# The National Accessibility Portal: An accessible information sharing portal for the South African disability sector

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## ABSTRACT

The National Accessibility Portal initiative is a large initiative aimed at improving the quality of life of people living with disabilities in South Africa. The initiative has several functional components, including the National Accessibility Portal, National Accessibility Portal Centers, research into developing localised client side assistive technologies and devices, advocacy as well as the development of a methodology allowing for replication in other developing countries with similar needs.

The focus of this paper is on the research and development of the portal in the bigger National Accessibility Portal initiative.

The portal's differentiating elements measured against other content portals is the ability to provide a configurable platform (based on the user's profile) for information sharing and communication in an accessible and usable fashion within the constraints of today's technologies, in the user's language of choice and in the most cost effective and sustainable fashion.

In this paper we describe the process involved in developing version 1.0 of the National Accessibility Portal; from gathering user requirements, addressing the issue of multilingualism, accessibility and usability challenges. We present initial user feedback comments and highlight ongoing challenges. In addition we present the technology stack and implemented functionality.

## Keywords

accessibility, internationalisation, localisation, configuration, adaptability, information sharing, content

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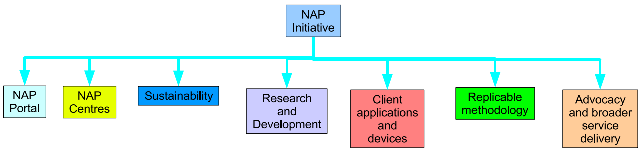


**Figure 1: Different functional components of the National Accessibility Portal Initiative**

## 1. INTRODUCTION

The National Accessibility Portal (NAP) initiative is a 5 year research & development project aimed at addressing the marginalisation of people with disabilities from the mainstream economy and society in South Africa [1, 2]. This initiative is lead by the Meraka Institute (also known as the African Advanced Institute for Information & Communication Technology) in partnership with a representative group of Disabled Person's Organisations (DPOs) [1] and the Office on the Status of Disabled Persons (OSDP) in the South African Presidency.

Figure 1 provides a high level overview of the various activities in the initiative. These activities include the development of the accessible portal, the design and implementation of centres to bring NAP closer to the community, various research and development initiatives aimed at filling gaps with regard to accessibility in a developing world context as well as the development of a methodology which can aid in the replication of the NAP initiative in other developing countries. In addition models are being developed to ensure the sustainability of the initiative and in particular the NAP Centres ensuring that this will continue to be a vibrant and growing intervention.

According to *Statistics South Africa*, at least 5.9% of the people living in South Africa live with one or more disabilities [3]. In a developing society, it is imperative that these

[1] The Independent Living Centre (ILC), The SA National Council for the Blind (SANCB), The Deaf Federation of South Africa (DeafSA), The National Council for Persons with Physical Disabilities in SA (NCPPDSA), The Quad-Para Association (QASA) and The South African Federation for Mental Health (SAFMH)

people have access to vital information and services and the means to effectively communicate.

To address the marginalisation of people a significant intervention is required. The NAP initiative faces the following challenges:

- lack of resources and capacity,
- fragmentation in the disability sector,
- funding limitations (creating a sustainable environment for the various aspects in the initiative),
- limited exposure to technology by the target audience,
- illiteracy challenges,
- the complexity involved in simultaneously addressing the different disabilities and
- the vast cultural and language diversity in South Africa.

In addition, several other significant social and technical challenges exist in providing access to functionality embeded in the portal, that provides information, services and communication in a cost effective and affordable way. These challenges include (but are not limited to):

- extracting usable requirements from the community,
- developing an initial information structure that is acceptable to the community and role players in which content can be loaded,
- no pre-existing mechanisms to make use of and include contributions from the community,
- presenting the mentioned functionality in an accessible format (this includes all disabilities as well as combination disabilities),
- presenting the interface in a usable format,
- all on a robust, configurable, sustainable, affordable and reproducible platform.

A number of accessibility guidelines has been developed for web designers, but they are seldom sufficiently implemented during the development phase [4]. Research has been published as how to optimise the impact of the guidelines with the least amount of cost to the developer [5]. Unfortunately these guidelines only address some of the challenges and obstacles that we faced in developing the portal. We thus needed to find unique and innovative solutions to be able to ensure community participation, provide solutions to their needs, to make the portal adaptable and hence more accessible and to be able to address multiple disabilities simultaneously.

In this paper we provide a technical overview of the National Accessibility Portal – an integrated, accessible, one-stop information, service and communication portal which attempts to address the challenges outlined above. Accessible websites exist to provide greater access to people with disabilities, where as the NAP portal is an accessible platform aimed at sharing information within the disability sector.

In the next section (Section 2) we describe the methodology used for the development of the portal. This is followed by a high level architectural view of the portal (Section 3) where we elaborate on the technological challenges and present the technology stack used. In Section 4 we describe the functionality delivered for the initial release.

In Section 5 we present our approach in providing a platform which is internationalisable, while Section 6 presents the techniques we employed to develop an accessible web interface. In Section 7 we describe experiences from both the user and the developer. We conclude in Section 8.

## 2. DEVELOPMENT METHODOLOGY

The portal's primary focus is to provide access to information in an appropriate and accessible format to assist in improving the lives of its target audience (this includes people with visual, hearing, physical, mental and intellectual disabilities as well as people with combined disabilities). Although a number of publications and initiatives focusing on web-based accessibility and usability are available, a limited number of publications on the development strategies and methodologies of web-based applications for people with disabilities are available. The methodology followed in developing the first release of the portal is described below.

A literature review was conducted on disability theory and practice in South Africa and internationally. The secondary research concentrated on the role players, the issues in the field as well as current interventions aimed at addressing the challenges in the disability domain. Site visits were made to a number of disability-related institutions such as DPOs (Disabled Persons Organisations), schools, colleges, universities, etc. In South Africa the Disabled Person's Organisations (DPOs) represent a cross-section of organisations representing people living with disabilities. During the site visits, observations were made and interviews were conducted to document and understand the environment and the current needs of the institutions and their members.

A co-operation agreement was established with appropriate DPOs to facilitate an exchange of information. This enabled the technical team to interact freely with experts in the domain and to identify the underlying needs and realities when living with a disability. Various methods were investigated with regard to the use of ICT to provide services more effectively to the disabled community.

The project team also conducted a number of workshops with stakeholders in one of the rural provinces in South Africa to understand the unique needs that exist for persons with disabilities in their environment. The delegates at the workshops included representatives from provincial government departments, local schools, colleges and universities, and other local service providers. In addition to general workshops on the landscape of disability in the province, the provincial Department of Education became one of the partners in the project and a number of workshops were conducted that focused on education and in particular the need for ICT to support the inclusive education initiative [2].

Using the knowledge gathered regarding the existing challenges, a high level architectural design was completed to provide an effective and cost-efficient solution to meet these challenges. An in-depth technology evaluation was initially conducted to determine which technologies provided the best solution to the unique requirements of this specific project. Based on the results of the initial evaluation a final technology stack was identified.

A first phase development of the National Accessibility Portal was implemented. An iterative, incremental design and development methodology was followed. NAP version 1.0 was completed and deployed. The portal was populated with initial data gathered from the various partners. Initial training on the system was provided to the various DPO members to ensure the use of the portal.

It is envisioned that future versions of the portal will be developed and deployed containing improved accessibility in addition to more functionality.

# 3. TECHNOLOGY

As described in Section 1 several challenges were identified and had to be addressed. With regard to the technology platform, several additional criteria were taken into account which influenced the technology choices:

- cost minimisation in terms of software licensing (assists in meeting the affordability challenge),
- an adherence to technical standards,
- a very active technical user community,
- a clear technology support and upgrade path,
- the technology must allow for rapid application design and development (including support for significant refactoring),
- this is a five year research and development project, thus the technology choice had to take in consideration the changing technology environment.

To address the cost minimisation and sustainability issues a decision was made to use open source technology. To allow for the longevity of the project a decision was made to use technology that has been standardised (or is in the process of being standardised) as this would ensure future technical support and maintenance. Cognisance of the available development pool influenced the choice of technology language. Java was selected, as South Africa has a large group of active Java developers which will be available to develop and support future versions of the portal.

## 3.1 Prototype technology investigation

An initial prototype was developed to investigate the various concepts in terms of usability, accessibility, localisation and internationalisation. This prototype was developed using a technology stack consisting of an Enterprise Application Server (JBoss 4), Struts [6] (for the presentation layer), EJB2.1 (stateless session beans – SLSB's) and Hibernate [7] as object-relational mapper (POJO's – plain old Java objects, representing database tables as entities) with PostgreSQL [8] as persistence store.

The development of the prototype demonstrator highlighted several issues that prevented the use of this technology stack. These included:

- State management: as only stateless session beans were used, the web session was used to maintain state (e.g. references to POJO's). This required manual management of the state in the web session. This approach to state management was the source of many bugs and memory leaks.

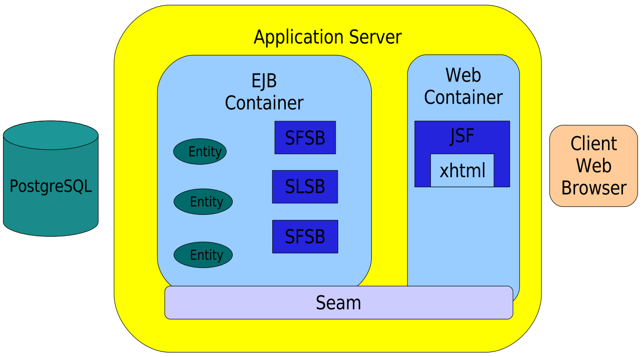


**Figure 2: Portal system architecture**

- Eager loading of POJO's from the persistence store – it is difficult to maintain an open Hibernate session required for lazy loading, thus the complete connected object graph containing all the entities is loaded when a top level object is retrieved. Obviously this is resource intensive and not the desired behaviour.
- Excessive plumbing code is required to wire the various stateless beans, Struts actions and POJO's.

## 3.2 NAP version 1.0 technology stack

Based on the learning obtained from the development of the prototype demonstrator, as well as attempting to comply to the technical criteria, it was decided to make use of several new building elements. The technology stack consisted of an Enterprise Application Server (JBoss 4) with support for the EJB3 [9] specification (a new component model for server side business and persistence logic). Domain objects were represented in entity beans. Application logic was coded in stateful (SFSB) and stateless (SLSB) session beans with the presentation layer developed using Java Server Faces [10] (a component model for the presentation tier) and Facelets (a presentation templating framework) [11]. JBoss Seam [12] (a new application framework for EJB3) was used. PostgreSQL was again used as persistence store. This technology stack is depicted in Figure 2.

Seam integrates the EJB3 and JSF component models, which simplifies design and implementation. In addition Seam introduces the following advantages:

- More efficient application environment:
  - Reducing code.
  - Easier to maintain.
  - Easier to refactor.
  - Use of annotations.
- Declarative state management.
- Lazy loading of entities.
- Out of container testing.

The chosen technology stack allowed for the rapid design and implementation of the portal. The use of Seam's conversation model allowed for effective resource management (a long running conversation is started with the presentation of a specific JSF page). This conversation and the associated resources are managed by Seam during the presentation of several JSF pages (e.g. a sequence of pages in a *wizard* to submit new content). At the end of the conversation (reached with the presentation of an appropriate JSF page) Seam releases all the resources, resulting in effective resource utilisation. With the introduction of annotations in Java 5 and the subsequent utilisation of the annotations in EJB3 and Seam, the need for plumbing code has been removed, allowing for a much cleaner code base with enhanced readability, resulting in code which is easier to maintain.

Facelets allows for the creation of templates (a grouping of JSF tags) which can be reused in any of the JSF pages. This functionality reduces maintenance effort as well as allowing for rapid layout changes.

# 4. FUNCTIONALITY

The portal was designed to contain functionality that is both useful and accessible. Some of the main functionality contained in the portal as shown in Figure 3, is described below.

- **Uploading of content:** Users are encouraged to upload information that would be of benefit to other users of the portal. Users have to register with the portal, and can then upload relevant material. Uploaded content goes through an approval process before it is available for viewing. This process ensures quality, applicability and relevance of content. Approved content can be edited by registered users. The edited content goes through another round of approval. Users can also translate a specific piece of content and upload the translated version. Examples of content that have already been uploaded to the portal are:
  - Information about specific disabilities.
  - Information on legislation pertaining to people with disabilities (e.g. the Integrated South African National Disability Strategy).
  - Contact details about schools for children with disabilities.
  - Information on workshops aimed toward persons with disabilities.
  - Contact details for accessible facilities such as day-care centers and residential homes.
  - Information regarding events associated with the disability community (e.g. the International Day for Persons with Disabilities).
- **Content View:** Allows users to view the content that has been uploaded. Users can select content for viewing through a hierarchical tree structure representation (consisting of *Services*, *Topics* and *Groupings*).
- **Content Structure:** Registered users with the appropriate access rights can manage the hierarchical tree structure in which content is uploaded. This tree structure ensures that content is logically grouped together.
- **Discussion Forums:** Registered users can join discussion forums on the portal dealing with specific issues ranging from assistive devices to education to training. Users can also create a new discussion forum thread if an appropriate discussion topic is not available.
- **RSS News Feed Aggregation:** The portal aggregates news feeds from various websites containing useful information about disabilities and related information. These websites are queried once a day to find relevant articles. Each RSS item remains in the portal for seven days before it is removed.
- **RSS News Feed Publication:** The portal presents new content elements in an RSS feed format, thus allowing aggregation from other sites.
- **Questionnaire:** The portal contains functionality which allows users (with appropriate administrative rights) to create a questionnaire or opinion poll. Analytical reports of the results are available to users.
- **Help us translate:** South Africa has a multitude of official languages and it is important for the content structure to be available in these languages. The *Help us translate* functionality on the portal allows users to assist with the translations in a chosen language. It fosters an environment of ownership and community among the users.
- **Search:** As the portal contains many different and wide ranging services, topics and content elements, a *Search* functionality is provided to allow for fast and accurate retrieval of desired content elements.
- **User Administration:** The portal contains a sophisticated user administration module providing role-based access to specific functionality.

Figure 4 presents the interface while displaying content. A few of the functional elements can be observed.

# 5. INTERNATIONALISATION AND LOCALISATION

In order to design and implement an application that can be localised, one has to identify the various elements that require translations and their respective technical challenges. These can be divided into three parts:

- Character set encoding.
- Entity representation at the application level.
- Static elements as presented on the web interface.

South Africa has 11 official languages. Many of these languages use a character set which cannot be represented with ASCII. This complexity necessitates the use of Unicode [13] (which provides a unique number for every character independent of the language, platform and program) and UTF-8 [14] (the lossless encoding of Unicode characters).

## 5.1 Character set encoding

In order to ensure the correct interpretation of the character set encoding the UTF-8 configuration has to be implemented in various layers of the application.

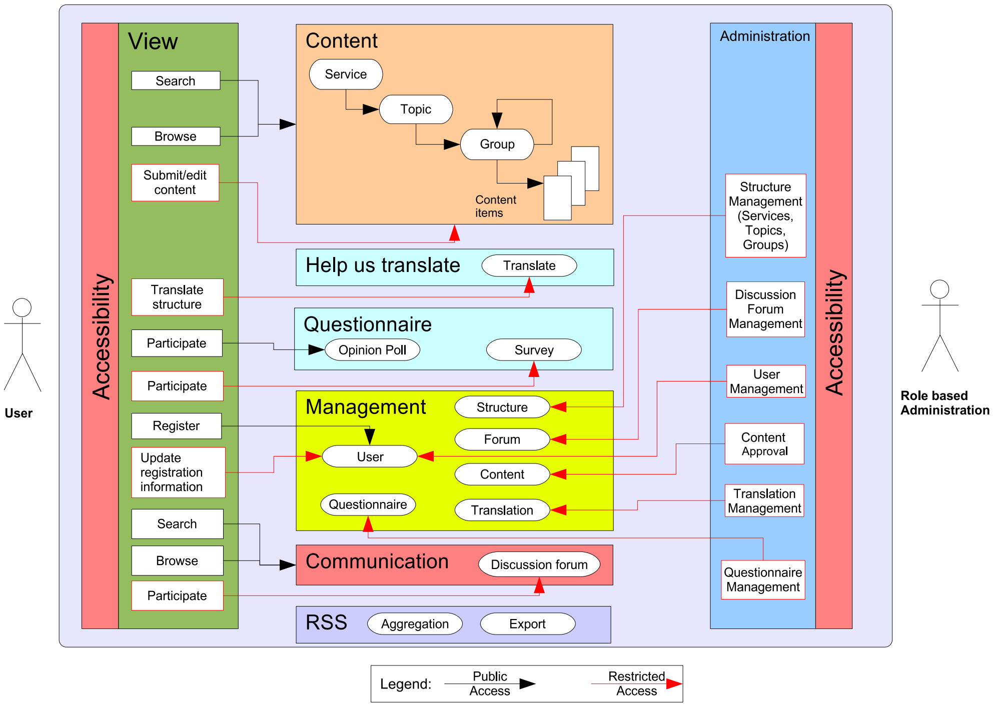
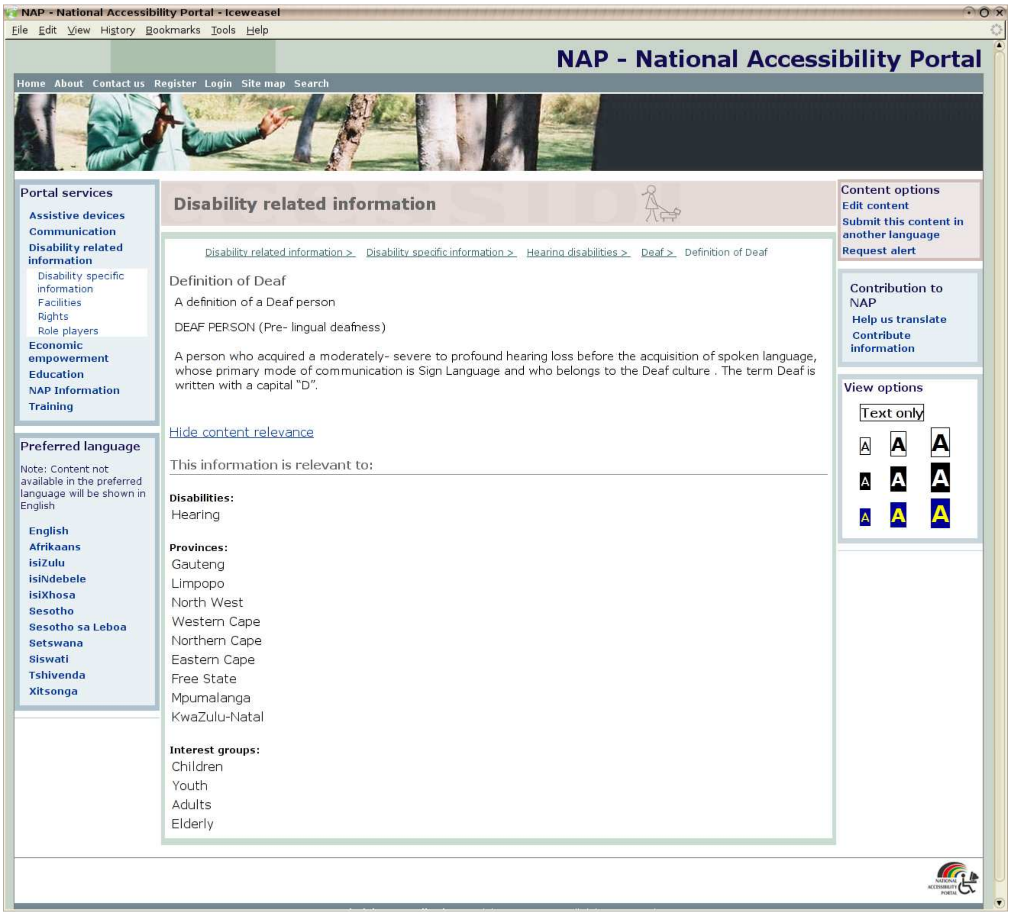


Figure 3: Functional components of the portal


NAP - National Accessibility Portal - Iceweasel
File Edit View History Bookmarks Tools Help
Home About Contact us Register Login Site map Search

NAP - National Accessibility Portal

Portal services

- Assistive devices
- Communication
- Disability related information
  - Disability specific information
  - Facilities
  - Rights
  - Role players
- Economic empowerment
- Education
- NAP Information
- Training

Preferred language

Note: Content not available in the preferred language will be shown in English

- English
- Afrikaans
- isiZulu
- isiNdebele
- isiXhosa
- Sesotho
- Sesotho sa Leboa
- Setswana
- Siswati
- Tshivenda
- Xitsonga

Disability related information

Disability related information > Disability specific information > Hearing disabilities > Deaf > Definition of Deaf

Definition of Deaf

A definition of a Deaf person

DEAF PERSON (Pre- lingual deafness)

A person who acquired a moderately- severe to profound hearing loss before the acquisition of spoken language, whose primary mode of communication is Sign Language and who belongs to the Deaf culture . The term Deaf is written with a capital "D".

Hide content relevance

This information is relevant to:

**Disabilities:**
Hearing

**Provinces:**
Gauteng
Limpopo
North West
Western Cape
Northern Cape
Eastern Cape
Free State
Mpumalanga
KwaZulu-Natal

**Interest groups:**
Children
Youth
Adults
Elderly

Content options

- Edit content
- Submit this content in another language
- Request alert

Contribution to NAP

- Help us translate
- Contribute information

View options

Text only

A A A
A A A
A A A

Figure 4: A view of a content page in the NAP portal

### 5.1.1 Database character set encoding

We used PostgreSQL as persistence store. In order to support the required UTF-8 character encoding scheme we had to create the database instance with Unicode enabled:

```
createdb -E UNICODE <instance> -O <owner>
```

### 5.1.2 Java Server Pages character set encoding

The following code snippet tells the browser to display the received page as UTF-8 encoded HTML.

```
<head>
 <f:loadBundle basename="nap" var="msgs" />
 <meta http-equiv="Content-Type"
 content="text/html; charset=UTF-8" />
 <title>#{msgs.applicationTitle}</title>
</head>
```

### 5.1.3 HTTP Request character set encoding

We implemented a Java Server Phaselistener to ensure correct character encoding interpretation between the web client and server (e.g. to prevent character mangling on form submits). The following piece of code illustrates the principle.

```
public class UnicodeEnforcerPhaseListener
                 implements PhaseListener {
 public UnicodeEnforcerPhaseListener() {}
 public void afterPhase(PhaseEvent arg0) {}
 public void beforePhase(PhaseEvent arg0) {
  try {
   ((HttpServletRequest) FacesContext
   .getCurrentInstance()
   .getExternalContext().getRequest())
   .setCharacterEncoding("UTF-8");
   } catch (Exception e) {
   logger.error("Failed to set UTF-8 encoding",e);
   }
  }
  public PhaseId getPhaseId() {
   return PhaseId.ANY_PHASE;
 }
}
```

## 5.2 Entity representation at application level

The portal has two different types of elements that need to be translated. They are the structural elements (allowing for the logical grouping of various content elements) and the content elements. Two different approaches are followed in providing interfaces which allow users to translate. Structural elements are translated with the *Help us translate* functionality, while content elements are translated through the addition of another content element.

### 5.2.1 Structural Elements

Figure 5 depicts the pattern used to allow for translations of a structural element. The *TranslatedName* entity implements the *International* interface containing methods to get and set the *name* attribute. The *StructureElement* contains a Map of *TranslatedName* entities for each of the languages for which translations are available.

### 5.2.2 Content Elements

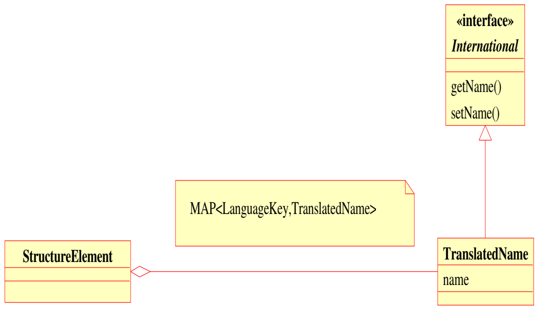


**Figure 5: Internationalisation of structural elements**

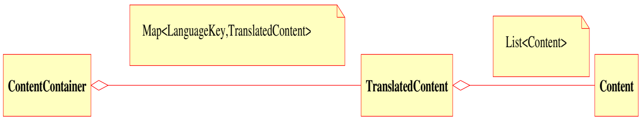


**Figure 6: Internationalisation of content elements**

The internationalised representation of content is more complex as it also has to allow for different versions of a specific translation (a current language version has been published and is viewable, whilst another version has been submitted containing improvements and is currently being reviewed by the content manager). Figure 6 shows the approach followed in allowing for translations as well as different versions of a translated element. *ContentContainer* has a Map which uses the language as key, containing *TranslatedContent* elements. This allows for different translations. The *TranslatedContent* element has a List of *Content* elements representing the different versions associated with a specific language.

## 5.3 Interface

Java Server Faces (JSF) makes use of resource bundles to associate translations with a specific key. Depending on the browser *locale* the desired translated string is represented in the HTML page. Shown below is a code snippet from nap.properties (the default resource bundle in English) illustrating the string to be displayed for the *welcomeNap* key.

```
welcomeNap=Welcome to NAP
```

Similarly nap_zu.properties contains the following isiZulu translation for the key.

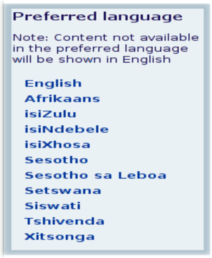
```
welcomeNap=Siyakwamukela ku-NAP
```

with a typical usage of the resource bundle as show in the JSF page snippet.

```
<h2>#{msgs.welcomeNap}</h2>
```

It is imperative that the interface provides a mechanism to easily switch between the available languages (especially seen in the light that not all content elements will have translations, thus requiring the user to switch to another language).

Figure 7 displays the HTML snippet allowing the user to change the preferred portal language.


Preferred language

Note: Content not available in the preferred language will be shown in English

- English
- Afrikaans
- isiZulu
- isiNdebele
- isiXhosa
- Sesotho
- Sesotho sa Leboa
- Setswana
- Siswati
- Tshivenda
- Xitsonga

**Figure 7: Available language choices for the interface**

# 6. ACCESSIBILITY

Accessibility is about giving equal access to everyone regardless of age, gender or disability. It is the degree of ease with which it is possible to reach a certain location from other locations. It is not to be confused with usability which is used to describe how easily an entity (e.g., device, service, environment) can be used by a user. One meaning of accessibility specifically focuses on people with disabilities and their right of access to information, often through use of assistive devices such as screen-reading assistive technologies.

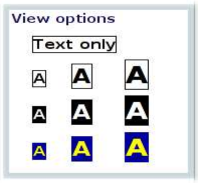
NAP's primary objective is to address the issue of accessibility simultaneously for all disabilities. However accessibility cannot be solved by the implementation of only one solution. The portal combines cutting edge open source technology, innovative approaches using this technology and knowledge gathered on accessibility (e.g. guidelines on accessibility as provided by the W3C [15]). Not all disabilities require technology solutions and devices, often only clear and concise language is required. The portal was designed with ease of navigation and consistency in mind. In some cases, no technical solutions exist for a specific disability (e.g. a Deaf user with low literacy). The NAP initiative has recognised this and is conducting active research (e.g. sign language avatars, other assistive technologies such as the Notetaker (a low cost, portable, open-source computing device configured for blind users) and GNApp (an open-source configurable, alternative and augmentative communication framework)) [16]. The portal provides various options to the user, allowing the user to choose the solution best aligned to address the user's disability.

## 6.1 Cascading Style Sheets

There are a number of choices a person can make on the portal to improve its accessibility. Firstly, the user of the portal has the option to change the size of the text, thus aiding people who have trouble reading small text. Each time a different font size is specified, a new cascading style sheet is loaded [17]. A user can also change the colour contrasts of the portal to increase its readability in particular for people with colour blindness. For instance a user can change it from white text on a black background to black text on a white background.

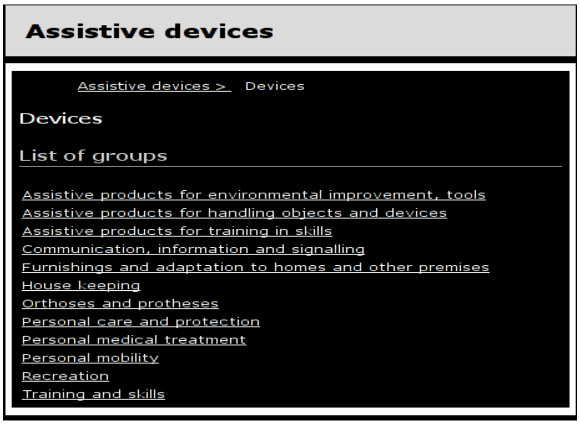
Figure 8 displays the font size options available as well the options to change the colour of the foreground and background. Figure 4 displays the interface with black foreground text and a white background. Figures 9 and 10 depict the other fore-and background options in the portal.

The portal provides an option to remove all cascading style sheet rendering, thus presenting the portal interface as


View options

Text only

**Figure 8: Different font sizes and background colours**


Assistive devices

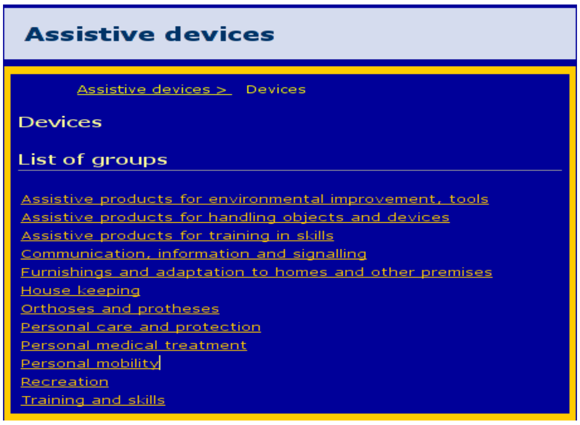
Assistive devices > Devices

Devices

List of groups

- Assistive products for environmental improvement, tools
- Assistive products for handling objects and devices
- Assistive products for training in skills
- Communication, information and signalling
- Furnishings and adaptation to homes and other premises
- House keeping
- Orthoses and protheses
- Personal care and protection
- Personal medical treatment
- Personal mobility
- Recreation
- Training and skills

**Figure 9: White on black presentation**


Assistive devices

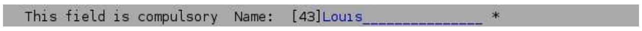
Assistive devices > Devices

Devices

List of groups

- Assistive products for environmental improvement, tools
- Assistive products for handling objects and devices
- Assistive products for training in skills
- Communication, information and signalling
- Furnishings and adaptation to homes and other premises
- House keeping
- Orthoses and protheses
- Personal care and protection
- Personal medical treatment
- Personal mobility
- Recreation
- Training and skills

**Figure 10: Yellow on blue presentation**



```
This field is compulsory  Name:  [43]Louis______________ *
```

**Figure 11: Rendered hidden text message**

text only. This mode can aid users with visual disabilities using screen readers.

## 6.2 Hidden text

Hidden text embedded in the HTML page enhances accessibility and navigation. The hidden text can be rendered as audio output by assistive technology clients such as screen readers. Hidden text can be used to insert invisible links to link directly to specific sections and to label the start and end of these sections.

Hidden text assists in labelling form elements and to indicate compulsory fields. Compulsory fields are normally indicated by a "★" next to the text input. However, the audible output of the symbol does not inform the blind user that the field is compulsory. In this instance a text string can be associated with the "★" which is rendered as audio by the screen reader.

The following code snippet generates a hidden text message to indicate to a user with a screen reader that the following text input field is compulsory. Figure 11 depicts the snippet as viewed through a console based browser.

```
<h:outputLabel for="firstname" id="l2">
  <span class="hidden-msg1">
   <h:outputText value=
      "#{msgs.compulsoryField}">
   </h:outputText>
  </span>
  <h:outputText value="#{msgs.name}:" />
</h:outputLabel>
<h:panelGroup>
 <h:inputText id="firstname" required="true"
  value="#{portalUser.firstname}">
 <f:validateLength minimum="1" maximum="50" />
 </h:inputText>
 <span class="compulsory">*</span>
</h:panelGroup>
```

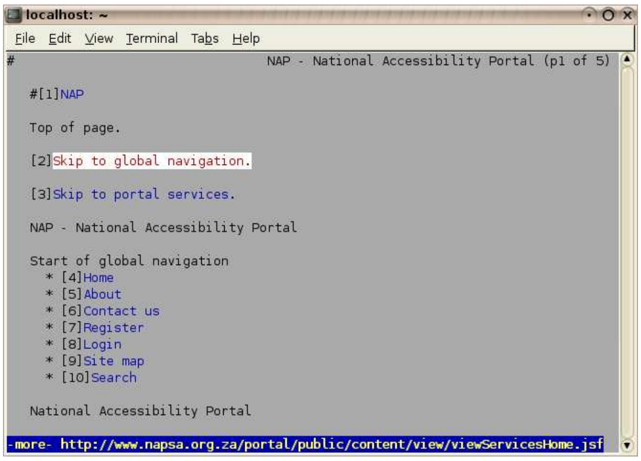
Below is the code snippet of the hidden text class used to embed hidden text messages.

```
.hidden-msg1 {
        overflow: hidden;
        position: absolute;
        left: -5000px;
        font-size:0em;
        display:none;
}
```

Figure 12 shows the portal homepage as viewed through a console based web browser. The presence of hidden text messages aiding in the navigation is clearly visible.

## 6.3 Accessible Content

Part of the functionality provided by the NAP portal includes the uploading of content by registered users. To ensure accessibility of uploaded content is quite difficult. The portal allows different types of content to be uploaded; for example documents, text, images and videos. Documents that contain images can be uploaded but these images will not necessarily have an image description, which makes it inaccessible.



```
#                                  NAP - National Accessibility Portal (p1 of 5)

   #[1]NAP

   Top of page.

   [2]Skip to global navigation.

   [3]Skip to portal services.

   NAP - National Accessibility Portal

   Start of global navigation
     * [4]Home
     * [5]About
     * [6]Contact us
     * [7]Register
     * [8]Login
     * [9]Site map
     * [10]Search

   National Accessibility Portal

-more- http://www.napsa.org.za/portal/public/content/view/viewServicesHome.jsf
```

**Figure 12: Console based browser showing hidden text messages**

One way to address this is to allow the user to load different content types separately. For example the user can upload an image, where the image name is a compulsory field. A field where the image can be described is also available but at this stage is not compulsory. In this way, meta information regarding the uploaded content is associated with the content elements. This meta information is rendered on the HTML page as *alt* tags. The same scenario is applied to the uploading of documents, videos etc.

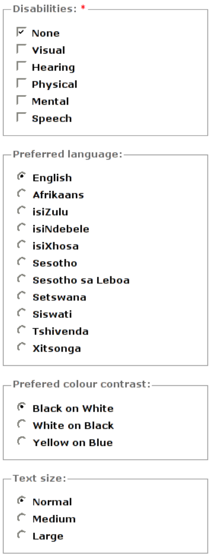
## 6.4 Interface configuration

Figures 7 and 8 depict mechanisms for the user to change the presentation of the interface based on current needs. The portal also provides functionality for the user to record personal preferences during registration. The preferences are used to reconfigure the interface upon login. Figure 13 depicts the input form presented to the user during registration.

# 7. EXPERIENCES

Initial user testing was carried out on users with visual, hearing and physical disabilities. The user base consists of two users employed as part of the NAP portal development team as well as five other users evaluating the portal in a usability lab. Feedback ranged from:

- easy to use and to navigate with the assistance of the hidden messages read by the screen reader,
- positive feedback on the availability of the different view options (Figure 8),
- requesting the addition of control keys to assist with navigation,
- target area around radio buttons and check boxes too small for easy selection, but preferring these as input mechanisms above list boxes,
- addition of 'Select All' option with check boxes,



Disabilities: *

☑ None
□ Visual
□ Hearing
□ Physical
□ Mental
□ Speech

Preferred language:

● English
○ Afrikaans
○ isiZulu
○ isiNdebele
○ isiXhosa
○ Sesotho
○ Sesotho sa Leboa
○ Setswana
○ Siswati
○ Tshivenda
○ Xitsonga

Prefered colour contrast:

● Black on White
○ White on Black
○ Yellow on Blue

Text size:

● Normal
○ Medium
○ Large

**Figure 13: User profile options**

- addition of back button on all screens to assist with navigation, and
- difficult for the blind to visualize the hierarchical tree structure of the portal.

We plan to address these comments in further versions of the portal, where after a full usability test cycle will be conducted.

There were a number of difficulties in creating multi-language content. Some issues which surfaced while creating multi-language content for the portal were:

- To encourage the formation of a user community who can submit appropriate content.
- The availability of people to assist with the translations of content and structural information elements.
- The availability of people who can verify that the translations were indeed correct and appropriate.

## 8. CONCLUSION

This paper introduced the South African National Accessibility Portal initiative. It focused on one element in the initiative, the process of developing the accessible portal for the South African disability sector. It described the development methodology, technology investigation and subsequent technology stack. The various techniques followed to make the portal internationalisable and accessible were also described.

The methodology implemented provided invaluable information and insight into the obstacles facing people with disabilities and thus allowed us to develop a platform which could address these needs.

This initiative is an ongoing research and development effort and as such we envision improvements to the portal in future releases containing enhanced accessibility for all disabilities with improved functionality. This includes making better of use of user profile information to reconfigure the interface on user login. The envisioned improvements is based on potential outputs of a number of different research programs in the NAP initiative, for instance sign language avatars and improved desktop accessibility using dedicated hardware. Research into developing a semantic retrieval engine for the heterogeneous information sources associated with the portal is a priority [18].

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