Anonymous Dublin Core Profiles for Accessible User Relationships with Resources and Services

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Abstract:

This paper presents the case for a private (anonymous) personal profile of accessibility needs and preferences expressed in a Dublin Core format. It introduces the idea that this profile, identified only by a URI, is motivated by a desired relationship between a user and a resource or service. It assumes a new Dublin Core term DC:Adaptability and argues that, without any reference to disabilities, personal needs and preferences, including those symptomatic of common physical and cognitive disabilities, context or location, can be described in a common vocabulary to be matched by resource and service capabilities.

Keywords:

Accessibility, Adaptability, Dublin Core, personal profile, needs and preferences, AccessForAll, metadata vocabularies.

1. Introduction

The European view of disability, adopting the words of the World Health Organisation, is broad and states significantly that disability:

is not entirely an attribute of an individual, but rather a complex social and environ- mental construct largely imposed by societal attitudes and the limitations of the human-made environment. Consequently, any process of amelioration and inclusion requires social action, and it is the collective responsibility of society at large to make the environmental and attitudinal changes necessary for their full participation in all areas of life.

The European Commission continues:

Disabled people are a widely hetero- generous group but they can be divided into the following categories for the purpose of describing difficulty with access to ICT:

People with: - cognitive, learning and developmental difficulties - deafness, hearing impairment; - blindness, visual impairment or partial sight; - deaf-blindness; - speech and language impairments; - physical disabilities. Data collected by Eurostat, the Eurobarometer and some Member States permit the following generalisations to be made:

– With the ageing process, the incidence of disability increases. With an ageing population in Europe, the number of persons with disabilities will grow.

– The current estimate of prevalence of disability is 10-15%.

There is an additional significant part of the population who, without being disabled, could benefit directly from measures to improve accessibility and usability primarily designed for disabled people (i).

It is inappropriate and inefficient, when such a view prevails, to continue to describe people by what are seen sometimes as their disabilities: everyone, at some time or another, is disabled by the circumstances in which they find themselves and most people, as they age, will experience disabilities more often. Most people will find their disabilities vary according to the circumstances in which they are operating. Disability, in this sense, is a description of a poor relationship between a person and their immediate operational requirements.

Similarly, it is inappropriate and inaccurate to attribute descriptions of disabilities, which are descriptions of relationships, to named people. At the same time, it is efficient to recognize that many relationships are similar and that when involved in a user-resource relationship, many people will want to use the same description of that relationship. For

instance, many blind people trying to access a Web page with images will want to use similar profiles of non-visual relationships between a user and a resource.

The existence of a machine-readable profile of a disability relationship can be used, by suitable applications, to match users with resources and services they can use. This process involves a description of a user's immediate needs and preferences being matched with a description of the components of a resource or service until there is no disability. This may involve the replacement, augmentation or transformation of components of the resource or service, such as changes of sensory modality.

The Inclusive Learning Exchange (TILE) (ii) demonstrates this. Descriptions of user needs and preferences are matched with descriptions of resource components until they match and their delivery will form an accessible relationship between the resource and the user.

The user's descriptions of their needs and preferences, often called their profiles, will be used according to the context or circumstances and may differ according to the occasion. For convenience, a user will want to store and refer to such profiles rather than to create them afresh every time one is required. In some cases, they will depend upon profiles created for them by others, and in such cases may be especially dependent on their being stored and available at all times.

One interesting example of how disabilities change occurs when users move from one location to another, especially in circumstances where resources and services are location-based. In such a situation, an English-speaking person moving through Asia will suffer a range of disabilities as the resources and services they want are delivered in local languages and use local cultural signals they do not understand.

2. Accessibility profiles

An accessibility profile for use by a blind person attempting to read a newspaper online will be very similar to that for a person driving a car wanting to access Google News: both users will want vision-free access to the resource. Both users will need alternatives to visual content contained in the primary resource they seek and both will want to control their access to that resource using non-visual techniques. A simple description of the relationship they seek with the resource will be of a non-visual relationship. The characteristics of this relationship, the user's needs and preferences profile, should be simply expressed in machine-readable form and available to any resource publisher. It can be identified by its URI and does not need to contain any information about any individual

or community of people. It is, in fact, a description of accessibility details and could be know as a 'non-visual accessibility profile'.

A more complicated example occurs where, for whatever reason, there is a need for a visual relationship but the objects being viewed need to be larger than they might be when used on a stand-alone desktop computer. Such a case occurs frequently when resources are displayed on a large screen before a large audience. For this to be an accessible relationship, it does not need to be non-visual but there are some qualifications to be made to the visual qualities: the text and images need to be enlarged. Exactly how large the text should be will usually be best decided by the author in a situation where the details of the relationship are well-known, as for the large audience, but should always be available for customization where individuals may have special needs.

Flexibility of the kind required in this case means there needs to be a common way of describing the range of sizes of text and images so that the correct accessible relationship can be indicated by the user. Responses to the description of the relationship in such a case may depend upon the transformability of the resource components: scalar vector images will be easily transformed to suit such requirements and text that is to be presented according to cascading styles should be suitably transformable but, if it contains tables, there will be more complicated considerations.

In some cases, it is not a transformation of available components that is required so much as their replacement or augmentation. Such a case exists where a non-auditory relationship is required with, for example, a movie. Then, a text transcription of the background sounds might need to be supplied with captions for all speech. These may all need to be synchronized with the visual content. Where the only problem with the aural content is likely to be the choice of language, captions might be required but the background sounds will not be a problem.

2.1. Mobility and Disability

Human mobility is increasing in a variety of ways that are related to disability. People with traditionally recognized disabilities are becoming more mobile as are their peers, so the need for public facilities to be more adaptable is increasing. Mobility is happening at a global and a local level: people travel between countries and contexts with increasing fluidity and they travel between work and homes in new ways, often not actually attending a workplace. In addition, they move across communications devices with on-going expectations for similar services and facilities, including expecting that single resources will make

the transition with them.

As people move from one territory to another they often change context in ways that can adversely affect them. A French person arriving in Spain may find information resources being presented in Spanish inaccessible while they may wish to be given the weather report for their new location. They may, however, want to know about the weather they have left behind. It is not clear that location-based services should always account for the physical location of the user.

Location-independent relationships with resources will sometimes be of use while at other times location-based relationships will be required. These issues have been described elsewhere in greater detail (iii).

Similarly, device dependent relationships with resources will sometimes be useful and at other times, users will want device independent relationships. Imagine the user who has just used a touch screen to access some information about a tourist facility and now is looking for the same information on their hand-held device. They may want the resource transformed to suit their hand-held device or they may want to see again exactly what they saw on the large-font, super-simple touch screen.

2.2. Accessible resources and services

The provision of resources and services that ensure the correct accessible relationship for a user depends upon the existence of many components all with special accessibility characteristics. Captions for films are usually made by organizations known as caption houses: caption houses specialize in making captions but not films. Signing for people who use sign languages is usually done by specialists in that field; videos of signing that might be needed to complete an accessible relationship are likely to come from a source other than the original publisher of the resource.

In other words, the components that may be required to complete an accessible relationship with a resource or service are often distributed and may be the result of cumulative authoring. All that is necessary is that the components are available just-in-time for delivery to the user.

Very often, as is obvious from the examples already given, they may be combined in different ways for different user/resource relationships. This means it is most convenient to not fix them to a particular relationship with any one resource, but to maintain them separately and make available the necessary metadata for them to be fetched when needed. The same metadata can be used to identify a need for more components in anticipation of a demand for them.

The definition of accessibility implied here is that

the relationship between the user and the resource is one that enables the user to make sensory and cognitive contact with the content of the resource. This is expected to occur at the time of accessing the resource or, in other words, to be achieved just-in-time. This is the definition being advocated by the IMS Global Project's Accessibility Special Interest Group and supported in a growing number of communities. It is known as the AccessForAll definition of accessibility (iv).

In addition to the availability of the necessary components to satisfy the relationship required by the user, there is a requirement for the metadata that will be used to arrange the final composition of the resource. There is also, of course, a need for a way of communicating the requirements, or the metadata. The vocabularies and common specifications for their description are the topic of this paper. W3C is working on similar issues in their Device Independent Working Group and their focus is on what they call the Composite Capabilities and Personal Preferences specifications (v). Collaboration between IMS and W3C will hopefully mean these developments will work together.

3. Relationship Descriptions

3.1.Human-Computer Interactions

There are three modalities universally recognized as relevant to the human-computer relationship: visual, auditory and tactile. (Although smell is sometimes used, work has not yet reached the stage where this can be included here.) There are many possible variations of the modalities and their roles can be important: auditory input and output are not necessarily related to a user but are often varied according to context. In a library, one may be able to listen with headphones but asked not to use voice input; in a car, general auditory output may be acceptable and voice input may be essential. While input and output are, in some cases, useful distinctions to make, in the case of accessibility it makes more sense to talk about display characteristics, control characteristics and content characteristics (vi).

For people who use adaptive technologies with special settings, describing their control needs and preferences may mean providing information about the settings for their personal adaptive technology, especially when that requires something like an on-screen keyboard to be activated by a head-pointer. In the case of an on-screen keyboard being used, the display characteristics of the resource also will need to be adapted to allow for the loss of screen space for display purposes. In addition, there may be requirements for other display characteristics, and

there may be separate needs for content adjustment.

Particularly for people for whom settings are crucial to their engagement with resources, needs and preferences are required. If a need cannot be fulfilled, their preference for what to compromise can make all the difference. For others, if flexibility is possible, it can mean greater satisfaction.

As, in fact, the many requirements can conflict, determining a structure for their representation that allows for them to be described fully and unambiguously is essential. For this reason, descriptions of needs and preferences for display, control and content characteristics need to be separated. The needs and preferences need to be easily describable, so it is essential that if there are no special needs, nothing needs to be described, but that when there is a need, there is a hierarchy of details that are easily understood and useful.

In addition to the three categories described and their details, there is an over-riding quality that is essential in the human-computer context. Usability is not a technical quality but it can be the most significant quality when user resource interactions are required. It is not included as a technical characteristic of AccessForAll but is assumed to be contemporaneously considered.

3.2 Display descriptions

Where there can be no effective visual relationship with resources and services, all visual displays will need to be presented in some other modality. Often the choice is for auditory presentation of the visual content but it may be for tactile displays such as Braille or other tactile forms. Where the adaptive technology does not change the modality but changes the characteristics of the display, as in the case where screen-enhancing software is being used, the requirements for the desired display may involve object sizes, colour, or placement on the screen. The requirements can be very detailed and vary depending on the circumstances. Changes in the modality of content, as occur when a screen reader renders visual content (text) as auditory content, may depend upon it being possible to transform the content in this way. This in turn will depend upon the form of the original content: it can be transformed easily unless there is formatting, for example, that interferes with the process. The 'transformability' of the text will need to be described if it is relevant to the user's relationship with the text.

3.3. Control descriptions

Not all users control their systems using the typical mouse and keyboard combination. In some cases, they use assistive technologies that effectively replace these devices without any adjustment but in others they use technologies that require special configuration. An on-screen keyboard will use screen space that will have to be denied to the resource or service so that any resource or service that cannot accommodate this loss of screen space, for example because it demands a full-screen display for all controls to be available, will not be suitable for use in some circumstances.

3.4. Content descriptions

The relationship between a user and a resource or service will also be accessible only if the content is perceptible by the user. Perception in this sense includes the case where a dyslexic person needs more than the usual image-based content because they cannot process a text-heavy resource; while a person with neurological damage, such as a stroke victim, may not manage a screen that is too 'busy', or a blind person is working with an explanation that is based on an example that is useful only to people with vision. It is often the case that the original content has to be supplemented, perhaps with the availability of a dictionary or captions, or replaced by different content that achieves the same outcome but in a different way. Information about the resource that indicates that it contains such alternative content, or the location of such content that is available externally, is needed to determine if the user will be able to form an accessible relationship with it in terms of perception.

3.5. User needs and preferences

The relationship between a user and a resource is defined as accessible when the characteristics of the resource or service, as delivered, match the user's control, display and content (perceptual) needs and preferences.

The resource or services' characteristics can be fully described for this purpose using the proposed Dublin Core Adaptability element or other metadata specifications.

Information about the user's needs and preferences also needs to be available.

Where visual content is to be presented by an adaptive technology, such as a screen reader, the user's preferred settings for the screen reader will need to be described. These settings can be very detailed and may or may not vary according to the circumstances in which they are being used. When the assistive technology is an on-screen keyboard, not only will it limit the screen space available for the resource, as described above, but the delivery system will need information about the user's requirements in
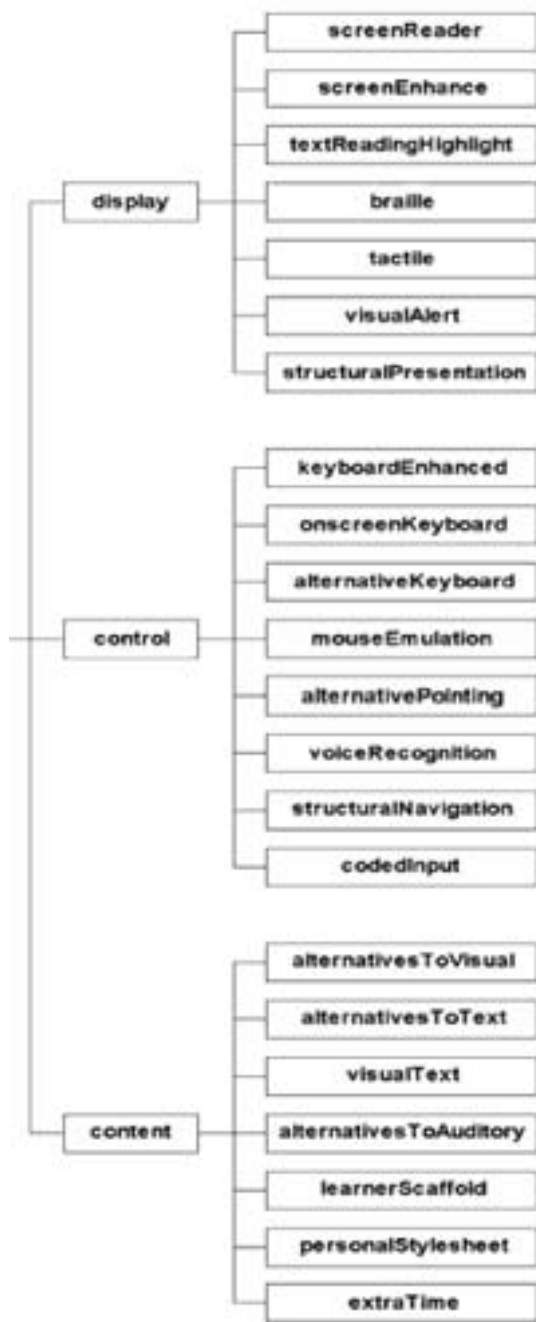
Fig. 1: AccessForAll structure and vocabulary (vii)

terms of keyboard settings.

The control settings for a user may be detailed and it is often not practical for the user to establish them every time they are used, even if they are able to do this themselves.

Details regarding the desired language of the content, the complexity, style and illusory level of the language used, and its cultural dependence, can be critical to accessibility.

Web-4-All uses a smart card that carries the necessary information about a user's needs and preferences for settings for adaptive devices and software available within a device. The computer establishes the correct control relationship between the software and the user and resets the computer when the user's card is withdrawn (viii).

It is the author's contention that if the resource or service's capacity to adapt to different user needs and preferences is described in a Dublin Core element, the individual user's needs and preferences also should be described in Dublin Core format. So we imagine a resource that contains information about a user's needs and preferences; what in some contexts is being called the user's Personal Needs and Preferences (PNP) (ix). Then we imagine a metadata record of that resource. It is possible, of course, that the metadata record is embedded in the resource.

4. A user needs and preferences application profile

It is obvious from the discussion above that in order to match a resource or service to a user to achieve accessibility, there is no need to identify the user. All that is required is machine-readable information about their needs and preferences.

The Dublin Core practice of creating a set of elements for use where those elements come from already established element sets is known as the process of creating an 'application profile'. An application profile for user accessibility needs and preferences that satisfies the requirements needs to contain one vital element; the DC:identity of the information (resource) expressed as a URI. This URI must, therefore, point to the user's accessibility needs and preferences information which should be in a machine-readable form. Users may like to think of profiles as being associated with certain contexts, for instance the lecture theatre version, or the JAWS laptop version, and in such a case the profile could be named. So we could find DC:title being used for this. The application profile may contain more DC elements, such as DC:subject, DC:description, DC:creator, etc. None of these need identify the user for or by whom the AccessForAll information will be used. They may, on the other hand, clarify who could take advantage of the profile: for instance, all students in a lecture theatre will probably share the need for large print on the overhead screen. This could be explained in a DC:description element. It may be of interest to know who developed the user needs and preferences profile, so DC:creator could be used to indicate this. The date of a profile might be significant when new versions of adaptive software are released so DC:date may be useful.

Recommended best practice for describing the
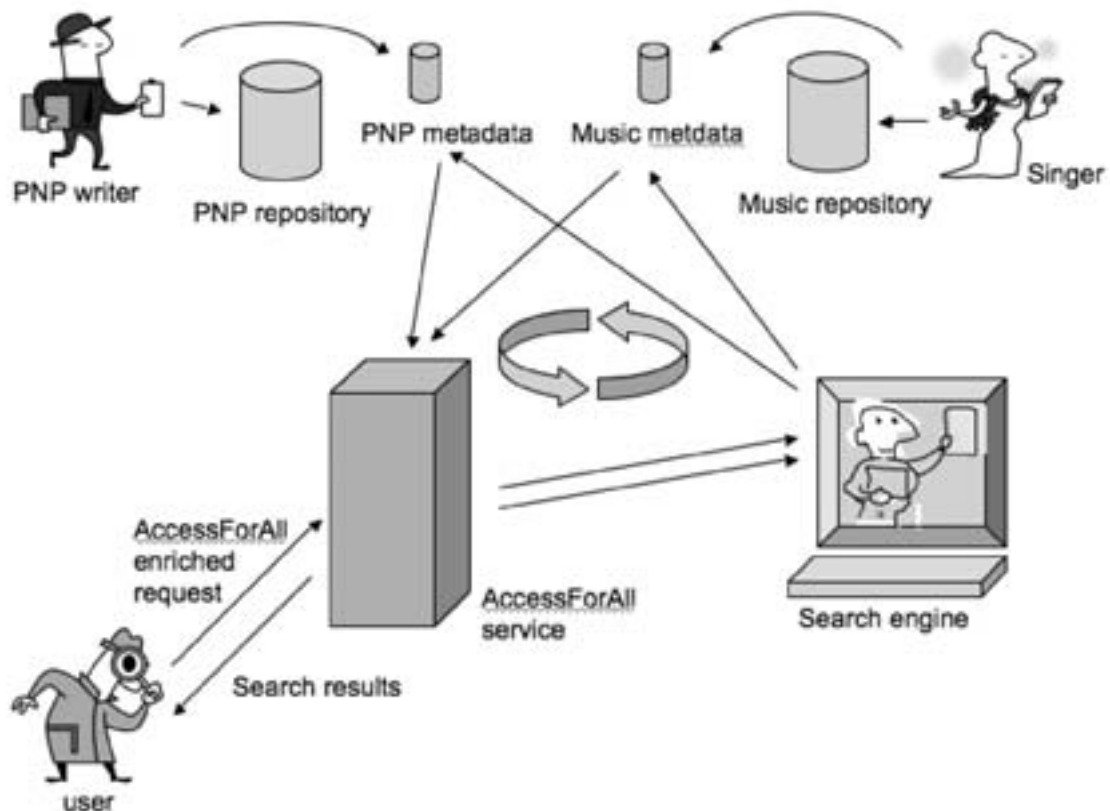
3.6 Fig. 2 Diagram showing cycle of searches and role of AccessForAll server

accessibility characteristics of resources and services is to use the structure and vocabulary developed by the DC Accessibility Working Group in collaboration with the IMS Global Consortium and others. As metadata about resource accessibility characteristics has to be matched to metadata about a user's needs and preferences, best practice for the description of the user's needs and preferences is to use the same structure and vocabulary as for the resource characteristics. The structures and vocabularies for describing the resources and the users' needs are known as the AccessForAll profiles and are described below.

4.1. User needs as a resource

By rendering the user's needs and preferences profile as a resource, problems associated with the politically unpopular activity of labeling people by disabilities can be avoided. The technical problem that a single person will be associated with a number of AccessForAll profiles is also avoided as they can point at different times to any of a range of profiles. In addition, where there is a need for many users to share a profile, as with students in a lecture theatre, this is easily achieved.

A system working on the match, to ensure accessibility, will read the AccessForAll profile of the user (or user group) and use that information to test the metadata of potential components for the resource or service to be delivered. In the absence of a user's AccessForAll profile, systems can assume that a user has no special needs to constrain their relationship with resources and services at that time.

When a system is to be used simultaneously by two users who point to different profiles, it may depend on the circumstances how this is to be handled. If they are to share a screen, their needs will have to be harmonized. If they are working on the same application but separately, as when two remote users share a chat session, their individual needs should be accommodated. When the two users are, for example, a corporate group for whom there is a corporate set of 'needs and preferences' that conflict with the individual's essential needs and preferences, the latter should be matched in preference to the former.

4.2. Accessible publishing

Systems, rather than individual resources, achieve accessibility according to the definition being promoted in this paper. Specifically, while universal

accessibility of resources and services is always a goal and conformance to the universal accessibility specifications recommended by the World Wide Web Consortium is recognized as best practice, it is known to be unlikely to be attained on a regular basis and not as essential as actual accessibility of the user and resource relationship at the time of use (x). The difference between the earlier approach and that now being offered with the use of metadata is that the latter definition allows for just-in-time provision of components to satisfy the accessible relationship and these components can be attained from cumulative, distributed authoring. The former definition, requiring universal accessibility of resources, demands just-in-case resource composition and therefore inclusion of all potentially necessary forms of display, control and content, including many that may never be used.

4.3. Accessibility Vocabularies

At this point it should be noted that while the user's PNP is described by a metadata record, it is itself metadata in another sense. The value of this is that it can be used in conjunction with resource metadata in the matching process for accessibility.

The vocabularies for the metadata to be associated with the resource or service and with the user's needs and preferences for accessibility have been carefully matched in the AccessForAll profiles. Other technical device information might also need to be conveyed to the resource server but it is expected to be covered by the work of the W3C Device Independence Working Group or others using CC/PP.

For all preferences, usage is required to determine if the user must or must not have it or if they merely have a preference for the setting. Flashing content, for example, can be dangerous for some users and content with nothing but graphics will be useless to a blind person unless they have a friend available to describe it to them.

As explained above, AccessForAll considers three aspects of resource accessibility and user needs; control, display and content.

4.4. Control

For control, there are a number of combinations and settings that have been recommended from experience and research at the Adaptive Technology Resource Center at the University of Toronto (). It is necessary to be able to capture what is necessary with proprietary devices and systems and also what is generic to types of systems and devices. It is also necessary to be aware of possible developments and so there is room for extensions. A typical example of the definition of these needs is as shown:

3.2.41

text reading highlight generic preference set
a collection of data elements that states a user's preferences regarding how to configure a text
reading and highlighting system that are common to all text readers/highlighters, regardless of vendor
3.2.42
text reading highlight preference set
a collection of data elements that states a user's preferences regarding how to configure a text
reading and highlighting system (xi)

These definitions have been represented in a structured hierarchy so that it is easy for users or their assistants to provide only as much detail as is necessary. Nevertheless, due to the complexity of dealing with the multitude of possible needs, the vocabulary is very large ().

4.5. Display

There are also many variations in what has been termed 'display'. Notably, sensory modality adaptations mean that a so-called display might be aural, visual, or tactile, for instance. Once the modality or modalities are determined, there may be settings that need to be determined. A typical example is for a user who can see but cannot distinguish red-green dependent information.

4.6. Content

Content alternatives and supplements such as learner scaffolds are the focus of the preference sets for content.

One aspect of content is the transformation of text to suit user's PNPs. Text, the format, is capable of being transformed into audio and tactile content if it is properly formed. Satisfaction is determined by compliance with the W3C Accessibility specifications (xii). Where a user's requirement is transformable text, then, it is also a requirement for partial conformance of the text with W3C guidelines.

4.7. Reuse of available vocabularies

As the vocabulary reaches its most detailed position, it is often possible to adopt existing standard vocabularies as has been done throughout the AccessForAll profiles. For example, the vocabulary for settings for dynamic Braille displays is established and AccessForAll has no reason to redefine it.

5. AccessForAll and Dublin Core

It has been argued that it would not be very difficult to develop an application profile for a set of user accessibility needs and preferences (PNP). Using

6.2 Display

6.2.1 Display Preference Set

Attribute	Allowed Occurrences	Datatype
screen reader preference set	Zero or one per Display Preference Set	Screen_Reader_Preference_Set
screen enhancement preference set etc	Zero or one per Display Preference Set etc	Screen_Enhancement_Preference_Set etc

6.2.2 Screen reader Preference Set

usage	Zero or one per Screen Reader Preference Set	Usage_Vocabulary
screen reader generic preference set application preference set	Zero or one per Screen Reader Preference Set Zero or one per Screen Reader Preference Set	Screen_Reader_Generic_Preference_Set Application_Preference_Set

And

6.2.9 Screen Enhancement Generic Preference Set

font face preference set	Zero or one per Screen Enhancement Generic Preference Set	Font_Face
font size preference	Zero or one per Screen Enhancement Generic Preference Set	Positive integer
foreground color preference	Zero or one per Screen Enhancement Generic Preference Set	Color
background color preference	Zero or one per Screen Enhancement Generic Preference Set	Color
etc	etc	Etc….

**Fig. 2 Extracts from the "Individualized Adaptability
and Accessibility in E-learning, Education and Training
Part 2: AccessForAll Personal Needs and Preferences Statement", ISO/IEC JTC1 SC 36/WG 7 draft (xv)**

resultant DC records for discovery of suitable PNPs is akin to finding any other resource. The deeper question is whether a PNP, given that it too is metadata, can fit into the DC framework and if it should. The argument in favour of pursuing such a goal is that it could then more easily be managed and processed by existing metadata systems. On the other hand, the complexity of the accessibility PNP might be better dealt with by a specialized system, perhaps as a service.

Another interesting challenge is to deal with the recursive nature of accessibility matching that involves having a first 'main' resource identified and then testing its match with a PNP before perhaps having to de-compose it to find an alternative to one component and to transform, replace or supplement that component, before re-assembling the resource and re-testing the resource or perhaps having already test-matched the new component..

6. Conclusion

This paper has presented a case for an application profile for a user's accessibility needs and preferences, expressed as a resource, that is of critical importance to some potential users of electronic resources and services. It is hoped that by working with familiar DCMI structures and practices, systems can easily access metadata that will be used to accommodate the needs and preferences of users, most particularly those for whom use of most resources and services is currently impossible, and so make information systems much more inclusive.

While the needs and preferences to be accommodated are for people, the case avoids the use of metadata describing people and instead offers the idea that a description of the necessary relationship between a user and resources and services is simply another resource. It advocates the use of well-described profiles of user accessibility needs and preferences and opens the way for these to be generalized for classes of users, such as non-visual users, or non-auditory users. It avoids all association of disabilities and special needs with people's identity.

It assumes the use of a Dublin Core element for adaptability and co-existence with specifications for Composite Capabilities and Personal Preferences from W3C.

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v http://www.w3.org/Mobile/CCPP/

vi http://www.imsglobal.org/accessibility/

vii image from AccessForAll Specifications, http://www.imsglobal.org/accessibility/

viii http://web4all.ca/

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x See eg 2005, "User-Centred Accessibility Supported by Distributed, Cumulative Authoring" http://ausweb.scu.edu.au/aw05/papers/refereed/nevile/ http:// www.utoronto.ca/atrc/

xi from http://jtc1sc36.org/doc/36N1025.pdf

xii see current version at time of writing at http://jtc1sc36.org/doc/36N1025.pdf

xiii http://www.w3.org/TR/WAI-WEBCONTENT/

xiv http://jtc1sc36.org/doc/36N1025.pdf