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What models, approaches or frameworks exist in the field of disability, ICT and post-secondary education: are they successful in transforming the support and delivery of ICT for disabled students or do we need new ones?

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INTRODUCTION

The purpose of this paper is to two-fold. Firstly to orientate readers to the main aims of the Leverhulme funded International Network on ICT, disability, post-secondary education and employment (Ed-ICT) and secondly to provide an underpinning critical framework for the first symposium of this network in which we examine the value and efficacy of models, frameworks and approaches that exist in the field of ICT, disability and post-secondary education.

The Ed-ICT International Network define disability broadly to include physical, sensory, mobility, social 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 experiences and attainment. Within this paper I will use the term 'disabled students' but in using this terms, I am aware that there are differences of opinion regarding which term or label is the most appropriate to use. My justification for preferring the term 'disabled student' to the term 'people with disabilities' is that the latter implies that the person's impairment or condition causes them to be 'disabled' (and consequently that it is their responsibility to overcome it), whereas 'disabled person' implies that the person is disabled not necessarily by their condition or impairment, but by society and its inability or reluctance to cater effectively for that person (and consequently that society must effect change to remove that disability). (Phipps, Sutherland and Seale 2002, iii). This reflects a social model of disability which is well understood in the UK and Europe, but less so in other parts of the world. The focus of the Ed-ICT International Network is on those disabled students who meet the regular admissions requirements of post-secondary institutions; these encompass further education (e.g. colleges), technical schools (that offer certificated programs) and higher education institutions (e.g., universities). We also define ICT broadly to include online learning (both distance and blended learning); assistive technologies such as screen-readers; general use technologies such as tablets; social and networking applications such as Facebook as well as specific application technologies such as statistics packages.

Overarching aim of the Ed-ICT International Network

The overarching aim of the Leverhulme funded International Network on ICT, post-secondary education and employment is 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. We know that disabled learners in post-secondary education. We know that disabled students are less likely than non-disabled students to stay enrolled, earn higher degrees and secure employment (See Seale, 2014 for a review of the evidence and research). 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 utilise potentially supportive ICTs (Asuncion et al. 2009; Fichten et al. 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, 2006; 2014).

Specific focus of the Seattle Symposium: models, frameworks and approaches

One of the main problems with standards and legislation is that they point to rules that practitioners should comply with. They don't however help practitioners translate those rules into practice. They tell a practitioner what they should do, but not how they can do it. A range of tools aimed at filling this gap have emerged. Broadly speaking these tools come in the form of models and frameworks. In the research and practice literature these terms tend to be used inter-changeably; however it is my contention that there is a difference between a model and framework and that it may help if we clearly delineate the difference in order to understand the relationship between the two and therefore how they might usefully combine to provide more detailed guidance to practitioners on the approaches they might take to promote the use of supportive ICTs that contribute to successful education and employment outcomes for disabled students.

Broadly speaking, in the context of the work of the Ed-ICT network, I conceive of models as practical or conceptual representations of the systems and processes within post-secondary education that are required to promote the use of supportive ICTs that contribute to successful education and employment outcomes for disabled students. The purpose of models therefore is to help people know, understand, or simulate the successful inclusion of disabled students in post-secondary education through provision of accessible and inclusive ICTs. If models focus on processes and systems (the bones or skeleton of a system) then frameworks add meat to the bones; they offer guidelines, rules or principles which may underpin or guide the way that systems and processes operate.

Together models and frameworks have the potential to provide a supporting structure around which practice can be built. The focus therefore of this Seattle symposium is to critique whether these models, frameworks and associated approaches are tools that can make a useful contribution to the development of practice in the field of disability, ICT and post-secondary education. In this paper I will:

- Compare and contrast the range of models and frameworks that exist;
- Evaluate the potential of these models and frameworks to help develop practices that can, through the use of ICT successfully alleviate disadvantage and exclusion of students with disabilities.

The outcome of this two-stage critique will be a series of questions that I will pose in the hope that it will stimulate critical debate amongst participants throughout both days of the Seattle symposium. It is my contention that we need to address such questions in order to decide as a community whether we need new models, frameworks and approaches or whether we simply need to use or adapt the existing ones in different or better ways.

WHAT MODELS AND FRAMEWORKS CURRENTLY EXIST?

Many of the models and frameworks that are cited in the field of disability, ICT and post-secondary education focus on 'accessibility'; a term that has meaning in relation to standards and legislation; but which may not always capture the activities and purpose of the multitude of stakeholders, systems and processes within a post-secondary institution.

Early models and frameworks which were not designed specifically to be applied to post-secondary contexts include the Web Content Accessibility Guidelines (Caldwell et al. 2004); the Web Accessibility Integration Model (Lazar et al. 2004) and the Tangram model. (Sloan et al. 2006; Kelly et al. 2007, 2008). All three focus on the accessibility of web pages, but the Web Content Accessibility Guidelines have become the most widely recognised, cited and implemented within post-secondary education. I will not go into these models in any detail here, but it is worth noting that the Web Content Accessibility Guidelines were influenced in part by the Universal Design model which I will discuss later and also that some of the other post-secondary education specific models that I do discuss do make reference to the fact that guidelines such as the Web Content Accessibility Guidelines are one component or factor that influences practice. The scope of the Web Accessibility Integration Model is limited in that it only focuses on one aspect of ICT use; the various influences on the development of an accessible web site. In doing so, the focus is narrowed to just the web site developer and their client. It does, however, place their interaction within a societal context of policies, laws and guidelines and we can see this interaction emphasised in later more post-secondary specific models such as the contextualised model of accessibility (Seale, 2006) which I will discuss later. The tangram model positions itself as different to but complimentary to the Web Accessibility Guidelines and in doing so exemplifies the tensions that exist between practices aimed at finding optimal universal solutions and those focused on multi-component solutions to accessibility issues.

Models and frameworks that are specific to post-secondary education

In my exploration and examination of what models and frameworks were designed specifically to apply to post-secondary contexts I have identified nine models or frameworks. The majority have been developed by UK or European researchers and practitioners. The one US model, Universal Design, is however the most widely cited and dominates the discourses. It was not always clear the models were being used to describe current practice (what is currently happening) or to proscribe best practice (what should be happening).

The models and frameworks also differ from one another is that some focus on the product or thing that needs to be made accessible and some focus on the context in which accessibility practice needs to develop. This binary distinction has been conceptualised by Burgstahler (DO-IT, n.d. a) as the difference between focusing on the micro and the macro level. Writing in the context of the universal design model she argues that one needs to look at universal design's application on both a micro and macro level in instruction. For

Burghstahler, the macro level is applying universal design to all teaching. This involves evaluating the learning goals and objectives of a course and applying the right method of teaching for each goal. The micro level focuses on the detail of making resources accessible. I wish to extend and adapt this argument to suggest that models and frameworks in post-secondary education can be distinguished by whether they focus on three different levels: The micro, the meso and the macro (See Table 1):

i) *Micro level*: the practices involved in making learning all resources and activities (all teaching) accessible
ii) *Meso level:* the delivery of services within a post-secondary education 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.

Using this distinction some models and frameworks focus on just one level:

- *Micro Level*: Universal Design for Learning/Instruction and the Holistic Model
- *Meso Level*: Composite Practice Model, The provisional staff development model and the Model of Accessibility Services Provision.
- *Macro Level*: Model of Professionalism

Other models incorporate two of the three levels. For example, the VIVID Model addresses both the micro and macro level. The Contextualised Model of Accessibility and the EU4All Model incorporate the meso and macro level. No model focused on all three levels.

Micro level models and frameworks

I have identified the Universal Design for Learning/Instruction and the Holistic Model as focusing on the micro level- practices involved in making blended learning resources and activities accessible to disabled students. The holistic model positions itself as an alternative to the Universal Design Model.

Name of Model or framework	Focus	Level
Universal Design for Learning/Instruction	Blended learning resources and activities	Micro
Holistic Model	Blended learning resources and activities	Micro
The VIVID (Vision Impaired using Virtual IT Discovery) Model	Blended learning resources; internal and external influencing factors	Micro/Macro
Composite practice model	Service Level: Assistive Technology Services	Meso
The provisional staff development model	Service Level: Staff development	Meso
A Model of Accessibility Services Provision for Students with Disabilities in Higher Education	Accessibility services	Meso
EU4ALL	Service level: E-services	Meso/Macro
Contextualised Model of Accessibility	Institutional Level	Meso/Macro
Model of professionalism in accessibility.	Institutional Level	Macro

Table 1: Distinguishing the focus and level of the different models and frameworks that have been developed for a post-secondary education context.

The Universal Design Model

There is no real consensus as to whether Universal Design is a model, framework or something else, however I note that Bisonette (2006: p. 9) has referred to Universal Design as: “a conceptual framework for designing and developing inclusive environments.”

Universal Design for Learning models or frameworks are influenced in varying degrees by the work of 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, have as their core 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 and inclusive instructional strategies that benefit a wide range of learners. There are however different approaches or branches to Universal Design in Education (See

Table 2) which I have argued practitioners need to be aware of in order to more clearly take ownership of their accessibility related practice (Seale, 2014).

	UNIVERSAL DESIGN FOR LEARNING (CAST)	**UNIVERSAL DESIGN FOR INSTRUCTION (CPED)**	**UNIVERSAL DESIGN FOR LEARNING (DO-IT)**
Main Sector Focus	Primary and Secondary with some Post-Secondary Education	Post- Secondary Education	Post-Secondary Education
Approach	Creating a new set of principles tailored to instructional settings	Adding unique instructional principles to the seven original principles of Universal Design	Applying the original seven basic principles of University design to education and adding unique instructional principles

Table 2: An overview of the similarities and differences of the three variants of Universal Design models

Based on a review of research literature, The Centre for Applied Special Technology (CAST) created a set of three overarching principles for what they called Universal Design for Learning (CAST, 2007):

1. *Multiple means of representation*: to give learners various ways of acquiring information and knowledge. (e.g. presenting information in multiple formats from lecture to discussion to individual and group assignments);
2. *Multiple means of expression*: to provide learners alternatives for demonstrating what they know. (e.g. offering students different ways to demonstrate learning);
3. *Multiple means of engagement:* to tap into learners' interests, offer appropriate challenges, and increase motivation (e.g. recognizing different learning styles, needs, and abilities to allow each learner to capitalize on his other learning strengths).

The CAST framework promotes a proactive approach to accommodations and the advocates of Universal Design for Learning also explain that universal design focuses on removing barriers through initial designs that consider the needs of diverse people, rather than overcoming barriers later through individual adaption (Meyer & Rose 2005). The primary focus of CAST has been primary and secondary education, but it has expanded its professional development work to higher education.

The Center on Postsecondary Education and Disability (CPED) at the University of Connecticut developed an approach they called Universal Design for Instruction (UDI). The proponents of this approach (Scott, McGuire & Foley, 2003) argued that the three principles from CAST were not comprehensive enough. They therefore went back to the original seven principles of Universal Design and reworked them to fit a post-secondary education context. The result was a list of nine principles for UDI (McGuire, Scott, & Shaw, 2003, p. 13):

1. Equitable use: Instruction is designed to be useful to and accessible by people with diverse abilities. Provide the same means of use for all students, identical whenever possible, equivalent when not.
2. Flexibility in use: Instruction is designed to accommodate a wide range of individual abilities. Provide choice in methods of use.
3. Simple and intuitive instruction: Instruction is designed in a straightforward and predictable manner, regardless of the student's experience, knowledge, language skills, or current concentration level. Eliminate unnecessary complexity
4. Perceptible information: Instruction is designed so that necessary information is communicated effectively, regardless of ambient conditions or the student's sensory abilities.
5. Tolerance for error: Instruction anticipates variation in individual student learning pace and prerequisite skills.
6. Low physical effort: Instruction is designed to minimize nonessential physical effort in order to allow maximum attention to learning. Note: This principle does not apply when physical effort is integral to essential requirements of a course
7. Size and space for approach and use: Instruction is designed with Consideration for appropriate size and space for approach, reach, Manipulations, and use regardless of a student's body size, posture, mobility, and communication needs
8. A community of learners: The instructional environment promotes interaction and communication among students and between students and faculty.
9. Instructional climate: Instruction is designed to be welcoming and inclusive. High expectations are espoused for all students.

The DO-IT project at the University of Washington has explored how the principles of universal design can be applied across the entire campus (DO-IT, n.d. b). In doing so they have identified three approaches to universal design in education:

1. apply the seven basic principles to universal design of instruction;
2. add unique instructional principles to the seven principles of universal design
3. create a new set of principles tailored to instructional settings (Burgstahler, 2010).

Burgstahler argues however that what these three approaches have in common is that the focus on 'universal' requires instructors to re-think the mix of strategies they use and ensure that the overall mix, as well as the implementation of each strategy is inclusive and accessible for everyone. Burgstahler (2010) and others discuss what they see as common threads through all the strands of universal design in education. 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 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.

Holistic model of accessibility

Kelly *et al.* (2004) propose a holistic model for e-learning accessibility, which places the learner at the centre of the development process (see Figure 1). 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. They also articulate in more detail the context in which this might take place by emphasising that solutions will need to take into account both online and offline learning activities and resources (blended learning). This emphasis on contextual factors is similar to some extent to the Web Accessibility Integration model. However, just as the Web Accessibility Integration model only focuses on the relationship between two potential stakeholders (designer and client) the holistic model appears to ignore the perspectives of stakeholders other than students and perhaps faculty.

[Figure 1 here]

The VIVID (Vision Impaired using Virtual IT Discovery) Model

Permvattana et al. (2013) offer their own alternative holistic model, but one which they developed specifically for e-learning environments for the vision impaired. The stimulus for this development is the argument that whilst models such as those proposed by Kelly et al. 2008 (and Seale 2006 see later) 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 that would make it easier to identify potential solutions to the problems faced by vision impaired students. The model they propose (see Figure 2) incorporates various aspects of other models but is also underpinned by insights gained from observations and interviews with the vision impaired students and teachers. 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. It is this inclusion of an external layer that suggests that the model is attempting to operate at both the micro and macro level.

[Figure 2 here]

Meso level models and frameworks

Models that operate at the meso level focus either on individual services such as Assistive Technology or Staff Development services or on a range of accessibility related services that include libraries, information technology services and student support services.

A focus on Assistive Technology

Raskind and Higgins (1998) conducted a lit review in order to identify basic models of assistive technology service delivery. One major finding they reported was that the location of the assistive technology differs from one institution to the next, with some programs distributing assistive technology throughout the campus (distributive model) at existing computer sites, and others providing assistive technology at a central location. Proponents of the distributive approach assert that it is more in line with federal regulations mandating integration of students with disabilities, and that it helps ensure greater access to the full range of campus-computing resources, while advocates of the centralized model argue that housing assistive technology services in a central location results in greater levels of student satisfaction and success, as well as more efficient delivery of services. Raskind and Higgins (1998: p 37) concluded that ' experience is still needed to determine which service delivery models, specific services, and technologies are the most appropriate for meeting the needs of individual institutions, LD support service programs, and students with LD'.

Leung et al. (1999) developed a composite practice model to describe and explain practice in regard to Assistive Technology service delivery in post-secondary educational settings across Australia. There were three main components to the model:

1. Policy funding
2. The players
3. The process of assessing students for their AT needs (See Figure 3).

Leung et al. (1999) argue that this model can serve as a check list for postsecondary institutions in assessing their response to AT needs of students with disabilities. This composite practice model for Assistive Technology service delivery recognises that there is a diversity of requirements for Assistive Technology, that assessment for Assistive Technology may involve screening or a more diagnostic evaluation, that there is a full range of available Assistive Technology from low tech to high tech that varies in cost, and that there should be utilisation of mainstream service provision whenever possible. Reasonable Assistive Technology relates to reasonable accommodation which is a modification or adjustment to individual methods and/or a class, programme, service, or activity and is provided to enable a student with a disability to have an equal opportunity to attain the same level of performance or to enjoy equal benefits and privileges as are available to a similarly situated student without a disability.

[Figure 3 here]

This model does not directly address arguments regarding distributive or centralised models of Assistive Technology provision across campus identified by Raskind and Higgins (1998). What is interesting however about this model is the fusion, intentionally or unintentionally, of polar opposite concepts or approaches. For example, on the one hand the model proposes the utilisation of mainstream service provision whenever possible. On the other hand the model provides for reactive approaches as exemplified by the heavy emphasis on reasonable accommodation which is a modification or adjustment to individual methods and/or a class, programme, service, or activity. It is not clear however, whether this model would champion the minimising of reasonable adjustments, like the Universal Design Model would.

Whilst the focus of this model is narrow what it does do effectively is highlight the contribution of a range of stakeholders including: administrators, student services, lecturers, librarians, IT services and Assistive Technology specialists- something that I expand on further in my contextualised model (see next section). In addition, like the contextualised model and a lesser extent the holistic model, the Composite Model acknowledges the powerful influence of external drivers such as policy and funding on practice.

A focus on staff development

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 4). The first is what they called *framework components*: raising awareness; improving understanding and improving skills. Awareness raising is the increase of the educator's consciousness and appreciation of the barriers that disabled students face in accessing standard e-learning materials, which have not been designed with accessibility in mind. Improved understanding refers to the development of enhanced knowledge of the effect that a specific disability may have on the way student access online learning materials. Skills improvement relates to the practical information, techniques and expertise that academics require in order to be able to design and develop accessible e-learning materials. The arrow denotes the path of the process; Inclusive learning and teaching as well as accessible e-materials appear at the core of the circle, emphasising the ultimate goal of providing an accessible curriculum to students with disabilities, with the components.

The second element is the *processes* which are required in order to raise awareness, enhance understanding and improve skills. Papadopoulos et al. (2102) argue that sustaining motivation and experiencing and empathising with the disabled student's experience are essential in order to develop self confidence in teaching students with disabilities, embrace inclusive online practices and seek support in designing accessible learning materials. Subsequently, skills training will lead to the necessary expertise. Thirdly, Papadopoulos et al. (2012) 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 the Tutor Accessibility Support Kit (TASK). The

motivational aspect of simulations are employed to raise accessibility awareness and provide a deep understanding of the impact of specific impairments on the learning experience of disabled students, through a process of experiencing and empathising with the student experience. Whilst TASK can be used to improve skills and technical knowledge. Finally, Papadopoulos et al. (2012) argue that culture change within an institution will not occur without individual self-reflection and collaboration with others.

[Figure 4 here]

A focus on a range of services

Kouroupetroglou, Pino and Kacorr (2011) propose a model of accessibility services which they argue takes into account both the "Design for All" 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. (See Figure 5).

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 6). Unlike the contextualised model of accessibility, Kouroupetroglou, Pino and Kacorr have implemented their model of the Accessibility Unit in practice**;** using it for several years in the University of Athens, the largest higher education institution in Greece.

[Figures 5 and 6 here]

Meso and macro level models and frameworks

I have identified two models or frameworks with operate at both the meso and the macro level. The contextualised model of accessible e-learning practice and the EU4ALL framework. The former informed, in a small part, the development of the latter.

A contextualized model of accessible e-learning practice in post-secondary education institutions

I have proposed a model of accessible e-learning practice (Seale, 2006) that takes into account:

- The stakeholders;
- The context: drivers and mediators;

- How the relationship between the stakeholders and the context influences the responses they make and the accessible e-learning practices that develop (see Figure 7.)

I argue that the extent to which e-learning material and resources is accessible will be influenced by how all the stakeholders within a higher education institution respond to external drivers for accessibility such as legislation, guidelines and standards. This response will be mediated by stakeholders views and understandings of disability, accessibility and inclusion; duty and responsibility; autonomy and freedom; teamwork and community. The accessible e-learning practices that develop out of these responses will vary depending on the stakeholders and the context in which they are operating but essentially centres on taking ownership and control as well as developing personal meaning from externally imposed impersonal mandates.

Legislation will not on its own change accessible e-learning practice within a higher education institution because the stakeholders have to translate legislation into polices and strategies that are meaningful to them in the context in which they are working. Universal accessibility guidelines on their own will not change accessible e-learning practice within a higher education institution because the stakeholders have to adapt and develop the guidelines into guidelines (and tools) that are meaningful to them in the context in which they are working. Universal accessibility standards on their own will not change accessible e-learning practice within a higher education institution because the stakeholders have to define and agree what the benchmarks of best practice might be in the context in which they are working. What a model such as this stresses is that there is a 'gap' between the drivers for accessible e-learning and their desired outcome (accessible e-learning material). The gap between drivers and outcome needs to be 'bridged' by accessible e-learning practices and the stakeholders within a higher education institution help to bridge that gap.

[Figure 7 here]

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 at Higher Education level 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). There were two main areas the framework aimed to address:

1. Enhancing 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 assistive technologies used with a desktop computer;
2. Providing 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. The technical elements of the EU4ALL framework describe the standards-based interoperable components that are integrated into an open web service architecture in order to deliver personalised learning across an institution. These technical components include a user modelling component, a content personalisation component, a recommendation system and an E-Services Server (ESS). The ESS component is described as intending to provide institutional level support for the delivery of services that necessitate the involvement and co-operation of a number of different stakeholders; which perhaps indicates a small nod to my contextualised model of accessibility and its emphasis on stakeholders (See Figure 8).

[Figure 8 here]

Macro level models and frameworks

One interesting outcome of the EU4ALL project was the development of Four Stage Model of Professionalism in Accessibility (See Table 3) which can be perceived as operating at the macro level.

A Model of Professionalism in Accessibility

The premise underpinning this model, is that accessibility has a broad impact that means that as well as systems and software; organisations need to consider the policy and indeed philosophy of the organisation towards how it meets the challenge of accessibility (Montandon, Arjona, and Weiermair 2010). It is argued that the model can help reflection 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) describe how the OU has used this model to reflect on organisation direction in relation to accessibility and to benchmark itself against four tiers of accessibility related 'professionalism'. Indicators of a low level of accessibility practice (T1) would include: responsibility and roles are unclear and ambivalent; low awareness by senior management; low levels of accessibility practice and weak legal frameworks. Indicators of an outstanding level of accessibility practice (T4) would include: responsibility and roles are clear; accessibility is a high priority; strong institutional processes and stakeholder involvement; legal frameworks are strong driver and implementation is evaluated.

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

Table 3: A model of professionalism in accessibility

CAN MODELS AND FRAMEWORKS TRANSFORM PRACTICE?

In the first part of this paper I compared and contrasted the range of models and frameworks that exist in the field of disability, ICT and post-secondary education. A central premise of the Ed-ICT International Network is that researchers and practitioners need to develop a critical approach to developing and implementing models and frameworks. Therefore, in this second part of the paper I will offer a framework of questions that I believe we should be asking in order to evaluate the potential of these models and frameworks to help develop practices that can, through the use of ICT successfully alleviate disadvantage and exclusion of students with disabilities. I propose three main questions that we should be asking of models and frameworks and of ourselves:

1. How valid and efficacious are the models and frameworks?
2. Have we carefully examined the validity and efficacy of models or are we blindly following others?
3. Have we considered all the options?

How valid and efficacious are the models and frameworks?

In judging the validity of models and frameworks we need to evaluate whether they are logically or factually sound and cogent. In order to do this I propose we examine:

- How were the models or frameworks derived?
- What evidence is there that they have improved practice or outcomes for disabled students?

In judging the efficacy of the models and frameworks we need to evaluate their capacity for producing the desired result or effect. In order to do this I propose we examine:

- How detailed are the models or frameworks- what is their level of granularity?
- Have the models and frameworks been implemented in practice? How widely have they been implemented?

In judging the level of granularity I argue that we need to 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 these set of questions and criteria I have critiqued the nine models and framework that I described in part one of this paper (See Table 4).

Judging validity

This 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 *c*laim 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 post-secondary education.

Model	Validity		Efficacy	
	How were they derived	**What evidence is there that they have improved practice or outcomes?**	**Level of granularity**	**Implemented in practice**
Universal Design/Instruction	Literature Review Practice examples Professional Judgement	Some-but of varying quality	3	Yes- wide-scale
Holistic model	Literature Review Professional judgement	None	2	Unclear
VIVID	Literature review Observations of students Interviews with staff and students	None	1	No
Composite Practice Model	Literature review Survey Practice examples	None	2	Unclear
Provisional Staff Development Model	Literature review Small scale pilots of some components Professional judgement	None	2	No
Model of Accessibility Services Provision	Analysis of student requirements	None	1	Yes in one post-secondary institution
Contextualised Model	Literature Review & socio-cultural theory	A little	1	No
EU4ALL	Literature Review Large scale survey	A little	2	Piloted in two universities
Model of Professionalism	Literature Review Large scale survey	Unclear	2	Piloted in at least one institution

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, Papadopolous, Pearson and Green 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. 2008; 2011) and as such their framework 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 post-secondary institution.

Just two of the nine models however, have used explicit practice examples to inform development (e.g. Universal design and Composite Model). Since the inception of the contextualised model Seale has attempted to provide data that illuminates the perspectives and practices of one of the stakeholders named in her model: that of disabled students. Through her studies of disabled students' relationship with technologies) she has revealed that disabled students employ a range of digitally agile strategies in their use of ICT to support their learning and that the decisions they make regarding whether to use ICT or not are influenced by a range of psycho-social factors including stigma, which stretch beyond the traditionally understood barriers to accessibility (e.g. design failure) (Seale, 2013; Seale et al. 2010).

With regards to evaluating the evidence available regarding 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. (See Seale, 2014 and 2017 for a wider discussion of the quality of this evidence). 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 as the Open University which had been designed using the EU4ALL framework. Using 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. In the laboratory-based user studies, students expressed familiarity with the content personalisation system but did not understand the ways that adaptations were being described and presented in the system. Finally, 93% of disabled students surveyed thought content personalisation was a good idea and 85% thought it could help them to study. Whilst illuminating, this data is not definitive evidence that the model is effective and more work is needed to provide this.

The varying quality of evidence that exists leads me to conclude that as a community we need a wide-ranging and in-depth discussion of the following:

- How we are defining effectiveness or success in relation to our models and frameworks;
- How we can meaningfully evaluate effectiveness or success of our models and frameworks;
- What counts as valid and valued evidence of effectiveness or success?

Judging Efficacy

I could find 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. The consensus of the self-rating process is that the Open University is currently at the institutional/professional boundary in this model (T3) though some of those working directly on accessibility were more cautious that aspects of T3 remain to be embedded. Overall there are strong aspirations to reach the highest level of professionalism of its accessibility processes (T4). Some of the key identified deficits were the need to more fully embed the addressing of accessibility in the core process of the university; a requirement for a clearer definition of responsibilities across the organisation; and partial and localised evaluation of accessibility implementation (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 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 post-secondary 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: expanding the gaze of the field beyond the practice of the technicians and technologists to include the practice of a wider range of stakeholders.

Applying my granularity criteria, eight of the nine models and frameworks reached level 2 (examples have been given to illuminate the ideas and principles). For the Universal Design model and its variants, there is a vast amount of information available that offers hypothetical examples and illustrations of the principles. The most common examples given of how Burgstahler's approach to universal design can be applied to e-learning are:

1. Making lecture materials available in multiple formats on the course Web site;
2. Making sure the Web is accessible.

Burgstahler also publishes extensively on how universal design can be applied to distance learning, and she frequently offers examples where tutors need to think about their use of technology (e.g. Burgstahler 2002). Email is argued to be accessible for all students; alternatives to synchronous chat are urged because of scheduling challenges and difficulties for those whose input method is slow; web pages should be accessible to those using a

variety of assistive technologies; making printed material available electronically to accommodate the needs of blind students and those with specific learning difficulties; captioning or transcription of video tapes and other multi-media material.

Judge and Floyd (2011) offer e-learning examples for three of Universal Design for Learning principles. Principle 1 suggests that the lecturer provide multiple representations of the same information, such as digital text read by text-to-speech software. Principle 2 suggest that the lecturer provides multiple means of expression such as allowing students to create PowerPoint or other multimedia presentations to demonstrate their knowledge or accommodating the use of technology that enables text-to-speech capabilities. Principle 3 suggests that the lecturer provides multiple means of engagement such as providing students with a choice of tools they can use to search or gather information. Zeff (2007) provides e-learning examples for five of the nine Universal Design for Instruction principles:

1. Equitable use: Using web-based courseware products with links to on-line resources so all students can access materials, regardless of varying academic preparation, distance from campus, etc.
2. Flexibility in use: Using varied instructional methods (lecture with a visual outline, group activities, use of stories, or web-based discussions) to support different ways of learning.
3. Perceptible information: Selecting text books, reading material, and other instructional supports in digital format so students with diverse needs can access materials through print or by using technological supports (e.g., screen reader, text enlarger).
4. Low physical effort: Allowing students to use a word processor for writing and editing papers or essay exams.
5. A community of learners: Fostering communication among students in and out of class by structuring study and discussion groups, e-mail lists, or chat rooms.

Other examples offered by Fichten et al. (2012) include: posting course notes online at least a week in advance of a lecture, so that students, including those with visual, hearing and learning disabilities can come prepared for class; equipping all computer labs with scanners and OCR software enabling all students to use their laptops more effectively due to a reduced need to carry paper; allowing students to submit assignments online to cater for those who difficulty getting to campus during office hours.

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). For example, Kinney and Kinney (2003) describe how the mathematics program at the University of Minnesota General College offers both computer-mediated and lecture-based mathematics courses in Introductory Algebra and Intermediate Algebra. Students are allowed to self-select into the instructional format that they believe will best meet their learning preferences. To assist them in their decision, students take an inventory containing items related to computer-mediated and lecture instruction and discuss their options with their advisor. In an attempt to provide students with the widest range of instructional materials and access to those materials, all students are provided with the textbook; software and a study guide. All students, whether enrolled in computer-mediated or lecture

classes, are able to use the software on campus or at home. Kinney and Kinney (2003) argue that this approach benefits students with acquired brain injury and other disabilities that impede the retention of knowledge because they can access the software if they do not understand the lecture and it also benefits those who were unable to attend lectures due to illness or other personal circumstances. They claim that the principles of Universal Design, however, do not suggest the elimination of lecture classes because many students still prefer to learn mathematics through lecture.

Grabinger (2010) uses universal design principles to suggest a framework for supporting online learning for students with psychiatric disabilities. He explains that students with disabilities such as depression or bipolar disorder would be overwhelmed by a standard Learning Management System, with its vast array of navigation buttons; over-flowing single-spaced text packed with information and growing discussion forum posts. He claims that these students can become so intimidated, that they frequently fall behind and drop-out. Grabinger then gives examples of how universal design principles applied to the LMS can accommodate the needs of such students. These include: using built-in live feedback to encourage students; offering multiple versions of content presentation with a variety of multimedia; providing highly structured directions; designing open and well organized screens or web pages and careful structuring of discussion forums to make threads easier to follow.

These two examples are relatively illuminative of universal design principles. Other examples however, are less illuminating and sometimes confusing. For example, in a book edited by universal design advocate Jean Higbee, called 'Curriculum Transformation and Disability; Implementing Universal Design in Higher Education', Brothen and Wambach (2003) describe a computer based psychology course which they argue is consistent with universal design principles. Learning on the computer based course is assessed by completion of short unit tests along with a final test. Students must score 8/10 to be allowed to progress to the next unit. Brothen and Wambach described how they worked with three disabled students; but I will focus on one, Ralph. Before Ralph joined the course, the disability support team advised the teaching team that he would need extra time on tests. The response of Brothen and Wambach was not to respond: 'our response to Ralph was no different than for any of our students; we monitored how he handled the work and responded accordingly' (p.133). This monitoring involved watching Ralph fall behind in class; adopt an ineffective strategy of taking the quizzes before doing the pre-reading and take the longest time to work on the computer exercises because he had trouble reading certain words and phrases in the computer-based material. It is only after they observed all this, that they contacted the disability support office, to be advised that Ralph had severe dyslexia. At this point, they regularly provided a reader for this quizzes. The authors claim a victory for universal design: ' because we had the opportunity to watch Ralph work, we could design accommodations that were more effective than those requested' (p.138). I am left wondering however, is this really universal design? A lack of anticipation of need; a lack of proactivity? To me the design of the computer based package was inflexible. The design of this did not change, other things had to change. The provision of a reader for Ralph, does not benefit other students, a change in the design of the computer based package might

have. And what about the potential devastating emotional effect on Ralph on having to struggle so long before a successful strategy was put in place? The authors do not comment on this. This example is symptomatic of what I have argued is a wide-scale lack of criticality in relation to Universal Design Models (See Seale, 2014) and why in my opinion, it has not reached level 4 on my scale of granularity. I will discuss this further in the next section.

Given my assessment of the validity and efficacy of the models and frameworks included my review it would seem that more development and evaluation work is needed in order for a more convincing case to made for any or all of them to have real and genuine potential to help develop practices that can, through the use of ICT successfully alleviate disadvantage and exclusion of students with disabilities.

Have we carefully examined the validity and efficacy of models

In my writing (Seale, 2014; 2017) I have expressed concern about how researchers and practitioners in the field of disability, ICT and post-secondary education are failing to critically engage with the validity and efficacy of their models of preference. I have called this phenomena ‘critical silences’. There are two kinds of critical silence:

- Criticising other models but failing to engage in anything other than a superficial way with the writings and work that underpin those models;
- Espousing the strengths of a chosen model but rarely discussing its weakness.

In my 2014 book the evidence I provided for the first kind of critical silence was the extent to which some model developers positioned their work as the antithesis of Universal Design. I argued that there is a tendency for critics of universal design to criticise an interpretation of what people say it is and a failure to engage with the underpinning principles as a whole or the different nuances from different applications of the approach. To use an archaeology metaphor, they have gathered artefacts from the surface (the rhetoric around 'one size fits all') to make deductions about the site; but they have failed to dig deeper below the surface of the site in order to understand its real significance.

In my 2014 book the evidence I provided for the second kind of critical silence is the evangelism surrounding Universal Design. I will now go on to provide evidence to justify my criticism. In doing so, I acknowledge that the dominance and popularity of the Universal Design model means that in stark contrast to the other models there is a wealth of literature from which I can draw out examples of critical silences. I also wish to stress that I am not opposed to the Universal Design model, I am however opposed to the way it is talked about.

Universal Design as an example of a lack of careful examination

I have argued that a major area in which universal design needs critical examination is the lack of good quality evidence that universal design principles bring about their intended effects (Seale 2014; 2017). In this paper I will illustrate with two examples.

- How followers of Universal Design make much of the fact that Universal Design is underpinned by research
- How authors engage superficially with the Universal Design literature they are citing and in doing so make dubious claims.

To illustrate the first phenomenon I will refer to the arguments of Grabinger (2010) who talks of how CAST has demonstrated ' leadership in the application of recent brain research to provide a framework for organisations recommendations to deal with differentiation' (p.104). This statement needs interrogating further, particularly as all that Grabinger cites to support his claim is CAST project web pages. CAST have not conducted their own brain research, they have reviewed research evidence from the cognitive and neurosciences to identify individual differences in human learning. From this review, they have distilled out three basic learning networks (recognition, strategic and affective) and used these to inform their design principles. On their website, for each checkpoint in their guidelines they provide a list of references which support their conclusions and guidelines. Whilst this is valuable work, I believe its value is overplayed and under-critiqued. This lack of critique is not helped by the fact that it is difficult to find any peer-reviewed paper written by the CAST team that provides any significant detail regarding the rigour of their literature review. In their 2000 paper ' Universal Design for Individual Differences' Meyer and Rose cite just four pieces of brain research to support their claim for learning networks (see pages, 40, 41 and 42). In their 2005 book chapter ' The Future is in the Margins', Meyer and Rose briefly refer to research on multiple intelligences and brain imaging to support their arguments (see pages 21-23). In a book chapter discussing the application of Universal Design to Higher Education, Hall and Stahl (2006), two CAST employees, cite a 2002 reference by Rose and Meyer to support their claim that the CAST approach to Universal Design is underpinned by research on how the learning brain functions. This 2002 reference is a teacher handbook (Teaching Every Student in the Digital Age: Universal for Learning); it contains no direct references at all to brain research. The result of all this circular and vague reference to 'brain research' is that we do not know what criteria CAST used to decide which research studies to include in their review, or what the team counted as evidence for or against a particular conclusion regarding learning differences. Furthermore however we judge this evidence, it is evidence to justify the use of differentiation, but it is not evidence that proves differentiation is effective (however we define effective). This is something that CAST acknowledge. Hall, Strangman and Meyer (2011, para.25) write on the CAST website:

> While no empirical validation of differentiated instruction as a package was found for this review, there are a generous number of testimonials and classroom examples that authors of several publications and web sites provide. Tomlinson reports individual cases of settings in which the full model of differentiation was very promising and teachers using differentiation have written about improvements in their classrooms.

To illustrate the second phenomenon I will refer to an article written by Kraglund-Gauthier et al. 2014) in which they focus on how faculty embed universal design in their practice and the need for professional development in this area, Kraglund-Gauthier et al. (2014, 7) argue:

> By increasing student choice and making connections with students' prior knowledge, student motivation to participate and to learn is also increased (Lombardi et al., 2011; Orr & Bachman Hammig, 2009).

A closer inspection of the references given to support the claim for increased student motivation, however reveals that the Lombardi, Murray and Gerdes (2011) paper is reporting a study on faculty attitudes to universal design and therefore offers no evidence regarding improvements in student motivation due to implementation of universal design. The Orr and Bachman-Hammig paper does offer some evidence in that it provides a review of studies that pertain in some way to the universal design principles. The review distilled out key themes across the studies and drew some tentative conclusions based on this analysis. As much research in the field is qualitative, we are unlikely to be able to conduct the kind of review where effect sizes and similar quantitative data can be tested across studies. However, I would argue that we do need to have some accepted process for interrogating this qualitative evidence. For example, the review by Orr and Bachman-Hammig included studies where universal design was not a specific focus and therefore not embedded in the aims or research questions of the studies in question. It is not clear to me therefore that their inclusion was appropriate in a review seeking to 'test' universal design. One example is the inclusion of the study by Beacham and Alty (2006) which was an investigation into the effects that digital media can have on the learning outcomes of individuals who have dyslexia. In the abstract the authors state that the 'purpose of the study was to obtain data that informed the development and design of e-learning and distance learning materials for universal use'. I would argue that 'universal use' should not be confused with universal design. In the beginning of the paper there is a small paragraph that acknowledges that there are different approaches to design and the work of the Centre for Applied Special Technology is cited but they conclude by stating:

> However, it does seem from our observations that very little extra learning material is being produced for adult dyslexic learners and none concerning assessment. We therefore set up a more detailed study, centred entirely on addressing the effects that computer-based media can have on adult learners who have dyslexia. (Beacham and Alty, 2006, 75)

Based on this, I would argue, that Beacham and Alty are not positioning their research as being about universal design. Furthermore, as Edyburn (2010) argues; using technology does not automatically mean that you are using universal design. I acknowledge that many of the originators of Universal Design have been much more cautious than their advocates in terms of the claims they make. For example, Scott et al. (2003) acknowledge the need for more detailed research into the effectiveness of Universal Design:

> Although the principles of UDI are grounded in literature and early construct validation through student focus groups, faculty interviews and college administrator discussion (Scott et al.2003) has been affirming, it will be most important to move this critical analysis onto the next level by conducting systematic research on the effectiveness of UDI. Indeed research should address the effectiveness of UDI through the following questions: Does it enhance instructional outcomes? Will it reduce the need for accommodations for disabled students? What considerations need to be made for the acceptance and ease of use by

> faculty? What institutional support is needed for faculty to implement these strategies? (p.376)

In addressing the question:' can we develop the Universal Design construct in a rigorous way?' McGuire et al. (2006) warn also against the dangers of perceiving Universal Design as a magical solution before it is more widely developed and proven:

> The fields of architecture and design have called for the development of a 'critical theory' of UD involving the testing of suppositions (i.e. UD principles) engaging in serious discourse and critical practice, implementing ongoing projects to document exemplars, and refining and validating the UD principles. In contrast to the quick solutions assumed to result from the application of UD to educational environments, this type of iterative theory building is essential to avoid the danger of yet another short-lived panacea for special education (p. 172).

Eleven years on from this, I would argue that the research and practice field is still too prone to viewing universal design as a magical solution and that we need to apply a much more critical lens to the presumed evidence for both Universal Design and the other eight models or frameworks I have reviewed in this paper. That is what I am hoping this Seattle symposium will do.

Have we considered all the options?

In this section I will offer examples of two questions, the discussion of which pushes us to go beyond the boundaries of the current nine models and frameworks that I have identified.

Can one model or framework do the job?

In my review I have identified a range of models and frameworks; each focusing on the micro, meso, and macro level or a combination of two of these. Assuming that it is helpful to distinguish between the practice level, service level, and the institutional level an important question for the symposium to consider is whether there is a need for one model that combines all three levels. If so, is it possible to develop a model that can deal in detail with all three levels?

Given the effort that has been put into developing the existing models and frameworks a preferable route might be to combine two or more of the existing models and frameworks. For example, Kelly et al (2008) argue that their tangram model (micro level) can inform post-secondary practices by being combined with models such as the one proposed by Seale (2006). Kelly et al. 2008 draw synergies and overlaps between their tangram model and the contextualised model. They argue that both models are underpinned by the argument that good design will be mediated by more factors than just a single set of guidelines. The accessibility community has tools (legislation, guidelines, standard and policies) but what it lacks is an agreed “way of doing things”- an agreed way of using these tools. Both models have been developed to offer a way forward from this stalemate position, by prompting us

to move from trying to find “one best way” towards finding a “range of acceptable ways” that can be adapted to suit different purposes and contexts.

One obstacle to the possible combining of models and frameworks is that some developers have positioned their work as the antithesis of other models and frameworks. For example Kelly et al. (2004:2008) position the holistic model as being individualistic rather than universal. In other words we are presented with what Allan (2010) called 'aporias'; oppositional or contradictory imperatives. I have argued that the two 'aporias' of universal design and individual design are not as contradictory as some argue and that we need to stop privileging one design approach over another in order to produce the best ICT supported learning experiences for disabled students (Seale 2014).

Are we applying the right critical lens?

I have framed my review of the models and frameworks by using the idea of micro, meso and macro levels. This might not be the only lens we can apply to a critical evaluation and future development of models and frameworks. Examples of other lenses that we could apply are:

- A disability lens
- An inclusion lens
- A geographic lens

If the models and frameworks that we develop are going to be relevant to disabled students and their experiences of being disabled within post-secondary institutions then perhaps models in this field need to be more firmly underpinned by models of disability. One danger in doing so, is that models of disability such as the social model of disability and the medical model of disability tend to be as polarised as models of accessibility (See Seale 2014). For example, if we apply a social model of disability lens to the composite model of assistive technology we could argue that reflects a social model of disability with its talk of examining the barriers resulting from the interaction between the disability and the campus environment and whether Assistive Technology can be used to remove barriers. On the other hand if we apply the medical model of disability, we could argue that the model reflects a medical model of disability with its reference to assessing for Assistive Technology that involves screening and diagnostic evaluation. Polarity such as this has led accessibility advocate Cooper (2012) to argue that a functional model of disability (which combines both social and medical aspects) has relevance for the field of accessibility.

There may be value in linking our models to models of inclusion such as models of inclusive education or of digital inclusion. For example, in my 2014 book I moved my gaze away from accessibility and towards a digital inclusion framework. Drawing on a conceptual framework that incorporated: access; accessibility; equity, empowerment and meaningful use I defined digital inclusion as a process whereby universities and colleges transform their structures and processes to ensure that disabled students are able to participate in higher education. This transformation requires three key actions:

1) Using technology in all college and university administrative and teaching processes (from admissions through to graduation) as a tool to increase both the accessibility of higher education to disabled students and the equity of learning opportunities and outcomes;
2) Enabling disabled students to make informed and empowered decisions about how to use technology to support their learning in ways that are personally meaningful;
3) Ensuring disabled students have ready access to the resources they require to act on these decisions.

Finally, with regards to a geographic lens, my question to this international symposium representing the five countries of US, Canada, UK, Germany and Israel is: Is it possible that different models are appropriate for different countries? If the answer is yes then this may explain why Universal Design dominates in US but not in UK or Europe.

CONCLUSION

One of the major aims of this paper has been to provide an underpinning critical framewoek for the first symposium of the International Network on ICT, disability, post-secondary education and employment. In my examination of the models and frameworks that exist in the field I have:

- Offered a framework for distinguishing between models and frameworks in terms of their focus and purpose
- Suggested three important and probing questions that we need to be asking of our models and frameworks and of ourselves.

It is my hope that the symposium will expand on my ideas and in doing so question those things that are 'taken-for granted' as truth or fact in the field in order to re-imagine both our research and our practice.

FIGURES

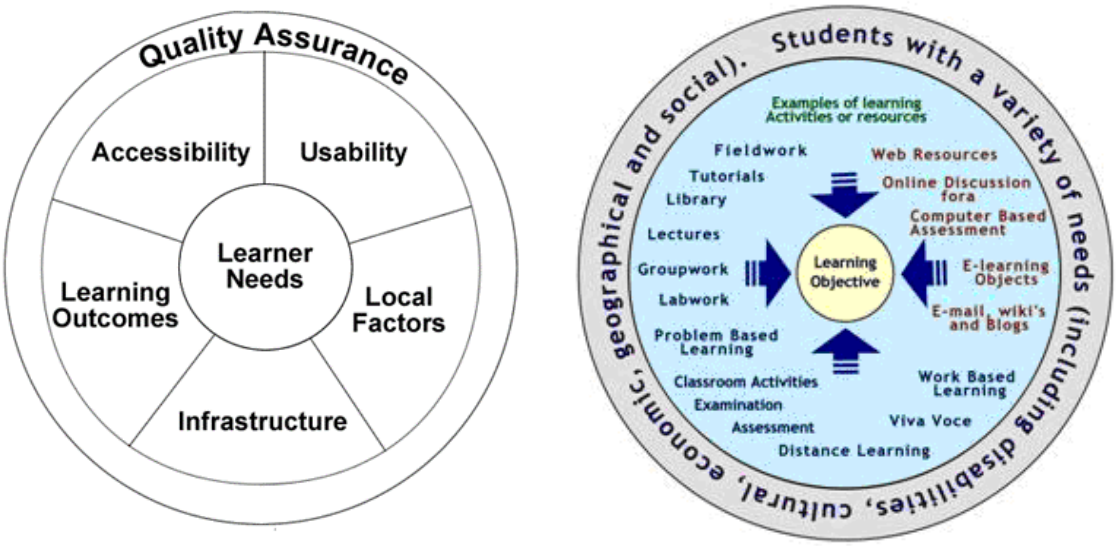

Fig 1 Early and later version of holistic model of accessibility

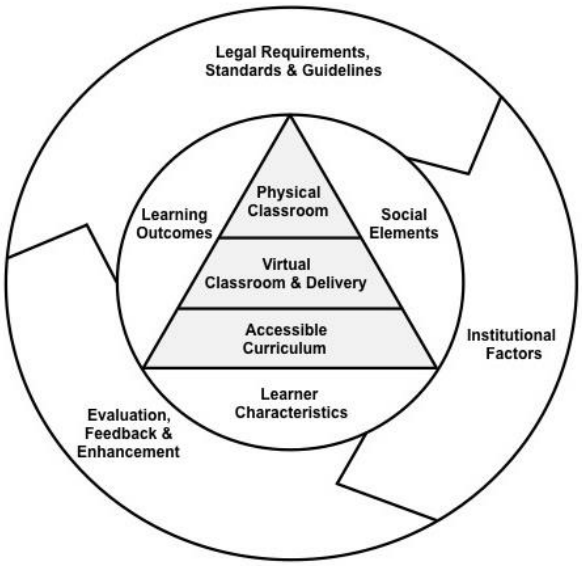

Figure 2: The VIVID (Vision Impaired using Virtual IT Discovery) Model

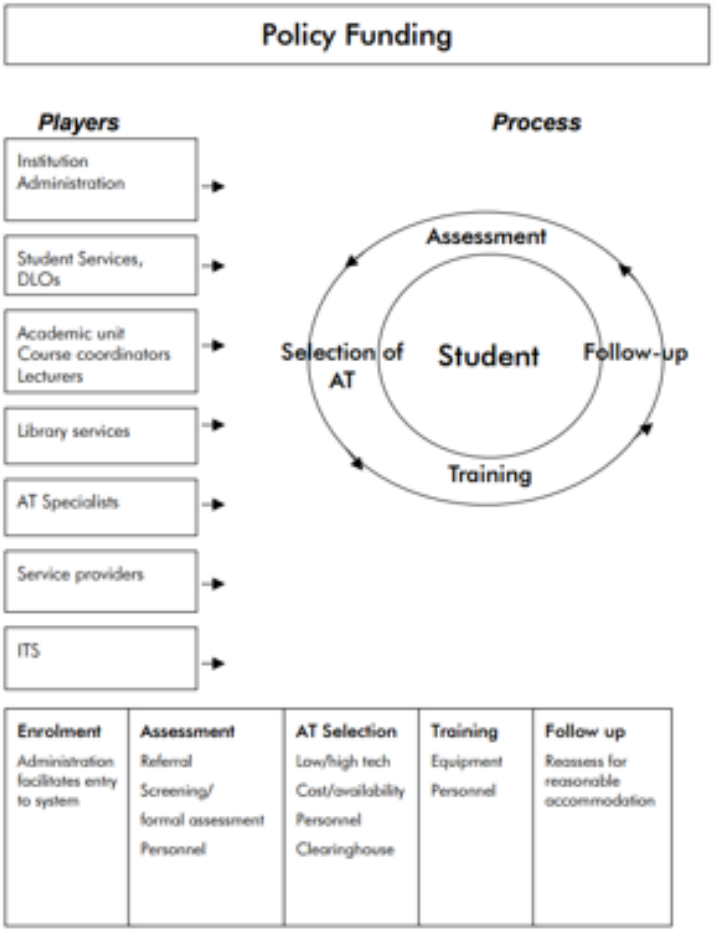

Figure 3: The composite model of Assistive Technology Service delivery in post-secondary education settings.

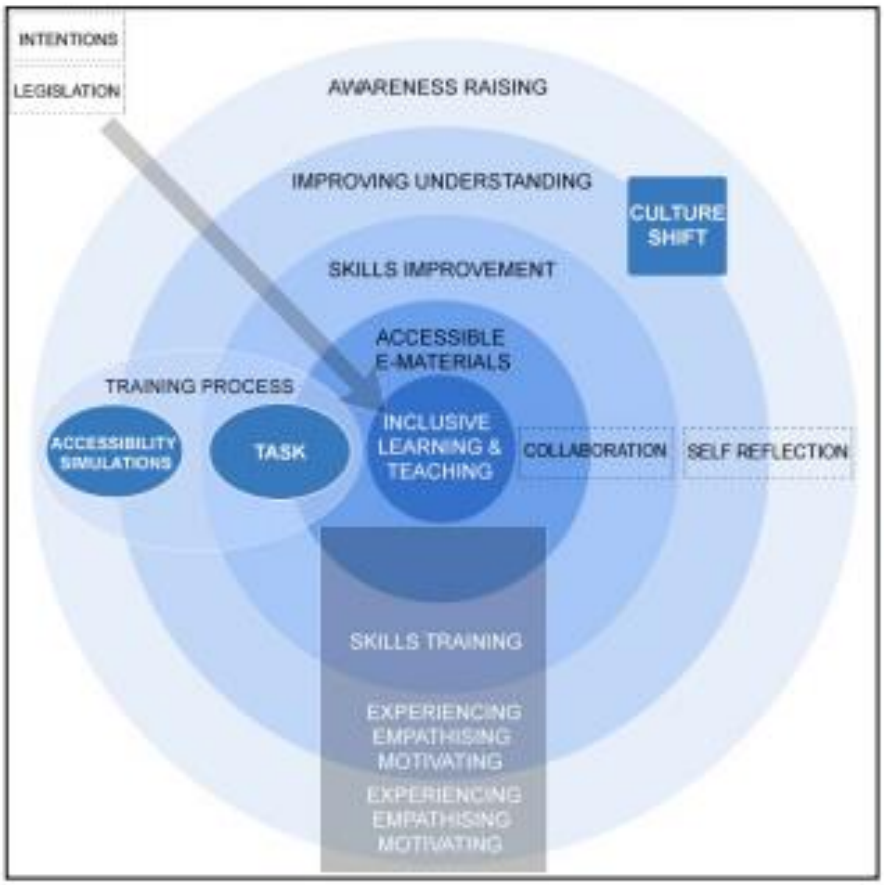

Figure 4: A staff development framework for inclusive learning design

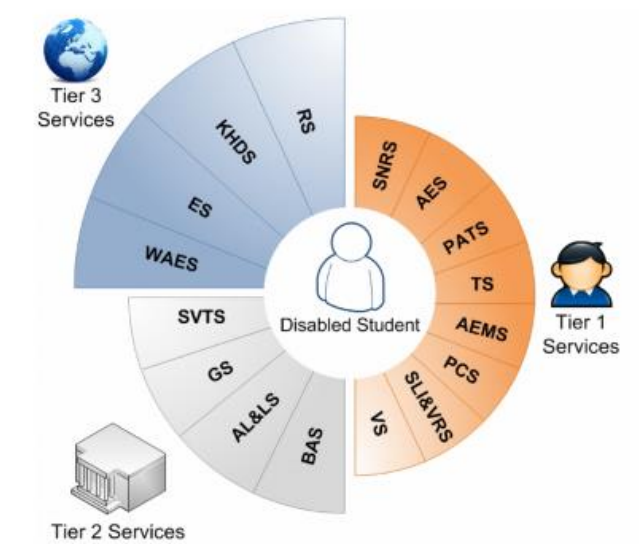

Figure 5: A Model of Accessibility Services Provision for Students with Disabilities in Higher Education

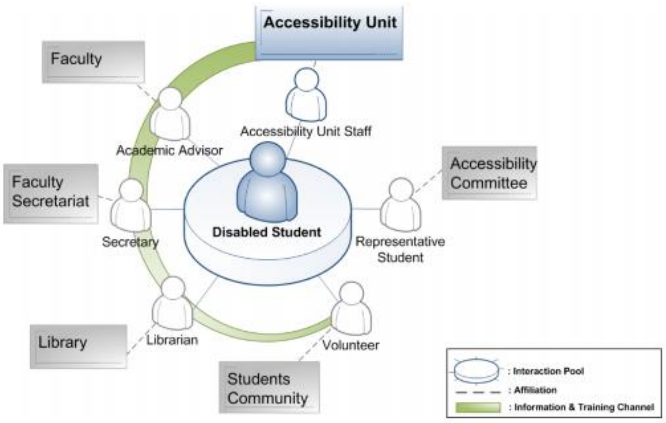

Figure 6: The stakeholders who mediate the relationship between a disabled student and the accessibility unit

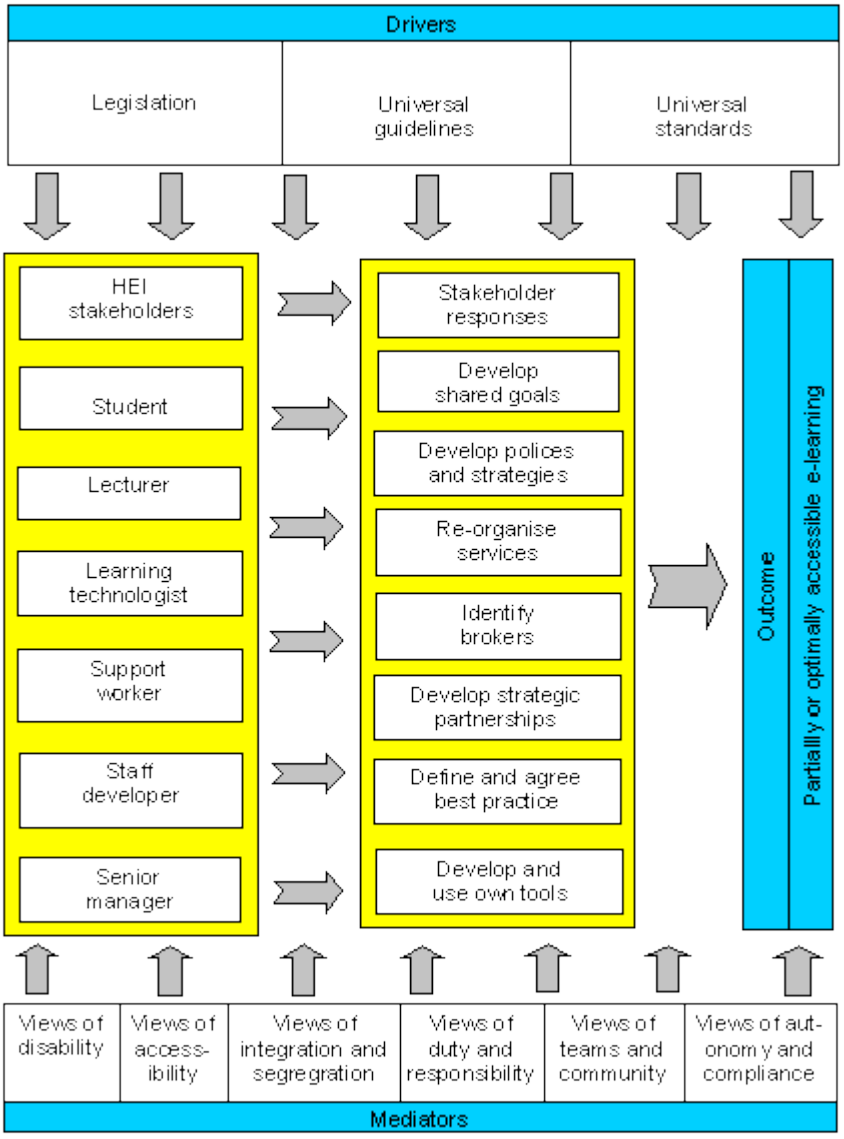

Figure 7: The contextualised model of accessibility

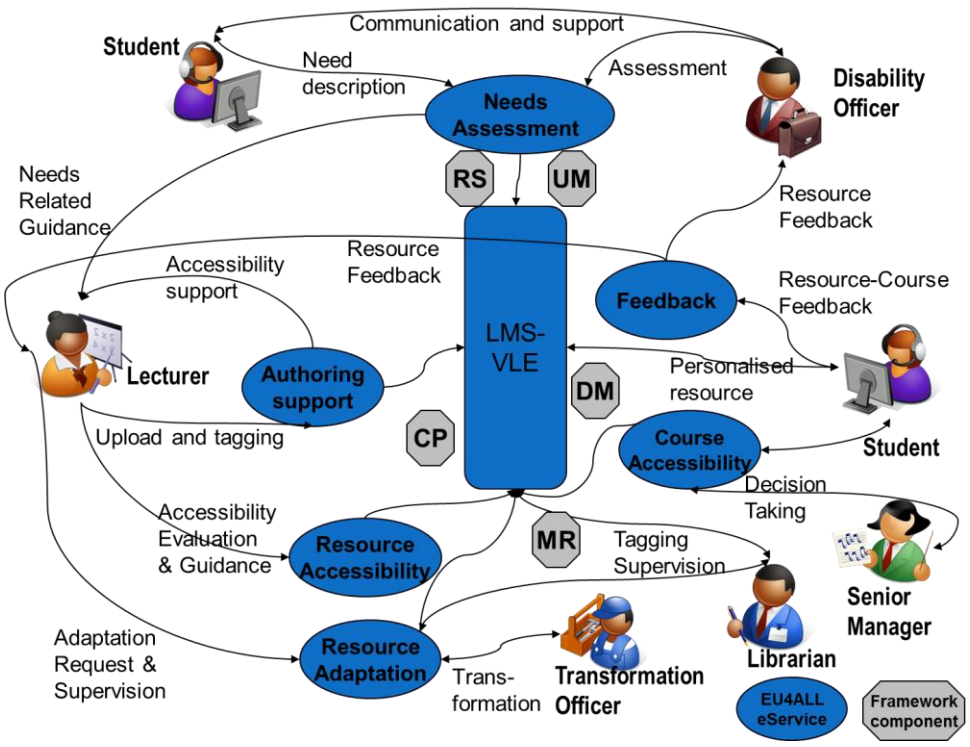

Figure 8: The EU4ALL Framework

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