginning since personal support with assistive services and tools, as recommended by Section 508, is most probably not an option. Maintenance in these courses has mostly to do with updating accessibility conditions and course content, as well as improving access based on observations and feedback. Communication and co-operation with all the people involved in web maintenance, platform maintenance, course maintenance and instruction are essential.

7.2.2.3.1. Case study 3: University of Southampton

The case study chosen for the third prototype comes from the University of Southampton, a British university ranked 96 in the QS World University Ranking and offering provision on all levels of higher education as well as online courses and MOOCs that are hosted in the FutureLearn platform. A closer look is taken at one of their open source courses to illustrate best practice in this domain, and the ensuing discussion centres on access to the internal and external perimeters as well as on sensory access to audiovisual content. Special attention is paid to an accessibility tool bar developed by the university and implemented from a rights-based approach. The course used for this purpose is “Understanding Money: the History of Finance, Speculation and the Stock Market”.

In its Accessibility Statement, the University of Southampton (n.d.: online) declares that it “is committed to providing a website that is accessible to the widest possible audience, regardless of technology or ability”, pledges its intention to fully comply with WCAG 2.0 Level AA and offers a list of assistive tools that can be used through the browser. There is a dedicated team working towards this achievement and the institution has announced its Access and Participation Plan 2019-20 with the aim to support access, participation and success among students from under-represented groups. The university also has a Disability Support Service, which offers Skype sessions and live chats for easy communication, and its website contains information about contact and support. These initiatives make the University of Southampton an example of best practice in the area of accessibility.

The three external perimeters, i.e. the welcome university webpage, the MOOCs webpage and the course page in FutureLearn, were initially human tested with a free screen reader, ChromeVox, which can easily be installed on the Google Chrome browser and helps evaluate the access level to the audiovisual content. The reader had difficulty moving from the main logo on the top left to the main navigation menu on the top right (see Figure 7.40), but after further tests with WAVE checker, which did not find any errors in the website's architecture, and the desktop-based NVDA screen reader, which did not encounter any problems, it was realised that the fault was with the screen readers as some of them could not recognise the upper menu. This is all the more problematic as the Accessibility Tools list is available there. This issue was recurrent in all pages, but no further problems were found.

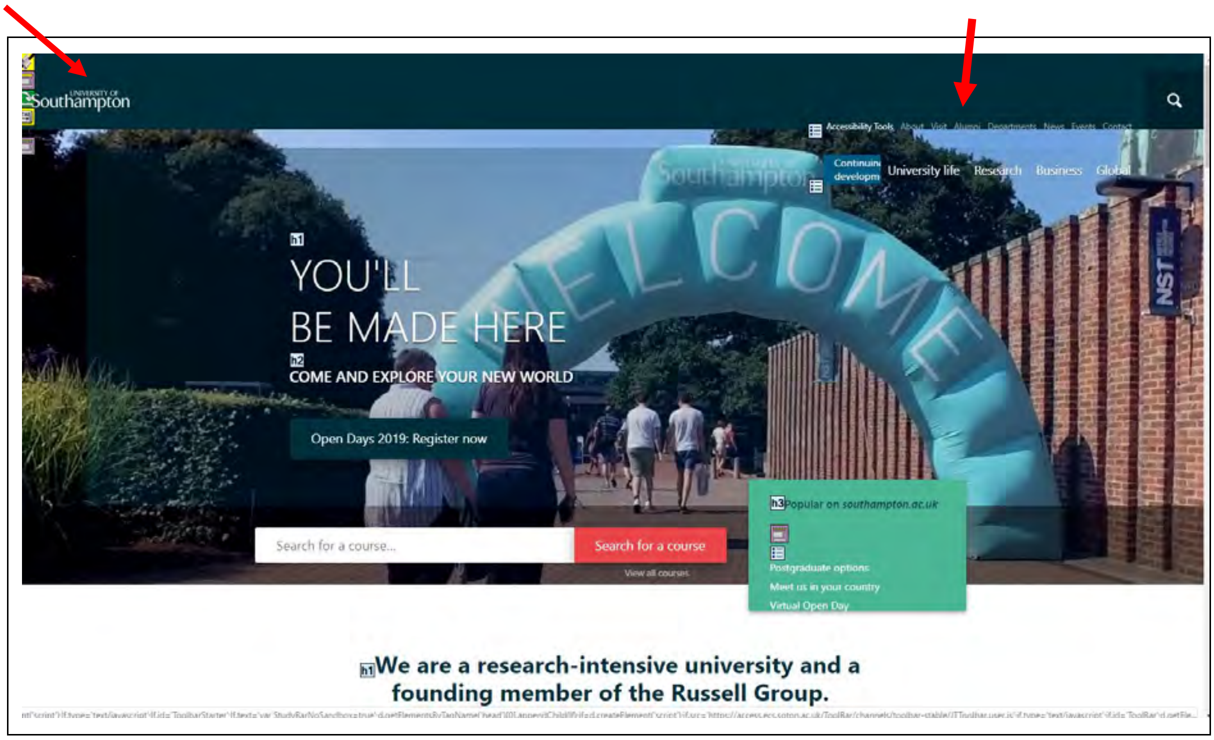


Figure 7.40: University of Southampton main welcome page

The assistive technology (AT) bar used on the website is a cross-browser toolbar that incorporates some tools to help users customise the way in which they view and interact with webpages. A high level of access can be said to have been attained when the tools are incorporated in the external or internal perimeter, which means that no external applications are needed by the user. In this precise example, as illustrated in Figure 7.41 below, one issue is the fact that the user needs to be able to select the text in order to use the internal text-to-speech (TTS) tool, which can be highly problematic for blind users as they would need to use a screen reader at the same time, which can make navigation very hard.

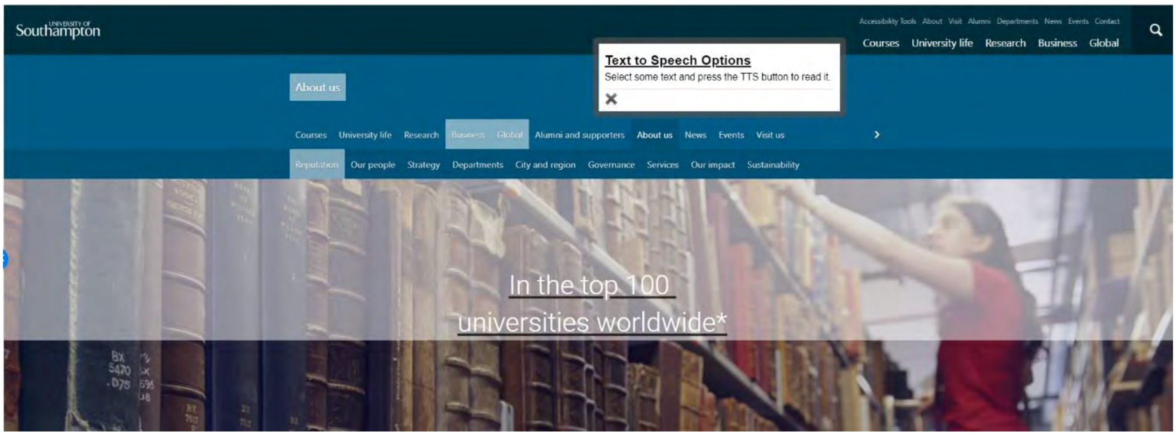


Figure 7.41: University of Southampton AT TTS tool

The page of the course in FutureLearn is fully accessible when using screen readers. Yet, although the videos are provided with transcripts and subtitles that include description of music and other labels (see Figure 7.42), AD is not available in the media player:

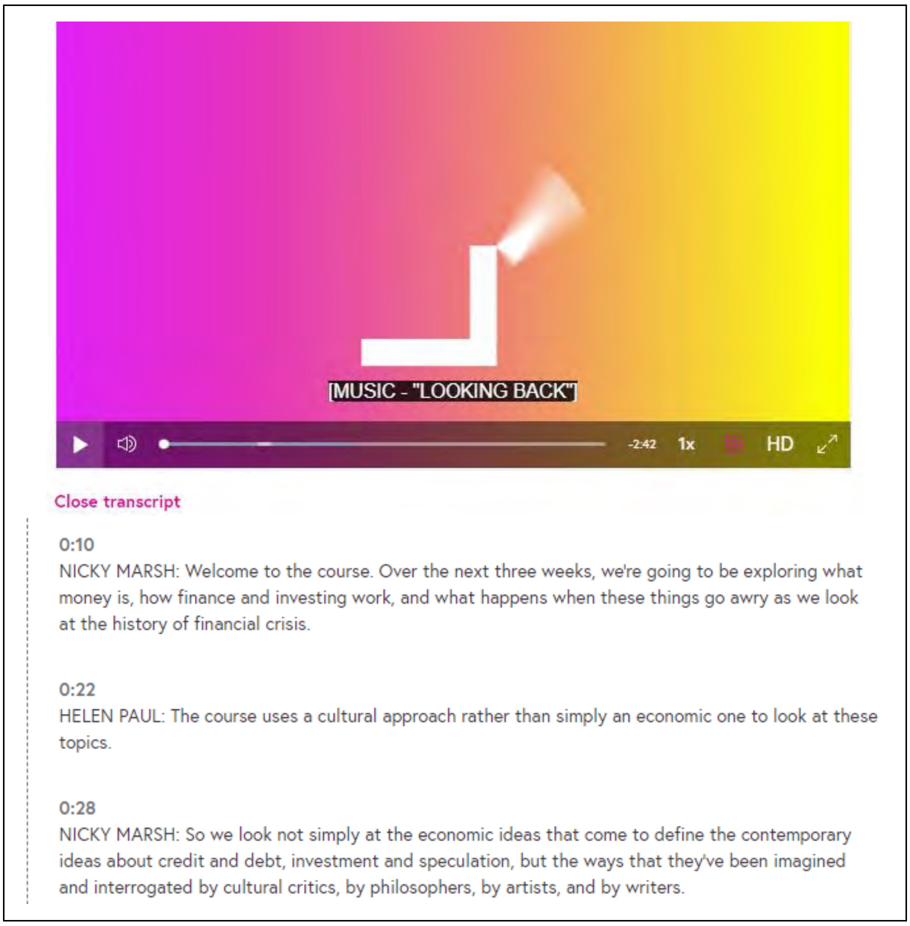


Figure 7.42: Southampton MOOC on FutureLearn, subtitled video

Another shortcoming is the fact that descriptions are not be provided for some images, as in the case of the world map shown in Figure 7.43:

Figure 7.43: Southampton MOOC on FutureLearn, inaccessible image

From the point of view of the design, the course is simple, straightforward and free of unnecessary elements, allowing for a smooth experience. All in all, it seems to be accessible in terms of providing alternatives for audio, but it is not when it comes to rendering visual content, which shows inconsistency in their approach to sensory access. Some content, like guidelines, is provided with simple structure and language, in the form of downloadable files that are accessible. On the downside, some links to external resources can lead users to inaccessible content, such as the interactive map in Figure 7.44:

Figure 7.44: Southampton MOOC on FutureLearn, link to inaccessible resource

In the case of this MOOC provided by the University of Southampton, an attempt can be seen to provide access at a more holistic level, concretised in some specific policies in place, alternative modes of interaction and communication, and consideration of sensory impairments, although text is clearly favoured over sound when it comes to audiovisual material. An approach of this nature is very close to the ideal suggested by the INCLUDE prototype, though some important improvements are still required.

7.2.3. Concluding remarks

It is interesting to notice how some of the best examples of accessible educational courses and content in higher education might seemingly comply with accessibility standards, yet a careful evaluation can show gaps in the application of access practices and tools. This finding highlights the importance of maintaining consistency when using assistive technology and access services for educational purposes, as any mishaps will negatively affect users' experience.

In general, approaches to online accessibility tend to focus on web accessibility standards, with little attention being paid to access to audiovisual material by people with sensory disabilities. When universities take steps to facilitate access to videos, captioned or subtitled material is normally given priority over audio-described media. It is also evident from the case studies carried out in these pages that ease of contact for support is not always considered and that there is no consistency in the provision of alternative forms of content.

The output of the survey together with the results gleaned from the analyses carried out in the second part of Chapter 7 help to draw an interesting picture on how universities approach accessibility. The survey shows a lack of consistency in the application of policies and frameworks that are focused on disability and accessibility, as well as in the use of assistive tools and services. In some of their answers, respondents also show to be unaware of important issues relative to accessibility. One of the attractive features of the INCLUDE model is that it provides the researcher with a list of steps to follow in order to conduct a systematic evaluation of any given webpages. In the current research, the empirical analyses of the various case studies tend to confirm, in some cases, this lack of consistency in the implementation of the various parameters affecting accessibility.

It is important to consider that being at its initial stages, this framework is by no means exhaustive in terms of the guidelines and parameters that determine the teaching methods, the tools as well as the course design and development. For course content to be fully accessible, various tools need to be employed in order to reformat existing content or to design new one. These tools cover a wide variety of aspects, such as choice of colours; management of images and sound; inclusion of sketches, graphics, flash elements and video management; links to external resources and the like. Whether instructional/teaching software/tools/aids are essential for the course will depend on the type of content taught, e.g. maths, as well as on the mode of delivery, e.g. static text or videos.

Each course is different and is determined by a number of factors, including its scope, the intended recipients, the institution, the mode of provision, the tutors who deliver it, their background, and so on. Specific characteristics of the course, which may not be contemplated in the guidelines and standards, should be borne in mind in the design process. At the same time, multimodal solutions should be provided where possible, for example synchronous and asynchronous learning, while flexible communication solutions should be an integral part of the course, allowing both participation and communication for support. Instructions on how to use and access each of the components of the course should be published in a prominent position, and assistive tools should be made available internally, i.e. in the main website of the institution or within the e-learning platform. Finally, when a course is accessible, it should be presented and advertised as such, so that it can be easily identified by potential participants.

Chapter 8

Conclusions

The current research aims to contribute towards the combined study of DS, AVT, ICT and OE in answer to the need for a theoretical background that could facilitate holistically applicable research in accessible OE. This final chapter determines whether, and to what extent, the research objectives of the thesis have been met. Its theoretical, practical and social implications are also discussed, with new ideas for the study of access services being put forward not only as an area of study, but also for professional purposes, with social parameters determining different approaches both to research and professional training. It summarises the outcome of the survey in the light of the study questions outlined in the Introduction (Chapter 1) and the Methodology (Chapter 6) and investigates further research directions based on the data presented in Chapter 7 and on additional information collected through the survey. It also identifies necessary improvements in terms of institutional legislation and policy, with the data from the survey and the analysis of the case studies acting as indicators for inconsistencies in the status of accessibility in higher education. This chapter also contains suggestions for further research, as, throughout this doctoral project, new ideas have surfaced with potential for further in-depth analysis on the potential synergies that could be established between AVT and the various disciplines involved, as well as the practical implications of the suggested framework. It also identifies new avenues for future technological development, specifically in relation to the technical means needed for the design and implementation of accessible educational environments and content. It calls for the irrevocable provision of accessible education and foregrounds the view that any progress in the delivery of access services in education cannot be effective when divorced from technology.

8.1. Research Outcomes

The evaluation of the research outcome is based on whether the objectives presented in Chapter 1 have been met, namely:

5. To explore and explain the connections among the various disciplines involved in the research, i.e. DS, AVT, OE, and ICT, as well as some of their most relevant developments and practices.
6. To build a theoretical framework that would account for the understanding and explanation of the various parameters that have an impact on the articulation of accessible online education.
7. To explore empirically how higher education institutions approach accessibility, by conducting a survey distributed among a number of high-profile institutions that provide disability support.
8. To suggest possible routes to enhance accessible online education, based on the survey findings, the case studies analysed and the conclusions extracted from previous theoretical debates.

The analysis carried out in Chapters 2 to 5, and again in section 8.2, shows that there is a strong connection among the disciplines discussed in the research, which is closely related to the applications of each discipline in society as a whole as well as in everyday life. DS has proved to be a useful, if not necessary, basis for research into the implementation of theoretical and technological developments in accessible education, as access to education is a human right and, as such, education should be offered to the whole of society on an equal basis. At the same time, for studies to be accepted by the disabled population, the principles that emanate from DS – more specifically the rights-based, emancipatory approach that aims to prioritise recipients' needs – are believed to be instrumental. Of equal importance is the fact that involving AVT – and AVT accessibility services in particular – is crucial as these services must be included in interdisciplinary research in accessible OE and, indeed, accessible education in general. SDH and AD have traditionally been seen as a form of AT as well as a constituent area of audiovisual translation and, to make sure that they continue to thrive in the future, they should receive further attention from a technological standpoint to guarantee that they are key in facilitating equal access to education.

The current research project has examined the status quo of SDH and AD within the industry and academia, not only to identify their practical usefulness but also to investigate the research avenues that could be most promising in the future. Both have been incorporated in the INCLUDE framework, whose ultimate goal is to improve the accessible dimension of (online) courses and educational environments.

The survey and case studies discussed in the previous chapters show the lack of a consistent approach in the provision of measures that can facilitate equal access to audiovisual material. The study also unravels a tendency to prioritise physical as opposed to sensory access to education and highlights that, although audiovisual material is widely used in OE, not enough attention is paid to its accessibility. Based on the answers provided in the survey, the level of training and knowledge of some of the respondents came across as an important parameter to consider in the future since, despite working in specialist units, their professional and educational background did not seem to be adequate enough if they are to plan and design the articulation of access services at some of the institutions. The situation is compounded by the fact that universities do not seem to have a clear-cut framework, in which specific reference is made to access services and their implementation. In many cases, access services are not provided as a matter of course and are only offered upon request.

Against this backdrop, the INCLUDE framework suggests ways of achieving accessible environments in OE in a reasonably easy manner, as long as the guidelines are followed in a consistent manner. By identifying various perimeters for access in educational contexts, the role of educators, support staff, web content administrators and web developers can be streamlined and clarified. This division into perimeters also allows for a comprehensive overview of the whole process, in which decisions taken at various stages – e.g. design, advertising, provision and maintenance of the content on the web – are all important for a successful outcome. When it comes to evaluating the appropriateness of some of the accessible measures in place at some universities, and despite the existence of applications that can conduct automatic checks, human evaluation has proved essential to fully ascertain the level and quality of the access solutions in place.

To sum up, the ultimate aim of this research has been the investigation of the role and potential of access services like SDH and AD in the specific context of online educational ecosystems, which has led to the design of the INCLUDE framework. The theoretical exploitation of various disciplines, namely DS, AVT, OE and ICT, has proved fruitful in tackling such an interdisciplinary domain.

8.2. Social and Technological Implications

The original drive to base this research on a DS framework may have been motivated by a desire to be involved in activism and to promote the rights of disabled people, yet such approach has proved useful for evaluating the principles, practices and services behind accessible OE from a socio-political and educational point of view. This research is considered socially valuable because, by implementing the notion of emancipation, it challenges conventional ways of discussing education and highlights the importance of the active involvement of disabled people at various stages, especially in the evaluation of accessible solutions. Such an approach, articulated around the needs and the feedback provided by the intended audience, has the potential of informing research on access services with relevant empirical data. Although reception studies have played an important role in some on the research projects conducted in this field, the involvement of disabled recipients has been traditionally limited to data collection and evaluation of research outcomes, whereby their opinions are teased out at the end of the experiments, by means of questionnaires or surveys. In this sense, there is a clear need for access services like AD and SDH to be investigated by teams made up of scholars and end-users, in order to gain first-hand knowledge about their experiences. This would certainly be in line with the motto propagated by disability organisations, “Nothing for us without us”, and with the principles of emancipatory research, first referred to by Mike Oliver in the early 1990s (Barnes 2001). Closer collaboration with investigators would allow disabled people to provide insights into other parts of the research, such as the use of language, the political and social conditions considered in the research, the theoretical basis of a research project and its dissemination among the target population, as well as its further development based on its usefulness for society as a whole. Ultimately, a rights-based approach would bring the audience and researchers closer to each other.

Methodologically, research into access services has proved that both qualitative and quantitative data can be used effectively, which is in line with the principles of emancipatory research. In this respect, reference to disabled people’s experiences is mostly placed within environmental and cultural contexts, since research in access services usually focuses on certain countries, languages, and specific groups of disabled audiences. The dissemination of practical outcomes is important and, as Barnes (2001) explains, emancipation is about empowerment and emancipatory research should have a meaningful outcome that can be shared with society in an attempt to improve the living conditions of disabled populations. Illustrative examples of research actions in which close collaboration between DS and SDH has borne fruit are, for instance, guidelines that specify reading speeds and conventions for subtitles in children’s programmes (Zárate, 2015). The current thesis hopes to be a contribution in the same direction, with the proposal of the INLCUDE framework.

The suggested interdisciplinary approach to the study of access services in this thesis is mainly based on the marriage of two principles, namely (a) understanding of the concept of disability with its relevant political and socio-cultural dimensions, and (b) extensive knowledge of access services, in theory and practice, so that they are exploited in the development of access services in specific contexts. To this aim, the current thesis has proposed a relevant theoretical background that takes into account online education, AT and accessible web, without forgetting DS and AVT access services. The INCLUDE framework is a practical outcome that can be used in the testing, evaluation and implementation of accessibility in online educational ecosystems.

The technical analysis of AT and access services has pointed to technological innovations that can be applied to satisfy the needs of the relevant target audience and has opened up numerous opportunities for further investigation. To make sure that results are positive, synergies need to be maintained and strengthened between

AVT and ICT, so that any developments in the latter take into consideration the nature of access services.

In this respect, the INCLUDE framework is a set of guidelines that suggests ways in which a variety of principles, products and services from various disciplines can be combined to enhance the access dimension of learning environments, which are divided into external and internal perimeters for easier management, as discussed in Chapter 5. Fruit of the theoretical analysis conducted in the initial chapters of the thesis, the INCLUDE framework is a first attempt to help in the creation of holistically accessible online educational content, though the framework is flexible enough to be also operational in other scenarios, such as entertainment. The division into standards and guidelines makes the model easy to manage and operationalise, while at the same time being approachable to educators and educational institution staff. Besides the distribution of duties becoming clearer, thanks to the division into perimeters of access, other upsides of the model are the fact that educators and course designers can learn about the points that they should look out for in an online education platform, they can determine what makes their courses accessible, they can get a clearer idea of whom they should approach for help within their institutions, and they can also discover how to maintain their online courses.

Given the way society is evolving, the best approach for practitioners and researchers working in the field of access services seems to be to embrace the potential offered by technology and automation, to make sure that access services continue to satisfy the needs of disabled audiences in the future.

8.3. Research Directions Indicated by Empirical Findings

The empirical findings of the survey conducted as part of the present research can be summarised as follows:

On what level do universities apply a framework for accessibility?

1. The existence of Disability Units in certain educational institutions does not necessarily mean the application of an accessibility framework, which can attributed to the absence of a standardised framework that could be applicable to all the areas of the institutions.
2. The existence of equipment for physical access does not necessarily mean full physical access, which results in irregular/inconsistent accessibility, since the external perimeter of access to institutions becomes inaccessible in a substantial number of cases.

Based on the above, applying accessibility frameworks in a way that captures both the content and the physical/structured environment appears to be problematic. There are also questions concerning access to the perimeters that allow users to get to services and products in these institutions, since the fact that a framework for accessibility is in place does not mean that all the assistive services are enforced in the same way.

Do universities offer audiovisual translation access services to students and, if so, to what extent?

1. The co-existence of AD and SDH variants as assistive services is not standardised in the institutions participating in the survey.
2. Automated alternatives do not seem to be very popular in participating institutions.
3. Access services are not usually included in the accessibility framework as compulsory components of the learning experience and are only provided upon request.

These findings reinforce the need for a comprehensive accessibility framework in higher education institutions, one that will provide educators with the necessary directions for the design, provision and delivery of accessible online courses and content, including information on how AVT practices can cater for the needs of all students.

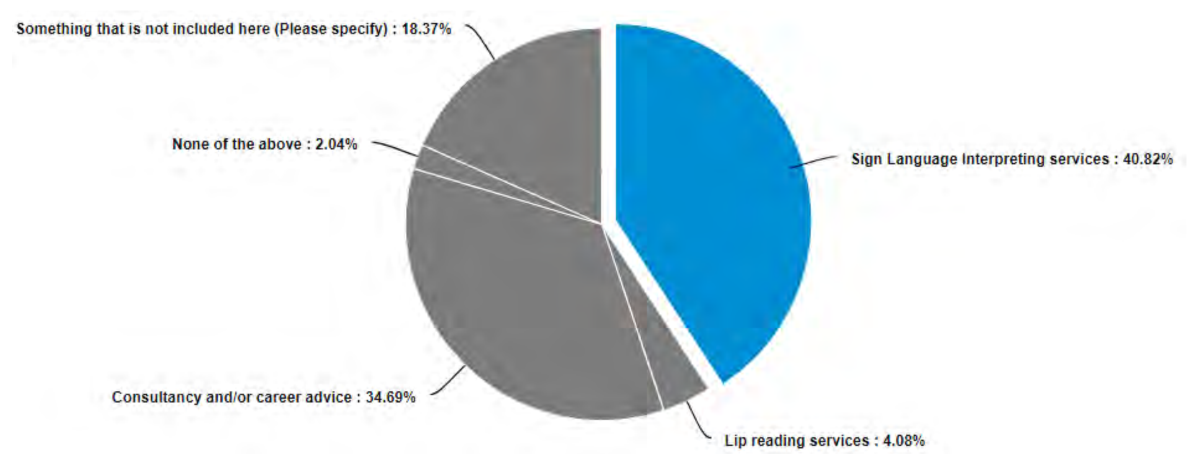
Do universities provide accessible online courses/content?

1. Institutions that provide online content/courses mostly use an e-learning platform for the delivery of the online course and material.
2. Most of the respondents use a platform that is at least partially accessible.
3. Universities provide online courses whose degree of accessibility cannot be determined due to a lack of standardisation in the provision of accessible content, both online and offline.

It is evident that having the right set of policies within institutions can play an important role in improving access services. Such policies should not simply act as guidance, but should rather include specific reference to AVT access services and variables that can satisfy the needs of learners. Instructions on the right use of web content and platforms should be included in such policies, and course designers and educators – as well as teaching support personnel – should be trained on the relevant techniques. Institutions should plan the provision of access services based on skills that are common in professional AVT, and accessible education should not be offered on demand, but rather by default, as instigated by the social model of disability. Considering that online education is a convenient solution for disabled people who cannot attend courses delivered in a traditional classroom, all forms of OE should be made accessible.

The survey used in this study is a useful source of additional information about access to universities. In order to gauge some of these potential avenues, responses were collected on aspects that are not directly related to the main goal of the study, but hint at possible routes for further research. More specifically, the last set of questions included in the survey (Generic Section II, Questions 23-27) required participants to elaborate on any further support given to disabled students and not covered in previous questions, to give their opinion on the level of accessibility offered by their institution, and to comment on the factors that they think hinder the provision of a better level of accessibility overall.

Responses collected for Question 23, “In addition to the aspects included in this survey so far, which of the following does your institution offer to disabled students?”, show that most universities provide Sign Language Interpreting services, consultation and/or career advice for disabled students (Figure 8.1). Two of them replied that they offer lip reading services, indicating a difference in treatment between prelingual and postlingual cases of hearing loss:



Answer	Count	Percent	20% 40%
Sign Language Interpreting services	20	40.82%	
Lip reading services	2	4.08%	
Consultancy and/or career advice	17	34.69%	
None of the above	1	2.04%	
Something that is not included here (Please specify)	9	18.37%	

Figure 8.1: Q23 statistics

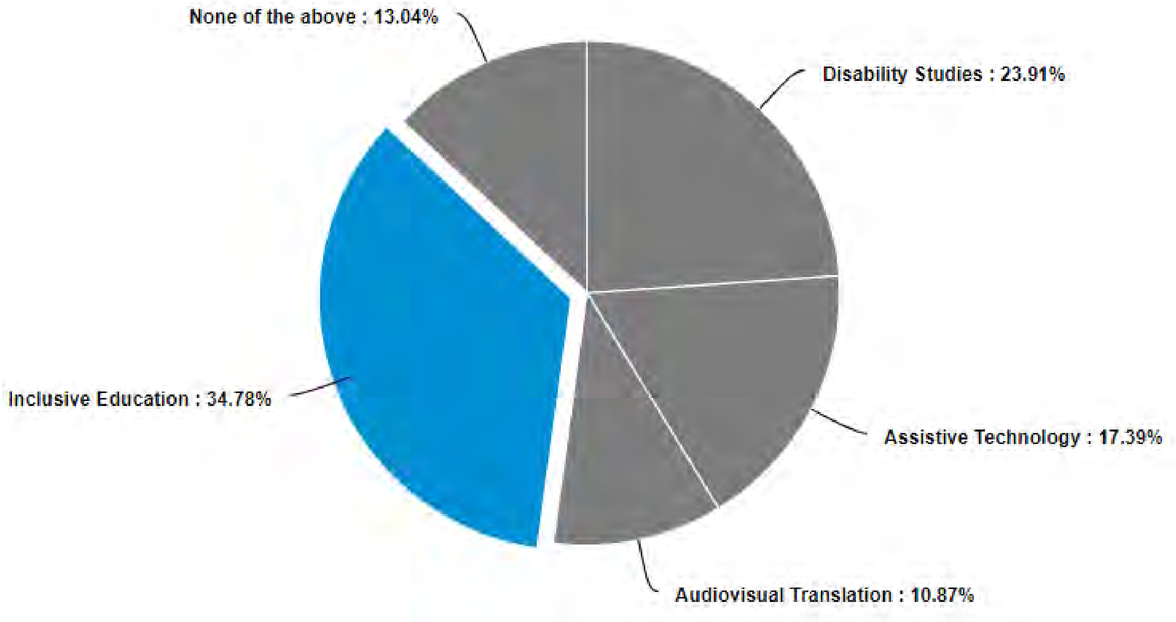
Question 24, “How would you rank accessibility in terms of the content of the courses provided by your institution (text, sound, image)?”, has been used to evaluate respondents’ learning process. As shown in Figure 8.2, 11 out of 23 (47.83%) claimed that their institution was partially accessible, while only 6 (26.9%) considered it fully accessible:

Answer	Count	Percent	20% 40%
Fully accessible (all of the content is/can be accessible to students with sensory impairments)	6	26.09%	
Partially accessible (e.g. the text is always accessible, but our video content is not)	11	47.83%	
Inaccessible (e.g. the content is not provided in alternative formats)	1	4.35%	
I don't know - It depends on the tutor and the course	1	4.35%	
Other (Please specify)	4	17.39%	
Total	23	100 %	

Figure 8.2: Q24 statistics

The responses collected at this stage of the survey are rather different to the ones given by participants to similar questions, Q4 and Q15, in earlier sections of the questionnaire. For example, 14 out of 23 (60.87%) claimed that their institution was fully-accessible in terms of physical access (Q4) and another 14 out of 23 (60.87%) claimed that their e-learning platform was accessible for students with sensory impairments (Q15), which are much higher than the numbers obtained for Q24. An answer to this disparity could be that while answering the various survey questions, respondents realised the various levels of access required in an educational environment and changed the way in which they judged the overall compliance of their institution with accessibility standards.

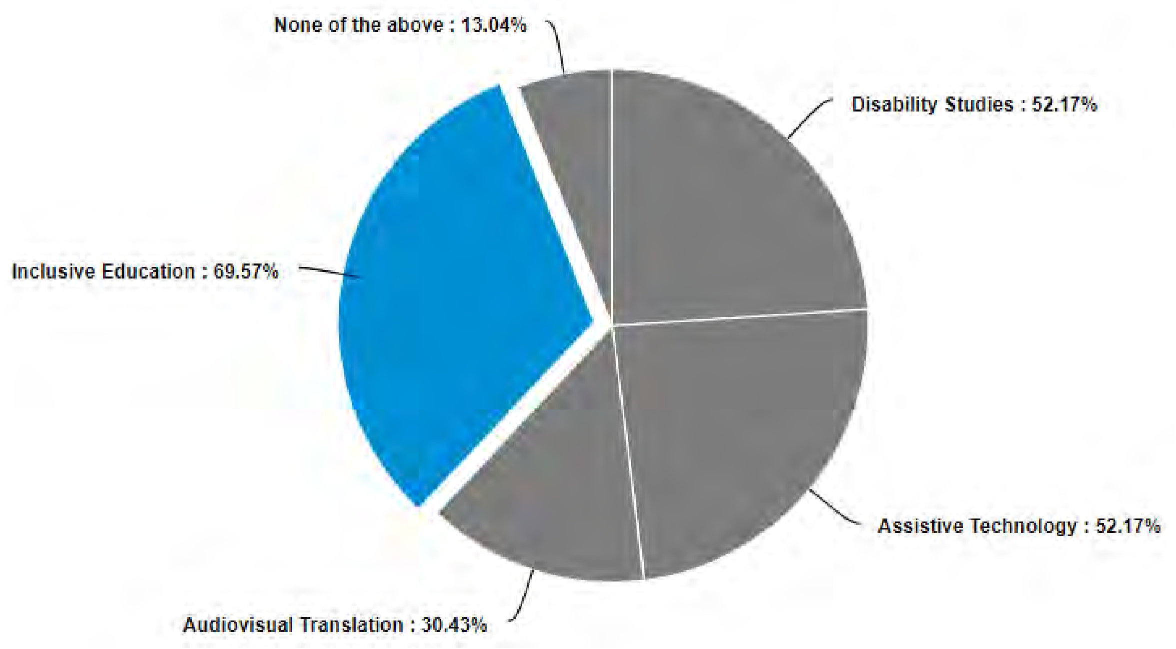
Questions 25, “Your institution offers courses in/related to the following areas”, provides further insights into the institutions that participated in the research. Figure 8.3 shows that 11 (23.91%) of the participating institutions offered courses in DS and 16 (34.78%) in Inclusive Education (16). 8 (17.39%) also offered courses on AT and 5 (10.87%) in audiovisual translation, while 6 (13.04%) did not offer courses in any of these fields.



Answer	Count	Percent	20% 40%
Disability Studies	11	23.91%	
Assistive Technology	8	17.39%	
Audiovisual Translation	5	10.87%	
Inclusive Education	16	34.78%	
None of the above	6	13.04%	
Total	46	100 %	

Figure 8.3: Q25 statistics

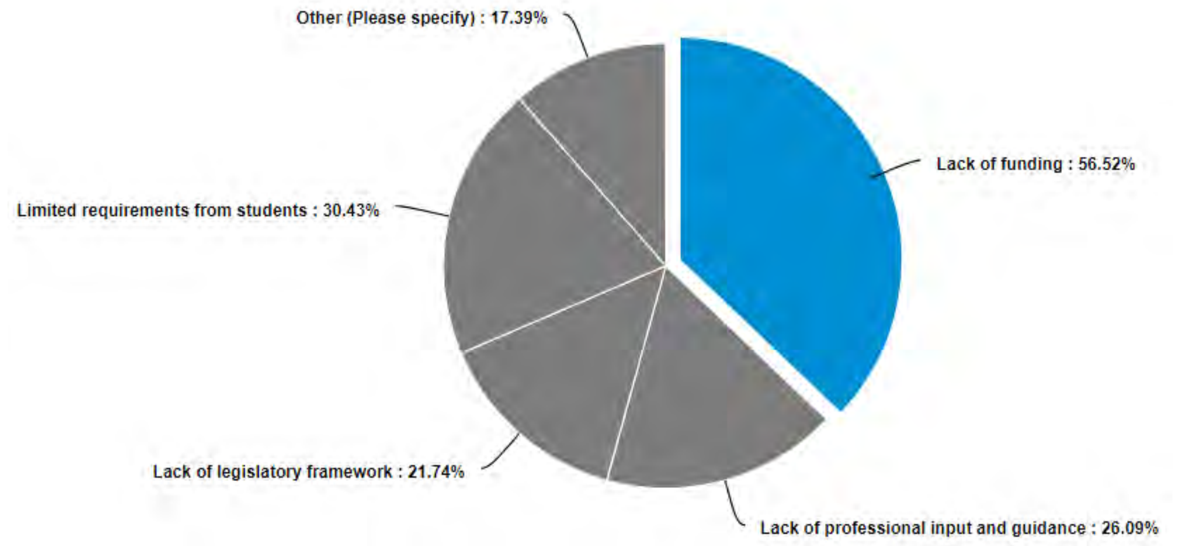
Question 26 focused on the research strengths of the various universities, by asking them: “Your institution does research in/related to the following areas”. As illustrated in Figure 8.4., most of them do embark on research that is closely linked to accessibility:



Answer	Count	Percent	20% 40% 60%
Disability Studies	12	52.17%	
Assistive Technology	12	52.17%	
Audiovisual Translation	7	30.43%	
Inclusive Education	16	69.57%	
None of the above	3	13.04%	
Total	50	n = 23	

Figure 8.4: Q26 statistics

Finally, when asked in Question 27, to state the reasons that limited the provision of access services in their institution, 13 respondents (56.52%) chose lack of funding as the most important factor, followed by “Limited requirements from students” chosen by 7 (30.43%) and “Lack of professional input and guidance” chosen by 6 (26.09%), as shown in Figure 8.5:



Answer	Count	Percent	20% 40% 60%
Lack of funding	13	56.52%	
Lack of professional input and guidance	6	26.09%	
Lack of legislatory framework	5	21.74%	
Limited requirements from students	7	30.43%	
Other (Please specify)	4	17.39%	
Total	35	n = 23	

Figure 8.5: Q27 statistics

Although the first was expected to be a popular answer, the other two factors proved that providing access services upon request is a common practice, which goes against the rights-based universal access approach, according to which all content and facilities should be accessible to all students by default, without putting them in a position of having to request a ‘special’ service because of a ‘special’ need that is outside the ‘norm’. The responses also foreground the importance of training in this area, leading us to conclude that it should be included in the accessibility framework of all institutions.

The last open-ended question, Q28 – “Are you aware of any plans in your institution to improve accessibility and/or studies/research in the area?”, allowed participants to speculate about what the future holds in terms of accessibility in their institutions. Of the 23 participants, 6 (26.08%) replied negatively, while some others mentioned plans to provide captioned lectures, compliance with WCAG 2.0 and physical and digital improvements. Some of the participants also mentioned that their Disability Unit was relatively new, which meant that there might be plans afoot for future developments.

Changes in the field of access in online education can occur rapidly and relaunching the survey after a few years could help secure updated information about accessibility in higher education. It could also provide a more detailed account of the various levels of access, both in terms of legislation and in individual policies/frameworks to improve access in education.

8.4. Standards and Legislation

As discussed throughout the thesis, policies and legislation play an important role in the way in which accessibility is provided, and a number of parameters should be considered carefully when drafting and implementing laws and regulations dealing with accessibility in general. These are explored in the suggestions put forward in this section.

Although the European Accessibility Act sets the conditions for “the application of all measures, including the free circulation of products and services and those prescribed in Article 3, by six years after the entry into force of the Directive” (EU, 2015: online), it is suggested in this thesis that in an attempt to maintain high standards, technology and the means of providing services should be specifically stated in a country’s national legislation, with particular reference to the equipment required, the types of broadcasting affected, and the quality standards that should be attained in the provision of access services. At the same time, national legislative bodies should hold relevant meetings and inform broadcasters of their obligations, while a regulatory mechanism should be assigned specific duties, including quality checks, advice and consultation for broadcasters, and penalisation for non-compliance.
It is also suggested that legislative bodies should hold open a dialogue with society, the industry and all the organisations and institutions involved in the production and delivery of accessibility and access services. This dialogue should be on-going so as to ensure the smooth provision of access services that does not focus solely on conforming to legislation, but also on satisfying the audience. The EU Directive, for

example, “does not prescribe in detail how the obligation to render a product or service accessible by complying with the defined accessibility requirements has to be achieved in practice” (*ibid.*: online), though it makes it clear that guidance should be offered as to how to overcome obstacles in the internal market. Close collaboration between all parties interested – i.e. organisations, academia, social groups and access services providers – would be productive in anticipating the nature of these obstacles and suggesting was of bypassing them.

At a more general level, when accessibility is included in legislative acts, the means and characteristics of access services and tools need to be explicitly stated, leaving no room for non-compliance. Likewise, the way in which services should be implemented in different contexts, for example on the web, in a classroom or at the theatre, should also be indicated. Where widely accepted and tested standards have been made available, as in the case of the web, reference to them would make the implementation of such regulations more guided and, thus, easier to implement.

Measures for the provision of accessible content should also be included in educational policies and regulations relevant to the operation of institutions. With accessibility being a relatively new area, technological developments in AT and web accessibility standards should be kept up-to-date and included in relevant regulations. Policies focusing specifically on the provision of accessible online education should be established at different levels of education and should include a variety of parameters that cover all stages of the preparation and provision of educational content. Accessibility requirements should be determined according to the type of institution and the form of education provided, in line with national legislation. At the same time, it is important to determine the duties of the personnel involved in this area, making it easier for course creators and instructors to prepare and deliver content accordingly.

Most policies focus on web accessibility, arrangements for examinations, and layout of facilities and accommodation among others, but in a rather disjointed manner. To be more effective, policies of this nature should cover a variety of aspects that coalesce into a coherent framework that is applied by the whole institution. All the relevant information should be easily accessed and openly available both to students and staff. In the analysed universities, one of the main weaknesses that has come to the fore is the lack of policies on making courses accessible and on the use of access services. One good example from Canada is Queen’s University of Kingston, which has an Accessibility Hub to support disabled students and offers information to students about their rights to accommodation, customer service, health services, customer support and IT services. Relevant support sites and information are offered to staff and instructors, who are required to take specific training on accessible instruction. This training centres on accessible customer services, compliance with accessibility-related legislation, human rights conventions and specific training on UDL. The university also refers instructors to an e-portal hosted by the Ontario Council of University Libraries, which contains accessible content in five different formats, though, on the downside, it seems that instructors are not given specific guidance as to how to create accessible content for their students and how to make it available to them. All policies are directly linked to Ontario legislation, highlighting how important it is for access services to gain legal recognition so that universities will have to take them into account when devising their own policies and provisions.

8.5. Limitations and Further Research Potential

One of the defining characteristics of this research is its interdisciplinary complexity as it combines input from DS, AVT, AT, ICT and OE. As a result, and due to space constraints, some of the topics have only been briefly touched upon. Although the aspects chosen for discussion and the links established in this research can be said to constitute progress in interdisciplinary research, it is also true that some of the areas explored in these pages could benefit from further, detailed research, such as the history, provision and legislation relevant to access services in different countries, the exploration of access services as learning aids in new scenarios, the development of standardised SDH and AD alternatives for educational purposes, the combination of automated and human services on educational platforms, the development of web and platform architectures that support access services and AT tools by default, and the inclusion of access services and AT tools in educators’ training, to name but a few.

When conducting further research, important factors to consider are the speed of technological developments in AVT and AT, the potential passing of new legislation in some countries as well as the appearance of updated guidelines and standards. Indeed, a new version of WCAG standards, EN 301 549 and Section 508, were published in 2018 and are still undergoing amendments in 2019, which will in turn have a knock-on effect on future reincarnations of the INCLUDE framework. To account for these eventualities, the INCLUDE framework presented in this study has been named version 1.0, as newer versions will irremediably have to be drafted to accommodate potential changes taking place in technology, legislation and education.

There are some limitations that affect the research tools employed that need to be taken into consideration. As mentioned in Chapter 6, not all responses were considered valid. A total of 27 out of 50 respondents either dropped out of the survey or provided incomplete input. This could be interpreted as a lack of information/interest on the respondents' side, and, to boost the number of participants, any future surveys should consider its length and focus with care. Another shortcoming is the fact that there was no geographic focus in the survey, which impeded an interpretation linked to country-specific regulations and practices.

As already discussed, the INCLUDE framework is a draft of a framework that is proposed as a means of combining guidelines from the areas of AVT, AT and OE for the provision of accessible online education at university level. Further investigation could focus on expanding the courses to which the model could be applied as well as on determining the different levels of education where it could be adopted, including vocational learning. Testing the framework with a newly designed course that has been prepared according to the INCLUDE recommendations will also help to prove its feasibility and replicability.

When it comes to the nature of access services on the web and in the context of education, more reception studies should be carried out to ascertain the opinion of end-users as to the forms and principles that articulate accessible online education. Another direction might be to implement the proposed framework in the design of inclusive environments other than OE, such as entertainment or commercial scenarios, where UDL would be substituted by other principles. Other possible directions for further research could include the standardisation of SDH and AD techniques in online educational ecosystems and the integration of SDH and AD authoring tools in e-learning platforms, both for teaching and for the provision of the relevant services within the institutions. Neural MT is another research area that is expanding in AVT, as new forms of MT can also be applied to visual content.

Indeed, the opportunities for further investigation on access services, in particular, and on accessible education on the web, in general, seem to be limitless and the present study is proof that interdisciplinarity may be the way forward when embarking on these activities.

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Appendix 1

Glossary

Access services: the means for achieving accessibility. In this study, SDH and AD.

Accessibility: availability of products/services/places to people with impairments of any kind – physical, cognitive, mental, sensory, emotional, developmental or a combination of the above.

Accessible: designed or provided under principles of accessibility.

Adaptation: alteration made so that a person who does not possess the requisite abilities needed for task completion can accomplish a task.

Adjunct mode: the use of space on the internet to provide supplementary learning material for a course. Also called blended mode.

Assistive technology**:** any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve access and the functional capabilities of users who would otherwise not be able to use or access specific content, areas, tools and/or services.

Asynchronous learning: learning that occurs in elapsed time.

Audio description: a process that provides a narration of the visual elements – action, costumes, settings, and the like – and some sounds of theatre, television/film, museums exhibitions, and other events and it allows patrons who are blind or have low-vision the opportunity to experience arts events more completely.

Audio subtitling: the spoken version of subtitles projected on screen.

Affirmation/affirmative model of disability: non-tragic view of disability and impairment which encompasses positive social identities, both individual and collective, for disabled people grounded in the benefits of life style and life experience of being impaired and disabled.

Behaviourist learning: based on two simple elements: the stimulus and the response.

Biopsychological model of disability: model whereby disability is seen as a condition that stems from physical, emotional and environmental factors.

Blended/mixed type learning: learning whereby significant portion of the traditional face-to-face classroom or distance education course is conducted online.

Cognitivist learning: internal learning process that involves memory, thinking, reflection, abstraction, motivation, and metacognition.

Commentary: in audiovisual translation settings, the term refers to speech sequences that usually relate to the original material rather than its translated version and which are uttered by invisible speakers over programme images.

Connectivist/collaborative learning: learning materialised in networked learning environments where information and learning needs constantly change.

Constructivist learning: model of learning whereby learners are active in the learning process and they are the ones who determine knowledge after receiving and interpreting information

Customer/empowering model of disability: model whereby professionals provide services based on the client's choice.

Deaf/deaf: when used with capital 'D', the term refers to a member of the cultural society of deaf people, usually raised in deaf families, with sign language being their first language, and usually pre-lingual deaf people. When written with a low 'd', the term refers to all deaf people or those who do not consider themselves members of the cultural society of deaf people, usually post-lingual deaf people. The use of the two varies among countries.

Disablism: social oppression of disability.

Disability: within the social model of disability, it is the disadvantage or restriction of activity caused by a contemporary social organisation which takes no or little account of people who have physical impairments and thus excludes them from participation in the mainstream of social activities.

Disability Creation Process: an explanatory model of the causes and consequences of disease, trauma and other disruptions to a person's integrity and development.

Disability Studies: academic disciplines related to the meaning, nature, and consequences of disability as a social construct.

Distance learning: any type of educational activity in which participants are at a distance from each other.

Dubbing: the process through which different translated versions of the original material, usually a film, are recorded and used in order to replace the initial auditory output.

Economic model of disability: model whereby disability is defined by the disabled person's inability to work, and impairment is viewed as a cause of productivity and financial problems.

e-Learning: synonym of online learning.

Emancipatory research: free from constrains, liberated and aimed at serving its recipients/end-users, rather than the personal ambitions of the researcher.

Expert/professional model of disability: model that is based on identifying impairment and its limitations in order to take proper action to improve disabled people's position in society, whereby the disabled person is seen as a passive recipient.

Eugenics: beliefs and practices aiming at improving the genetic quality of the human population.

Fansubbing: subtitling by fans who want to watch movies or television broadcasts by downloading them from the internet.

Impairment: lacking part of or all of a limb, or having a defective limb, organ or mechanism of the body.

Impairment/disability dualism: disassociation of the mind and the body in the context of disability.

Inclusion**:** active participation in mainstream settings alongside non-disabled peers, with mutual satisfaction of the needs of both in a merged environment.

Individual model of disability: model focusing on the problem of disability, viewing it as a misery that has been caused from functional limitations or psychological losses.

Instructional technology: any technology that is used as part of the education of an individual.

Integration: adapted participation in mainstream settings, with special support for non-mainstream subjects.

Interface model of disability: model whereby disability exists at the meeting point or interface between the person's medical diagnosis and the environmental factors that affect disability.

Intertitles: piece of filmed, printed text that appears between scenes.

Live subtitling: insertion of subtitles into a television transmission the contents of which have not been scrutinized by a subtitler beforehand (also used in other live contexts, such as conferences).

Medical model of disability: model that equates disability with impairment.

Nagi model of disability: model that claims correlations among impairments, functional limitations, and disability.

Narration: synonym to commentary.

Online Collaborative Learning: collaborative learning, knowledge building, and internet use as a means to reshape formal, nonformal and informal education for the Knowledge Age.

Online learning: education in which instruction and content are delivered primarily over the Internet. See also *eLearning*.

Perimeters of access**:** the borders that determine areas where specific access services and assistive technology tools and services are needed to ensure accessibility.

Quebec model of disability: adoption of the ICIDH by OPHQ and the Quebec Committee in 1987 under the 'On Equal Terms' government policy of 1984.

Reading speed: the time needed by the audience to read subtitles on screen.

Rehabilitation: state of recovery from an impairment.

Rehabilitation model of disability: model based on the idea that disability is something that can be overcome with adequate effort and the proper medical support.

Religious/moral model of disability: model that views disability as punishment or curse inflicted upon the disabled person by an external force, stigmatising the whole family.

Respeaking: technique in which a speaker listens to the original sound of a live programme or event and respeaks it, including punctuation marks and some specific features for the deaf and hard-of-hearing audience, to a speech recognition software, which turns the recognised utterances into subtitles displayed on the screen with the shortest possible delay.

Revoicing: replacement of the original voice track by another track in audiovisual material.

Rights-based model of disability: model that refers to disability as a socio-political construct.

Segregation: segregated placement in specifically designed settings.

Sensory access services: access services that facilitate the visual or the auditory channel.

Social barriers model of disability: synonym to the social model of disability.

Social model of disability: model based on which disability is seen as barriers of inaccessibility set by society to those with an impairment.

Special need: the actual need an individual has, particularly in situations where accessibility is required because such a need is not satisfied through the current settings.

Special education: educational practices based on the actual needs of an individual, in educational contexts where accessibility is required because such a need is not satisfied through the current settings.

Speech rate: the speed with which dialogue is delivered in audiovisual material.

SDH: *see Subtitling for the Deaf and the Hard-of-Hearing*.

Spotting: the precise determination of the time-in and time-out of subtitles or descriptions, meaning when they should emerge and when they should disappear.

Subtitling: translation practice that consists of presenting a written text, generally on the lower part of the screen, that endeavours to recount the original dialogue of the speakers, as well as the discursive elements that appear in the image (letters, inserts, graffiti, inscriptions, placards and the like), and the information that is contained on the soundtrack (songs, voices off).

Subtitling for Deaf and Hard-of-Hearing People (SDH): subtitling that has been consciously devised to cater for the needs of viewers who are Deaf or hard-of-hearing, following specific conventions and guidelines for this purpose.

Surtitling: form of off-screen subtitling intended for live events like the theatre, the opera, concerts, or conferences.

Synchronisation: timely association of text or audio with image or video.

Synchronous learning: learning that occurs in real-time.

Tragedy/charity model of disability: model that depicts disabled people as pitied victims of a certain circumstance.

Timecode: a sequence of numeric codes generated at regular intervals by a timing synchronization system, in this context in subtitling and AD software.

Universal design: the concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life.

Universal Design for Learning**:** a framework for guiding educational practice based on the principles of architectural Universal Design.

Virtual learning: synonym to online learning.

Voiceover: the action of voicing over the picture; it is also the result of this action.

Waveform (sound): the shape and form of a sound signal as a wave moving in a physical medium or an abstract representation.

Web accessibility**:** availability of online tools, services and content, based on specific guidelines.

Web accessibility standards**:** sets of guidelines for the process of making web-based tools and environments accessible.

Appendix 2a

WCAG 2.0 Checklist[23]

Guideline 1.1 : Provide text alternatives for all non-text content

Level	Success Criterion
L1	***1.1.1*** For all *non-text content*, one of the following is true: • If non-text content presents information or responds to user input, text alternatives serve the same purpose and present the same information as the non-text content. If text alternatives cannot serve the same purpose, then text alternatives at least identify the purpose of the non-text content. • If non-text content is multimedia; live audio-only or live video-only content; a test or exercise that must use a particular sense; or primarily intended to create a specific sensory experience; then text alternatives at least identify the non-text content with a descriptive text label. • If the purpose of non-text content is to confirm that content is being operated by a person rather than a computer, different forms are provided to accommodate multiple disabilities. • If non-text content is pure decoration, or used only for visual formatting, or if it is not presented to users, it is implemented such that it can be ignored by assistive technology.

Guideline 1.2 : Provide synchronized alternatives for multimedia

Level	Success Criterion
L1	***1.2.1*** Captions are provided for pre-recorded multimedia.
	1.2.2 Audio descriptions of video, or a full multimedia text alternative including any interaction, are provided for pre-recorded multimedia.
L2	***1.2.3*** Audio descriptions of video are provided for pre-recorded multimedia.
	1.2.4 Captions are provided for live multimedia.
L3	***1.2.5*** Sign language interpretation is provided for multimedia.
	1.2.6 Extended audio descriptions of video are provided for pre-recorded multimedia.
	1.2.7 For pre-recorded multimedia, a full multimedia text alternative including any interaction is provided.

[23] This checklist has been copied and adopted from W3C and should not be used without reference to the source: www.w3.org/TR/2006/WD-WCAG20-20060427/appendixB.html. Links have been retained for usefulness and they all direct to the W3C documentation on WCAG 2.0.

Guideline 1.3 : Ensure that information and structure can be separated from presentation

Level	Success Criterion
L1	***1.3.1*** Information and relationships conveyed through presentation can be programmatically determined, and notification of changes to these is available to user agents, including assistive technologies.
	1.3.2 Any information that is conveyed by color is also visually evident without color.
	1.3.3 When the sequence of the content affects its meaning, that sequence can be programmatically determined.
L2	***1.3.4*** Information that is conveyed by variations in presentation of text is also conveyed in text, or the variations in presentation of text can be programmatically determined.
	1.3.5 Information required to understand and operate content does not rely on shape, size, visual location, or orientation of components.

Guideline 1.4 : Make it easy to distinguish foreground information from its background

Level	Success Criterion
L2	***1.4.1*** Text or diagrams, and their background, have a luminosity contrast ratio of at least 5:1.
	1.4.2 A mechanism is available to turn off background audio that plays automatically, without requiring the user to turn off all audio.
L3	***1.4.3*** Text or diagrams, and their background, have a luminosity contrast ratio of at least 10:1.
	1.4.4 Audio content does not contain background sounds, background sounds can be turned off, or background sounds are at least 20 decibels lower than the foreground audio content, with the exception of occasional sound effects. **Note:** A 20 decibel difference in sound level is roughly four times (4x) quieter or louder. Background sound that meets this requirement will be approximately four times (4x) quieter than the foreground audio content.

Guideline 2.1 : Make all functionality operable via a keyboard interface

Level	Success Criterion
L1	***2.1.1*** All functionality of the content is operable in a non-time-dependent manner through a keyboard interface, except where the task requires analog, time-dependent input. **Note:** This does not preclude and should not discourage the support of other input methods (such as a mouse) in addition to keyboard operation.
L3	***2.1.2*** All functionality of the content is operable in a non-time-dependent manner through a keyboard interface.

Guideline 2.2 : Allow users to control time limits on their reading or interaction

Level	Success Criterion
L1	***2.2.1*** For each time-out that is a function of the content, at least one of the following is true: • the user is allowed to deactivate the time-out; or • the user is allowed to adjust the time-out over a wide range that is at least ten times the length of the default setting; or • the user is warned before time expires and given at least 20 seconds to extend the time-out with a simple action (for example, "hit any key"), and the user is allowed to extend the timeout at least ten times; or

Guideline 2.2 : Allow users to control time limits on their reading or interaction	
Level	**Success Criterion**
	• the time-out is an important part of a real-time event (for example, an auction), and no alternative to the time-out is possible; or • the time-out is part of an activity where timing is essential (for example, competitive gaming or time-based testing) and time limits cannot be extended further without invalidating the activity.
L2	***2.2.2*** Content does not blink for more than three seconds, or a method is available to stop all blinking content in the web unit or authored component. **Note:** For requirements related to flickering or flashing content, refer to *Guideline 2.3 Allow users to avoid content that could cause seizures due to photosensitivity*.
	2.2.3 Content can be paused by the user unless the timing or movement is part of an activity where timing or movement is essential.
L3	***2.2.4*** Except for real-time events, timing is not an essential part of the event or activity presented by the content.
	2.2.5 Interruptions, such as updated content, can be postponed or suppressed by the user, except interruptions involving an emergency.
	2.2.6 When an authenticated session expires, the user can continue the activity without loss of data after re-authenticating.

Guideline 2.3 : Allow users to avoid content that could cause seizures due to photosensitivity	
Level	**Success Criterion**
L1	***2.3.1*** Content does not violate the general flash threshold or the red flash threshold.
L3	***2.3.2*** Web units do not contain any components that flash more than three times in any 1-second period.

Guideline 2.4 : Provide mechanisms to help users find content, orient themselves within it, and navigate through it	
Level	**Success Criterion**
L1	***2.4.1*** A mechanism is available to bypass blocks of content that are repeated on multiple web units.
L2	***2.4.2*** More than one way is available to locate content within a set of web units where content is not the result of, or a step in, a process or task.
	2.4.3 Web units have titles.
	2.4.4 Each link is programmatically associated with text from which its purpose can be determined.
L3	***2.4.5*** Titles, headings, and labels are descriptive.
	2.4.6 When a Web unit or authored component is navigated sequentially, components receive focus in an order that follows relationships and sequences in the content.
	2.4.7 Information about the user's location within a set of web units is available.
	2.4.8 The purpose of each link can be programmatically determined from the link.

Guideline 2.5: Help users avoid mistakes and make it easy to correct mistakes that do occur

Level	Success Criterion
L1	***2.5.1*** If an input error is detected, the error is identified and described to the user in text.
L2	***2.5.2*** If an input error is detected and suggestions for correction are known and can be provided without jeopardizing the security or purpose of the content, the suggestions are provided to the user.
	2.5.3 For forms that cause legal or financial transactions to occur, that modify or delete data in data storage systems, or that submit test responses, at least one of the following is true: 1. Actions are reversible. 2. Actions are checked for input errors before going on to the next step in the process. 3. The user is able to review and confirm or correct information before submitting it.
L3	***2.5.4*** Context-sensitive help is available for text input.

Guideline 3.1: Make text content readable and understandable

Level	Success Criterion
L1	***3.1.1*** The primary natural language or languages of the web unit can be programmatically determined.
L2	***3.1.2*** The natural language of each passage or phrase in the web unit can be programmatically determined. **Note:** This requirement does not apply to individual words or phrases that have become part of the primary language of the content.
L3	***3.1.3*** A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon.
	3.1.4 A mechanism for finding the expanded form of abbreviations is available.
	3.1.5 When text requires reading ability more advanced than the lower secondary education level, supplemental content is available that does not require reading ability more advanced than the lower secondary education level.
	3.1.6 A mechanism is available for identifying specific pronunciation of words where meaning cannot be determined without pronunciation.

Guideline 3.2: Make the placement and functionality of content predictable

Level	Success Criterion
L1	***3.2.1*** When any component receives focus, it does not cause a change of context.
	3.2.2 Changing the setting of any form control or field does not automatically cause a change of context (beyond moving to the next field in tab order), unless the authored unit contains instructions before the control that describe the behavior.
L2	***3.2.3*** Navigational mechanisms that are repeated on multiple web units within a set of Web units or other primary resources occur in the same relative order each time they are repeated, unless a change is initiated by the user.
	3.2.4 Components that have the same functionality within a set of web units are identified consistently.

Guideline 3.2: Make the placement and functionality of content predictable	
Level	**Success Criterion**
L3	***3.2.5*** Changes of context are initiated only by user request.

Guideline 4.1: Support compatibility with current and future user agents (including assistive technologies)	
Level	**Success Criterion**
L1	***4.1.1*** Web units or authored components can be parsed unambiguously, and the relationships in the resulting data structure are also unambiguous.
	4.1.2 For all user interface components, the name and role can be programmatically determined, values that can be set by the user can be programmatically set, and notification of changes to these items is available to user agents, including assistive technologies.

Guideline 4.2: Ensure that content is accessible or provide an accessible alternative	
Level	**Success Criterion**
L1	***4.2.1*** At least one version of the content meets all level 1 success criteria, but alternate version(s) that do not meet all level 1 success criteria may be available from the same URI.
	4.2.2 Content meets the following criteria even if the content uses a technology that is not in the chosen baseline: 1. If content can be entered using the keyboard, then the content can be exited using the keyboard. 2. Content conforms to success criterion 2.3.1 (general and red flash).
L2	***4.2.3*** At least one version of the content meets all level 2 success criteria, but alternate version(s) that do not meet all level 2 success criteria may be available from the same URI.
L3	***4.2.4*** Content implemented using technologies outside of the chosen baseline satisfies all Level 1 and Level 2 requirements supported by the technologies.

Appendix 2b

EN 301 549 Checklist[24]

Functional Accessibility Requirements for Web sites and applications

Part A – Functional Performance Statements

EN 301 549 Clauses	Explanations
4.2.1 Usage without vision	Where ICT provides visual modes of operation, some users need ICT to provide at least one mode of operation that does not require vision.
4.2.2 Usage with limited vision	Where ICT provides visual modes of operation, some users will need the ICT to provide features that enable users to make better use of their limited vision.
4.2.3 Usage without perception of colour	Where ICT provides visual modes of operation, some users will need the ICT to provide a visual mode of operation that does not require user perception of colour.
4.2.4 Usage without hearing	Where ICT provides auditory modes of operation, some users need ICT to provide at least one mode of operation that does not require hearing.
4.2.5 Usage with limited hearing	Where ICT provides auditory modes of operation, some users will need the ICT to provide enhanced audio features.
4.2.6 Usage without vocal capability	Where ICT requires vocal input from users, some users will need the ICT to provide at least one mode of operation that does not require them to generate vocal output.
4.2.7 Usage with limited manipulation or strength	Where ICT requires manual actions, some users will need the ICT to provide features that enable users to make use of the ICT through alternative actions not requiring manipulation or hand strength.
4.2.8 Usage with limited reach	Where ICT products are free-standing or installed, the operational elements will need to be within reach of all users.
4.2.9 Minimize photosensitive seizure triggers	Where ICT provides visual modes of operation, some users need ICT to provide at least one mode of operation that minimizes the potential for triggering photosensitive seizures.
4.2.10 Usage with limited cognition	Some users will need the ICT to provide features that make it simpler and easier to use.
4.2.11 Privacy	Where ICT provides features that are provided for accessibility, some users will need their privacy to be maintained when using those ICT features that are provided for accessibility.

Part B - Functional Accessibility Requirements

NOTE: Web pages that conform to WCAG 2.0 Level AA are deemed to have met the web content requirements of clause 9.2 and the conformance requirements of clause 9.3.

[24] This checklist has been copied and adopted from CEN and should not be used without reference to the source: http://mandate376.standards.eu. It has been generated as an example of requirements for websites and applications.

EN 301 549 Clauses	Explanations
9.2.1 Non-text content	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.1.1 Non-text content. **WCAG 2.0 Success Criterion 1.1.1 Non-text content** All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below: • **Controls, Input:** If non-text content is a control or accepts user input, then it has a name that describes its purpose. (Refer to WCAG 2.0 Guideline 4.1 for additional requirements for controls and content that accepts user input.) • **Time-Based Media:** If non-text content is time-based media, then text alternatives at least provide descriptive identification of the non-text content. (Refer to WCAG 2.0 Guideline 1.2 for additional requirements for media.) • **Test:** If non-text content is a test or exercise that would be invalid if presented in text, then text alternatives at least provide descriptive identification of the non-text content. • **Sensory:** If non-text content is primarily intended to create a specific sensory experience, then text alternatives at least provide descriptive identification of the non-text content. • **CAPTCHA:** If the purpose of non-text content is to confirm that content is being accessed by a person rather than a computer, then text alternatives that identify and describe the purpose of the non-text content are provided, and alternative forms of CAPTCHA using output modes for different types of sensory perception are provided to accommodate different disabilities. • **Decoration, Formatting, Invisible:** If non-text content is pure decoration, is used only for visual formatting, or is not presented to users, then it is implemented in a way that it can be ignored by assistive technology.
9.2.2 Audio-only and video-only (pre-recorded)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.2.1 Audio-only and Video-only (Pre-recorded). **WCAG 2.0 success criterion: Audio-only and video-only (pre-recorded)** For pre-recorded audio-only and pre-recorded video-only media, the following are true, except when the audio or video is a media alternative for text and is clearly labelled as such: • Pre-recorded Audio-only: An alternative for time-based media is provided that presents equivalent information for pre-recorded audio-only content. • Pre-recorded Video-only: Either an alternative for time-based media or an audio track is provided that presents equivalent information for pre-recorded video-only content.
9.2.3 Captions (pre-recorded)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.2.2 Captions (Pre-recorded). **WCAG 2.0 success criterion: Captions (pre-recorded)** Captions are provided for all pre-recorded audio content in synchronized media, except when the media is a media alternative for text and is clearly labelled as such.
9.2.4 Audio description or media alternative (pre-recorded)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.2.3 Audio Description or Media Alternative (Pre-recorded).

	WCAG 2.0 success criterion: Audio description or media alternative (pre-recorded) An alternative for time-based media or audio description of the pre-recorded video content is provided for synchronized media, except when the media is a media alternative for text and is clearly labelled as such. NOTE 1**:** The WCAG 2.0 definition of "audio description" says that "audio description" is "Also called 'video description' and 'descriptive narration'". NOTE 2**:** Secondary or alternate audio tracks are commonly used for this purpose**.**
9.2.5 Captions (live)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.2.4 Captions (Live). **WCAG 2.0 success criterion: Captions (live)** Captions are provided for all live audio content in synchronised media.
9.2.6 Audio description (pre-recorded)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.2.5 Audio Description (Pre-recorded). **WCAG 2.0 success criterion: Audio description (pre-recorded)** Audio description is provided for all pre-recorded video content in synchronised media.
9.2.7 Info and relationships	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.3.1 Info and Relationships. **WCAG 2.0 success criterion: Info and relationships** Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text.
9.2.8 Meaningful sequence	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.3.2 Meaningful Sequence. **WCAG 2.0 success criterion: Meaningful sequence** When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined.
9.2.9 Sensory characteristics	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.3.3 Sensory Characteristics. **WCAG 2.0 success criterion: Sensory characteristics** Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound. NOTE**:** For requirements related to colour, refer to WCAG 2.0 Guideline 1.4.
9.2.10 Use of colour	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.4.1 Use of Color. **WCAG 2.0 success criterion: Use of colour**

	Colour is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. NOTE: This success criterion addresses colour perception specifically. Other forms of perception are covered in WCAG 2.0 Guideline 1.3 including programmatic access to colour and other visual presentation coding.
9.2.11 Audio control	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.4.2 Audio Control. **WCAG 2.0 success criterion: Audio control** If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. NOTE: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether or not it is used to meet other success criteria) shall meet this success criterion. See Conformance Requirement 5: Non-Interference.
9.2.12 Contrast (minimum)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.4.3 Contrast (Minimum). **WCAG 2.0 success criterion: Contrast (Minimum)** The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following: • Large Text: Large-scale text and images of large-scale text have a contrast ratio of at least 3:1. • Incidental: Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement. • Logotypes: Text that is part of a logo or brand name has no minimum contrast requirement.
9.2.13 Resize text	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.4.4 Resize text. **WCAG 2.0 success criterion: Resize text** Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality.
9.2.14 Images of text	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 1.4.5 Images of Text. **WCAG 2.0 success criterion: Images of text** If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text except for the following: • **Customizable:** The image of text can be visually customized to the user's requirements.

	• **Essential:** A particular presentation of text is essential to the information being conveyed. NOTE: Logotypes (text that is part of a logo or brand name) are considered essential.
9.2.15 Keyboard	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.1.1 Keyboard. **WCAG 2.0 success criterion: Keyboard** All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. NOTE 1: This exception relates to the underlying function, not the input technique. For example, if using handwriting to enter text, the input technique (handwriting) requires path-dependent input but the underlying function (text input) does not. NOTE 2: This does not forbid and should not discourage providing mouse input or other input methods in addition to keyboard operation.
9.2.16 No keyboard trap	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.1.2 No Keyboard Trap. **WCAG 2.0 success criterion: No Keyboard Trap** If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away. NOTE: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole document, all content on the Web page (whether or not it is used to meet other success criteria) must meet this success criterion.
9.2.17 Timing adjustable	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.2.1 Timing Adjustable. **WCAG 2.0 success criterion: Timing Adjustable** For each time limit that is set by the content, at least one of the following is true: • **Turn off:** The user is allowed to turn off the time limit before encountering it; or • **Adjust:** The user is allowed to adjust the time limit before encountering it over a wide range that is at least ten times the length of the default setting; or • **Extend:** The user is warned before time expires and given at least 20 seconds to extend the time limit with a simple action (for example, "press the space bar"), and the user is allowed to extend the time limit at least ten times; or • **Real-time Exception:** The time limit is a required part of a real-time event (for example, an auction), and no alternative to the time limit is possible; or

	• **Essential Exception:** The time limit is essential and extending it would invalidate the activity; or • **20 Hour Exception:** The time limit is longer than 20 hours. NOTE: This success criterion helps ensure that users can complete tasks without unexpected changes in content or context that are a result of a time limit. This success criterion should be considered in conjunction with WCAG 2.0 Success Criterion 3.2.1, which puts limits on changes of content or context as a result of user action.
9.2.18 Pause, stop, hide	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.2.2 Pause, Stop, Hide. **WCAG 2.0 success criterion: Pause, Stop, Hide** For moving, blinking, scrolling, or auto-updating information, all of the following are true: • **Moving, blinking, scrolling:** For any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential; and • **Auto-updating:** For any auto-updating information that (1) starts automatically and (2) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential. NOTE 1: For requirements related to flickering or flashing content, refer to WCAG 2.0 Guideline 2.3. NOTE 2: This success criteria is applicable to all content (whether or not there is an alternate accessible version of the content) since any content that does not meet this success criterion can interfere with a user's ability to use the whole page (including a link to the alternate version). NOTE 3: Content that is updated periodically by software or that is streamed to the user agent is not required to preserve or present information that is generated or received between the initiation of the pause and resuming presentation, as this may not be technically possible, and in many situations could be misleading to do so. NOTE 4: An animation that occurs as part of a preload phase or similar situation can be considered essential if interaction cannot occur during that phase for all users and if not indicating progress could confuse users or cause them to think that content was frozen or broken.
9.2.19 Three flashes or below threshold	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.3.1 Three Flashes or Below Threshold. **WCAG 2.0 success criterion: Three Flashes or Below Threshold** Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds. NOTE: This success criterion is applicable to all content on the Web page (whether or not there is an alternate accessible version of the content) since any part of a document that does not meet this success criterion can interfere with a user's ability to use the whole page (including a link to the alternate version).
9.2.20 Bypass blocks	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.1 Bypass Blocks.

	WCAG 2.0 success criterion: Bypass Blocks A mechanism is available to bypass blocks of content that are repeated on multiple Web pages.
9.2.21 Page titled	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.2 Page Titled. **WCAG 2.0 success criterion: Page Titled** Web pages have titles that describe topic or purpose.
9.2.22 Focus Order	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.3 Focus Order. **WCAG 2.0 success criterion: Focus Order** If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability.
9.2.23 Link purpose (in context)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.4 Link Purpose (In Context). **WCAG 2.0 success criterion: Link Purpose (In Context)** The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general.
9.2.24 Multiple ways	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.5 Multiple Ways. **WCAG 2.0 Success criterion: Multiple Ways** More than one way is available to locate a Web page within a set of Web pages except where the Web Page is the result of, or a step in, a process.
9.2.25 Headings and labels	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.6 Headings and Labels. **WCAG 2.0 Success Criterion: Headings and Labels** Headings and labels describe topic or purpose.
9.2.26 Focus visible	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 2.4.7 Focus Visible. **WCAG 2.0 Success Criterion: Focus Visible** Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible.
9.2.27 Language of page	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.1.1 Language of Page. **WCAG 2.0 Success Criterion: Language of Page**

	The default human language of each Web page can be programmatically determined.
9.2.28 Language of parts	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.1.2 Language of Parts. **WCAG 2.0 Success Criterion: Language of Parts** The human language of each passage or phrase in the content can be programmatically determined except for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text.
9.2.29 On focus	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.2.1 On Focus. **WCAG 2.0 Success Criterion: On Focus** When any component receives focus, it does not initiate a change of context.
9.2.30 On input	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.2.2 On Input. **WCAG 2.0 Success Criterion: On Input** Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behaviour before using the component.
9.2.31 Consistent navigation	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.2.3 Consistent Navigation. **WCAG 2.0 Success Criterion: Consistent Navigation** Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user.
9.2.32 Consistent identification	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.2.4 Consistent Identification. **WCAG 2.0 Success Criterion: Consistent Identification** Components that have the same functionality within a set of Web pages are identified consistently.
9.2.33 Error identification	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.3.1 Error Identification. **WCAG 2.0 Success Criterion: Error Identification** If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text.
9.2.34 Labels or instructions	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.3.2 Labels or Instructions. **WCAG 2.0 Success Criterion: Labels or Instructions** Labels or instructions are provided when content requires user input.

9.2.35 Error suggestion	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.3.3 Error Suggestion. **WCAG 2.0 Success Criterion: Error Suggestion** If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content.
9.2.36 Error prevention (legal, financial, data)	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 3.3.4 Error Prevention (Legal, Financial, Data). **WCAG 2.0 Success Criterion: Error prevention (Legal, Financial, Data)** For Web pages that cause legal commitments or financial transactions for the user to occur, that modify or delete user-controllable data in data storage systems, or that submit user test responses, at least one of the following is true: 1. **Reversible:** Submissions are reversible. 2. **Checked:** Data entered by the user is checked for input errors and the user is provided an opportunity to correct them. 3. **Confirmed:** A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.
9.2.37 Parsing	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 4.1.1 Parsing. **WCAG 2.0 Success Criterion: Parsing** In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features NOTE: Start and end tags that are missing a critical character in their formation, such as a closing angle bracket or a mismatched attribute value quotation mark are not complete.
9.2.38 Name, role, value	Where ICT is a web page, it shall satisfy WCAG 2.0 Success Criterion 4.1.2 Name, Role, Value. **WCAG 2.0 Success Criterion: Name, Role, Value** For all user interface components (including but not limited to: form elements, links and components generated by scripts), the name and role can be programmatically determined states, properties, and values that can be set by the user can be programmatically set and notification of changes to these items is available to user agents, including assistive technologies NOTE: This success criterion is primarily for Web authors who develop or script their own user interface components. For example, standard HTML controls already meet this success criterion when used according to specification.
9.39 WCAG 2.0 conformance requirements	Where ICT is a web page, it shall satisfy all the following five WCAG 2.0 conformance requirements at Level AA. 1. Conformance level 2. Full pages 3. Complete processes 4. Only Accessibility-Supported Ways of Using Technologies

	5. Non-interference

Appendix 2c

Section 508 Checklists[25]

Section 508 Checklist for Functional Performance Criteria

Severity Level[26]	Functional Performance Criterion
Critical	At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided.
Critical	At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 shall be provided in audio and enlarged print output working together or independently, or support for assistive technology used by people who are visually impaired shall be provided.
Critical	At least one mode of operation and information retrieval that does not require user hearing shall be provided, or support for assistive technology used by people who are deaf or hard of hearing shall be provided.
Critical	Where audio information is important for the use of a product, at least one mode of operation and information retrieval shall be provided in an enhanced auditory fashion, or support for assistive hearing devices shall be provided.
Critical	At least one mode of operation and information retrieval that does not require user speech shall be provided, or support for assistive technology used by people with disabilities shall be provided.
Critical	At least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and that is operable with limited reach and strength shall be provided.

[25] These two checklists have been copied and adopted from the US Department of Veterans Affairs and should not be used without reference to the source: www.section508.va.gov/Standards_Checklist.asp. They were downloaded as complete lists of points for functionality and websites and applications.

[26] Severity Levels Used In Section 508 Audits:

Critical: This issue results in severe barriers for users with disabilities, either because content is blocked or functionality is inoperable. It causes global issues across the project because people with disabilities are unable to use it. This violation must be resolved before content/functionality can be considered fully compliant. Remediation should be a top priority.

High: This issue results in significant barriers for individuals with disabilities. Some important content/functionality is not accessible. Users of Assistive Technology may not be able to access all content and/or functionality. Remediation should be a priority.

Medium: This issue results in some barriers for individuals with disabilities but will not prevent them from accessing fundamental elements or content. This violation must be resolved before content/functionality can be considered fully compliant.

Low: This issue causes minimal impact for users with disabilities. This may be a technical violation of the law but doesn't make the content inaccessible. This content/functionality should be remediated in order to be considered fully compliant, but remediation can be given a low priority.

Section 508 Checklist for Web-based Internet Information and Applications

Severity Level	Functional Performance Criterion
Critical	A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).
Critical	Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.
High	Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
Medium	Documents shall be organized so they are readable without requiring an associated style sheet.
Critical	Redundant text links shall be provided for each active region of a server-side image map.
Moderate	Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.
Critical	Row and column headers shall be identified for data tables.
Critical	Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
Critical	Frames shall be titled with text that facilitates frame identification and navigation.
Critical	Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
Critical	A text-only page with equivalent information or functionality shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.
Critical	When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.
Critical	When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).
High	When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
High	A method shall be provided that permits users to skip repetitive navigation links.
Critical	When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

Appendix 3

Universal Design for Learning Guidelines[27]

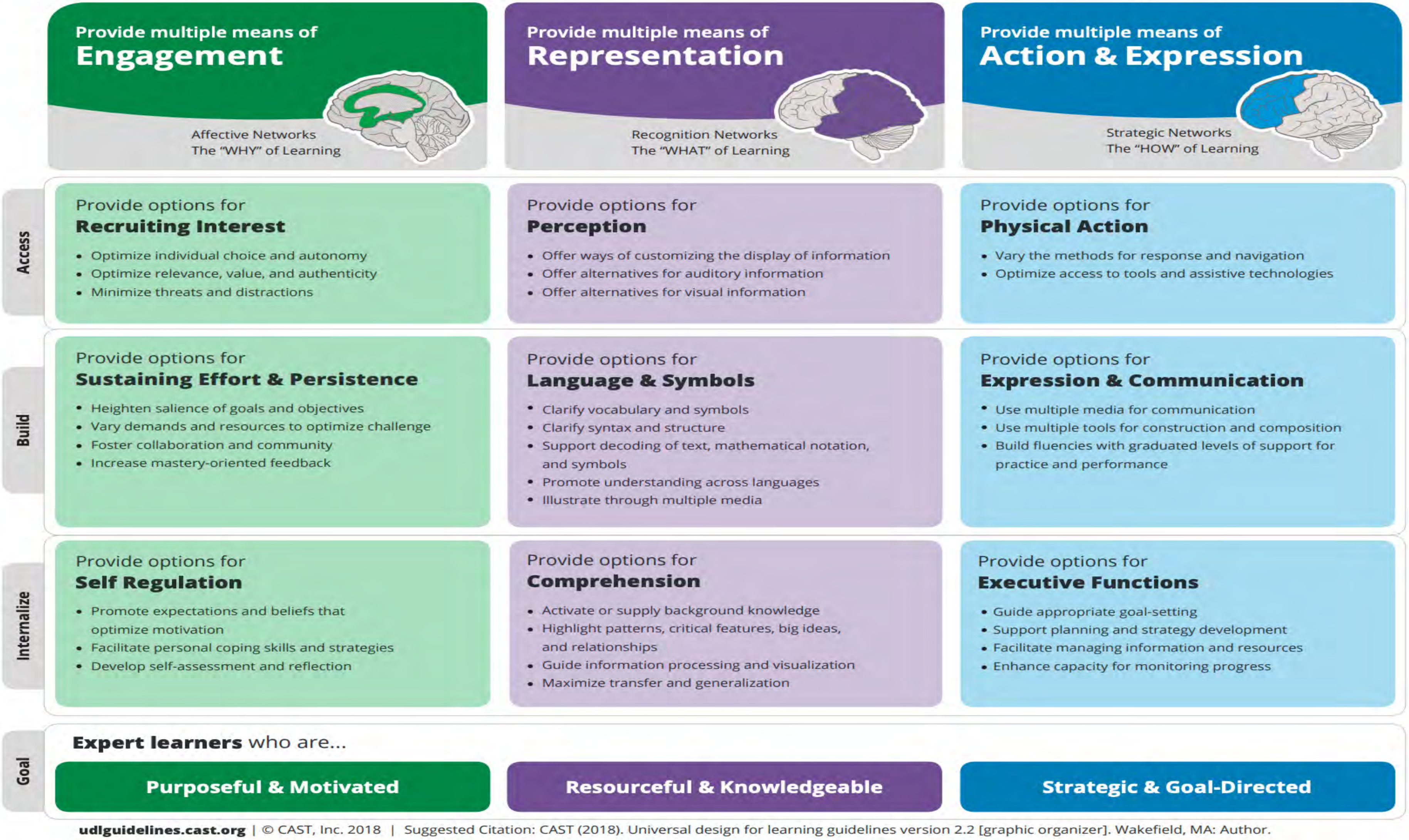
UDL Guidelines – Educator Checklist Version 2

I. Provide Multiple Means of Representation		
Provide options for perception		
	1.1	Offer ways of customizing the display of information
	1.2	Offer alternatives for auditory information
	1.3	Offer alternatives for visual information
Provide options for language, mathematical expressions, and symbols		
	2.1	Clarify vocabulary and symbols
	2.2	Clarify syntax and structure
	2.3	Support decoding of text, and mathematical notation, and symbols
	2.4	Promote understanding across language
	2.5	Illustrate through multiple media
Provide options for comprehension		
	3.1	Activate or supply background knowledge
	3.2	Highlight patterns, critical features, big ideas, and relationships
	3.3	Guide information processing, visualization, and manipulation
	3.4	Maximize transfer and generalization
II. Provide Multiple Means for Action and Expression		
Provide options for physical action		
	4.1	Vary the methods for response and navigation
	4.2	Optimize access to tools and assistive technologies
Provide options for expression and communication		
	5.1	Use multiple media for communication
	5.2	Use multiple tools for construction and composition
	5.3	Build fluencies with graduated labels of support for practice and performance
Provide options for executive functions		
	6.1	Guide appropriate goal setting
	6.2	Support planning and strategy development
	6.3	Facilitate managing information and resources
	6.4	Enhance capacity for monitoring progress
III. Provide Multiple Means for Engagement		
Provide options for recruiting interest		

[27] This checklist has been adopted from CAST and should not be used without reference to the source: www.uvic.ca/learningandteaching/assets/docs/instructors/for-review/Teaching%20Support/Guidelines_20_Educator_Worksheet_0.pdf and http://mps.milwaukee.k12.wi.us/MPS-English/CAO/Documents/RtI-Academics/resources/math-intervention-6RP3b_UDLChecklistGeysers1.pdf.

7.1	Optimize individual choice and autonomy
7.2	Optimize relevance, value, and authenticity
7.3	Minimize threats and distractions
Provide options for sustaining effort and persistence	
8.1	Heighten salience of goals and objectives
8.2	Vary demands and resources to optimize challenge
8.3	Foster collaboration and community
8.4	Increase mastery-oriented feedback
Provide options for self-regulation	
9. 1 Promote expectations and beliefs that optimize motivation	
9. 2 Facilitate personal coping skills and strategies	
9. 3 Develop self-assessment and reflection	

UDL Guidelines – Graphical representation by CAST (2018)



Appendix 4

Survey and responses

University Access Survey

4%

Please answer questions marked with an asterisk (*)

* **Full Name :**

* **Name of Institution (and your Position) :**

* **Email Address :**

Dear participant,

You are invited to participate in the *University Access Survey*, which is carried out in order to map accessibility in universities. In this survey, chosen universities and/or university centres (based on popularity, online presence and accessibility) will be asked to answer questions about the level of accessibility provided in their institution.

It will take you approximately 15 minutes to complete the questionnaire. If the information required can be found on your website, you can skip the comments by adding the relevant URL for our reference. Your participation in this study is completely voluntary, but is expected to be extremely helpful for the future of research in inclusive education. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. Please inform us if you do not want to participate in the research so that we pick another institution in your place.

It is very important for us to learn your opinions. Your survey responses will be strictly confidential and data from this research will be reported in an academic manner, in a thesis deliivered as part of a doctoral research on Accessibility. Your information will be coded and will remain confidential, but we ask for your name and email address so that we can contact you if any of the information provided is unclear.

WHAT YOU LEARN AND WHAT YOU EARN

Your participation in this research will be rewarded in the following ways:

1) Upon completion of the analysis, all the data will be made available to you and your institution for further research in the field and development of your access services.

2) You wiill receive three learning scenarions with specific recommendations on making your couses accessible.

3) You are always welcome to contact us for further suggestions and keep in touch for a potential future collaboration.

Please note that this is part of a lengthy Action Research in the area of Accessible Online Education, which is made of three levels:

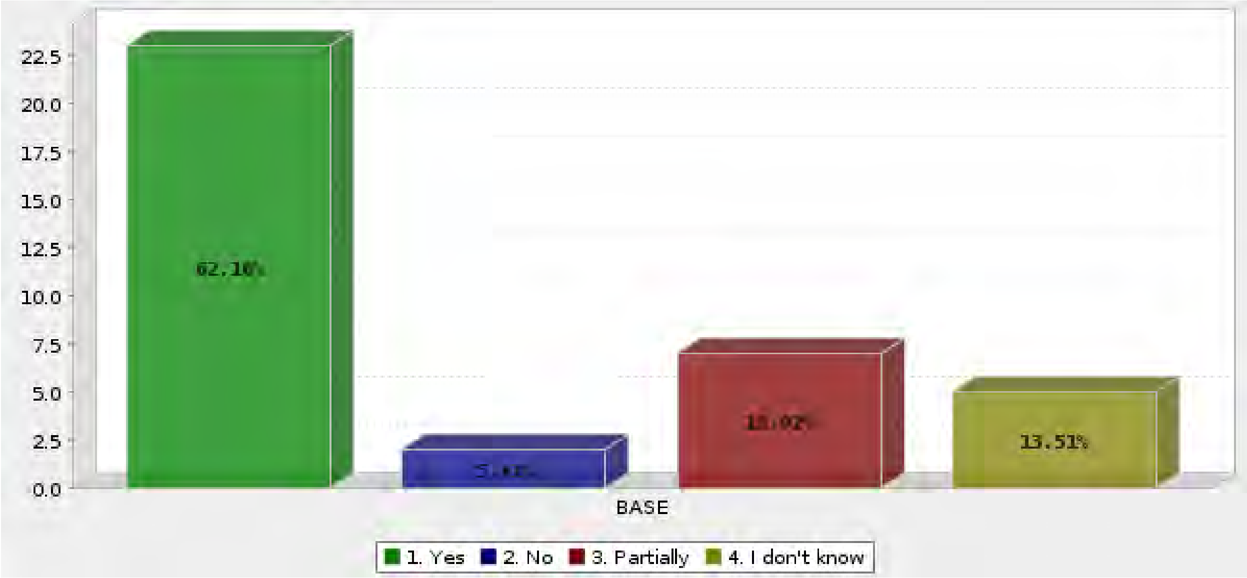
Level I: Building a theoretical background based on Disability Studies in order to create a common ground for interdisciplinary research. (2011-2016)

Level II: Mapping university accessibility, designing learning scenarios and building learning context prototypes. (2014-2016)

Level III: Building and testing the suggested prototypes. (2017-2019)

If you have questions at any time about the survey or the procedures, you may contact Miss Emmanouela Patiniotaki at e.patiniotaki@ucl.ac.uk. Thank you very much for your time and support. Please start with the survey now by clicking on the Continue button below.

1. Does your institution apply an accessibility framework for disabled students?



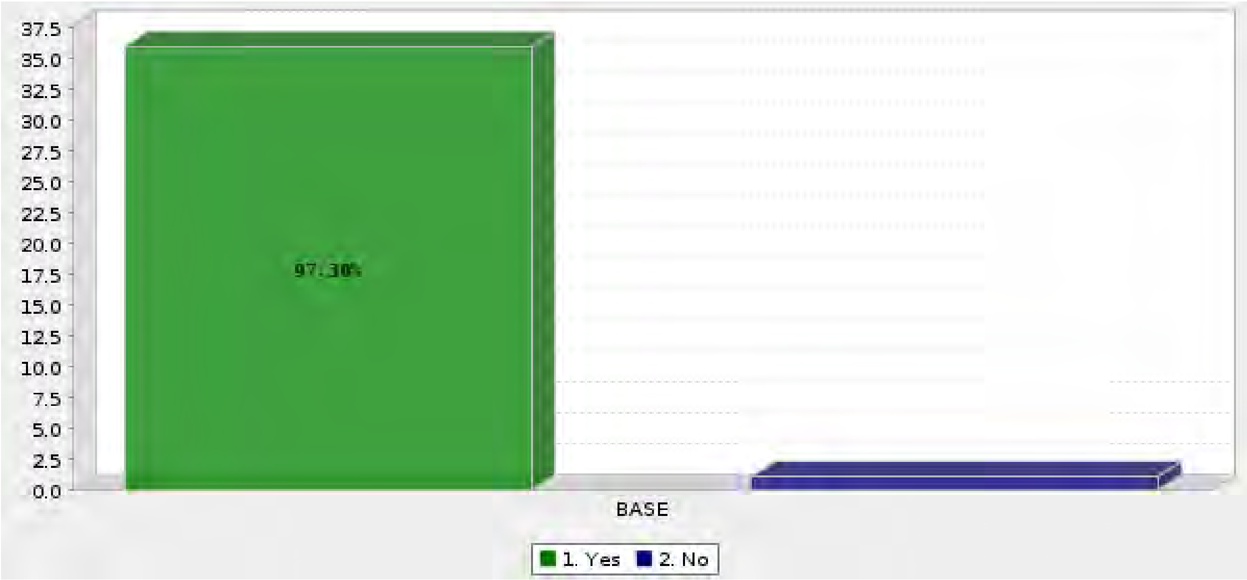
	Answer	Count	Percent
1.	Yes	23	62.16%
2.	No	2	5.41%
3.	Partially	7	18.92%
4.	I don't know	5	13.51%
	Total	37	100%

Mean : **1.838**	Confidence Interval @ 95% : **[1.462 - 2.214]**	Standard Deviation : **1.167**	Standard Error : **0.192**

95738058	[Partially] We do not have a formal accessibiluity framework, but we do have processes and policies in regards to making our institution accessible for disabled students,
65064236	[Yes] You can find it at our website: - offer for students http://www.don.uj.edu.pl/en_GB/dla-studentow - offer for university personnel http://www.don.uj.edu.pl/en_GB/dla-pracownikow
64910227	[Yes] staff training, support centre for students, accessibile labs, providing accessible materials upon request
64510422	[Yes] support centre for students, technical support for improving accessibility in academic services, specific adaptations for exams, accessibility guidelines for learning resources development
64447148	[Yes] The AccessAbility Centre is the main hub from which support flows. http://www2.le.ac.uk/offices/accessability All depts. have an AccessAbility Tutor. Most teaching rooms are accessible.
64418330	[Yes] Training, support centre, accessible labs, accessible buildings...
64404824	[Yes] https://www.uts.edu.au/sites/default/files/article/downloads/UTS%20access%20and%20inclusion%20plan%202015-2019_0.pdf

64362861	[Partially] It depends: physical accessibility is much more considered than sensory of intellectual accessibility. There is a framework to provide on-site / individual accessibility but there is no framework on universal accessibility (regarding teaching practices, platforms and materials).
64281574	[Yes] fdasfa
64195490	[Yes] Disability Services, Disabled Student Network
64016780	[Partially] What do you mean by this; universal design? If so no
63982561	[Yes] Our University has a full support network for disabled students, including 6 FT disability advisers, training courses, DSA assessments (and subsequent equipment or provision) and IT support.
63962269	[Yes] support centre for students
63899041	[Yes] office dedicated to coordinating academic and housing accommodations, as well as another office which coordinates facilities accommodations for visitors
63888287	[Yes] Services for Students with Disabilities, staff training, accessible labs, etc.
63844604	[Partially] There is no official accessibility policy covering the accessibility of physical and digital spaces
63809097	[Yes] Student center, that deals with the matter.
63807802	[Yes] faculty/staff training & center for students
63807024	[Partially] Our campus is not fully accessible.
63796910	[Partially] http://www.bathspa.ac.uk/regulations/disabled-student-guidelines
63792953	[Yes] suppot center for students
59617421	[Partially] due to the majority of the building, physical access is not possible all over furthermore, there is lack of financial resources which limits access throughout.
59720864	[Yes] Staff training, support centre for students and accessible labs
59690761	[Yes] support centre for students, accessible labs
59685980	[Yes] Student support, staff training, physical accessibility on campus, administrative/organisation accessibility.
59682563	[Yes] Disability Information and Support works within Kia Orite - Achieving Equity (best practice guidelines) and is classed as a leader in the field of tertiary education in New Zealand. We offer staff training, support services for students with a number of support services (alternative test and exam arrangements, ergonomic equipment, assistance to find accessible accommodation, mobility parking spaces, note-taking services, alternative formats, accessible lecture theatres etc.)
59644689	[Yes] faculty and dept. training, individualized assessment and determination of accommodations
59613794	[Yes] Accessibility Unit for students with disabilities
59576476	[Yes] Support center, staff and faculty, training, outreach, accessibility
59562279	[Yes] The Office for Students with Disabilities (OSD) is housed in the center of campus to provide support for undergraduate and graduate students. In addition, we work collaboratively with the ADA Title II Committee on campus to enhance accessibility for all.

2. Does your institution have a disability support service (i.e. a group of people in a specified location who offer advice, support and equipment to disabled students)?



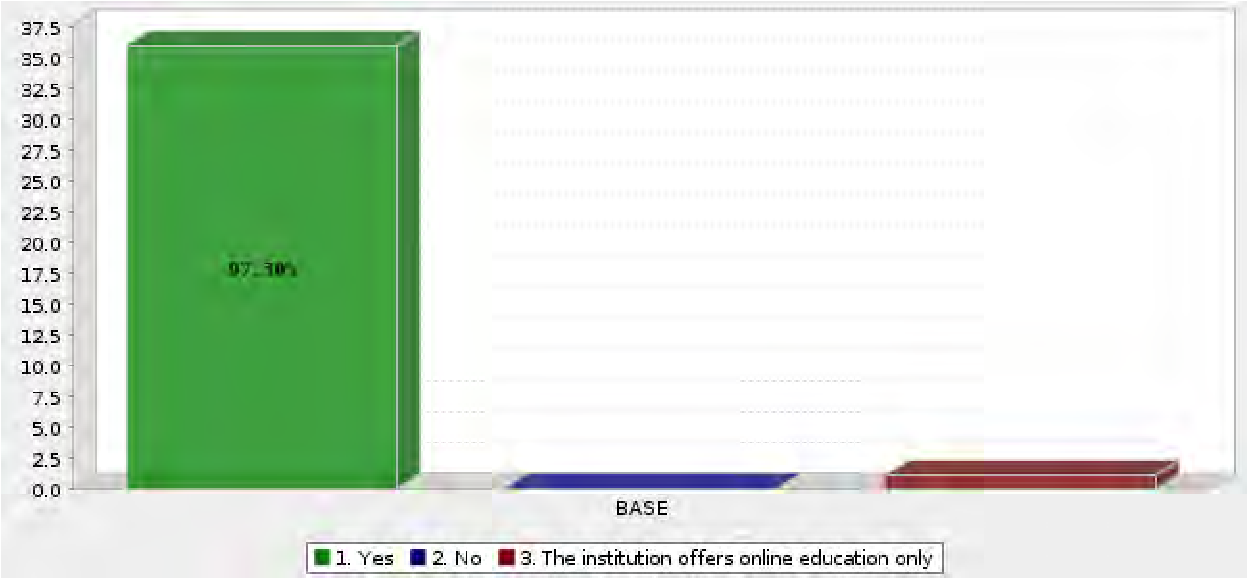
	Answer	Count	Percent
1.	Yes	36	97.30%
2.	No	1	2.70%
	Total	37	100%

Mean : **1.027**	Confidence Interval @ 95% : **[0.974 - 1.080]**	Standard Deviation : **0.164**	Standard Error : **0.027**

95738058	[Yes] Student Support and Wellbeing Disability and Specific Learning Difficulties Service
65064236	[Yes] Disability Support Service http://www.[PROTECTED]
64910227	[Yes] UJ Disability Support Service of the Jagiellonian University
64524216	[Yes] The Disability Advisory Service
64521978	[Yes] Disability Services which includes: Support Worker Team; Disability Co-ordinator team [PROTECTED]Assessment Centtre; Transcription Services; Information point.
64510422	[Yes] [PROTECTED
64460938	[Yes] The AccessAbility Centre http:// [PROTECTED]
64447148	[Yes] The AccessAbility Centre - http:// [PROTECTED]
64418330	[Yes] Unidad de apoyo educativo (educational support unit)
64404824	[Yes] Special Needs Service https://www.uts.edu.au/current-students/information-special-needs-students/students-disabilities-or-ongoing-illnesses
64362861	[Yes] [PROTECTED]
64281574	[Yes] Special needs Service

64195490	[Yes] Student Disability Services
64037300	[Yes] Disability Service
64016780	[Yes] Accessibility Services
63982561	[Yes] Disability Services https://www[PROTECTED]
63962269	[Yes] a group of people in a specified location who offer advice, support and equipment to disabled students
63899041	[Yes] Office of Accessible [PROTECTED]
63888287	[Yes] Services for Students with Disabilities
63844604	[Yes] Disability Services (https://student. [PROTECTED])
63825238	[Yes] Exam Proctoring E-Readers E-Text Conversion
63809097	[Yes] Each building has supervisor, that can help disabled people.
63807802	[Yes] Student Disability Services
63807024	[Yes] Learning Center
63796910	[Yes] Student Support
63792953	[Yes] office
59617421	[Yes] ACCESS-Disability Support Unit
59720864	[Yes] [PROTECTED]Centre
59701994	[Yes] [PROTECTED]Center, McIntyre Exam Center
59690761	[No] I do not know
59685980	[Yes] Health, Counselling and Disability Services
59682563	[Yes] Disability Information and Support, [PROTECTED]
59644689	[Yes] Accessible Education Center
59613794	[Yes] a) e-Accessibility: Assistive Technologies Service, Accessibility workstations in libraries, Video Relay Service, Volunteer Service, Production of Accessible Textbooks, Guidelines and Tools b) Transportation Service, c) Psychological Counseling, d) Built Environment Accessibility
59576476	[Yes] [PROTECTED]Office - Disability Resources
59562279	[Yes] [PROTECTED]
59543203	[Yes] Student Disability Service

3. Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?



	Answer	Count	Percent
1.	Yes	36	97.30%
2.	No	0	0.00%
3.	The institution offers online education only	1	2.70%
	Total	37	100%

Mean : **1.054**	Confidence Interval @ 95% : **[0.948 - 1.160]**	Standard Deviation : **0.329**	Standard Error : **0.054**

95738058	[Yes] Lifts, accessible toilets, wheel chairs for loan, furniture
65064236	[Yes] If you're asking about physical accessibility - most of the buildings are adapted to the needs of persons with disabilities, if not we offer e.g. schedule modifications. More information: http://www.[PROTECTED]
64910227	[Yes] Accessible labs, elevators,
64524216	[Yes] shuttle buses, elevators, automatic doors, assistive technology room with height adjustable tables, hearing loops etc
64521978	[Yes] Teh majority of the physicial campus is accessible; We hold site licences for assistive software, there is a loan equipment schele, students requiring alternative accommodtion are offered this at a reduced rate, a wide range of physical adaptations are avaialbel toall areas of campus, We do not provide any physical mobility equipment - this is the responsability of the student.
64510422	[Yes] architectural accessibility in all buildings and study centres (near 190 throughout spanish country), accesible academic on-line services
64460938	[Yes] most buildings have lifts but we have some Victorian buildings in conservation areas

64447148	[Yes] Most buildings have lifts, and while labs are not filled with accessible equipment the student is able to access a lab experience with the assistance of human support and a rise and fall wheelchair. Access, however, is not only about physical access.
64418330	[Yes] Buses, labs, elevators, ramps...
64404824	[Yes] https://www. [PROTECTED]
64362861	[Yes] Physical accessibility is guaranteed and technical equipment is provided upon request with the support of national institutions ([PROTECTED])
64281574	[Yes] link to website?
64195490	[Yes] You can request equipment in the disability office
64037300	[Yes] All of the above listed and Assitive Tech software and equipment in the Library, accessible/modified accomodation, motorised scooters, ergo equipment, provision of technology to support learning eg smart pens, magnifiers, portable cctv
64016780	[Yes] Too lengthy
63982561	[Yes] We can provide taxi transport for some students. All areas of campus are either accessible or students' lectures are moved to accessible locations.
63962269	[Yes] wheelchairs, elevetors, lifts etc.
63899041	[Yes] golf cart service (transportation around campus) campus-wide shuttle service - most buses are accessible
63888287	[Yes] Shuttles, labs, elevators, etc
63844604	[Yes] these resources exist
63825238	[Yes] Residence Hall Accessibility/Accommodations Classroom Accessibility/Accommodations
63809097	[Yes] Elevators, lifts.
63807802	[Yes] wheelchairs, elevators,
63807024	[Yes] It is limited.
63796910	[Yes] Some eg adjustable desks, some automatic doors, lifts/ramps
63792953	[Yes] accessible labs wheelchais elevators
59617421	[Yes] UoM has two motorised wheelchairs which students with mobility problems can use. the majority of buildings have lifts installed. the new buildings offer full accessibility including loop systems for the hearing impaired
59720864	[Yes] I am not sure about campus shuttle buses but we do have accessible labs, wheelchairs, elevators and where appropriate lifts. IE: Lift in Health Services
59701994	[Yes] accessible classroom/labs
59690761	[Yes] Elevators and lifts everywhere
59685980	[Yes] specialised equipment (specific to student and location), software, accessible computers, lifts, wheelchairs, mobility scooters, height adjustable tables, wheelchair accessible shuttle buses.
59682563	[Yes] Accessible venues, wheelchairs, mobility scooters, lifts, ramps etc.
59644689	[Yes] Minimal..wheelchair loan, access shuttle, recorders, etc..

59613794	[Yes] Shuttle buses, assistive technologies, [PROTECTED] Free AT Software Inventory
59576476	[Yes] Accessible classrooms, elevators, assistive technology,
59543203	[Yes] We can provide whatever support disabled students require and will make adaptations to the estate both on a proactive basis as part of refurbishment and new project developments, and in response to specific requirements.

Comments on 4. You can add your comments here:

95738058	Some of our buildings, particularly town houses are not accessible.
65064236	Some of the buildings are physically inaccessible, but the [PROTECTED] will develop suggested adaptations to minimise inconveniences resulting from such barriers. Some examples of such accommodations include: moving the course meetings to buildings/rooms adapted to the needs of persons with disabilities, schedule modifications, and changing the group attended by the student. More: http://www. [PROTECTED]
64910227	
64524216	
64521978	The majority of the campus is accessible wite the acception of the grade 1 and 2 listed biuldings which have been adapted where possible. Any issues with access that are found are assessedand quickly addressed.
64510422	
64460938	most buildings have lifts but we have some Victorian buildings in conservation areas
64447148	I have put partially accessible because we do have some Victorian buildings in a conservation area that are not accessible but I would say 90% of the campus and its facilities are accessible and some are 100% accessible - the library for example.
64418330	
64404824	
64362861	Accessibility is not complete in some cases.
64281574	
64195490	
64037300	
64016780	
63982561	https://www. [PROTECTED]
63962269	
63899041	most teaching spaces are accessible; any time that a space is not accessible, we move the class
63888287	
63844604	
63825238	Partially Inaccessible - some of our buildings are very old and as we update our buildings, they are brought to code. In most cases, we have work-arounds, but we are striving to becoming fully accessible.
63809097	Student dormitories and main campus is accessible by disabled students. In every building there are support services elevators and wheelchair friendly ramps. Outside main campus there is designated person who will help in case of need.
63807802	I would say most of our classrooms are accessible and we have designated residential rooms in all buildings with the exception of two out of the 13.

63807024	
63796910	Some push-button doors, not all. Some buildings are Grade 2 listed and cannot have lifts/adaptations
63792953	
59617421	
59720864	
59701994	
59690761	
59685980	There are still a couple of rooms with physical access issues, but we can work around this.
59682563	Disability Information and Support works with Timetables to ensure students impairment related needs are taken into consideration when streaming them into venues.
59644689	Any inaccessible areas are addressed through program or class relocation when other options aren't feasible.
59613794	
59576476	
59562279	We are committed to accessibility and to increase in certain areas of campus, are working with an architectural group to update several buildings over the next few years, as our [PROTECTED] Transition Plan.
59543203	Our estate comprises over 800 separate buildings some of which are hundreds of years old, and so inaccessible. however, we move teaching rooms to other accessible locations as required.

Comments on 5. You can add your comments here:

95738058	We are working on developing such a framework, but to date this is not active
65064236	You can find more information about our offer for students with disabilities at our website: http://www. [PROTECTED] "Which of the following better describes the accessibility level of your institution's main website?" Main website is mostly compliant with W3C , but not in every point.
64910227	
64524216	
64521978	As a central service we make recommendations for each individual student howver we are seeking to desing and impliment a framewok which will be applied to all school and faculty areas.
64510422	UNIDIS have developed guidelines for making accesible LR
64460938	We do not have a framework as such but all departments are aware of the need to provide accessible resources and make reasonable adjustments
64447148	This is the wrong questions. All departments are required to make their courses accessible - there are expectations in module design to ensure access but reasonable adjustments can also be made.
64418330	
64404824	Liz? Policy?
64362861	
64281574	link to website? policy?
64195490	
64037300	We provide staff information and training and havr procedures for staff to follow when developing course content hosted on the learning platform so that its in an accessible format.
64016780	Need to add partial; some yes some no
63982561	This is something we are working on at the moment with a new post in accessibility. We believe that the majority of our courses are in an accessible format and this is also supported by a Disability Adviser in the Library. https://www. [PROTECTED]/ The main software is compliant, but some of the content inserted staff may not be.
63962269	
63899041	
63888287	
63844604	There is no formal process for controlling the accessibility of course content
63825238	
63809097	
63807802	
63807024	
63796910	http://www. [PROTECTED] We are trying to promote the provision of information in accessible format but this is variable.

63792953	
59617421	however [PROTECTED]is still in the process of upgrading all IT on Campus
59720864	
59701994	
59690761	
59685980	There is training and information for staff, but not all staff access this.
59682563	This is an area for improvement.
59644689	At this time there is still an accommodation focuses effort.... there is not a streamlined universal design protocol.
59613794	
59576476	
59562279	
59543203	All courses are expected to ensure that all materials are accessible to all students and all materials produced by the institutions have the accessibility tagline regarding availability in other formats.

7. Provisions for blindness/visual impairments.

95738058	Advice, networked assistive technology, ability to purchase technology and equipment if needed, ability to access support workers, braille printing, alternative assessment, reasonable adjustments
65064236	Adaptations of the educational process, educational materials in accessible formats, advice and training in assistive technologies, english language courses, adaptations of physical education, special bursary, other support More: http://www[PROTECTED]
64524216	Lecture Recording, e-format documents, other adjustments made as necessary e.g. buying specialist equipment or NMH
64510422	Electronic versions of printed materials, textual transcriptions of videoclases, specific adaptation of presential exams, some audio-descriptions
64460938	relevant advice via the [PROTECTED]Centre and reasonable adjustments as required - also Zoomtext and Zoom Ex software and others, such as JAWS, as required.
64447148	Each student's needs are considered and appropriate equipment and software provided as required. We have a CCTV and Zoomtest and Zoom Ex software. JAWS is installed when required.
64418330	I don't know
64404824	Alternative Formats Notetaking service Exam Provisions Assistive Technology Equipment Loans Faculty Liaison Assignment Extensions Library Access & Support Peer Tutoring
64037300	Assistive tech software and hardware, other equipment eg cctv, magnifiers, alternate formats, transition support, learning support, peer mentoring, on campus access tours and orientation, lab facilities and additional lab technician support, accesible accomodation, note taking, adjustments on field trips and placements, extensions, alternate exam arrangements
64016780	Adaptive tech Test and exam accommodations Adaptive software Navigation support/EAs
63982561	Support workers, screen readers, Personal Learning Support Plan, reasonable adjustments for examinations.
63962269	electronic documents for readings etc.
63844604	formal: assistive technology (software), classwork support, and alternative formatting services available for students who register with disability services; informal: arrangements (e.g. audio descriptions of images and video content) made with instructor on case-by-case basis
63825238	We offer registration to Learning Ally and scan and convert those texts and other materials into a usable format.
63809097	Some supporting equipment.
63807802	advice, content in alt. format
63807024	I don't know.
63796910	Advice, enabling technology, liaison with academics and library re alternative formats. Assistance animals allowed
63792953	electronic tools
59617421	open access text to speech software can be made available on all work stations, accessible course content in different format,

59720864	Course content in different formats: IE: JAWS for visual impairments/Kurzweil. Students can borrow electronic tools from our [PROTECTED]Centre
59701994	Yes
59690761	Not sure
59685980	lecture and video transcriptions, conversion of written materials into accessible format, computers with accessible software, advice, free loan of equipment, campus orientation, course content in accessible format, extensions for assignments, alternative exam arrangements.
59682563	We work with students to obtain texts in an appropriate format and have computers with screen magnification available. We may also provide individual tutors to assist students, if required.
59613794	advice, free electronic tools, free Assistive Technologies, textbooks and course content in a different format, accommodations for exams, notetakers
59562279	Counsel and guidance from [PROTECTED] and individual accommodation plans, electronic assistance, and course content in a different format.
59543203	Provision of assistive technology, equipment or software, either on loan for duration of studies or via [PROTECTED] process. Provision of 1:1 non-medical personal help ([PROTECTED]) as required. Personal profile of reasonable adjustments to teaching and learning as required by individual students. Provision of Personal Emergency Evacuation Plan.

8. Provisions for motor disability.

95738058	Advice, networked assistive technology, ability to purchase technology and equipment if needed, ability to access support workers, materials can be provided in alternative formats, alternative assessment, reasonable adjustments
65064236	Adaptations of the educational process, educational materials in accessible formats, advice and training in assistive technologies, adaptations of physical education, special bursary, physical accessibility More: http://www. [PROTECTED]
64524216	elevators
64510422	specific adaptation of presential exams, architectural accessibility of university buildings and library
64460938	Relevant advice via the [PROTECTED] Centre; the campus is accessible as are most teaching rooms.
64447148	Most of the campus and halls of residence are already accessible so extra provision is not necessary unless it is minor adaptations in rooms to meet student requirements - ie lower or higher desks for eg
64418330	I don't know
64404824	Notetaking service Exam Provisions Alternative Formats Assistive Technology Equipment Loans Faculty Liaison Assignment Extensions Library Access & Support Peer Tutoring
64037300	Assistive tech software and hardware, other equipment eg motorised scooters, smart pens, alternate formats, early access to notes, transition support, learning support, peer mentoring, on campus access tours and orientation, lab facilities and additional lab technician support, accesible accomodation, note taking, adjustments on field trips and placements, extensions, alternate exam arrangements
64016780	Accessible classrooms/washrooms/entrance Info on all of the above available
63982561	Support workers, such as note takers, Personal Learning Support Plan, reasonable adjustments for examinations, equipment to support use of IT and appropriate software.
63962269	slopes etc
63844604	formal: assistive technology, classwork support, note-taking, exam adjustments available for students who register with disability services; informal: arrangements (e.g. time extensions, scheduling of course times) made with instructor on case-by-case basis
63825238	I don't know
63809097	Supporting equipment.
63807802	advice, assistance on main campus,
63807024	I don't know.
63796910	As above. In residential: eg. hoists,
63792953	elevators, accesible classes
59617421	access to most areas, lifts and ramps, motorised wheelchair may be made available for use on campus.
59720864	PMC centre has wheelchairs and a scooter

59701994	Yes
59690761	Ramps everywhere
59685980	Physical access, free loan of equipment/mobility scooter, access to online materials (if unable to use paper books), campus orientation, negotiation with academics, advice, alternative exam arrangements.
59682563	Based on individual need and may include the provision of accessible venues, alternative test or exam arrangements etc.
59613794	transportation service from/to home advice, free electronic tools, free Assistive Technologies, textbooks and course content in a different format, accommodations for exams
59562279	We have accessible transportation for students, [PROTECTED] Mobility.
59543203	Provision of ergonomic equipment as required also assistive technology if necessary. Provision of 1:1 [PROTECTED] as required. Teaching locations can be moved to ensure full access, plus ongoing programme of refurbishment ensuring provision of Fire Evacuation lifts etc. to guarantee buildings are fully accessible. Personal profile of reasonable adjustments to teaching and learning as required by individual students. Provision of Personal Emergency Evacuation Plan.

9. Provisions for deafness/hearing impairments.

95738058	Advice, networked assistive technology, ability to purchase technology and equipment if needed, ability to access support workers, materials can be provided in alternative formats, alternative assessment, reasonable adjustments
65064236	Adaptations of the educational process, advice and training in assistive technologies, english language courses, special bursary More: http://www. [PROTECTED]
64524216	hearing loops, other adjustments made as necessary e.g. buying specialist equipment
64510422	Subtitled video-clases, pecific adaptation of presential exams
64460938	Relevant advice via the [PROTECTED]Centre; all teaching rooms have loops fitted and appropriate fire alarms as do halls of residence.
64447148	All buildings and halls of residence have appropriate alarms fitted and support is put in place for students as required.
64418330	I don't know
64404824	Interpreting, Captioning & Stenographer services Notetaking service Exam Provisions Assistive Technology Equipment Loans Faculty Liaison Assignment Extensions Library Access & Support Peer Tutoring
64037300	Assistive tech software and hardware, other equipment, alternate formats, transition support, learning support, peer mentoring, on campus access tours and orientation, lab facilities and additional lab technician support, note taking, transcription services, adjustments on field trips and placements, extensions, alternate exam arrangements
64016780	Sign language/real time captioning/computerized note taking tutoring test and exam accommodations extensions if needed
63982561	Support workers, such as BSL interpreters, Personal Learning Support Plan, reasonable adjustments for examinations, equipment to support use of IT and appropriate software.
63962269	PC letter translation etc
63844604	formal: alternative formatting services, classwork support, audio loops available for students who register with disability services; informal: arrangements (e.g. captions on videos) made with instructor on case-by-case basis
63825238	CART Services or Interpreter Services
63809097	Supporting equipment.
63807802	advice, sign language interpreter, content in alternative format, notetaker service
63807024	An interpreter when needed.
63796910	Fire alarms/beacons, hearing loops, and as above
63792953	provide language for the deaf assistants
59617421	loops systems, recommendation to access funds for SLI
59720864	Not sure
59701994	Yes
59690761	Not sure

59685980	lectures and videos transcribed and captioned, Sign language interpreters, computers with accessible software, advice, free loan of equipment, course content in accessible format, alternative arrangements for oral presentations and placements (when required), alternative exam arrangements.
59682563	Based on individual need - [PROTECTED] Sign Language Interpreters, electronic note-takers, tutors, equipment.
59613794	video relay service, advice, free electronic tools, free Assistive Technologies, notetakers, accommodations for exams
59562279	Counsel and guidance from [PROTECTED] and individual accommodation plans, electronic assistance, and course content in a different format.
59543203	Provision of assistive technology, equipment or software, either on loan for duration of studies or via [PROTECTED] process. Provision of 1:1 non-medical personal help ([PROTECTED]) as required. Provision of vibrating pillow/flashing light fire alarms in University accommodation as required. Provision of Personal Emergency Evacuation Plan. Personal profile of reasonable adjustments to teaching and learning as required by individual students.

10. Provisions for speech impairments.

95738058	Advice, alternative assessment, reasonable adjustments
65064236	Adaptations of the educational process, other support More: http://www. [PROTECTED]
64524216	adjustments made as necessary
64510422	specific adaptation of presential exams
64460938	Relevant advice via the [PROTECTED] Centre. Staff are aware of the need to make reasonable adjustments - for presentations for example.
64447148	reasonable adjustments are made as required - for presentations for example.
64418330	I don't know
64404824	Exam Provisions (oral exams) Alternative assessments to presentations Faculty Liaison Assignment Extensions Peer Tutoring
64037300	Assistive tech software and hardware, other equipment eg smart pen alternate formats, transition support, learning support, peer mentoring, on campus access tours and orientation, additional lab technician support, alternative assessment to oral presentation, adjustments on field trips and placements, extensions, alternate exam arrangements
64016780	Accommodations re presentations
63982561	Support workers, Personal Learning Support Plan, reasonable adjustments for examinations, equipment to support use of IT and appropriate software.
63962269	substitution of the task etc
63844604	formal: assistive technology (software) and classwork support available; informal: arrangements made with instructor on case-by-case basis
63825238	I don't know
63809097	None.
63807802	advice
63807024	I don't know.
63796910	None
63792953	assistant in the classroom
59617421	arrangements and support to put the student at ease during presentations.
59720864	Not sure
59701994	Yes
59690761	Speech therapy clinic
59685980	Advice, negotiation with academics, alternative arrangements for oral presentations and placements (when required), free loan of equipment when required.
59682563	Based on individual need and may include liaison with teaching staff.
59613794	advice, free electronic tools, free Assistive Technologies, textbooks and course content in a different format, accommodations for exams

59562279	Counsel and guidance from [PROTECTED]and individual accommodation plans, electronic assistance, and course content in a different format.
59543203	Depends what you mean? If the impairment is associated with a learning difficulty such as dyslexia, we would support the student with relevant assistive technology, software and appropriate adjustments. If the speech impairment had no impact on the student's study support would not be implemented. All of the support we provide is dictated by how the student's condition affects their study and is tailored to their individual needs.

11. Provisions for learning difficulties (e.g. dyslexia, dyscalculia, dysgraphia, visual/auditory processing difficulties, attention/executive difficulties, mental impairments etc.)

95738058	Advice, networked assistive technology, ability to purchase technology and equipment if needed, ability to access support workers, materials can be provided in alternative formats, alternative assessment, reasonable adjustments
65064236	Adaptations of the educational process, Constellation Station (www below), More: - http://www. [PROTECTED]- http://www. [PROTECTED]
64524216	study skills tuition, drop in sessions, Claroread and Mindview available on university computers, library concessions available, lecture recording and online lecture notes
64510422	staff support and specific adaptation of presential exams
64460938	Relevant advice via the AccessAbility Centre and the need for reasonable adjustments as required.
64447148	There are Assessed Work Coversheets, library memos, software on the network (Read and Write Texthelp Gold and Inspiration) and support as required.
64418330	Extra time in exams, training for teachers, special sessions with teachers and parents...
64404824	Alternative Formats Notetaking service Exam Provisions Assistive Technology Equipment Loans Faculty Liaison Assignment Extensions Library Access & Support Peer Tutoring Referral for psychometric assessment Referral to other support eg. Learning Skills counsellor, [PROTECTED] HELPS: https://www. [PROTECTED]
64037300	The above plus individual independent learning skills program
64016780	Cue cards/calculators test and exam accommodations Extensions/notetaking Tutoring/coaches
63982561	Support workers, Dyslexia Tutors, Mental Health Professionals, Autistic Spectrum specialists, Personal Learning Support Plan, reasonable adjustments for examinations, equipment to support use of IT and appropriate software.
63962269	use of PC prolonged examination time etc.
63844604	formal: assistive technology (software), classwork support, and alternative formatting available for students who register for disability services; informal: arrangements made with instructor on case-by-case basis
63825238	We send out accommodation statements for classroom accommodations to be provided by the Professor.
63809097	None.
63807802	advice, notetaker service, equipment rental (e.g. smart pen), content in alternative format, reduced course load
63807024	Numerous resources available.
63796910	As above
63792953	extra time non written exams/oral exams do not take into consideration grammatical mistakes
59617421	use of PC, exam access arrangements, use of alternative venues
59720864	Not sure

59701994	Yes
59690761	Specialized personnel which offers support
59685980	Accessible software on campus, advice, negotiation with academics, extensions for assignments, alternative exam arrangements (eg use of computer/software).
59682563	Based on individual need and may include: individual tutoring, proof reading, alternative test or exam arrangements, speech recognition software, negotiated extensions etc.
59613794	advice, free electronic tools, free Assistive Technologies, textbooks and course content in a different format, accommodations for exams
59562279	Counsel and guidance from [PROTECTED] and individual accommodation plans and course content in a different format.
59543203	Provision of assistive technology, equipment or software, either on loan for duration of studies or via [PROTECTED] process. Provision of 1:1 non-medical personal help ([PROTECTED]) as required. Personal profile of reasonable adjustments to teaching and learning as required by individual students.

Comments on 12. Please provide examples of the courses for each of the categories:

95738058	
65064236	At our university there is an e-learning platform [PROTECTED]: http:// [PROTECTED] There are some courses available one the platform, but mostly clases requires physical presence.
64524216	Lectures are recorded but courses include essential labs and group work
64510422	All Masters Training and Continuos Training are delivered full on-line. Language Training and Regular HE offering such as Grades are offered on-line with presential tutoring in study centres
64460938	Management courses and MOOCs for example. Archaeology for example.
64418330	
64404824	Most undergraduate courses are exclusively face to face supplemented by online teaching and learning experiences. Some post graduate courses are either a mix of online and face to face or a small amount are exclusively distance education (eg. B. Arts, Business, Law, Nursing etc for UG all face to face, PG Business, Law & Health either a mix or DE).
64037300	Too many to list. Please refer to UOW course Handbook at uow.edu.au
63982561	Most Science & engineering courses on campus. Distance: https://www. [PROTECTED] Mixed: eg MSc in Technology [PROTECTED] Most of our courses make their materials available in a VLE, so course presentations and lecture capture are available to all students.
63962269	basically courses are offered at the campus
63844604	we are a large university with courses in all these categories
63825238	I am not sure of the specific courses, I've just heard about the different formats from the students our office serves.
63807802	
63809097	
63807024	
63796910	VLE used for posting of presentations, handbooks etc
63792953	hybrid courses, half of the module will be provided in class and the other half using distance education
59617421	courses such as social work require physical presence due to the lecture content and placement. this applies to many other courses. the majority of the course materials are made available to students through the virtual learning environment
59701994	we offer online courses as well courses on campus
59690761	On line/ Distance Education Unit Hybridity Education to conventional classes
59685980	Every subject, in every course offered has online content. Some subjects are fully online, and others have a mix of online and on-campus requirements. For example, Bachelor Nursing has some online subjects, but all students must complete compulsary on-campus workshops in order to pass and do a placement. Bachelor of Business admin is fully online.
59682563	Otago offers both on campus and distance taught options.
59613794	

59562279	
59543203	

[redacted]

Comments on 13. You can add your comments here.

95738058	
65064236	Some lecturers provide materials via e-mail or sharing platform, but the materials are mostly additional to stationary classes. [PROTECTED]is the official e-learning platform.
64524216	
64510422	[PROTECTED] has an a personalized e-learning platform ([PROTECTED]) based on open source software along with a proprietary video- platform based on Flash software ([PROTECTED]). Both platforms are fully integrated. Also some Continuos training is delivered by MOOC platforms (OpenMOOC and edX) or Moodle
64460938	and through the post.
64418330	
64404824	
64037300	
63982561	
63962269	there are none, but system requires answer so we checked the first box with no mean.
63844604	
63825238	I'm not for certain the format, but had to choose one.
63807802	
63809097	
63807024	
63796910	
63792953	we are using blackboard
59617421	
59701994	
59690761	q8?
59685980	We use a Moodle platform, and have modified it to suit our university. It is called [PROTECTED] Learn [PROTECTED] ([PROTECTED]).
59682563	
59613794	
59562279	
59543203	

14. Please name the e-learning/content sharing platform(s) used by your institution:

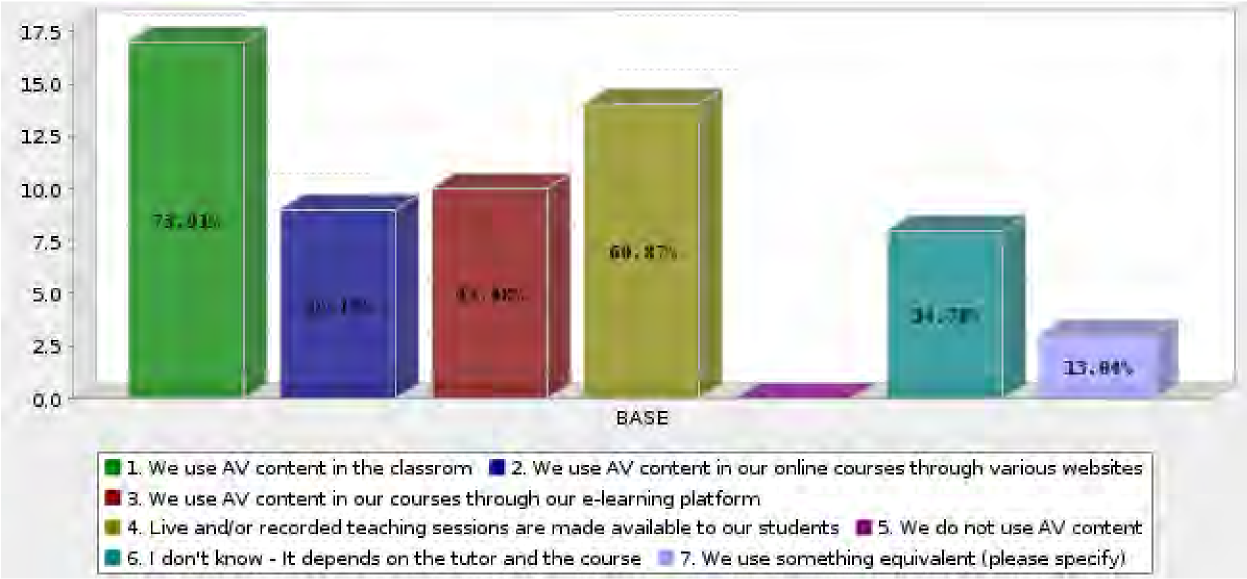
95738058	Moodle
65064236	http:// [PROTECTED
64524216	Blackboard
64510422	. [PROTECTED]and Moodle
64460938	BlackBoard, but departments may have other platforms.
64418330	Moodle
64404824	Blackboard
64037300	moodle
63982561	Blackboard
63962269	there are none, but system requires answer so we checked the first box with no mean.
63844604	Moodle
63825238	I do not know
63807802	Blackboard
63809097	[PROTECTED]
63807024	Blackboard
63796910	Blackboard
63792953	blackboard
59617421	VLE
59701994	[PROTECTED]
59690761	Blackboard
59685980	Moodle
59682563	Blackboard
59613794	http:// [PROTECTED]
59562279	Unknown
59543203	Learn

Comments on 16. Please add any other accessibility features offered through your platform

95738058	
65064236	"Which of the the following apply to the platform you use? (you can select more than one)" Platform can be used by students with sensory impairments, but this platform is not fully accessible, there are problems with some types of content. And lecturers not always provide materials in accessible format.
64524216	I don't know what the features of Blackboard are - this is a question for the academic departments who use it
64510422	Many of the functionalities described above are not offered by the platform but the students can use them freely in their own devices via personalization or open software (screen readers, zoom text functionalities, speech to text sw, etc)
64460938	The University uses Panopto as a means of lecture capture and this content is made available on BlackBoard.
64418330	
64404824	We don't know. We don't have access to it as staff.
64037300	
63982561	This is an area we will soon be doing some more detailed work on. At the moment, Blackboard gives these accessibility features. https:// [PROTECTED]
63962269	there are none, but system requires answer so we checked the first with no mean.
63844604	image alt text, ARIA landmark roles, captions can be added to embedded videos
63825238	Moodle is the only one I know how it works - but not totally.
63807802	I am not 100% sure on all it's features
63809097	
63807024	
63796910	I don't know.
63792953	
59617421	lecture capture is being introduced hence students can access lectures virtually for as many times as they want.
59701994	
59690761	
59685980	
59682563	
59613794	
59562279	

59543203	As I am not involved in any of the teaching using the online learning platform at the University, I have guess the answers to the above questions.

17. Which of the following describes the use of audiovisual (AV) content in your institution?

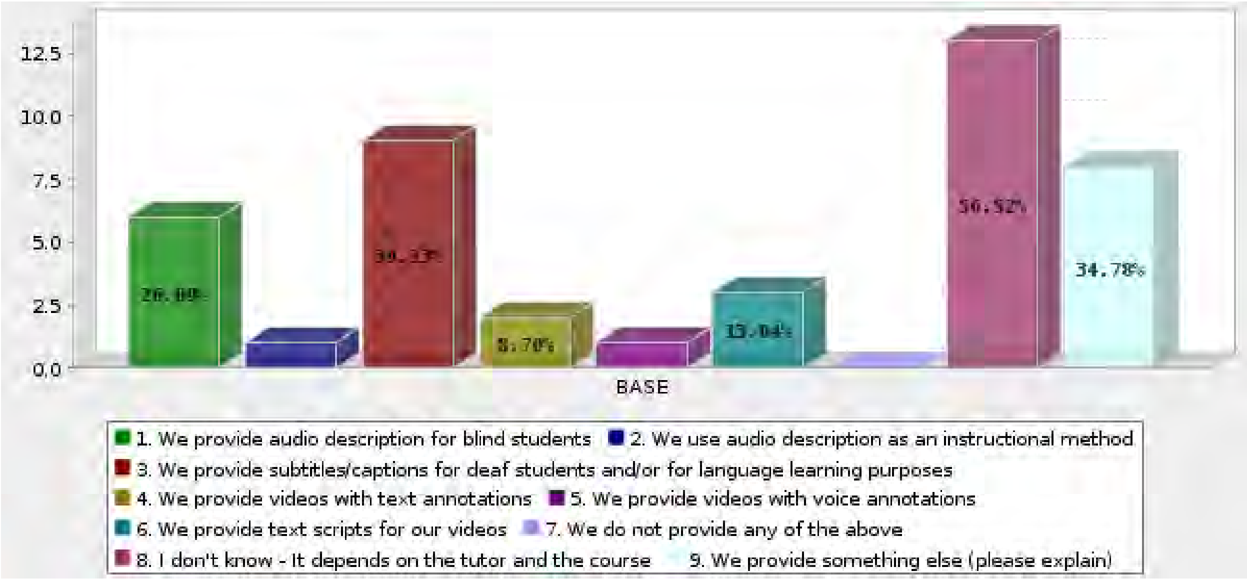


	Answer	Count	Percent
1.	We use AV content in the classrom	17	73.91%
2.	We use AV content in our online courses through various websites	9	39.13%
3.	We use AV content in our courses through our e-learning platform	10	43.48%
4.	Live and/or recorded teaching sessions are made available to our students	14	60.87%
5.	We do not use AV content	0	0.00%
6.	I don't know - It depends on the tutor and the course	8	34.78%
7.	We use something equivalent (please specify)	3	13.04%
	Total	61	n = 23.0

Mean : **3.115**	Confidence Interval @ 95% : **[2.645 - 3.584]**	Standard Deviation : **1.872**	Standard Error : **0.240**

64510422	At [PROTECTED] platform is capable of streaming and recording live sessions. [PROTECTED] is the federated repository for AV content (harvesting [PROTECTED] and e-spacio digital repositories). All possibilities are offered: HD interconection of videoconferencing sessions, use of AV content from different websites or through our e-learning platform, etc
63962269	no designed accesibility
59543203	I am not qualified to answer these questions for the 100s of programmes and courses taught at the University [PROTECTED] [PROTECTED]

18. Which of the following better describes the way that you make AV content available to your students?



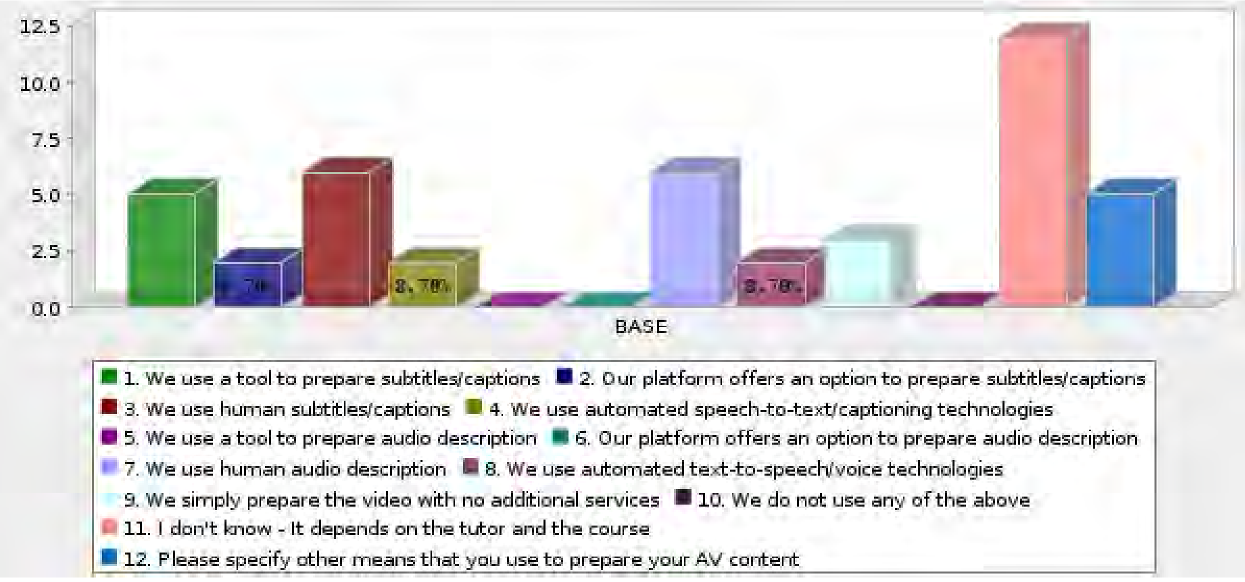
	Answer	Count	Percent
1.	We provide audio description for blind students	6	26.09%
2.	We use audio description as an instructional method	1	4.35%
3.	We provide subtitles/captions for deaf students and/or for language learning purposes	9	39.13%
4.	We provide videos with text annotations	2	8.70%
5.	We provide videos with voice annotations	1	4.35%
6.	We provide text scripts for our videos	3	13.04%
7.	We do not provide any of the above	0	0.00%
8.	I don't know - It depends on the tutor and the course	13	56.52%
9.	We provide something else (please explain)	8	34.78%
	Total	43	n = 23.0

Mean : **5.628**	Confidence Interval @ 95% : **[4.736 - 6.520]**	Standard Deviation : **2.984**	Standard Error : **0.455**

95738058	We recommend providing captions - however, we provide audio description more often as needed for students, as opposed to proactively
65064236	It depends on the tutor. Disability Support Service produce its own videos and provide audio description and subtitles to this content.
64510422	Not yet for all AV content
64460938	We provide reasonable adjustments as required.
64404824	We can provide audio descriptions and subtitles however this is a service the student with the disability would need to request via the special needs service rather than a practice adopted by the faculties as universal design

63982561	We are currently working on supplying BSL interpreters in our lecture capture (They are already present in the room) and/or captioning of selected lectures. This will be geared towards ESL and disabled students.
63962269	we provide the accommodations on demand
59543203	I am not qualified to answer these questions for the 100s of programmes and courses taught at the [PROTECTED]

19. Which of the following better describe how you prepare your AV content?



	Answer	Count	Percent
1.	We use a tool to prepare subtitles/captions	5	21.74%
2.	Our platform offers an option to prepare subtitles/captions	2	8.70%
3.	We use human subtitles/captions	6	26.09%
4.	We use automated speech-to-text/captioning technologies	2	8.70%
5.	We use a tool to prepare audio description	0	0.00%
6.	Our platform offers an option to prepare audio description	0	0.00%
7.	We use human audio description	6	26.09%
8.	We use automated text-to-speech/voice technologies	2	8.70%
9.	We simply prepare the video with no additional services	3	13.04%
10.	We do not use any of the above	0	0.00%
11.	I don't know - It depends on the tutor and the course	12	52.17%
12.	Please specify other means that you use to prepare your AV content	5	21.74%
	Total	43	n = 23.0

Mean : **7.256**	Confidence Interval @ 95% : **[6.060 - 8.452]**	Standard Deviation : **4.001**	Standard Error : **0.610**

95738058	As above - it is done as needed as opposed to in preparation as far as I am aware
65064236	as above
64510422	Only some % of total amount of AV content have above adaptations: maybe 10-20% of total amount. [PROTECTED]for [PROTECTED]is actually working on future automated processes for 2017
64404824	Notetaking, captioning & stenographer services
59543203	I am not qualified to answer these questions for the 100s of programmes and courses taught at [PROTECTED]

20. Do you use any instructions/guidelines for the preparation of the AV content and the services that make it accessible (if any)? Please specify.

95738058	No - we provide advice and guidance as required
65064236	Disability Support Service helps with accesibility, if it's necessary.
64524216	
64510422	Some guidelines are being published by [PROTECTED] and Research [PROTECTED]"Technology [PROTECTED]" on accesible pdf's, developing textual transcriptions and subtitling
64460938	
64418330	
64404824	
64037300	We provide training and information to staff on universal design principles and how to make AV and learning resources accessible.
63982561	
63962269	No
63844604	
63825238	
63807802	This is all handled by our Instructional design office
63809097	
63807024	
63796910	
63792953	
59617421	currently no but it is planned
59701994	
59685980	Yes, training for staff, and online information (not compulsary).
59682563	No
59613794	Yes, [PROTECTED]
59543203	Yes - see our website: http://www. [PROTECTED]

21. Which of the following forms of Assistive Technology support does your institution offer?

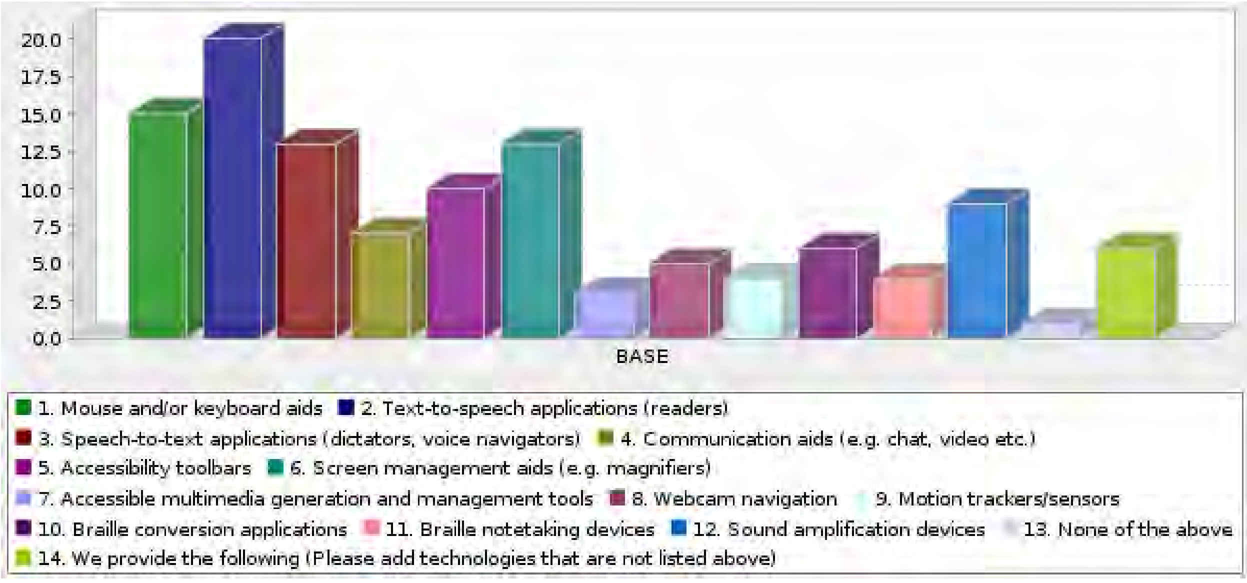
	Answer	Count	Percent
1.	We have a lab with software and hardware installed on the computers	13	56.52%
2.	We provide a list of tools on our website	7	30.43%
3.	We provide both	6	26.09%
4.	We do not provide Assistive Technology support	0	0.00%
5.	We provide support in another way (Please specify)	11	47.83%
	Total	37	n = 23.0

Mean : **2.703**	Confidence Interval @ 95% : **[2.166 - 3.239]**	Standard Deviation : **1.664**	Standard Error : **0.274**

65064236	Technological support can be developed depending on the student's disability-related needs. We provide training sessions. More: http://www. [PROTECTED]
64510422	http://www. [PROTECTED]
64460938	Inspiration and Read and Write Texthelp on the network Zoomtext and Zoom Ex in the AccessAbility Centre
64404824	Assessment and coaching by the Disability officer 1-1 training for students to trial software with a special needs librarian liaison Long term software loans Access to TextHelp R&W Gold on all general access computers
64037300	We also provide students software and equipment and trainjng and tech support
63982561	We have not centered all our support into one lab as we feel this could be discriminatory. Our key softwares (MindView, TextHelp, lecture capture) are available on all university computers. Many students in receipt of [PROTECTED] have their own software available on a laptop, and we have made provision for these to be used around campus. We have a full range of assistive technology support, but it is a new post (4 months) and we are now preparing the website to add details and training materials.

63844604	students can apply for access to assistive technologies through disability services
63825238	We reserve equipment from the Library and/or the [PROTECTED] (our [PROTECTED] Information Center) when a student needs more than the limited number of laptops with DNS, E-Readers, etc. If special equipment/software is needed, UIS is generally able to provide this to our office.
63807024	I don't know.
59613794	We provide personal assistive technologies (H/W and S/W) as well as free Assistive Technology Software http:// [PROTECTED]
59543203	We employ a Technology Advisor in the Student Disability Service, who provides advice on the provision of Assistive Technology for students who require it, and will also train them in its use. We also have a University wide Technology Information and [PROTECTED] Committee, which as a sub-group of the University [PROTECTED] Committee, which considers the mainstreaming of assistive technology and software. there is also a Disability Computing Support group monitoring the provision of assistive technology etc.

22. Which of the following does your institution provide to students through the platform or in the lab?



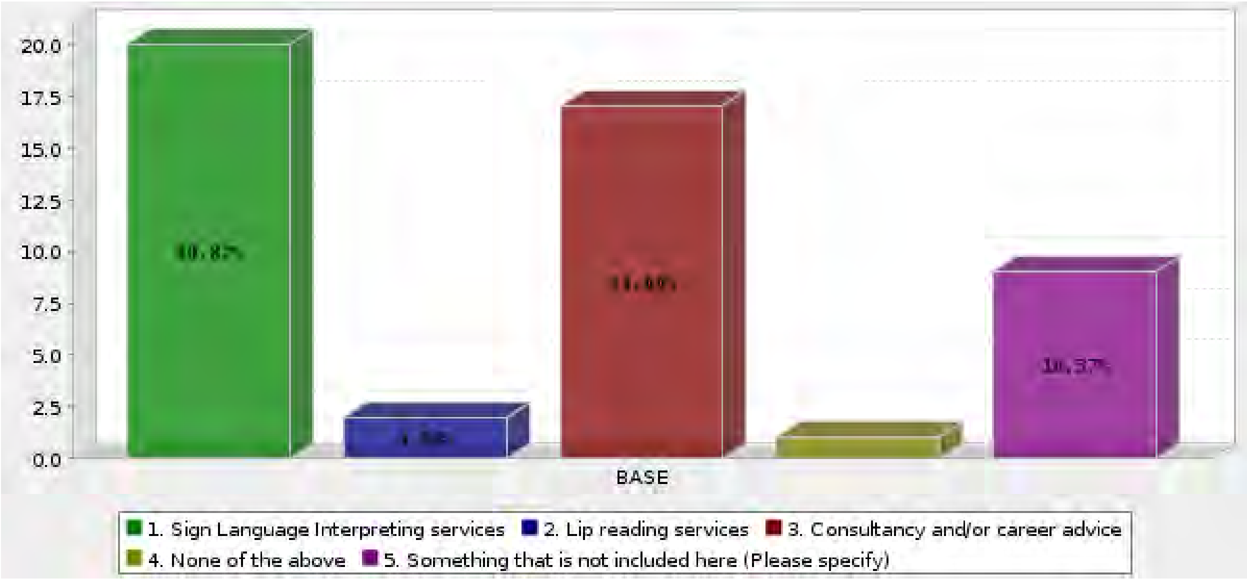
	Answer	Count	Percent
1.	Mouse and/or keyboard aids	15	65.22%
2.	Text-to-speech applications (readers)	20	86.96%
3.	Speech-to-text applications (dictators, voice navigators)	13	56.52%
4.	Communication aids (e.g. chat, video etc.)	7	30.43%
5.	Accessibility toolbars	10	43.48%
6.	Screen management aids (e.g. magnifiers)	13	56.52%
7.	Accessible multimedia generation and management tools	3	13.04%
8.	Webcam navigation	5	21.74%
9.	Motion trackers/sensors	4	17.39%
10.	Braille conversion applications	6	26.09%
11.	Braille notetaking devices	4	17.39%
12.	Sound amplification devices	9	39.13%
13.	None of the above	1	4.35%
14.	We provide the following (Please add technologies that are not listed above)	6	26.09%
	Total	116	n = 23.0

Mean : **5.655**	Confidence Interval @ 95% : **[4.926 - 6.385]**	Standard Deviation : **4.009**	Standard Error : **0.372**

64510422	Accessibility toolbars are provided automatically by operating systems, with screen magnifying tools, and virtual keyboards. Mouse and/or keyboard aids, Text-to-speech applications (readers), proprietary screen magnifiers, Motion trackers/sensors , Braille software and sound amplification devices are provided freely or with financial aid by [PROTECTED] [PROTECTED]to affiliated students in Spain with disabilities. UNIVERSIA also offers financial aids for specific adapted devices.

64404824	While all of the above aren't immediately available - the disability officer will discuss the students needs & identify whether any additional support or adjustments can be provided
63844604	I'm not sure, but likely all of the above
63807802	site license for Read & Write Gold
59685980	Software: JAWS, Texthelp Read and Write Gold, Zoomtext, Dragon Naturally Speaking. Equipment: CCTV, Magnifier, printing, scanning. If a student requires other specialised software/hardware, we will purchase this.
59543203	A very broad range of assistive software, equipment and technology is available to all students at the University who have a disability, learning difficulty or health condition which affects their studies.

23. In addition to the aspects included in this survey so far, which of the following does your institution offer to disabled students?



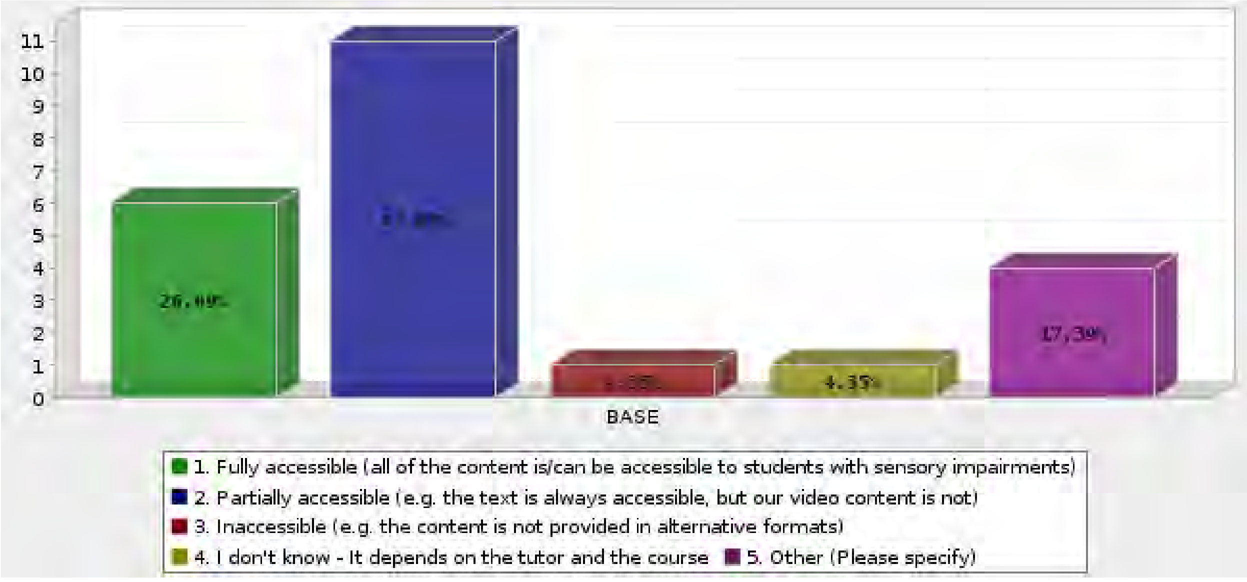
	Answer	Count	Percent
1.	Sign Language Interpreting services	20	40.82%
2.	Lip reading services	2	4.08%
3.	Consultancy and/or career advice	17	34.69%
4.	None of the above	1	2.04%
5.	Something that is not included here (Please specify)	9	18.37%
	Total	49	100%

Mean : **2.531**	Confidence Interval @ 95% : **[2.110 - 2.951]**	Standard Deviation : **1.501**	Standard Error : **0.214**

64460938	Support is student centred and provided as required rather than across the board all the time.
64404824	Case management and liaison with Faculty, and other support services Workshops around disability related issues such as disclosure & careers Supplementary programs such as subsidised peer tutoring and career planning
64037300	Transition mentors, organisational mentors, independent learning skills development, peer subject mentors, notetaker service
63982561	Wellbeing services Note-taking Mental Health services
63844604	peer mentorship
63796910	Sign language as funded through [PROTECTED]
63792953	Nothing else
59685980	Peer mentoring, study assistant (eg to assist in lab work for a student with limited fine motor skills), Transition support (eg for a student with ASD who requires weekly meetings with someone to support transition), personalised campus orientation tours, alternative exam arrangements,

	assistants on placement, or at conferences, Higher Degree Research assistant support (eg transcribing interviews for students who need assistance with this).
59543203	We implements an Accessible and Inclusive Learning Policy at the University in 2013. The details of the policy are available on our website: http://www. [PROTECTED]

24. How would you rank accessibility in terms of the content of the courses provided by your institution (text, sound, image)?



	Answer	Count	Percent
1.	Fully accessible (all of the content is/can be accessible to students with sensory impairments)	6	26.09%
2.	Partially accessible (e.g. the text is always accessible, but our video content is not)	11	47.83%
3.	Inaccessible (e.g. the content is not provided in alternative formats)	1	4.35%
4.	I don't know - It depends on the tutor and the course	1	4.35%
5.	Other (Please specify)	4	17.39%
	Total	23	100%

Mean : **2.391**	Confidence Interval @ 95% : **[1.817 - 2.966]**	Standard Deviation : **1.406**	Standard Error : **0.293**

65064236	Disability Support Service can help with accessibility of the content of the courses, but it depends on the tutor and on the student.
64460938	Most courses are accessible but there will inevitably be aspects of courses that are accessible for some students and not as easy for others without further adjustment.
63844604	extremely variable; we recommend compliance with WCAG 2.0 to levels A and AA, but this is not enforced
59543203	We aim to ensure all materials are fully accessible, but I'm sure that there are some of the many 100s of courses and programmes taught at the University that are using inaccessible content.

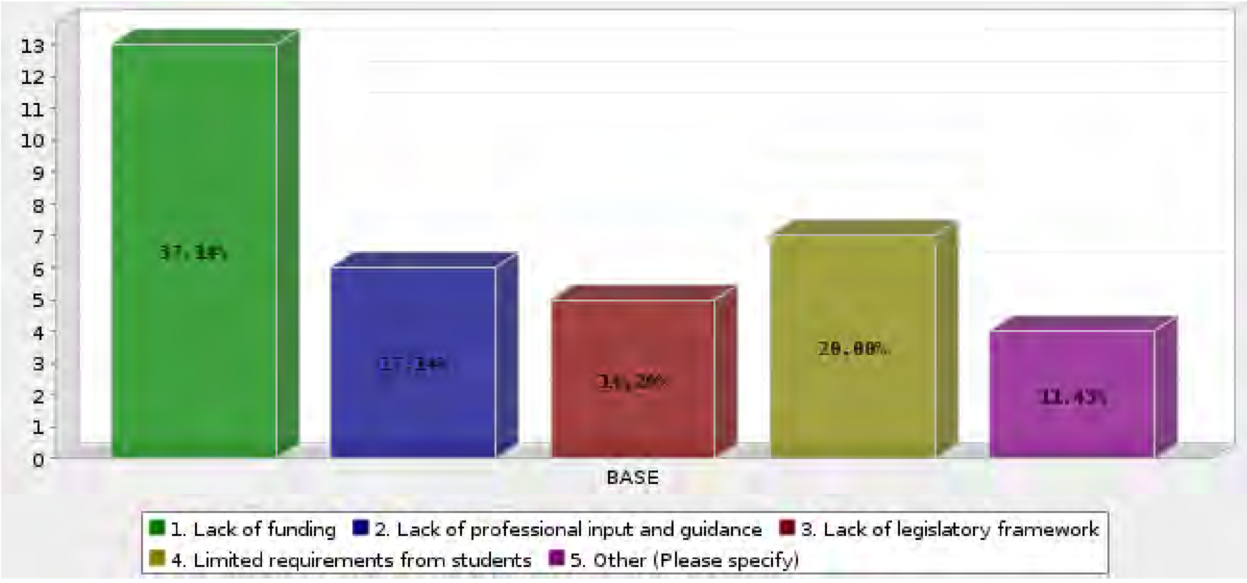
Comment on 25. Please mention relevant departments/courses/centres in your institution.

95738058	[PROTECTED]Autism [PROTECTED]unit
65064236	Disability Support Service provide optional course with Institute of Romance Philology - "Assisting the Disabled in Learning A Language". We also provide training sessions about education/disabilities/technologies.
64524216	
64510422	Faculty of Computer Science[PROTECTED]Faculty of Psychology Faculty of Education
64460938	
64418330	
64404824	
64037300	Post grad cert in autism Bachelor of Education [PROTECTED]
63982561	
63962269	
63844604	Disability Studies [PROTECTED] (mental health)
63825238	
63807802	
63809097	
63807024	
63796910	Institute for Education
63792953	
59617421	
59701994	
59685980	School of Education, School of Disability Studies, School [PROTECTED], School of [PROTECTED].
59682563	The University of [PROTECTED] [PROTECTED]of Education
59613794	
59543203	We provide training to all staff on the above. There are also some degree programmes at the University that touch on these issues.

Comments on 26. Please mention relevant departments/courses/centres in your institution.

95738058	[PROTECTED]research unit
65064236	I don't have information about all researches at our University, but probably there are researches connected with this topics.
64524216	
64510422	[PROTECTED]
64460938	
64418330	
64404824	[PROTECTED]
64037300	
63982561	[PROTECTED]
63962269	
63844604	Disability Studies and [PROTECTED]
63825238	
63807802	
63809097	
63807024	
63796910	Institute [PROTECTED]Education
63792953	
59617421	
59701994	[PROTECTED]Center
59685980	School of Education, School of Disability Studies, School of [PROTECTED]
59682563	A number of teaching staff are interested in and committed to inclusive education.
59613794	Speech and [PROTECTED]Laboratory http:// [PROTECTED]
59543203	Student Disability[PROTECTED]

27. Do you recognise any of the following as factors that limit the provision of such services in your institution?



	Answer	Count	Percent
1.	Lack of funding	13	37.14%
2.	Lack of professional input and guidance	6	17.14%
3.	Lack of legislatory framework	5	14.29%
4.	Limited requirements from students	7	20.00%
5.	Other (Please specify)	4	11.43%
	Total	35	100%

Mean : **2.514**	Confidence Interval @ 95% : **[2.030 - 2.999]**	Standard Deviation : **1.463**	Standard Error : **0.247**

63844604	Lack of awareness and political will; academic culture; small administrative and legal staff
63825238	Space is our main issue for exam proctoring.
59685980	Lack of time to network with academics and collaborate with them on inclusive practices.
59682563	While I have noted lack of funding, this is more to do with the fact that our Equity funding has not increased.

28. Are you aware of any plans of our institution in order to improve in terms of accessibility and/or studies/research in the area?

95738058	We are working on improving accessibility, both physical and digital and we are working on promoting inclusivity and developing inclusive curriculum design
65064236	Our unit ([PROTECTED]) is relatively young, we are still developing and we are trying to improve accessibility at our University, e.g. by training sessions.
64524216	Intending to start captioning recorded lectures
64510422	Fully automation of transcription and subtitling extended to all AV content (project from [PROTECTED]) Continuos cooperation of [PROTECTED]with Technology Dept ([PROTECTED]) and [PROTECTED]Dept. developing internal accessibility reports on academic services and projects
64460938	There are various initiatives going forward, one was the roll out of Panopto this year, there is a huge amount of work going into improving the student experience and also an accessible and inclusive curriculum.
64418330	No.
64404824	Encouraging those responsible for constructing curriculum with accessibility needs in mind at point of design.
64037300	We are always working on ways to improve accessibity to campus and curriculum
63982561	The Assistive Software and Accessibility officer started work 4 months ago. We do anticipate change in our ability to use and deliver this.
63962269	no
63844604	WCAG 2.0 is being incorporated into quality frameworks for the development and improvement of blended and online courses; Diversity, Equity and Inclusion ([PROTECTED]) is a pillar of our 10-year business strategy and we have just appointed a new [PROTECTED] chairperson and 5 [PROTECTED]champions.
63825238	We are planning on surveying our students as soon as our software is installed and will allow us access to group formats and protects student's anonymity.
63807802	No
63809097	Continue to develop more accessible course materials. Also in AV form.
63807024	No
63796910	We are constantly trying to improve accessibility. We are looking at provision of content capture and now provide training for academics on developing reasonable adjustments.
63792953	No
59617421	[PROTECTED]is working towards meeting its obligations for the implementation of the [PROTECTED]
59701994	No
59685980	This is ongoing.
59682563	Otago is in the process of creating an Accessibility Policy and this will assist with modifications.
59613794	Provide to the deaf students online real-time text communication in the classroom using tablets

59543203	Yes - the University is currently undertaking a major Disability review focusing amongst other things on physical access and the implementation of adjustments.

Appendix 5

Example of feedback provided to survey participant

Dear participant,

Thank you for taking the time to complete the University Access survey, whose aim is to attempt to map accessibility in universities. As mentioned in the Welcome page of the survey, upon completion, all respondents should expect to receive:

a) All the data they delivered for further research in the field and development of their access services.
b) Three learning scenarios with specific recommendations on making their courses accessible.

Please find the relevant feedback below:

a) Individual Survey Report

Response Details	
ID:	65064236
Timestamp:	03 Jan, 2017 12:53:41 AM PST
IP Address:	149.156.234.19
Time Taken:	7814 seconds
Back Button Usage:	Not used
Score:	0.0
Survey Language:	English
Source Identifier:	
Email Address:	
Email List:	

Integration Tags
External Reference:
Custom Variable 1:
Custom Variable 2:
Custom Variable 3:
Custom Variable 4:
Custom Variable 5:

Geo Coding	
Country:	[PROTECTED]
Region:	[PROTECTED]
Latitude:	0.0
Longitude:	0.0

Radius:	0.0

Please answer questions marked with an asterisk (*)

University Access Survey

Full Name
[PROTECTED]
Name of Institution (and your Position)
[PROTECTED]
Email Address
[PROTECTED]

* Does your institution apply an accessibility framework for disabled students?

»Yes
You can find it at our website: - offer for students http://www. [PROTECTED]

* Does your institution have a disability support service (i.e. a group of people in a specified location who offer advice, support and equipment to disabled students)?

»Yes
Disability Support Service http://www. [PROTECTED]

* Does your institution have equipment to support disabled students on campus (e.g. campus shuttle buses, accessible labs, wheelchairs, elevators, lifts)?

»Yes
If you're asking about physical accessibility - most of the buildings are adapted to the needs of persons with disabilities, if not we offer e.g. schedule modifications. More information: http://www. [PROTECTED]

* How would you rank accessibility in terms of physical access in your institution?

»Fully accessible (we can accommodate rooms based on teaching needs so that all students can access them and all functional areas are fully accessible)

You can add your comments here:

Some of the buildings are physically inaccessible, but the [PROTECTED] will develop suggested adaptations to minimise inconveniences resulting from such barriers. Some examples of such accommodations include: moving the course meetings to buildings/rooms adapted to the needs of persons with disabilities, schedule modifications, and changing the group attended by the student. More: http://www. [PROTECTED]

* Does your institution apply a framework across courses/departments to provide course content in an accessible format?

»Yes

You can add your comments here:

You can find more information about our offer for students with disabilities at our website: http://www. [PROTECTED]

'Which of the following better describes the accessibility level of your institution's main website?' Main website is mostly compliant with W3C, but not in every point.

* Which of the following better describes the accessibility level of your institution's main website?

»Compliant with W3C
»Tested for accessibility by the institution

Provisions for blindness/visual impairments.
Adaptations of the educational process, educational materials in accessible formats, advice and training in assistive technologies, english language courses, adaptations of physical education, special bursary, other support More: http://www. [PROTECTED]

Provisions for motor disability.
Adaptations of the educational process, educational materials in accessible formats, advice and training in assistive technologies, adaptations of physical education, special bursary, physical accessibility More: http://www. [PROTECTED]

Provisions for deafness/hearing impairments.
Adaptations of the educational process, advice and training in assistive technologies, english language courses, special bursary More: http://www. [PROTECTED]

Provisions for speech impairments.
Adaptations of the educational process, other support More: http://www. [PROTECTED]

Provisions for learning difficulties (e.g. dyslexia, dyscalculia, dysgraphia, visual/auditory processing difficulties, attention/executive difficulties, mental impairments etc.)
Adaptations of the educational process, Constellation Station (www below), More: - http://www. [PROTECTED]- http://www. [PROTECTED]

* Which of the following better describes the courses offered by your institution? (you can select more than one)

»Courses require physical presence at the campus
»Courses are mixed (delivered partially online and partially offline)
»Some courses are delivered exclusively in class and some are delivered exclusively online

Please provide examples of the courses for each of the categories:
At our university there is an e-learning platform [PROTECTED]: http:// [PROTECTED] There are some courses available one the platform, but mostly clases requires physical presence.

* Which of the following describes the main method used by your institution to deliver course content online?

»Through an e-Learning Platform

You can add your comments here.

Some lecturers provide materials via e-mail or sharing platform, but the materials are mostly additional to stationary classes. [PROTECTED] is the official e-learning platform.

Please name the e-learning/content sharing platform(s) used by your institution:
http:// [PROTECTED]

* Which of the following apply to the platform you use? (you can select more than one)

»The platform can be used by students with sensory impairments
»The platform is flexible in terms of design, so content can be arranged according to what is considered more user-friendly and easily accessible

* The e-learning platform that you use:

»Allows sharing of both text content and audiovisual content
»Allows students to download the content and use it offline

Please add any other accessibility features offered through your platform.

'Which of the following apply to the platform you use? (you can select more than one)
Platform can be used by students with sensory impairments, but this platform is not fully accessible, there are problems with some types of content. And lecturers not always provide materials in accessible format.

* Which of the following describes the use of audiovisual (AV) content in your institution?

»I don't know - It depends on the tutor and the course

* Which of the following better describes the way that you make AV content available to your students?

»We provide audio description for blind students
»We provide subtitles/captions for deaf students and/or for language learning purposes
»I don't know - It depends on the tutor and the course
»We provide something else (please explain) It depends on the tutor. Disability Support Service produce its own videos and provide audio description and subtitles to this content.

* Which of the following better describe how you prepare your AV content?

»We use human subtitles/captions
»We use human audio description
»I don't know - It depends on the tutor and the course
»Please specify other means that you use to prepare your AV content as above

Do you use any instructions/guidelines for the preparation of the AV content and the services that make it accessible (if any)? Please specify.
Disability Support Service helps with accesibility, if it's necessary.

* Which of the following forms of Assistive Technology support does your institution offer?

»We provide both
»We provide support in another way (Please specify) Technological support can be developed depending on the student's disability-related needs. We provide training sessions. More: http://www. [PROTECTED]

* Which of the following does your institution provide to students through the platform or in the lab?

»Mouse and/or keyboard aids
»Text-to-speech applications (readers)
»Communication aids (e.g. chat, video etc.)
»Screen management aids (e.g. magnifiers)
»Braille conversion applications
»Braille notetaking devices
»Sound amplification devices

* In addition to the aspects included in this survey so far, which of the following does your institution offer to disabled students?

»Sign Language Interpreting services
»Consultancy and/or career advice

* How would you rank accessibility in terms of the content of the courses provided by your institution (text, sound, image)?

»Other (Please specify) Disability Support Service can help with accessibility of the content of the courses, but it depends on the tutor and on the student.

* Your institution offers courses on/related to the following areas:

»Inclusive Education

Please mention relevant departments/courses/centres in your institution.
Disability Support Service provide optional course with Institute [PROTECTED]. We also provide training sessions about education/disabilities/technologies.

* Your institution does research in/related to the following areas:

»Disability Studies
»Assistive Technology
»Audiovisual Translation
»Inclusive Education

Please mention relevant departments/courses/centres in your institution.
I don't have information about all researches at our University, but probably there are researches connected with this topics.

Do you recognise any of the following as factors that limit the provision of such services in your institution?

»Lack of funding
»Lack of professional input and guidance

Are you aware of any plans of our institution in order to improve in terms of accessibility and/or studies/research in the area?
Our unit (Disability Support Service) is relatively young, we are still developing and we are trying to improve accessibility at our University, e.g. by training sessions.

b) INCLUDE Framework

The INCLUDE framework is one of the outcomes of the study that also includes the survey you participated in. It provides guidelines on creating and maintaining accessible online educational material. A brief version of the guidelines is provided below:

The suggested standards and guidelines of the proposal can be summarised as follows:

<u>Provider's external perimeter (Web presence)</u>
WCAG 2.0 on *Web Accessibility*

<u>User's external perimeter (computer/other device access)</u>
Section 508 on *Assistive services*

<u>Provider's internal perimeter (platform access)</u>
EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*

<u>User's internal perimeter (assistive technology)</u>
Section 508 on *Assistive services* and *tools*

<u>Learning methodology and course curriculum</u>
UDL guidelines

<u>Course content</u>
UDL guidelines and WCAG 2.0

The steps that we propose for the implementation of the proposed framework are presented below:

1) **Preparation**
   a. Validate your internal perimeter based on EN 301 549 V1.1.2
   b. Validate your hosting (external) perimeter based on WCAG 2.0

2) **Course drafting**
   a. Design your curriculum with inclusion in mind based on UDL guidelines on curriculum
   b. Decide on the learning methodology based on the topic, the mode of delivery and UDL guidelines on curriculum

3) **Design**
   a. Design your course with accessibility in mind based on EN 301 549 V1.1.2
   b. Prepare the content based on UDL guidelines on design and WCAG 2.0
   c. Add useful tools in your internal perimeter to support access based on EN 301 549 V1.1.2 on *Web-based internet/intranet systems* or *websites and applications*

4) **Enrolment & Support**
   a. Make sure sufficient means to access the course are available by providing assistive services based on Section 508
   b. Support and direct users for the acquisition of assistive tools based on Section 508

5) **Maintenance**
   a. Make sure accessibility is an integral part of the maintenance process

Note: Where parts of this process require collaboration, the instructor or the course designer will need to maintain a monitoring role.

More information on the framework will be available through the published version of the thesis, and relevant information will be sent to you via email with a link to access the full thesis via the Imperial College Library.

Thank you for your input and collaboration.

Appendix 6

WCAG Access Audit Reports

Main Imperial College webpage

WCAG AccessAudit Report

Imperial College London
https://www.imperial.ac.uk

There are 2 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

2 Warning:

These elements are focusable but either invisible or obscured by another element
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

3 elements break this rule:

1. id("skip-to-content")
2. id("skip-to-search")
3. id("link-to-accessibility")

Text elements should have a reasonable contrast ratio
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

6 elements break this rule:

1. id("skip-to-content")
2. id("skip-to-search")
3. id("link-to-accessibility")
4. id("header")/div[@class="container cf"]/div[@class="navigation-header"]/h1[@class="logo"]/a[@class="brand"]
5. id("footer-contact")/a[@class="footer-brand"]
6. id("a2a_thanks")/div[@class="a2a_localize"]

There are 19 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

10 would be Severe:

Elements with ARIA roles must be in the correct scope

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_09

ARIA state and property values must be valid

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_04

Elements with ARIA roles must use a valid, non-abstract ARIA role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_01

Controls and media elements should have labels

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

Any ID referred to via an IDREF must be unique in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

A label element may not have labelable descendants other than its labeled control

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#-ax_text_03--labels-should-only-contain-one-labelable-element

ARIA attributes which refer to other elements by ID should refer to elements which exist in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_02

Elements with ARIA roles must have all required attributes for that role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_03

Elements with ARIA roles must ensure required owned elements are present

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_08

This element has an unsupported ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_10

9 would be Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

This element has an invalid ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_11

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

A tabpanel should be related to a tab via aria-controls or aria-labelledby

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_13

Imperial College Business School main webpage

WCAG AccessAudit Report

Imperial College Business School - London, UK
https://www.imperial.ac.uk/business-school

There are 7 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

1 Severe:

Any ID referred to via an IDREF must be unique in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

2 elements break this rule:

1. id("searchForm")/input[@id="query"]
2. id("cd-primary-nav")/li[@class="search-mobile"]/a[1]/form[@class="gtm-ignore-generic-submission"]/input[@id="query"]

6 Warning:

These elements are focusable but either invisible or obscured by another element

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

3 elements break this rule:

1. id("Header")/div[@class="container"]/div[@class="column one"]/a[@class="screen-reader-text skip-link"]
2. id("Content")/div[@class="container content_wrapper clearfix"]/div[@class="vc_news_feed section intelligence-feed"]/div[@class="section_wrapper clearfix"]/div[@class="items_group clearfix"]/div[@class="column one-fourth article_box"]/div[@class="article_box"]/div[@class="image_title_wrapper feedhp"]/a[1]
3. id("Content")/div[@class="container content_wrapper clearfix"]/div[@class="vc_news_feed section intelligence-feed"]/div[@class="section_wrapper clearfix"]/div[@class="items_group clearfix"]/div[@class="column one-fourth article_box"]/div[@class="article_box"]/div[@class="image_title_wrapper feedhp"]/a[1]

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

2 elements break this rule:

1. id("searchForm")/img[@class="scale-with-grid magn-glass"]
2. id("Footer-Logo")/a[1]/img[1]

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

1 element breaks this rule:

1. id("Footer-Logo")/a[1]

Text elements should have a reasonable contrast ratio

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

10 elements break this rule:

1. id("soliloquy-512002")/li[@class="soliloquy-item soliloquy-item-1 soliloquy-id-528533 soliloquy-image-slide"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]
2. id("soliloquy-512002")/li[@class="soliloquy-item soliloquy-item-2 soliloquy-id-255101 soliloquy-image-slide soliloquy_bottom_left soliloquy_red"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
3. id("soliloquy-512002")/li[@class="soliloquy-item soliloquy-item-3 soliloquy-id-525233 soliloquy-image-slide soliloquy_bottom_left soliloquy_red soliloquy-active-slide"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
4. id("soliloquy-512002")/li[@class="soliloquy-item soliloquy-item-4 soliloquy-id-524969 soliloquy-image-slide"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
5. id("soliloquy-512002")/li[@class="soliloquy-item soliloquy-item-5 soliloquy-id-524814 soliloquy-image-slide"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
6. id("soliloquy-512251")/li[@class="soliloquy-item soliloquy-item-1 soliloquy-id-404016 soliloquy-image-slide soliloquy_bottom_left soliloquy_blue"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
7. id("soliloquy-512251")/li[@class="soliloquy-item soliloquy-item-2 soliloquy-id-521342 soliloquy-image-slide soliloquy-active-slide"]/div[@class="soliloquy-caption soliloquy-caption-bottom soliloquy-caption-mobile"]/div[@class="soliloquy-caption-inside"]/a[1]
8. id("Content")/div[@class="container content_wrapper clearfix"]/div[@class="vc_row wpb_row vc_row-fluid giving-homepage"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner "]/div[@class="wpb_wrapper"]/div[@class="vc_ib_button_container"]/a[@class="vc_ib_button full-width-button-primary"]
9. id("cookie-more")/button[@class="cookie-ajax cookie-button cookie-decline "]
10. id("cookie-leave")

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

4 elements break this rule:

1. id("soliloquy-container-512002")/div[@class="soliloquy-wrapper"]/div[@class="soliloquy-controls soliloquy-has-controls-direction"]/div[@class="soliloquy-controls-direction"]/a[@class="soliloquy-prev"]
2. id("soliloquy-container-512002")/div[@class="soliloquy-wrapper"]/div[@class="soliloquy-controls soliloquy-has-controls-direction"]/div[@class="soliloquy-controls-direction"]/a[@class="soliloquy-next"]
3. id("soliloquy-container-512251")/div[@class="soliloquy-wrapper"]/div[@class="soliloquy-controls soliloquy-has-controls-direction"]/div[@class="soliloquy-controls-direction"]/a[@class="soliloquy-prev"]
4. id("soliloquy-container-512251")/div[@class="soliloquy-wrapper"]/div[@class="soliloquy-controls soliloquy-has-controls-direction"]/div[@class="soliloquy-controls-direction"]/a[@class="soliloquy-next"]

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

1 element breaks this rule:

1. id("Header")/div[@class="container"]/div[@class="column one"]/a[@class="screen-reader-text skip-link"]

There are 9 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

5 would be Severe:

ARIA state and property values must be valid

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_04

Controls and media elements should have labels

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

A label element may not have labelable descendants other than its labeled control.

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#-ax_text_03--labels-should-only-contain-one-labelable-element

ARIA attributes which refer to other elements by ID should refer to elements which exist in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_02

This element has an unsupported ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_10

4 would be Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

This element has an invalid ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_11

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

Sun Apr 14 2019 23:31:51 GMT+0300 (Θερινή ώρα Ανατολικής Ευρώπης) WCAG Accessibility Audit Developer UI

Imperial College Business School course

WCAG AccessAudit Report

Online programme overview | Imperial College Business School
https://www.imperial.ac.uk/business-school/programmes/msc-business-analytics/study-mode-online

There are 7 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

1 Severe:

Any ID referred to via an IDREF must be unique in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

2 elements break this rule:

1. id("searchForm")/input[@id="query"]
2. id("cd-primary-nav")/li[@class="search-mobile"]/a[1]/form[@class="gtm-ignore-generic-submission"]/input[@id="query"]

6 Warning:

These elements are focusable but either invisible or obscured by another element

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

9 elements break this rule:

1. id("Header")/div[@class="container"]/div[@class="column one"]/a[@class="screen-reader-text skip-link"]
2. id("menu-item-394804")/a[1]
3. id("menu-item-24352")/a[1]
4. id("menu-item-24355")/a[1]
5. id("menu-item-24354")/a[1]
6. id("menu-item-37390")/a[1]
7. id("menu-item-527527")/a[1]
8. id("menu-item-49151")/a[1]
9. id("menu-item-230205")/a[1]

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

2 elements break this rule:

1. id("searchForm")/img[@class="scale-with-grid magn-glass"]
2. id("Footer-Logo")/a[1]/img[1]

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

6 elements break this rule:

1. id("menu-item-24344")/a[1]/div[@class="sub-menu-icon"]/a[1]
2. id("menu-item-394822")/a[1]/div[@class="sub-menu-icon"]/a[1]
3. id("menu-item-37393")/a[1]/div[@class="sub-menu-icon"]/a[1]
4. id("menu-item-24338")/a[1]/div[@class="sub-menu-icon"]/a[1]
5. id("menu-item-24560")/a[1]/div[@class="sub-menu-icon"]/a[1]
6. id("Footer-Logo")/a[1]

Text elements should have a reasonable contrast ratio

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

10 elements break this rule:

1. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-8"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="wpb_text_column wpb_content_element "]/div[@class="wpb_wrapper"]/p[2]/a[1]
2. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-featured-box"]/div[@class="featured-box-content"]/p[2]/span[1]
3. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-featured-box"]/div[@class="featured-box-content"]/p[2]/span[2]
4. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-featured-box"]/div[@class="featured-box-content"]/p[2]/span[3]
5. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-featured-box"]/div[@class="featured-box-content"]/p[2]/span[4]
6. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-ib-quote"]/span[@class="quote-title"]
7. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-ib-quote"]/span[4]/a[@class="quote-link"]
8. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-12"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-ib-quote"]/div[@class="ib-quote-content"]/div[@class="ib-quote-text"]/div[1]/span[@class="quote-title"]
9. id("cookie-more")/button[@class="cookie-ajax cookie-button cookie-decline "]
10. id("cookie-leave")

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

7 elements break this rule:

1. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-4"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-ib-quote"]/span[@class="quote-icon"]
2. id("Content")/div[@class="content_wrapper clearfix"]/div[@class="sections_group"]/div[@class="section the_content"]/div[@class="section_wrapper"]/div[@class="the_content_wrapper"]/div[@class="vc_row wpb_row vc_row-fluid"]/div[@class="wpb_column vc_column_container vc_col-sm-12"]/div[@class="vc_column-inner"]/div[@class="wpb_wrapper"]/div[@class="vc-ib-quote"]/span[@class="quote-icon"]
3. id("menu-item-24344")/a[1]/div[@class="sub-menu-icon"]/a[1]/span[1]
4. id("menu-item-394822")/a[1]/div[@class="sub-menu-icon"]/a[1]/span[1]
5. id("menu-item-37393")/a[1]/div[@class="sub-menu-icon"]/a[1]/span[1]
6. id("menu-item-24338")/a[1]/div[@class="sub-menu-icon"]/a[1]/span[1]
7. id("menu-item-24560")/a[1]/div[@class="sub-menu-icon"]/a[1]/span[1]

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

1 element breaks this rule:

1. id("Header")/div[@class="container"]/div[@class="column one"]/a[@class="screen-reader-text skip-link"]

There are 5 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

2 would be Severe:

Controls and media elements should have labels

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

A label element may not have labelable descendants other than its labeled control

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#-ax_text_03--labels-should-only-contain-one-labelable-element

3 would be Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

University College London Main website

WCAG AccessAudit Report

UCL - London's Global University
https://www.ucl.ac.uk/

There are 6 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

1 Severe:

Controls and media elements should have labels
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

1 element breaks this rule:

1. id("index")/div[@class="hero hero--video"]/div[@class="hero__content"]/video[@class="bg-video"]

5 Warning:

These elements are focusable but either invisible or obscured by another element
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

3 elements break this rule:

1. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item active"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
2. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
3. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]

Text elements should have a reasonable contrast ratio
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

16 elements break this rule:

1. id("index")/header[@class="header"]/div[@class="wrapper"]/div[@class="photograph"]/div[@class="brand"]/p[@class="brand__heading"]
2. id("index")/header[@class="header"]/div[@class="wrapper"]/div[@class="photograph"]/div[@class="brand"]/a[@class="brand__link"]/span[@class="visually-hidden"]
3. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="news__block"]/div[@class="news__introduction"]/div[@class="news__desktop__controls owl-nav"]/div[@class="controls__nav"]/div[@class="owl-prev disabled"]

4. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item active"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]/span[@class="visually-hidden"]
5. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item active"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
6. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item active"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/figcaption[1]/p[@class="name"]
7. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]/span[@class="visually-hidden"]
8. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
9. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/figcaption[1]/p[@class="name"]
10. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]/span[@class="visually-hidden"]
11. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
12. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/figcaption[1]/p[@class="name"]
13. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]/span[@class="visually-hidden"]
14. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/blockquote[1]/a[1]
15. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__content"]/figure[1]/figcaption[1]/p[@class="name"]

16. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="study__desktop__controls owl-nav"]/div[@class="controls__nav"]/div[@class="owl-prev disabled"]

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

1 element breaks this rule:

1. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="announcement"]/a[1]/i[@class="arrow-white-right"]

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

4 elements break this rule:

1. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item active"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]
2. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]
3. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]
4. id("index")/div[@class="row row--white"]/div[@class="site-content wrapper clearfix"]/div[@class="study__carousel"]/div[@class="owl-carousel2 owl-loaded owl-drag"]/div[@class="owl-stage-outer"]/div[@class="owl-stage"]/div[@class="owl-item"]/div[@class="study__item"]/div[@class="study__image"]/div[@class="owl-video-wrapper"]/a[@class="owl-video"]

Video elements should use elements to provide captions

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_video_01

1 element breaks this rule:

1. id("index")/div[@class="hero hero--video"]/div[@class="hero__content"]/video[@class="bg-video"]

There are 13 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

7 would be Severe:

Elements with ARIA roles must be in the correct scope

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_09

ARIA state and property values must be valid

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_04

Elements with ARIA roles must use a valid, non-abstract ARIA role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_01

Any ID referred to via an IDREF must be unique in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

A label element may not have labelable descendants other than its labeled control.

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#-ax_text_03--labels-should-only-contain-one-labelable-element

Elements with ARIA roles must have all required attributes for that role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_03

This element has an unsupported ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_10

6 would be Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

This element has an invalid ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_11

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

Mon Apr 15 2019 02:06:50 GMT+0300 (Θερινή ώρα Ανατολικής Ευρώπης) WCAG Accessibility Audit Developer UI

WCAG AccessAudit Report

Centre for Translation Studies - UCL - London's Global University
https://www.ucl.ac.uk/translation-studies

There are 2 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

1 Severe:

Controls and media elements should have labels
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

1 element breaks this rule:

1. id("centre-translation-studies-centras")/header[@class="header header--desktop"]/div[@class="masthead"]/div[@class="wrapper clearfix"]/div[@class="masthead__search"]/form[1]/div[@class="search-form"]/span[@class="twitter-typeahead"]/span[@class="twitter-typeahead"]/input[@class="search-form__input search-form__input--search tt-input"]

1 Warning:

Text elements should have a reasonable contrast ratio
https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

9 elements break this rule:

1. id("centre-translation-studies-centras")/header[@class="header header--desktop"]/div[@class="wrapper"]/div[@class="photograph "]/div[@class="brand"]/p[@class="brand__heading"]
2. id("centre-translation-studies-centras")/header[@class="header header--desktop"]/div[@class="wrapper"]/div[@class="photograph "]/div[@class="brand"]/a[@class="brand__link"]/span[@class="visually-hidden"]
3. id("centre-translation-studies-centras")/header[@class="header header--desktop"]/div[@class="wrapper"]/div[@class="sidebar"]/nav[@class="nav nav--mobile"]/ul[@class="menu"]/li[1]/a[@class="first leaf menu-fields-menu-link active"]
4. id("centre-translation-studies-centras")/header[@class="header header--desktop"]/div[@class="wrapper"]/div[@class="sidebar"]/nav[@class="nav nav--left"]/ul[@class="menu"]/li[1]/a[@class="first leaf menu-fields-menu-link active"]
5. id("centre-translation-studies-centras")/div[@class="site-content wrapper"]/div[@class="site-content__inner clearfix"]/div[@class="site-content__body"]/div[@class="site-content__main"]/article[@class="article"]/div[2]/div[@class="field-collection-container clearfix"]/section[@class="middle-split"]/section[@class="middle-split__column1"]/section[@class="teaser"]/div[@class="tag"]/span[@class="tag__heading"]/a[1]
6. id("centre-translation-studies-centras")/div[@class="site-content wrapper"]/div[@class="site-content__inner clearfix"]/div[@class="site-content__body"]/div[@class="site-content__main"]/article[@class="article"]/div[2]/div[@class="field-collection-container clearfix"]/section[@class="middle-split"]/section[@class="middle-split__column2"]/section[@class="teaser"]/div[@class="tag"]/span[@class="tag__heading"]/a[1]

7. id("centre-translation-studies-centras")/div[@class="site-content wrapper"]/div[@class="site-content__inner clearfix"]/div[@class="site-content__body"]/div[@class="site-content__main"]/article[@class="article"]/div[2]/div[@class="field-collection-container clearfix"]/section[@class="middle-split"]/section[@class="middle-split__column1"]/section[@class="teaser"]/div[@class="tag"]/span[@class="tag__heading"]/a[1]
8. id("centre-translation-studies-centras")/div[@class="site-content wrapper"]/div[@class="site-content__inner clearfix"]/div[@class="site-content__body"]/div[@class="site-content__main"]/article[@class="article"]/div[2]/div[@class="field-collection-container clearfix"]/section[@class="middle-split"]/section[@class="middle-split__column2"]/section[@class="teaser"]/div[@class="tag"]/span[@class="tag__heading"]/a[1]
9. id("centre-translation-studies-centras")/footer[@class="footer wrapper"]/div[@class="footer__inner clearfix"]/ul[@class="list-inline footer__list list-unstyled list-inline--divided"]/li[@class="text-muted small"]

There are 11 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

2 would be Severe:

ARIA state and property values must be valid

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_04

This element has an unsupported ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_10

9 would be Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

This element has an invalid ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_11

These elements are focusable but either invisible or obscured by another element

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

University College London – CenTraS – Medical Translation module

WCAG AccessAudit Report

Course: CMII0096: Medical Translation (18/19), Topic: English->Chinese
https://moodle-1819.ucl.ac.uk/course/view.php?id=6411

There are 7 fail-rules:

This implies that there were elements on the page that did not pass this audit rule. This is the only result you will probably be interested in.

3 Severe:

ARIA state and property values must be valid

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_04

28 elements break this rule:

1. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
2. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
3. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
4. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
5. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 contains_branch"]
6. id("random5cb3be902710b42_group")/li[@class="type_setting depth_4 item_with_icon"]
7. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
8. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
9. id("random5cb3be902710b35_group")/li[@class="type_container depth_2 contains_branch"]
10. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
11. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
12. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
13. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
14. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
15. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
16. id("random5cb3be902710b57_group")/li[@class="type_setting depth_3 item_with_icon"]
17. id("random5cb3be902710b57_group")/li[@class="type_setting depth_3 item_with_icon"]
18. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
19. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
20. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
21. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
22. id("random5cb3be902710b35_group")/li[@class="type_container depth_2 contains_branch"]
23. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
24. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
25. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
26. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
27. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
28. id("random5cb3be902710b35_group")/li[@class="type_system depth_2 item_with_icon"]

ARIA attributes which refer to other elements by ID should refer to elements which exist in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_02

28 elements break this rule:

1. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
2. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
3. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
4. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 item_with_icon"]
5. id("random5cb3be902710b38_group")/li[@class="type_setting depth_3 contains_branch"]
6. id("random5cb3be902710b42_group")/li[@class="type_setting depth_4 item_with_icon"]
7. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
8. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
9. id("random5cb3be902710b35_group")/li[@class="type_container depth_2 contains_branch"]
10. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
11. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
12. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
13. id("random5cb3be902710b49_group")/li[@class="type_setting depth_3 item_with_icon"]
14. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
15. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
16. id("random5cb3be902710b57_group")/li[@class="type_setting depth_3 item_with_icon"]
17. id("random5cb3be902710b57_group")/li[@class="type_setting depth_3 item_with_icon"]
18. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
19. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
20. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
21. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
22. id("random5cb3be902710b35_group")/li[@class="type_container depth_2 contains_branch"]
23. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
24. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
25. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
26. id("random5cb3be902710b64_group")/li[@class="type_setting depth_3 item_with_icon"]
27. id("random5cb3be902710b35_group")/li[@class="type_setting depth_2 item_with_icon"]
28. id("random5cb3be902710b35_group")/li[@class="type_system depth_2 item_with_icon"]

Elements with ARIA roles must ensure required owned elements are present

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_08

1 element breaks this rule:

1. id("above-header")/div[@class="clearfix container userhead"]/div[@class="headermenu row"]/div[@class="dropdown secondone"]/ul[@class="dropdown-menu usermen"]

4 Warning:

This element does not support ARIA roles, states and properties

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_12

1 element breaks this rule:

1. id("page-footer")/div[@class="info container2 clearfix"]/div[@class="container"]/div[@class="row-fluid"]/div[@class="span4 helplink"]/a[@class="helplinkpopup"]/img[@class="icon iconhelp icon-pre"]

This element has an invalid ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_11

2 elements break this rule:

1. id("nav-message-popover-container")/div[@class="popover-region-toggle nav-link"]
2. id("nav-notification-popover-container")/div[@class="popover-region-toggle nav-link"]

These elements are focusable but either invisible or obscured by another element

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_01

8 elements break this rule:

1. id("page-course-view-onetopic")/div[@class="skiplinks"]/a[@class="skip"]
2. id("section-45")/div[@class="content"]/h3[@class="sectionname accesshide"]/span[1]/a[1]
3. id("fsb-1")
4. id("fsb-2")
5. id("fsb-3")
6. id("fsb-4")
7. id("fsb-6")
8. id("fsb-7")

Text elements should have a reasonable contrast ratio

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_color_01

82 elements break this rule:

1. id("above-header")/div[@class="clearfix container userhead"]/div[@class="headermenu row"]/div[@class="dropdown secondone"]/a[@class="dropdown-toggle usermendrop"]
2. id("nav-message-popover-container")/div[@class="popover-region-toggle nav-link"]/div[@class="count-container "]
3. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[2]/a[1]/div[@class="tab_content tab_position_1 tab_level_0 dimmed "]/span[1]
4. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[3]/a[1]/div[@class="tab_content tab_position_2 tab_level_0 dimmed "]/span[1]
5. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[4]/a[1]/div[@class="tab_content tab_position_3 tab_level_0 dimmed "]/span[1]
6. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[5]/a[1]/div[@class="tab_content tab_position_4 tab_level_0 dimmed "]/span[1]
7. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[6]/a[1]/div[@class="tab_content tab_position_5 tab_level_0 dimmed "]/span[1]
8. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[7]/a[1]/div[@class="tab_content tab_position_6 tab_level_0 dimmed "]/span[1]
9. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[8]/a[1]/div[@class="tab_content tab_position_7 tab_level_0 dimmed "]/span[1]

10. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[9]/a[1]/div[@class="tab_content tab_position_8 tab_level_0 dimmed "]/span[1]
11. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[10]/a[1]/div[@class="tab_content tab_position_9 tab_level_0 dimmed "]/span[1]
12. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[11]/a[1]/div[@class="tab_content tab_position_10 tab_level_0 dimmed "]/span[1]
13. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[12]/a[1]/div[@class="tab_content tab_position_11 tab_level_0 dimmed "]/span[1]
14. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[13]/a[1]/div[@class="tab_content tab_position_12 tab_level_0 dimmed "]/span[1]
15. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[14]/a[1]/div[@class="tab_content tab_position_13 tab_level_0 dimmed "]/span[1]
16. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[15]/a[1]/div[@class="tab_content tab_position_14 tab_level_0 dimmed "]/span[1]
17. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[16]/a[1]/div[@class="tab_content tab_position_15 tab_level_0 dimmed "]/span[1]
18. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[17]/a[1]/div[@class="tab_content tab_position_16 tab_level_0 dimmed "]/span[1]
19. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[18]/a[1]/div[@class="tab_content tab_position_17 tab_level_0 dimmed "]/span[1]
20. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[19]/a[1]/div[@class="tab_content tab_position_18 tab_level_0 dimmed "]/span[1]
21. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[20]/a[1]/div[@class="tab_content tab_position_19 tab_level_0 dimmed "]/span[1]
22. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[21]/a[1]/div[@class="tab_content tab_position_20 tab_level_0 dimmed "]/span[1]
23. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[22]/a[1]/div[@class="tab_content tab_position_21 tab_level_0 dimmed "]/span[1]
24. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[23]/a[1]/div[@class="tab_content tab_position_22 tab_level_0 dimmed "]/span[1]
25. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[24]/a[1]/div[@class="tab_content tab_position_23 tab_level_0 dimmed "]/span[1]
26. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[25]/a[1]/div[@class="tab_content tab_position_24 tab_level_0 dimmed "]/span[1]
27. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[26]/a[1]/div[@class="tab_content tab_position_25 tab_level_0 dimmed "]/span[1]

28. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[27]/a[1]/div[@class="tab_content tab_position_26 tab_level_0 dimmed "]/span[1]
29. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[28]/a[1]/div[@class="tab_content tab_position_27 tab_level_0 dimmed "]/span[1]
30. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[29]/a[1]/div[@class="tab_content tab_position_28 tab_level_0 dimmed "]/span[1]
31. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[30]/a[1]/div[@class="tab_content tab_position_29 tab_level_0 dimmed "]/span[1]
32. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[31]/a[1]/div[@class="tab_content tab_position_30 tab_level_0 dimmed "]/span[1]
33. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[32]/a[1]/div[@class="tab_content tab_position_31 tab_level_0 dimmed "]/span[1]
34. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[33]/a[1]/div[@class="tab_content tab_position_32 tab_level_0 dimmed "]/span[1]
35. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[34]/a[1]/div[@class="tab_content tab_position_33 tab_level_0 dimmed "]/span[1]
36. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[35]/a[1]/div[@class="tab_content tab_position_34 tab_level_0 dimmed "]/span[1]
37. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[36]/a[1]/div[@class="tab_content tab_position_35 tab_level_0 dimmed "]/span[1]
38. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[37]/a[1]/div[@class="tab_content tab_position_36 tab_level_0 dimmed "]/span[1]
39. id("region-main")/div[1]/div[@class="course-content"]/div[@class="single-section onetopic"]/ul[@class="nav nav-tabs"]/li[38]/a[1]/div[@class="tab_content tab_position_37 tab_level_0 dimmed "]/span[1]
40. id("label_4_25")
41. id("label_4_26")
42. id("label_4_27")
43. id("label_4_28")
44. id("label_4_29")
45. id("label_4_30")
46. id("label_4_31")
47. id("label_4_32")
48. id("label_4_33")
49. id("label_4_34")
50. id("label_4_35")
51. id("label_4_36")
52. id("label_4_37")
53. id("label_4_38")
54. id("label_4_39")
55. id("label_4_40")
56. id("label_4_41")
57. id("label_4_42")

58. id("label_4_43")
59. id("label_4_44")
60. id("label_4_45")
61. id("label_4_46")
62. id("label_4_47")
63. id("label_4_48")
64. id("label_4_49")
65. id("label_4_50")
66. id("label_4_51")
67. id("label_4_52")
68. id("label_4_53")
69. id("label_4_54")
70. id("label_4_55")
71. id("label_4_56")
72. id("label_4_57")
73. id("label_4_58")
74. id("label_4_59")
75. id("label_4_60")
76. id("label_4_61")
77. id("label_3_103")
78. id("label_3_104")
79. id("page-footer")/div[@class="container blockplace1"]/div[@class="row-fluid"]/div[@class="left-col span4"]/h4[1]
80. id("page-footer")/div[@class="container blockplace1"]/div[@class="row-fluid"]/div[@class="left-col span4"]/h4[1]
81. id("page-footer")/div[@class="container blockplace1"]/div[@class="row-fluid"]/div[@class="left-col span4"]/h4[1]
82. id("footer-ucl-diag-host")

There are 16 pass-rules:

This implies that there were elements on the page that may potentially have failed this audit rule, but they passed. Congratulations!

7 would be Severe:

Elements with ARIA roles must be in the correct scope

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_09

Elements with ARIA roles must use a valid, non-abstract ARIA role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_01

Controls and media elements should have labels

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_01

Any ID referred to via an IDREF must be unique in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_02

A label element may not have labelable descendants other than its labeled control.

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#-ax_text_03--labels-should-only-contain-one-labelable-element

Elements with ARIA roles must have all required attributes for that role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_03

This element has an unsupported ARIA attribute

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_10

9 would be Warning:

aria-owns should not be used if ownership is implicit in the DOM

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_06

The web page should have the content's human language indicated in the markup

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_html_01

Images should have a text alternative or presentational role

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_02

The purpose of each link should be clear from the link text

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_text_04

role=main should only appear on significant elements

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_05

Meaningful images should not be used in element backgrounds

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_image_01

An element's ID must not be present in more that one aria-owns attribute at any time

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_aria_07

The web page should have a title that describes topic or purpose

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_title_01

Avoid positive integer values for tabIndex

https://github.com/GoogleChrome/accessibility-developer-tools/wiki/Audit-Rules#ax_focus_03

Mon Apr 15 2019 02:13:52 GMT+0300 (Θερινή ώρα Ανατολικής Ευρώπης) WCAG Accessibility Audit Developer UI

Appendix 7

Resources for the preparation of accessible educational material

The following list is not exhaustive and should only be used as a set of examples for quick reference to resources that can help educators prepare accessible online content. All resources were last accessed on September 10th, 2019.

The City University of New York accessibility toolkit for open educational resources
https://guides.cuny.edu/accessibility

The DRIAGRAM CENTER guidelines for geographic and political maps
http://diagramcenter.org/specific-guidelines-e-2.html

The ESVI-AL guide for creating accessible digital content
http://www.esvial.org/wp-content/files/ESVIAL_LibroDigital_ingles_en_2015.pdf

The Idaho Training Clearinghouse guidelines on accessible educational materials
https://idahotc.com/Topics/A-M/Accessible-Educational-Materials?page11125=1&size11125=6

The Institute of Fundamental Sciences, Massey University list of statistical software for blind users
https://r-resources.massey.ac.nz/StatSoftware/

The National Center on Accessible Educational Materials guides
http://aem.cast.org/about/aem-basics.html

The National Federation of the Blind higher education accessibility online resource center
https://nfb.org/programs-services/center-excellence-nonvisual-access/higher-education-accessibility-online-resource

The New York University step-by-step guides for accessible digital material
https://www.nyu.edu/life/information-technology/help-and-service-status/accessibility/how-to-guides.html

The Nothern Illinois University Faculty of Development and Instructional Design Center resources for accessible teaching
https://www.niu.edu/facdev/resources/accessibility/index.shtml

The Open University guidelines on creating eLearning content
https://www.open.edu/openlearn/education-development/education-careers/accessibility-elearning/content-section-3

The PEARSON accessibility guidelines for e-learning
http://wps.pearsoned.com/accessibility/115/29601/7577872.cw/

The Portland Community College list of math and science tools
https://www.pcc.edu/instructional-support/accessibility/mathscience/

The SIG Access guide to accessible presentations
https://www.sigaccess.org/welcome-to-sigaccess/resources/accessible-presentation-guide/

The SNOW Inclusive Learning & Education accessible education material and media guide
https://snow.idrc.ocadu.ca/accessible-media-and-documents/

The Stanford University Office of Accessible Education guide to accessible MS Word Docs
https://oae.stanford.edu/scribe/accessible-ms-word-docs

The Texas School for the Blind and Visually Impaired lists of accessible math tools
https://www.tsbvi.edu/tools/2181-math-tools

The University of Minnesota tutorials on creating accessible courses and content
https://accessibility.umn.edu/tutorials

The University of Sydney guidelines for accessible blended and online courses
https://teaching.unsw.edu.au/guidelines-accessible-blended-and-online-courses

The University of Tasmania guide to accessible content and learning resources
https://www.teaching-learning.utas.edu.au/content-and-resources/accessibility

The Vanderbilt University guide for accessible learning environments
https://nfb.org/programs-services/center-excellence-nonvisual-access/higher-education-accessibility-online-resource

The W3C guidelines on accessible presentations
https://www.w3.org/WAI/teach-advocate/accessible-presentations/

The W3C resources for accessibility presentations and training
https://www.w3.org/WAI/teach-advocate/accessibility-training/

The World Blind Union guide to accessible presentations
https://2019.ifla.org/wp-content/uploads/2019/03/wbu-visual-presentations-guidelines-summary.pdf

The Youngstown State University guidelines for accessible files
https://cms.ysu.edu/sites/default/files/documents/administrative-offices/distance-education/Creating%20Accessible%20Documents%20Manual.pdf

The Perkins guidelines for accessible geography and social studies
https://www.perkinselearning.org/scout/resources/social-studies

The Portland Community College accessibility survival guide for instructors
http://spot.pcc.edu/~mgoodman/DL/survival.php