One model to rule them all, one model to bind them? A critique of the use of accessibility-related models in post-secondary education

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ONE MODEL TO RULE THEM ALL, ONE MODEL TO BIND THEM? A CRITIQUE OF THE ROLE AND USE OF ACCESSIBILITY RELATED MODELS IN POST-SECONDARY EDUCATION

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ABSTRACT

The focus of this paper is to examine the role that models play in informing the approach that post-secondary education institutions take to developing inclusive and equitable practices that successfully and appropriately address the access needs of disabled students in relation to information and communications technology. It reviews the current approach of the post-secondary education community to using models to inform their accessibility practice with respect to ICT and explores the answers to three related questions 1. What alternatives to the UD model exist? 2. How do we differentiate between different accessibility models? 3. Do we need more than one model to inform accessibility practice? One key outcome of this exploration is a proposed evaluation framework that can help post-secondary institutions make informed decisions about the most appropriate model for them to adopt. The paper concludes that such a framework has potential to transform practitioners’ approach to accessibility by suggesting that excellence may not require a ‘blanket approach’ in which just one model ‘rules’ or dominates their thinking.

Keywords: ICT, IT, accessibility, disabilities, post-secondary education, models

INTRODUCTION

The focus of this paper is students with disabilities, Information and Communications Technology (ICT) and the practices developed within post-secondary education (PSE) institutions to support students with disabilities in their use of ICT. We define disability broadly to include physical, sensory, mobility and cognitive disabilities, but also acknowledge that disability does not define a single homogeneous group- students with different disabilities and within disability groups show substantial variation in terms of their access related experiences and attainment. In particular, we are interested in those disabled students who meet the regular admissions requirements of PSE institutions; these encompass colleges, technical schools (that offer certificate programs) and universities. We know that students with disabilities in PSE are less likely than non-disabled students to stay enrolled, earn higher degrees and secure employment (Advance HE, 2018; M. Jorgensen et al., 2015; Ma, Pender, & Welch, 2016). We also know that disabled learners can experience discrimination when institutions expect them to use inaccessible ICTs as part of their studies or fail to implement potentially supportive ICTs (Fichten et al. 2014, 2020).

We define ICT broadly to include online learning (both distance and blended learning); assistive technologies (AT) such as screen-readers and alternative keyboards; general use technologies such as tablets and mobile phones; administrative applications such as registration systems; social and networking applications such as Facebook and Twitter as
well as specific application technologies such as statistical packages. We also know that the majority of university and college websites in the US and worldwide that are tested have many accessibility faults and that this inaccessibility persists over time (Kimmons, 2017; Seale, 2014). This is despite the fact that accessibility standards exist and many countries have disability discrimination legislation in place that directly or indirectly requires educational institutions to address how their use of technologies mediates disadvantage for their disabled learners (Seale, 2014; Seale et al. 2019).

BACKGROUND

The authors of this paper are partners in a Leverhulme Trust funded International Network called Ed-ICT. Partners from US, Canada, UK, Germany and Israel have been meeting regularly over the past three years in order to seek ways in which research can inform practice (and vice versa) in the field so that the disadvantage that disabled learners experience can be reduced or better still eliminated. A central premise of the Ed-ICT International Network is that the community needs to develop a critical approach to developing inclusive and accessible practices with respect to the provision of ICT in PSE institutions. One key area that we suggest needs particular critiquing is the way the community currently uses accessibility models.

The PSE community approach to developing accessibility practice- a sole focus on Universal Design

In the 1990’s, the introduction of disability and accessibility related legislation in many countries (e.g. The Americans with Disabilities Act) prompted practitioners to look to accessibility related standards and guidelines (e.g. The Web Content Accessibility Guidelines of the World Wide Consortium) as tools to transform and guide their practice. These tools were however very technical and complex in nature and did not cover aspects of accessibility particularly relevant to PSE such as pedagogy. This has led many practitioners to look for alternative tools- particularly models- to guide practice. With respect to the focus of this paper, we understand ‘models’ as practical or conceptual representations of the systems and processes within PSE that are required to promote the use of supportive ICTs that contribute to successful education and employment outcomes for disabled students. Models may describe current practice (what is currently happening) or proscribe best practice (what should be happening).

Arguably, the most common model that practitioners have turned to for guidance when considering the accessibility of ICTs in PSE is Universal Design (See for example Rao, Edelen-Smith & Waliehua, 2015; Linder, Fontaine-Rainen & Behling, 2015). There are different variants of Universal Design (UD), with different titles, but all of them have been influenced in varying degrees by the work of the Centre for Universal Design which conceives Universal Design as: ‘the design of products and environments to be usable by all people to the greatest possible extent’ (Centre for Universal Design, 1997). Seven principles were formulated to underpin this concept: Equitable Use, Flexibility in Use, Simple and Intuitive
Design, Perceptible Information, Tolerance for Error, Low Physical Effort, and Size and Space Appropriate for Approach and Use. These principles, though tied to architecture and the physical environment, maintain the core precept of keeping as many users in mind as possible in the design and development process. And by so doing, 'Universal design provides a blueprint for maximum inclusion of all people' (Story, Mueller, and Mace, 1998, p. 13). Broadly speaking, universal design in educational contexts is an approach characterised by proactive design if educational products and environments that offer full benefit to individuals with a wide range of characteristics.

Burgstahler (2015) and others discuss what they see as common threads through all the strands of universal design in education, organized broadly into four overlapping categories: instruction, services, physical spaces and ICT. Firstly universal design is about anticipating the needs of a diverse group of learners. This does not mean designing an application that is fully usable by everyone; it is not about eradicating the need for accommodations, but minimising the need for them. Secondly universal design is positioned as inclusive because it values diversity and equity (Hockings, 2010); thirdly, disabled students are not required to continually advocate for access or accommodations (Hadley, 2011); and finally it offers an alternative way of conceptualising accessibility as something that can part of the design of an application rather than considered as an after-thought once an individual with a disability encounters a barrier. Universal Design provides a broad approach that may, in implementation, make use of accessibility standards and guidelines; in the case of applications to ICT the most commonly applied guidelines are the international Web Content Accessibility Guidelines presented by the World Wide Web Consortium.

There have been some criticisms of UD. Several accessibility researchers have come out against universal design or what they label a 'one size fits all' approach. For example, Kelly et al. (2008) argued that the goal of universal access although appealing is unachievable. Douce and Porch (2009) and Douce et al. (2010) argued that whilst a universally designed resource may seem to be universally accessible; it may still present challenges for some individual learners. Sampson and Zervas (2011, p.354) argue that ‘The main drawback of this approach is that, typically, resources may be accessible by everyone but optimal for no one.’ While Gkatzidou and Pearson (2009, p.98) argued that ‘an equivalent learning outcome, rather than a universally accessible single resource, meets the needs of individual learners more appropriately’. Despite these criticisms, Seale (2014, 2017a,b) observed that Universal Design dominated the discourse in practitioner focused publications. Seale (2014, 2017ba,) also identified many examples where practitioner-focused publications were citing supposed evidence that UD ‘worked’ but when she examined the evidence in detail herself it had either been misinterpreted or misrepresented. This lead Seale to argue that the concepts underpinning Universal Design for Learning are so powerful, that it is rare to find a practitioner who will oppose or critique it. In other words, there is an-unquestioned assumption that there is only one model to choose from: Universal Design.

The overarching aim of this paper is to test this assumption. Our purpose is not to criticise the UD model, nor to come out in favour of an alternative to UD. Rather it is our intention to enable practitioners to make informed decisions about the model(s) they are using. It is our
contention that significant questions need to be addressed before the community reaches 
the conclusion that UD is the preferred solution or panacea for addressing the exclusionary 
practices that students with disabilities experience as they use or attempt to use ICT in PSE. 
These questions include:

1. What alternatives to the UD model exist?
2. How do we differentiate between different accessibility models?
3. Do we need more than one model to inform accessibility practice?

These are some of the questions that were addressed at the first meeting of the Ed-ICT 
International Network in Seattle in March 2017. We brought together a range of 
stakeholders including students with disabilities, faculty, researchers, ICT companies and 
AT/access service providers. Drawing on presentations, panel discussions and world-café 
reflections and wider research literature we will outline and discuss our response to these 
questions and the implications the answers have for accessibility practice. As part of this 
discussion we will outline and justify a proposed evaluation framework that we suggest can 
help PSE institutions make informed decisions about the most appropriate model (s) for 
them to adopt.

**WHAT ALTERNATIVES TO THE UD MODEL EXIST?**

Seale (2017b) presented the results of a literature review she undertook which sought to 
identify what other accessibility models relevant to the provision of ICT in PSE have been 
proposed. She identified eight alternatives to UD. These were labelled by their originators as 
models or frameworks. However, as the terms appear to be used interchangeably and are 
not given clear definitions, Seale included all of them in her review. The majority have been 
developed by UK or European researchers and practitioners. In this section we will provide 
an overview of the eight models. Some focus narrowly (e.g. particular stakeholders or a 
particular impairment), other more broadly (e.g. institution-wide practices). An overview of 
the similarity and differences of the nine models can be found in Table 1. We will now 
consider each model in more detail.
<table>
<thead>
<tr>
<th>Model /Criterion</th>
<th>Key publications which introduce and justify the model</th>
<th>Which stakeholder is the target of the model in terms of the practice that the model will be applied to</th>
<th>What is the ultimate goal of the model</th>
<th>Does the model embrace or reject the notion of universal solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Design for Higher Education</td>
<td>Burgstahler (2015)</td>
<td>Faculty</td>
<td>To minimise the need for disabled students to have to ask for accommodations</td>
<td>EMBRACE</td>
</tr>
<tr>
<td>Holistic Model</td>
<td>Kelly et al. (2004) Kelly et al. (2008)</td>
<td>Faculty</td>
<td>Solutions that are tailored to take into account the individual’s specific needs, institutional factors, the subject discipline and the broader cultural and political factors</td>
<td>REJECT</td>
</tr>
<tr>
<td>The VIVID (Vision Impaired using Virtual IT Discovery) Model</td>
<td>Permavattana et al. (2013)</td>
<td>Faculty</td>
<td>To make it easier to identify potential solutions to the access barriers commonly faced by vision impaired students</td>
<td>NEITHER</td>
</tr>
<tr>
<td>Composite practice model</td>
<td>Leung et al. (1999)</td>
<td>AT service providers</td>
<td>To offer a framework to help PSE institutions assessing their response to the AT needs of disabled students</td>
<td>NEITHER</td>
</tr>
<tr>
<td>The staff development model</td>
<td>Papadopoulos et al. (2011) Papadopolous, Pearson and Green (2012)</td>
<td>Staff developers</td>
<td>To support academics to develop accessible and inclusive online-materials</td>
<td>NEITHER</td>
</tr>
<tr>
<td>The Model of Accessibility Services Provision for Students with Disabilities in Higher Education</td>
<td>Kouroupetroglou, Pino and Kacorr (2011)</td>
<td>Faculty and Institutional service providers</td>
<td>The implementation of a range of services within a PSE institution (not just AT services) that might support disabled students</td>
<td>EMBRACE</td>
</tr>
<tr>
<td>EU4ALL</td>
<td>Boticario et al. 2012 Douce et al. (2010)</td>
<td>Faculty and Institutional service providers (e.g. library, AT services)</td>
<td>Enhance the learning experience of disabled students by presenting learning materials that are appropriate for and matched to modality and</td>
<td>REJECT</td>
</tr>
</tbody>
</table>
Table 1: An overview of the similarity and differences of nine accessibility models

Holistic model of accessibility for e-learning applications

Kelly et al. (2004) proposed a holistic model for e-learning accessibility, which places the learner at the centre of the development process (see Figure 1a). Kelly et al. use the holistic model to argue against the pursuit of universal solutions. Instead they argue for solutions that are tailored to take into account the individual’s specific needs, institutional factors, the subject discipline and the broader cultural and political factors. Kelly et al. (2008) go on later to refine their model to argue that a learner-centric model would place learning objectives at the centre (See Figure 1b). They also articulate in more detail the context in which this model might take place by emphasising that e-learning solutions will need to take into account both online and offline learning activities and resources (blended learning). The holistic model appears to ignore the perspectives of stakeholders other than students and

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perhaps faculty. Although this model is designed for e-learning applications, it may be adaptable to apply to ICT access more generally.

Fig 1a Early version of holistic model of e-learning accessibility
Fig 1b Later version of holistic model of e-learning accessibility

The VIVID (Vision Impaired using Virtual IT Discovery) Model for e-learning applications

Permvattana et al. (2013) offer their own alternative holistic model; one which they developed specifically for e-learning environments for the vision impaired. The stimulus for this development was the argument that whilst models such as those proposed by Kelly et al. (2008) provide valuable input into the design of specialised e-learning environments for the vision impaired they are open to too much ‘subjective interpretation’ when applied in practice. They therefore attempt to provide a more detailed model which they assert would make it easier to identify potential solutions to the access barriers commonly faced by vision impaired students. The model they propose incorporates various aspects of other models but is also underpinned by insights gained from observations and interviews with vision impaired students and teachers (see Figure 2). At the centre of the model are the components or resources that need to be made accessible: the physical classroom, the virtual classroom and the curriculum. Around this core is a layer of local factors that will influence accessibility decisions: learning outcomes, learner characteristics and social elements. The external layer of influencing factors or drivers include institutional factors, legal requirements, standards and guidelines and evaluation, feedback and enhancement. Whilst this model claims to focus on visual impairment, it appears to be generic enough that with some adaptation it could cater for a wider range of students.

Figure 2: The VIVID (Vision Impaired using Virtual IT Discovery) Model

Composite Practice Model for AT service delivery

Disabled students do not just interact with faculty in physical or virtual classrooms. They often interact with AT or access services who support them to acquire and use specialist technologies or to request accommodations. It would therefore make sense for models to exist that guide the process for acquiring AT. Leung et al. (1999) developed a composite model to describe and explain practice in regard to AT service delivery in PSE settings across Australia. There were three main components to the model: 1) policy funding; 2) the players (stakeholders) and 3) the process of assessing students for their AT needs. Leung et al. (1999) argue that this model can serve as a check list for PSE institutions in assessing their response to AT needs of students with disabilities. This model for AT service delivery recognised that there are multiple factors to consider, that assessment for AT may involve

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screening or a more diagnostic evaluation, that there is a full range of available AT from low tech to high tech that varies in cost, and that there should be utilisation of mainstream service provision whenever possible.

Whilst the focus of this model is narrow what it does do is highlight the contribution of a range of stakeholders including: administrators, student services, lecturers, librarians, IT services and AT specialists. In addition, like the Contextualised Model (See later section) the Composite Model acknowledges the powerful influence of external drivers such as policy and funding on practice. Furthermore, the model acknowledged that a cyclical process exists of eligibility, assessment, selection, training, and reassessment, which has the potential to be useful in a practice model of service delivery.

A staff development model

The development of accessible practices within PSE relies on faculty and other staff having the knowledge and skills necessary to change and improve what they do. Staff development is therefore an important element of accessible practice. It would therefore make sense for models to exist that guide the design and delivery of staff development initiatives. Papadopolous, Pearson and Green (2012) propose a provisional staff development framework for supporting academics to develop accessible and inclusive e-materials. There are four main elements to their framework (See Figure 3). The first they call framework components: raising awareness; improving understanding and improving skills. The second element is the processes which are required in order to raise awareness, enhance understanding and improve skills. Thirdly, Papadopoulos et al. (2011) propose a training procedure comprising two main elements, which through the adoption of the identified processes, function as a means to achieve the framework’s components: Accessibility Simulations and a ‘Tutor Accessibility Support Kit’ (TASK). Finally, Papadopoulos et al. (2012) argue that culture change within an institution will not occur without individual self-reflection and collaboration with others. Like other models, the staff development framework acknowledges the influence of external drivers such as legislation and internal drivers such as institutional or individual intentions. Unlike other models, it does not explicitly incorporate different stakeholders, nor does it position itself in relation to universal or individualistic approaches to accessibility.

Figure 3: A staff development framework for inclusive learning design

A model of accessibility services

The model of accessibility services attempts to describe how a range of services within a PSE institution (not just AT services) might support disabled students. Kouroupetroglou, Pino and Kacorr (2011) propose a model of accessibility services which they argue takes into

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account both the “Design for All” (a term used synonymously with UD) and the “Individual Accommodation” approaches. However, they do not explicitly illustrate how the two approaches have underpinned their model. The main pillar of this model is the “Accessibility Unit” which provides a number of supportive services, arranged in a three-tier architecture according to their “proximity” to the student: 1) accessibility services addressed directly to the student; 2) accessibility services applied to the student’s environment, and 3) accessibility promoting services. Like the contextualised model of accessibility (see later section) this model seeks to identify the stakeholders who mediate the relationship between a disabled student and the different services such as academic advisor, librarian and student representative (see Figure 4). Unlike the contextualised model of accessibility, Kouroupetroglou, Pino and Kacorr have implemented their model in practice; applying it for several years in the University of Athens, the largest PSE institution in Greece.

Figure 4: The stakeholders who mediate the relationship between a disabled student and the accessibility unit

A contextualized model of accessible e-learning practice

Seale (2006) proposed a model of accessible e-learning practice that takes into account all relevant factors that mediate an institutional response to accessibility: the stakeholders; the context (drivers and mediators); and how the relationship between the stakeholders and the context influences the responses made and the accessibility practices developed (see Figure 5.) This model stipulates that the extent to which e-learning material and resources is accessible will be influenced by how all the stakeholders within a PSE institution respond to external drivers for accessibility such as legislation, guidelines and standards. This response will be mediated by stakeholders’ views and understanding of disability, accessibility and inclusion; duty and responsibility; autonomy and freedom; teamwork and community. The accessibility practices that develop out of these responses will vary depending on the stakeholders and the context in which they are operating, but they essentially depend on stakeholders taking ownership and control as well as developing personal meaning from externally imposed impersonal mandates. Examples of such practices within the Open University in the UK include the creation of Faculty Accessibility Specialist roles (Slater et al. 2015) and a Special Needs Development Group (SNDG) within Library Services (Mears and Clough, 2015). The practice of Faculty Accessibility Specialists involves: increasing disability awareness among academics and support staff responsible for curriculum content; supporting production teams to embed accessibility in curriculum design and production; helping to deliver individual adjustments for content and assessment post-production and advising faculties and support teams about subject-specific anticipatory and individual adjustments. The practice of the SNDG involves supporting students via the library helpdesk and liaising with academics to embed library resources and digital and information literacy skills into modules.

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Whilst the model of accessibility services is descriptive, reflecting existing practice within one institution, the contextualised model is conceptual—suggesting an ideal practice.

*Figure 5: The contextualised model of accessibility*

**The EU4ALL framework**

The EU4ALL framework emerged from a four-year European project that developed a general framework to address the needs of accessible lifelong learning in PSE consisting of several standards-based interoperable components integrated into an open web service architecture aimed at supporting adapted interaction to guarantee students' accessibility needs (Boticario et al. 2012). The framework aimed to 1) enhance the learning experience by presenting learning materials that are appropriate for and matched to modality and end-user devices preferences, such as mobile devices or AT used with a desktop computer and 2) provide a wide range of services that an institution can adopt to ensure that the needs of learners who have disabilities are most appropriately supported.

Douce et al. (2010) describe the EU4ALL framework as both conceptual and practical. The conceptual elements of the framework are two-fold. Firstly, they conceptualise an approach to designing accessible learning that they call individualised design or designing for adaptability. They position this approach as radically different to the universal design approach. Secondly, through a study of different organisations and interviews with key stakeholder groups across Europe, they have produced a broad ontology of services which they suggest is a conceptual map or presentation of ideal institutional processes which have the potential to inform the creation of new services. This conceptual framework underpins the technical or practical framework in which existing standards are used to define and implement an open and extensible architecture of services for Accessible Lifelong Learning. (See Figure 6). Like, the contextualised model, the EU4ALL framework emphasises the involvement and co-operation of a number of different stakeholders.

*Figure 6: The EU4ALL Framework*

**A Model of Professionalism in Accessibility**

One interesting outcome of the EU4ALL project was the development of Four Stage Model of Professionalism in Accessibility (See Table 2) which can be perceived as operating at the macro level. The premise underpinning this model is that accessibility has a broad impact. This means that as well as systems and software, organisations also need to consider the policy and indeed philosophy they hold towards how to meet the challenge of accessibility (Montandon, Arjona, and Weiermair 2010). It is argued that the model can encourage

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campus leaders to reflect on organisational direction and offers a way for an institution to benchmark itself against four tiers, from initial intervention to professionalism (McAndrew et al. 2012).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Intervention/ institutionalisation</th>
<th>Institutionalisation/ professionalism</th>
<th>Professionalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low level of accessibility practice (T1)</td>
<td>Medium level of accessibility practice (T2)</td>
<td>Substantial level of accessibility practice (T3)</td>
<td>Outstanding level of accessibility practice (T4)</td>
</tr>
<tr>
<td>• Responsibility and roles unclear, ambivalent</td>
<td>• Low awareness and responsibility of management, accessibility no priority</td>
<td>• Responsibility of senior management clear, accessibility a priority</td>
<td>• Responsibility clear</td>
</tr>
<tr>
<td>• Low awareness by senior management</td>
<td>• Considerable activity for students with disabilities by single persons</td>
<td>• Community of Practice with high level of institutionalised processes</td>
<td>• High priority of accessibility</td>
</tr>
<tr>
<td>• Low level of accessibility practice</td>
<td>• Existing practice not institutionalised</td>
<td>• Strong legal requirements</td>
<td>• Institutional processes and stakeholder involvement</td>
</tr>
<tr>
<td>• Weak legal frameworks</td>
<td>• Ad hoc solutions to ad hoc problems</td>
<td>• Development of policies</td>
<td>• Evaluation of implementation</td>
</tr>
<tr>
<td></td>
<td>• Weak legal frameworks</td>
<td>• Legal framework strong driver</td>
<td>• Legal framework strong driver</td>
</tr>
</tbody>
</table>

Table 2: A model of professionalism in accessibility

HOW DO WE DIFFERENTIATE BETWEEN DIFFERENT ACCESSIBILITY MODELS?

Along with the identification of eight accessibility models, in addition to UD, comes the task of differentiating between them in order to choose which one(s) might be the most appropriate to apply in practice. During the Seattle Ed-ICT Symposium, participants talked about both the function and nature of models. They spoke of three particular purposes: to inspire, to describe and to guide (University of Washington, 2017). For many of our participants, whilst inspiring practice was important to them, they were concerned that models that were more theoretical (i.e. based on hypotheses that are not necessarily proven about what makes good practice) would be less helpful than those that were more pragmatic (i.e. informed by actual practice). Whilst distinguishing between models based on their nature and function may be a helpful start, we would suggest that these criteria are rather too vague to help practitioners make informed decisions. We offer an evaluation framework based on four criteria: Context, Focus, Validity and Efficacy.

Distinguishing between models based on context

A key aspect that practitioners might instinctively use to differentiate models from one another, is whether the model can be easily applied to their own working contexts, for example whether they can be applied to online learning, campus-based learning, open learning or distance learning. All models, with the exception of the Composite Practice
model, were developed to inform online learning practice. However, not all models make it explicit whether they can be applied to campus, distance or open learning. Just three models go beyond the traditional focus on campus-based learning. For example, Key UD advocates such as Burgstahler have incorporated distance learning in their descriptions and discussions of how UD can be implemented (see for example Burgstahler, 2002). In addition, a key partner in the development of the EU4All and the Professionalism model was the Open University in the UK and both models were piloted within the Open University (see for example McAndrew, Farrow and Cooper, 2012). We are not suggesting that if a model has thus far, only be described in the context of campus-based learning, that it is not applicable to distance and open education. Neither would we wish to see a ‘not invented here’ attitude develop where practitioners automatically dismiss any model that was derived from an institution other than their own. Rather we are arguing that practitioners need to make informed-decisions and part of this entails doing as much reading and research as they can about a model and the contexts to which it has been applied to so far. This, along with information about institutional focus, validity and efficacy (see following sections) will enable them to take a more rounded view as to the applicability of a model to their own practice.

Distinguishing between accessibility models based on level of institutional focus

Seale (2017b) proposed that UD and the eight additional modules that she had identified could be differentiated by judging whether they operated at one of three levels (See Table 3):

i) Micro level: the practices involved in making all learning resources and activities (all teaching) accessible-

ii) Meso level: the delivery of services within a PSE institution that play a role in promoting the use of supportive ICTs that contribute to successful education and employment outcomes for disabled students

iii) Macro level: the institution in which those services (meso) and practices (micro) take place, and the internal and external factors that influence or drive the institutions development and organisation of those services and practices.
<table>
<thead>
<tr>
<th><strong>Name of Model or framework</strong></th>
<th><strong>Focus</strong></th>
<th><strong>Level</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Design for Learning/Instruction</td>
<td>Online/Blended learning resources and activities</td>
<td>Micro</td>
</tr>
<tr>
<td>Holistic Model</td>
<td>Online/Blended learning resources and activities</td>
<td>Micro</td>
</tr>
<tr>
<td>The VIVID (Vision Impaired using Virtual IT Discovery) Model</td>
<td>Online/Blended learning resources; internal and external influencing factors</td>
<td>Micro/Macro</td>
</tr>
<tr>
<td>Composite practice model</td>
<td>Service Level: AT Services</td>
<td>Meso</td>
</tr>
<tr>
<td>The staff development model</td>
<td>Service Level: Staff development</td>
<td>Meso</td>
</tr>
<tr>
<td>A Model of Accessibility Services Provision for Students with Disabilities in Higher Education</td>
<td>Service level: Accessibility services</td>
<td>Meso</td>
</tr>
<tr>
<td>EU4ALL</td>
<td>Service level: E-services</td>
<td>Meso/Macro</td>
</tr>
<tr>
<td>Contextualised Model of Accessibility</td>
<td>Institutional Level</td>
<td>Meso/Macro</td>
</tr>
<tr>
<td>Model of professionalism in accessibility.</td>
<td>Institutional Level</td>
<td>Macro</td>
</tr>
</tbody>
</table>

**Table 3: Distinguishing accessibility models based on the level of their focus**

Using this framework Seale suggested that institutions needed to implement more than one model in order to ensure that ICT related accessibility and inclusion issues were addressed across the whole of a university or college. Seale also argued that the nine accessibility models could be evaluated (and therefore distinguished) on their validity and efficacy; where validity is understood as the extent to which the model is logically or factually sound and cogent and efficacy is understood as the extent to which the models are capable of producing the desired effect.

**Distinguishing between accessibility models based on validity**

Seale (2017b) evaluated whether the models were logically or factually sound and cogent by examining how the models were derived and what evidence there is that they have improved practice or outcomes for disabled students (See Table 4). Her critique reveals that the models and frameworks vary considerably in terms of how they were derived. The majority have used a review of literature in some way to inform development (e.g. the contextualised model). Some go further than this to include data derived from surveys or observations (e.g. EU4ALL and VIVID). The developers of the Model of Accessibility Services Provision claim that the model is derived from an analysis of student requirements; but they provide no evidence of this. They do not present data from a survey of their own students and they provide no detailed literature review of existing studies that have examined disabled students needs in relation to ICT and PSE.
<table>
<thead>
<tr>
<th>Model</th>
<th>Validity</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How were they derived</td>
<td>What evidence is there that they have improved practice or outcomes?</td>
</tr>
<tr>
<td>Universal Design/Instruction</td>
<td>Literature review Practice examples Professional judgement</td>
<td>A little</td>
</tr>
<tr>
<td>Holistic model</td>
<td>Literature review Professional judgement</td>
<td>None</td>
</tr>
<tr>
<td>VIVID</td>
<td>Literature review Observations of students Interviews with staff and students</td>
<td>None</td>
</tr>
<tr>
<td>Composite Practice Model</td>
<td>Literature review Survey Practice examples</td>
<td>None</td>
</tr>
<tr>
<td>Staff Development Model</td>
<td>Literature review Small scale pilots of some components Professional judgement</td>
<td>None</td>
</tr>
<tr>
<td>Model of Accessibility Services Provision</td>
<td>Analysis of student requirements</td>
<td>None</td>
</tr>
<tr>
<td>Contextualised Model</td>
<td>Literature review &amp; socio-cultural theory</td>
<td>None</td>
</tr>
<tr>
<td>EU4ALL</td>
<td>Literature review Large scale survey</td>
<td>A little</td>
</tr>
<tr>
<td>Model of Professionalism</td>
<td>Literature review Large scale survey</td>
<td>Unclear</td>
</tr>
</tbody>
</table>

Table 4: An overview of the validity and efficacy of the nine models and frameworks

The extent to which the models and framework are derived from professional practice is very limited. Although not explicitly stated, the Holistic model and the Provisional Staff Developmental Model appear to be derived from the professional experience or judgement of the model developers who have many years of experience working in the field. For example, the originators of the Staff Development Framework have a considerable amount of experience developing certain aspects of their framework such as accessibility simulations and the Tutor Accessibility Support Kit (Papadopoulos et al. 2011) and as such their model is underpinned by professional understanding. What would strengthen this framework is rich detailed descriptions and evaluations of how this framework has been implemented in one or more PSE institution. Just two of the nine models however, have used explicit practice examples to inform development (the Universal design and Composite Model).
With regards to evaluating the evidence available concerning whether the models or frameworks actually work—whether they have helped to inform or improve practice or student outcomes—evidence exists for only two of the nine models. This evidence is however of varying or questionable quality. For Universal Design the wide-scale implementation of the model means that there is a wide range of descriptive case studies available. It is only relatively recently however that quasi-experimental trials have been conducted (e.g. Roberts, Satlykgylyjova, & Park, 2015). For the EU4ALL model, some survey results suggest that the principles of the model were evaluated positively by stakeholders. McAndrew, Farrow and Cooper (2012) provide an overview of how they collected information from stakeholder groups to evaluate e-services at the Open University which had been designed using the EU4ALL framework. Utilizing an illuminative evaluation framework, they used focus groups, a remote learner survey and laboratory based user studies to collect information from students and staff. Data from the focus groups revealed that both disabled and non-disabled students were enthusiastic about the e-services, saying it gave them more control over the way learning content is presented. Staff were also positive, but concerned over implementation. Whilst illuminating, this data is not definitive evidence that the model is effective and further evaluation is needed.

**Distinguishing between accessibility models based on efficacy**

In judging the efficacy of the models and frameworks we need to evaluate their capacity for producing the desired result or effect by examining how detailed the models are (i.e. their level of granularity) and how widely the models have been implemented in practice. In judging the level of granularity Seale (2017b) argued that we should look for four different levels of detail:

1. **Level 1**: Description of overarching principles, components and processes
2. **Level 2**: Examples (which may be hypothetical or real) given to illuminate the principles, components and processes
3. **Level 3**: Descriptions of the model or framework in action—typically provided by practice-based case studies
4. **Level 4**: Detailed critical evaluation of strengths and weaknesses of model

Using this set of questions and criteria the nine identified accessibility models can be critiqued (See Table 3). We have found evidence that just four of the models and frameworks have been implemented in practice and for three of these, the implementation was limited to pilot work as part of research and development projects (EU4ALL, A model of professionalism; Model of Accessibility Service Provision). For example, to further explore the framework, the EU4ALL project attempted to illustrate its operation with two different systems and sites: the Moodle Virtual Learning Environment used by the Open University in the UK, and the dotLRN Virtual Learning Environment used by Universidad Nacional de Educación a Distancia (UNED), in Spain. The model of professionalism model was used explicitly in discussion with a range of stakeholders at one pilot institution, The Open
University. The stakeholders included senior managers, disability service providers and IT specialists (McAndrew, Farrow and Cooper 2012).

Permvattana et al. (2013) acknowledge that the VIVID model has not yet been fully applied in new and different e-learning environments and that such applications are likely to suggest ways in which the model might be enhanced. Whilst the contextualised model has been widely cited in academic and research literature, there is no concrete public evidence that it has been implemented in practice. This is despite the fact that the Open University in the UK adopted the book in which the model was first discussed (Seale, 2006) as a core text for a professional development module called ‘Accessible online learning: supporting disabled students’. Over the course of eight or nine years many practitioners with a responsibility for student support in PSE institutions have studied the module and in their assignment reflected on the application of the model to their own practice. These reflections are however, not published widely. The contribution of the contextualised model therefore remains at the conceptual level.

Applying the granularity criteria, eight of the nine models and frameworks reached level 2 (giving examples to illuminate the ideas and principles). For the UD model and its variants, there is a vast amount of information available that offers hypothetical/real examples and illustrations of the principles (see for example, Burgstahler, 2002; Zeff, 2007; Fichten et al. 2012). Judge and Floyd (2011) offer e-learning examples for three of the UD principles. For example, principle 1 suggests that the lecturer provide multiple representations of the same information, such as digital text read by text-to-speech software. Universal Design is the only model or framework for which there exists descriptions of the model or framework in action- typically provided by practice-based case studies (Level 3 granularity) (See for example Burgstahler (2015).

DO WE NEED MORE THAN ONE MODEL TO INFORM ACCESSIBILITY PRACTICE?

In arguing for the adoption of an evaluation framework to enable us to differentiate between accessibility models we are not proposing that practitioners use the results of any evaluation to choose one model in preference to another. Rather, we argue that there may well be value in combining models and adopting a multi-model approach, in which case, decisions about which models to combine could be usefully informed by evaluations concerning the similarities, differences, strengths and weakness of each model in the combination. One issue in particular that requires further examination is that of compatibility. For example, can the EU4ALL (Meso/Macro) model really be combined with UD (Micro level), when EU4ALL embraces individualism rather than universalism? It might however be compatible with the holistic model which is positioned as being individualistic rather than universal (Kelly et al. 2004; 2008). In addition to navigating the universal-individualistic dichotomy, one related challenge for those contemplating combining models relates to how they conceptualise disability- as located within the individual student or within the environment that the student has to operate. This dichotomy is often associated with the medical versus social model of disability debate and it is this debate that Seale (2006) was referring to when she positioned ‘views of disability’ as one important factor.
that mediates accessibility practice within her contextualised model. It is our contention that accessibility practice can be usefully underpinned by a combination of disability models and accessibility models.

**Two practice examples of combining disability models with accessibility models**

At the Seattle ED-ICT symposium, two network partners, Alice Havel from Canada and Sheryl Burgstahler from the US shared how they and their colleagues combined accessibility and disability models in their approach to accessibility. Alice described how practitioners in Quebec use The Human Development Model (which reflects both the social and interactional model of disability) alongside UD. (Havel et al. 2017). The Human Development Model – Disability Creation Process (HDM-DCP), originated in Quebec, is a conceptual model commonly used for categorising disabilities and developing policy (Fougeyrollas al.1998). It recognizes a “disabling situation” as an interaction between personal and environmental factors that impact on participation in society, without minimising the importance of the impairment. This model however has a limited influence in education as eligibility for funding services is based solely on a medical model that requires a documented diagnosis. Government guidelines for service delivery in post-secondary institutions suggest a needs-based organizational model when determining accommodations, taking into account the student’s strengths, abilities and needs and emphasising the support required to eliminate environmental barriers. A significant increase in the number of post-secondary students with special needs, the prohibitive cost of psycho-educational assessments and a more diverse and inclusive society explain why UD is slowly gaining acceptance among service providers and faculty in Quebec.

Sheryl Burgstahler described how the University of Washington (UW) integrates a social model of disability (see ‘Values’ in Figure 7) and UD (see ‘Approach’ in Figure 7) within its institutional wide approach to accessible practice (Burgstahler, 2017). In outlining how the values of social justice underpin their approach Sheryl explained that much of the work in providing access to individuals with disabilities at the UW, like most PSE institutions in the United States, has involved the self-disclosure of a disability and appropriate documentation to a disabilities services office followed by the approval of accommodations by that office which is shared with faculty and staff who must do their part in implementing them. Typical accommodations include sign language interpreters; extra time and alternative locations for exams; and remediation of inaccessible websites, documents, videos and other IT. Much of this work is based on the medical model of disability which focuses on individual functional limitations and how an inaccessible product or environment can be altered to make it more accessible to someone with these limitations. The UW has however made gradual steps towards focusing more on the product (e.g., a website) or environment (e.g., a location where computers are placed for student use) and how it can be proactively designed to be accessible to a broad audience, thus minimizing the need for accommodations for specific individuals with disabilities. For UW, therefore there is compatibility between the social model of disability and UD. Sheryl also considers that The UW approach integrates various
aspects of other models presented in this paper. Clearly UD is embraced as a central approach for addressing all applications of ICT, but it shares elements of the three models presented that specifically focus on making e-learning accessible to students with disabilities. Furthermore, the process for providing AT for individuals at the UW is much like the AT service delivery model and the approach in the staff development model includes aspects of what the UW addresses in its “training” practice.

Figure 7: The University of Washington approach to accessibility

CONCLUSION

In this paper we have reviewed the current approach of the PSE community to using models to inform their accessibility practice with respect to ICT and suggested that it could be expanded if the community were more aware of the range of the models that exist along with their strengths and weaknesses. To assist this expansion we have compared and contrasted nine models and offered an evaluation framework that can help PSE institutions make informed decisions about the most appropriate model or models for them to adopt. (See Figure 8). By applying our proposed evaluation framework to the nine identified models, it would seem reasonable to conclude that further development and evaluation work is needed. This would allow for a more convincing case to be made for one or more of the models to have a genuine potential to help develop practices that can, through the use of ICT, successfully alleviate disadvantage for students with disabilities. We have also provided practice-based examples to support our suggestion that institutions may benefit from 1) adopting more than one model in order to ensure practice across the whole institution is addressed 2) combining models of disability with models of accessibility. This paper makes an original contribution to knowledge by challenging assumptions regarding the best way to address the access needs of disabled students. Excellence may not require a ‘blanket approach’ in which just model ‘rules’ or dominates the thinking of PSE practitioners.
<table>
<thead>
<tr>
<th>Questions to seek answers to</th>
<th>Possible Answers</th>
<th>Tick all that apply</th>
<th>Tick all that you require in order to be convinced to apply the model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which educational context can or has the model been applied to?</td>
<td>Campus-based</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distance Learning</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Open Learning</td>
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<td></td>
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<tr>
<td></td>
<td>Online Learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blended Learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Focus</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At what practice ‘level’ can the model operated at</td>
<td>Micro level: the practices involved in making all learning resources and activities (all teaching) accessible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meso level: the delivery of services within a PSE institution that play a role in promoting the use of supportive ICTs that contribute to successful education and employment outcomes for disabled students. For example AT services, Accessibility services, e-services, or staff development programmes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Macro level: the institution in which those services (meso) and practices (micro) take place, and the internal and external factors that influence or drive the institutions development and organisation of those services and practices.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Validity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How was the model derived?</td>
<td>Literature review</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practice descriptions (case studies)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional judgement</td>
<td></td>
<td></td>
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<td></td>
<td>Observations of students</td>
<td></td>
<td></td>
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<td></td>
<td>Interviews with staff and/or students</td>
<td></td>
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<td></td>
<td>Small scale survey</td>
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<tr>
<td></td>
<td>Large scale survey</td>
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<td></td>
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<tr>
<td></td>
<td>Small scale pilots of some or all components</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large scale pilots of some or all components</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analysis of student requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Level 1: Description of overarching principles, components and processes</td>
<td>Level 2: Examples (which may be hypothetical or real) given to illuminate the principles, components and processes</td>
<td>Level 3: Descriptions of the model or framework in action - typically provided by practice-based case studies</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>What evidence is there that the model has improved practice or outcomes?</td>
<td>None</td>
<td>A little</td>
<td>A moderate amount</td>
</tr>
<tr>
<td>How detailed are the models (what is their level of granularity?)</td>
<td>Level 1: Description of overarching principles, components and processes</td>
<td>Level 2: Examples (which may be hypothetical or real) given to illuminate the principles, components and processes</td>
<td>Level 3: Descriptions of the model or framework in action - typically provided by practice-based case studies</td>
</tr>
<tr>
<td>Has the model been implemented/piloted within a post-secondary institution?</td>
<td>No or unclear</td>
<td>Yes - in just one institution</td>
<td>Yes - in between two and ten institutions</td>
</tr>
</tbody>
</table>

Figure 8: A framework for evaluating accessibility models in the context of ICT related practice in PSE

ACKNOWLEDGEMENTS

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REFERENCES


