

## Background Information – NIMAC & NIMAS

### A. Relationship to NCLB

The No Child Left Behind Act of 2001 (NCLB) established strict new requirements for schools. These requirements affected teacher qualifications, instructional programs and strategies, student testing and test reporting, and support for students not meeting standards and students with special needs. But most fundamentally NCLB increased schools' accountability for *all* students' educational progress. Such accountability was first legislated with the landmark 1997 Amendments to the Individuals with Disabilities Education Act (IDEA), which demanded access, participation, and progress for students with disabilities in the general education curriculum, as well as participation in large-scale assessments. NCLB cemented and even intensified this outlined responsibility of schools to provide students with disabilities with the same quality education as their peers.

But there is still an achievement gap separating students with disabilities and their peers (Thurlow, Wiley & Bielinsky, 2003). Existing general education curricula and the accountability systems that accompany them are not usually designed to achieve or measure results for children with disabilities. Indeed, students with disabilities are rarely included during any phase of the development, adoption, or validation of curricula. Thus, most general education curricula lack research-based alternative methods, materials, and assessments that support the progress of diverse learners.

One of the most significant shortcomings of general education curricula is their widespread use of rigid, print-based materials. Following the passage of IDEA, it has become essential that all students have access to the general curriculum, and thus to the print materials of which it is largely composed. But for many students with disabilities, the limitations of print technology raise barriers to access, and therefore to learning. For students who cannot see the words or images on a page, cannot hold a book or turn its pages, cannot decode the text or comprehend its syntax, or cannot engage with words on paper, printed text is a serious impediment. These students may each experience different challenges and require different supports to extract meaning from this medium, but the barrier they face is one and the same—printed text. In a print-based curriculum these students may be misidentified as unable to learn when in reality they simply do not have appropriate learning tools and materials to access learning.

Teachers must make their best efforts to diminish the barriers raised by print textbooks through adaptations, accommodations, and the development of alternative systems and programs. These locally developed alternatives are costly and inefficient, lack a research base and systematic development, and create yet another *separate track* rather than true engagement in the general curriculum. In order to resolve these issues and realistically implement the priorities of NCLB and IDEA, students with disabilities need access to more flexible versions of materials, and they need this access at the same time that print versions are available to their non-disabled peers.

Modern digital materials can present the same content as printed books but in a medium that is much more flexible and accessible. For students who cannot see the words or images, the digital version can more easily be converted to braille or voice with text descriptions of the images. For students who cannot hold the printed book or turn its pages, the virtual pages of a digital book

can be turned with a slight press of a switch. For students who cannot decode the text, any word can be automatically read aloud. For students who lack the background vocabulary in the text, definitions (in English or another language) can be provided with a simple click. Moving beyond accessibility, digital texts can also be embedded with supports for syntax, semantics, and comprehension (Boone & Higgins, 1993; Dalton, Pisha, Eagleton, Coyne, & Deysher, 2001; MacArthur & Haynes, 1995).

The advantage of digital versions is that these alternatives, and many others, can be available on an individual basis—available for students who need them, invisible or non-distracting for those who don't. They enable teachers to individualize materials in previously unimaginable ways (Hay, 1997; Lewin, 2000; MacArthur & Haynes, 1995). Such customizable alternatives can substantially reduce the barriers found in traditional texts. Mounting research evidence demonstrates the benefits of using such digital materials in the classroom (Barker & Torgesen, 1995; Bottge, 1999; Dalton et al., 2001; Erdner, Guy, & Bush, 1998; MacArthur & Haynes, 1995; Wise, Ring, & Olson, 1999).

## **B. The Need for a National Standard**

As a result of the new accountability for all students, the availability of accessible core curriculum materials has become critically important to state and local educational agencies. Authentic access, participation and progress of students with disabilities in the general education curriculum will not occur until accessible, flexible, and customizable learning resources are widely available to all students, particularly those with print disabilities.

For several reasons, few students with disabilities presently have access to the highly functional accessible books they need. In some cases the problem is knowledge-related—many educators do not understand the issue of access or the potential solutions that are available. For the majority of students however, lack of access is rooted primarily in the absence of a uniform development and distribution system for accessible versions of print textbooks, an absence that precludes their timely delivery.

The existing development and distribution systems rely on inefficient policies and procedures that raise barriers rather than opportunities. These barriers hinder success at every level of the system.

**Publishers** generally do not manufacture and distribute fully accessible digital versions of print materials for use by all students with disabilities. Although laws in a number of states require publishers to provide digital versions of their instructional materials to third parties (*authorized entities* as defined by the *Chafee Amendment* copyright exemption) for conversion into braille and other accessible formats for students with print disabilities, publishers face inefficiencies based on current regulatory and technological requirements. Unclear administrative processes and the lack of a universally-accepted file format at the state level often hamper publishers' compliance efforts. Without a universal file format it is difficult for publishers to comply (different states, disability organizations, teachers and students all request different versions and formats). Additionally, the current system promotes redundancy in efforts to convert the digital versions into accessible formats, increases the costs to the states for acquiring these materials, and causes unnecessary delays in receiving the accessible formats.

Moreover, these laws do not address the needs of all children with disabilities. The Chafee Amendment, enacted in 1996, is narrowly tailored to serve a small subset of students with disabilities (i.e., those with *print disabilities*). Qualification for eligibility for alternate format materials references [36 CFR 701.10 Title 36 Code of Federal Regulations](#) and identifies:

- Blind persons whose visual acuity, as determined by competent authority, is 20/200 or less in the better eye with correcting glasses; or whose widest diameter of visual field subtends an angular distance no greater than 20 degrees.
- Persons whose visual disability, with correction and regardless of optical measurement, is certified by competent authority as preventing the reading of standard printed material.
- Persons certified by competent authority as unable to read or unable to use standard printed material as a result of physical limitations.
- Persons certified by competent authority as having a reading disability resulting from organic dysfunction and of sufficient severity to prevent their reading printed material in a normal manner.

Pursuant to the Chafee Amendment, the current distribution structure for accessible formats intentionally bypasses the marketplace and provides the materials through a third-party *authorized entity* without compensation to the copyright holder. The needs of a broader set of students with disabilities could be met through a variety of free market solutions. For example, publishers could directly manufacture and distribute fully accessible versions of their materials to serve the needs of this population. Alternatively, a licensing system could be created to simplify the process for third parties to obtain permission from, and provide compensation to, the textbook copyright holders in order to make and distribute accessible versions of the print textbooks.

Current publishing practices also diminish the financial incentives to make and distribute fully accessible materials, because it is not yet commonplace for publishers to acquire the digital rights to the materials they produce, or the images that they purchase to include in textbooks. These materials are often used in multiple editions of books. Consequently, it is difficult for publishers to acquire the digital rights of pre-existing material after the original licensing arrangement has been set. Thus, creating a marketplace, driving demand, and providing publishers with the financial incentives to produce and distribute fully accessible digital materials in a manner generally consistent with copyright law are critical to ensuring full access to print materials for all children with disabilities.

**Not-for-profit agencies and their designated vendors**, referred to as *authorized entities* in the Chafee Amendment, have emerged to develop and distribute more accessible versions of published materials on behalf of individuals with disabilities. The largest of these, like Recording for the Blind and Dyslexic (RFB&D) and American Printing House for The Blind (APH), are national and have long served students by creating alternate formats of print materials. Under the Chafee Amendment, these formats are restricted to, braille, audio, or digital text. This limitation means that these authorized entities are currently not able to expand their production and distribution of accessible materials to serve a broader range of students. Many of these agencies have begun migrating to digital versions as a better way to serve their clients, but the lack of a

standard source format from publishers for these versions has hampered their progress. Because different publishers tend to use different proprietary formats or templates in their digital production and distribution, it is difficult for authorized entities to develop an efficient process for transforming materials. Most find it easier to begin with the printed book itself rather than a digital version supplied by the publisher, opting to recreate a digital version from the printed book.

Beyond the inefficiencies created by the lack of a consistent and uniform publisher source format, additional redundancy of effort exists since most authorized entities do not, at present, have in place any mechanism for or incentive to share marked up digital files. The implementation of a uniform publisher source format will provide the technological foundation for subsequent sharing of the digital source file among authorized entities, an approach that would further decrease the current inefficiencies associated with the creation of accessible versions of print textbooks.

Outside of the not-for-profit arena, for-profit conversion companies like Texterity, Data Conversion Laboratory, Mazer Corporation, ghBraille LLC, Duxbury Systems and others would also benefit from the adoption of a uniform publisher source format in the work they do as a part of commercial product development or as subcontractors in the conversion cycle.

Because **schools and school districts** generally do not get accessible versions of their curricular materials directly from the same sources as they get their *regular* materials, they must work with authorized agencies to obtain accessible materials—or else create them themselves. Either path is complicated and time consuming. Districts must identify the format or formats that both meet the needs of individual students and work with the technologies available in their various schools and classrooms. They must select a vendor or process for creating the necessary formats. After ordering materials they must develop a repository and distribution system to match versions to individual students and technologies. Finally, they need to develop local capacity for supporting teachers in using these accessible versions. The abundance of technologies and formats greatly complicates this already drawn out process and delays the delivery of materials until a point at which all too often the need has passed.

**Teachers** have limited choices for acquiring accessible versions for their classrooms. If teachers work in districts or within states that have a system of guidelines in place to define the process of identifying what books are needed and how orders are processed and alternative formats delivered to students, they can receive audio or braille versions of textbooks. If teachers work in districts without an established procedure, they can identify a format that is appropriate for their student(s) and compatible with their existing classroom technology and then find a vendor or repository that can supply it. A second option for such teachers is to work with an *in-district* authorized entity, a qualifying special educator, for example, to create, in a time consuming and often error-ridden process, (e.g., without access to a licensed braille transcriber), a digital version of the print textbook themselves. Neither of these present options had proven to be successful in providing high-quality accessible textbooks to students in a timely manner. Moreover, teachers are not able to obtain materials for every student who needs them in an accessible format, due to the copyright and market constraints referenced previously.

While there are many barriers to accessibility, the problems that are caused by multiple file formats are particularly frustrating. But they are also easily remedied by adoption of a standard file format. The adoption of a common or standard format is a simplifying step that has been crucial to progress in many other fields from railroads (adopting a common track gauge) to video technology (adopting a common format for DVD and HDTV). Similarly, defining a common National Instructional Materials Accessibility Standard (NIMAS) for the provision of digital source versions of print textbooks would greatly stimulate progress in accessibility. Existing and emerging standards related to electronic publishing support the designation of a flexible core format that separates the content of instructional materials from its presentation, allowing for output of multiple accessible versions, including braille, large print and audio, from a single source. With that single change, a number of barriers at many points in the educational system can be addressed.

With one clear and consistent file format to produce, publishers would be able to deliver a high quality digital version of their print instructional materials expeditiously and simultaneously to all authorized entities for further conversion and distribution.

Authorized entities would be able to efficiently transform these materials into an accessible version (i.e., accessible digital versions and printed braille) and expeditiously deliver them to schools and school districts.

*It should be noted, however, that the NIMAS initiative is, at present, indelibly linked to existing copyright law and its exemption, the Chafee Amendment. This linkage will continue to require a multi-step process in order to ensure that students are provided access to accessible versions of print textbooks. The multi-step process involves the delivery of source files (NIMAS version 1.0-compliant) to third parties (authorized entities) for conversion markup. Once this secondary (optional) markup has been completed, the source files are ready for transformation into student ready formats such as braille, Digital Talking Book and other specialized formats. For a more detailed discussion of this process, please refer to Section IV A of this report.*

With the provision of materials in one common digital format to third party conversion organizations, the likelihood that teachers could consistently get accessible materials in a timely fashion and in a format that could be readily implemented in the classroom increases significantly. Students would finally get the accessible materials they need when they need them.

Several key states, California, Texas, New York, and Kentucky, have existing or have enacted new or amended legislation requiring the consideration of accessibility in the textbook procurement process. The intent of these state legislative initiatives is to ensure that students with disabilities have access to appropriate learning resources at the same time that *traditional* materials are made available to their non-disabled peers. But the existence of a national standard for the provision of digital source files for print textbooks, from which accessible student versions can subsequently be created, is vital to this objective. In fact, it is the only way to achieve the U.S. Department of Education's goal of an efficient system for production and distribution of accessible core curriculum instructional materials. A NIMAS has the potential to significantly enhance the learning opportunities available to all students and is therefore of

significant importance to publishers, technology specialists, teachers, advocacy groups, and students.

### C. The Goals

The goals of this initiative were several-fold. The *overarching goal* was to make appropriate and accessible versions of print textbooks available to every student who needs them. This goal is currently undermined by the inefficiency of the development and distribution system for these materials, which leaves schools struggling to provide instructional materials on a student-by-student basis (particularly for students with print disabilities). Because the system's inefficiency derives in large part from the multiplicity of file formats, the *specific aim* of this work was to make progress toward standardization.

The general approach was to select a panel of stakeholders that would develop and detail a proposed NIMAS that would limit the use of diverse file formats in favor of a single source format sufficiently flexible to create multiple output transformations (braille, Digital Talking Book, etc). This one step would drive the creation of solutions to problems existent throughout the accessible curricular materials development and distribution system, achieving the following objectives:

- Improving the efficiency of third party relationships by reducing the need of publishers to produce different formats for different instances.
- Making the process of transformation and delivery by authorized entities more efficient by reducing the need for repetitious and often ineffective transformations (print-to-braille; print-to-ebook, etc.) and establishing a unified approach for the development of accessible learning materials.
- Simplifying the acquisition process for schools and teachers.
- Simplifying the implementation process for teachers.

Development of a NIMAS raises a number of challenging and important questions that must be addressed for such a standard to be worthwhile and effective. While pursuing its targeted aim of developing a NIMAS, the Technical Panel sought to specifically address the following questions and problems:

- What structure will best ensure that states, schools, and students have access to accessible digital curricular materials in a timely fashion? Student needs for digital curricular materials change over time. The crux of the problem today is an inefficient system that cannot regularly support "just in time" delivery. As a result, by the time students receive their materials they often are no longer appropriate.
- How do we overcome the constraint imposed by the Chafee Amendment copyright exemption, which limits the distribution of accessible content to a subset of the special needs population? Although the Chafee Amendment was originally crafted as an approach to ensure the practical availability of accessible versions to students who need them, its definition of qualifying students does not cover many in need.

- How do we reconcile the technological conflict between accessibility and Digital Rights Management (DRM), technology-based security that limits unauthorized distribution in order to facilitate the exercise of marketing rights by the copyright owner? At the present time, for DRM to be effective, the text in ebooks must be locked to prevent copying. Popular assistive technology tools such as screen readers and supported reading software are incompatible with locked text.
- How useful are accessible instructional materials in increasing the achievement of students with disabilities? This and other research questions related to the consideration of students with disabilities in standards-based instruction—standards, materials, instructional practice and assessment—needs to be addressed.

Ultimately addressing these important questions and achieving the specific aim of developing a NIMAS will facilitate, at the state level, the development of a systemic approach to providing accommodations for diverse learners, ensuring the quality, consistency, and timely distribution of accessible curriculum materials to students.

#### **D. The Process**

At the direction of and in consultation with the U.S. Department of Education, the National Center for Accessing the General Curriculum (NCAC), in collaboration with the National Institute of Standards and Technology (NIST) at the Department of Commerce, assembled a Technical Panel consisting of 40 members representing consumers, technical experts, and feasibility experts.

*Identified since its inception as the **National File Format Technical Panel**, the goal of this group has also been referred to as the **National File Format**. Throughout this report the designation **National File Format** and its acronym (*NFF*) have been replaced with the designation **National Instructional Materials Accessibility Standard** or *NIMAS* to align with the formal language in the charge from the U.S. Department of Education.*

The Panel was convened at a series of three meetings (all open to the public, their dates, times, and locations posted on the NCAC Web site: <http://nimas.cast.org>) over a 6-month period. Each of the three Panel meetings was focused on the contributions of members representing each of the Panel's subgroups (consumers, technical experts and feasibility specialists). The first meeting concentrated on identifying the needs of students with disabilities with respect to accessible materials and emphasized the contributions of the consumer representatives. The second meeting concentrated on identifying the technical issues involved in establishing a NIMAS, and emphasized the contributions of the technical representatives. The third meeting concentrated on presenting the feasibility issues (intellectual property concerns, market exigencies, etc.) and emphasized the contributions of the feasibility representatives. Detailed summaries of all three Panel meetings are available at the Web site referenced above and are attached to this report as [Appendix A](#).

Throughout these meetings, the Panel developed and refined a proposed instructional materials accessibility standard in compliance with the constraints of 2U.S.C. 15a, "An Act to Provide Books for the Adult Blind" and a subsequent copyright exemption built upon that Act (e.g.,

Section 121, the 1996 "Chafee Amendment"), which authorize the provision of accessible versions of non-dramatic works without compensation to the copyright holder to individuals with qualifying print disabilities.

Before each meeting, group representatives were asked to submit specific information that would inform the discussion. After each meeting CAST consolidated a record of the discussion and circulated a draft of these items for review, discussion, and further revision. These subsequent communications occurred in an online forum and via follow-up telephone conferences.

#### **E. The Technical Panel**

In collaboration with NIST at the Department of Commerce, NCAC convened a forty member Technical Panel from each of the following groups:

- Organizations that represent consumers (e.g. advocacy groups for individuals with visual, print and other disabilities and state and local educational representatives).
- Organizations that represent parents of students with disabilities (e.g., blind, print and other disabilities).
- Instructional materials publishers or their organizational designees (e.g., School Division, Association of American Publishers).
- Assistive technology developers or their organizational designees (e.g., Assistive Technology Industry Association).
- Producers of materials in specialized formats (e.g., RFB&D, APH, etc.).
- State special education program administrators or their organizational designees (e.g., National Association of State Directors of Special Education).
- Special educators and local administrators.
- State textbook administrators from adoption states or their organizational designees (e.g., National Association of State Textbook Administrators) and equivalent personnel from non-adoption states.
- Developers of accessibility, publishing software and supporting technologies.
- Information technology standards organizations (e.g., The Access Board).
- Data transformation organizations with substantial experience in accessible file format preparation and automated conversion technologies.


Nominees to the Technical Panel were selected for their expertise in identifying and detailing the specific instructional needs of K–12 students with disabilities, their investment in increasing the availability of accessible digital materials, their experience in curriculum design, and their technical expertise.

In addition to delegates from the constituencies listed above, the Panel solicited commentary and guidance from NCAC partner members, including Harvard University Law School, and the Secretary of Education designated 3 employees from the Department as ex-officio members of the Technical Panel.

The charge of this Technical Panel was to present the Secretary of Education with "a set of technical specifications to facilitate the efficient delivery of accessible instructional materials, a timeline for the implementation of the proposed standards, and process for assessing the success of standards implementation."

## **F. Summary of Meetings**

### ***1. Inaugural Meeting***

During the first meeting, held January 7, 2003, the Technical Panel addressed the needs of the Consumer constituency and began developing a list of the features and functions that the instructional materials accessibility standard must address. To inform this discussion each participating organization representing the consumer constituency was asked to submit a wish list of the features and functionality that would benefit their constituent students. During this same period, CAST gathered comments from interested consumers who were not members of the Technical Panel. Based on the discussion and input from this meeting, CAST developed a working list of proposed instructional materials accessibility standard features and functions, which was then circulated among the Panel members for comment and feedback. Panel members had the opportunity to discuss and revise the proposed working list through online discussions at the  [Online NFF Community](#) established by CAST. Recommended features and functions were then approved at a brief follow-up meeting/telephone conference in early February.

For a more detailed summary of the inaugural meeting please see [Appendix A](#).

### ***2. Meeting 2***

At the second meeting on March 11, 2003, the Technical Panel addressed the interests of the Technical Group and began the process of identifying the technical specifications for an instructional materials accessibility standard. Prior to the meeting, representatives from the Technical Group were asked to review existing file formats, accessibility guidelines and emerging technologies in the context of the wish list and submit their recommendations and concerns. As with the first meeting, CAST coordinated the comments and feedback of Panel members and circulated the proposed technical standards following the meeting. Technical Panel members had the opportunity to discuss and revise these proposed technical standards at the NFF Technical Panel Web site and during a follow-up meeting/telephone conference held at the end of March.

For a more detailed summary of the second meeting please see [Appendix A](#).

### ***3. Meeting 3***

At the third and final meeting on June 9 and 10, 2003, the Technical Panel assessed the market influences, copyright constraints, and protocols and procedures necessary to ensure the widespread adoption of voluntary standards. Feasibility Group representatives were asked to submit their comments on this topic to CAST before the meeting. Following the meeting CAST

once again circulated a proposed set of recommendations to the Technical Panel members and provided the Technical Panel with an opportunity to discuss and revise the recommendations through the NFF Web site and a follow-up meeting/telephone conference.

For a more detailed summary of the third meeting please see [Appendix A](#).

## **II. Technical Panel Consensus and Understanding**

During the course of the three convenings, the Technical Panel built a consensus around the need for a NIMAS to improve access to educational materials for children with disabilities. Consensus was reached on four issues: 1) guiding principles for a NIMAS; 2) baseline format for the NIMAS; 3) application of the format for the NIMAS; and 4) limitations of and restrictions on the NIMAS.

### **A. Identifying Student Needs**

As set forth in greater detail in Section III below, the Technical Panel developed a set of principles to guide the adoption and implementation of the NIMAS. These governing principles reflect the Technical Panel's assessment of the barriers that students with disabilities face in obtaining access to print instructional materials. They attempt to define the boundaries of what it means to provide access to educational materials for students with disabilities. Alone, these principles are neither prescriptive nor restrictive; rather, they are intended to help those following the NIMAS to interpret whether a particular application satisfies the goal of providing access to instructional materials.

### **B. Baseline Format for the National Instructional Materials Accessibility Standard**

Rather than develop a new standard, the Technical Panel opted to develop guidelines for the use and implementation of an existing standard. The primary reason for this decision was the time constraint on the panel for completing its report and recommendations, which precluded development of a completely new standard. The Technical Panel considered several different standards, including ANSI/NISO Z39.86, DocBook, and simple ASCII files. After significant discussion, it concluded that an extensible format should be adopted, primarily to ensure that the format would be sufficiently flexible to address the needs of a variety of children with disabilities, to provide output in a variety of formats, to expand to address new needs as they are identified, and to easily evolve over time. Additionally, the Technical Panel recognized that several existing standards had been developed with the intent to address many of the same needs identified by this panel. Several of these standards had already gained traction in segments of the education community and therefore had conversion houses and publishers who were already technically capable of providing instructional materials in these standards.

One standard in particular, ANSI/NISO Z39.86, was formally submitted to the Technical Panel for consideration by panel members who served both on the NIMAS Technical Panel and on the Z39.86 Advisory Committee.\* These Panel members provided this background information on the Z39.86 standard:

One key factor behind the ever-growing enthusiasm for Z39.86 is the support for the XML source content identified in DTBook. Demonstrations at the NIST 2001 Electronic Publishing conference showed a source file encoded in DTBook, and from that file braille, a Microsoft Reader version, and a Digital Talking Book were generated. Thus, DTBook enables the generation of many formats from a single source. The support for Z39.86 ranges across a variety of areas:

- National organizations who provide content to persons with disabilities, such as NLS, RFB&D, APH, American Foundation for the Blind (through AFB Press), and BookShare have implemented or are planning to implement the standard.
- Developers of braille translation software are building their tools to accommodate Z39.86.
- The AFB Textbooks and Instructional Materials Solutions Forum is poised to support Z39.86 in the further development of their training program.
- Internationally, a DAISY XML Techniques working group is focused on implementation and training for the Z39.86 standards.
- Conversion houses that transform publishers' content have expressed great interest in DTBook and the Z39.86 standard.
- Recording software developers have plans to implement the standard.
- Multimedia developers are looking at identifying features that can enhance the standard.
- Playback and Reading System developers are planning to implement the standard.
- Open source developments are targeting Z39.86 for their activities.
- The Advisory Committee is developing supporting software and valid sample implementations.
- The United Nations has expressed great interest in the DAISY standards for making information accessible for all.

Based on these factors, the Technical Panel agreed to designate the NIMAS as an *application* of the DTBook element set of the ANSI/NISO Z39.86 standard. The identification of the NIMAS as an application of an existing standard allowed the Panel to separate the DTBook element set into two distinct categories:

1. The *Baseline* element set: digital files marked up with these tags are provided by publishers and comprise NIMAS version 1.0
2. The *Optional* element set: required in order to subsequently create an accessible representation of the textbook, the NIMAS-conformant digital files are marked up by authorized entities with these additional tags to make them ready for transformation into student ready versions (braille, Digital Talking Book, etc.)

The ANSI/NISO Z39.86 standard "defines the format and content of the electronic file set that comprises a digital talking book (DTB)" (<http://www.niso.org/standards/resources/Z39-86-2002.html>). Commonly referred to as "DAISY" (Digital Accessible Information System), the ANSI/NISO Z39.86 standard provides the technical protocol for creating accessible digital versions of print works. The following section is excerpted from the DAISY *Structure*

*Guidelines* (available online at

<http://www.daisy.org/publications/guidelines/sg-daisy3/structguide.htm#contents>).

The DAISY DTB is a collection of digital files (from this point onward referred to simply as "files") that provides an accessible representation of the printed book for blind, visually-disabled, and print-disabled users. These files may contain digital audio recordings of human speech, marked-up text, and a range of machine-readable files.

The structure of the book is designated by the XML tags and is accessible to the reader by use of a browser or a playback device. The DAISY DTB utilizes the technology of the Internet with some specialized applications added to provide greatly improved access to the information.

DAISY 3 supports any of the following classes of DTB:

- **Audio with Title element only:** DTB without structure. This is the simplest class of DTB and is used for books where structure will not be applied. The XML textual content file may not be present, or if it is, contains only the title of the book, and other required notation. The book must be read linearly. Direct access to points within the DTB is not possible.
- **Audio with NCX only (see "The NCX" below):** DTB with structure. The XML textual content file, if present, contains only the structure of the book and may contain links to features such as narrated footnotes, etc. This is the most common form of DTB and is ideal for stand-alone players.
- **Audio with NCX and partial text:** DTB with structure and some additional text. The XML textual content file contains only the structure of the book and the text of components where keyword searching and direct access to the text would be beneficial (e.g., index, glossary, etc.).
- **Audio and full text:** DTB with structure and complete text and audio. This form of a DTB is the most complex but provides the greatest level of access. The XML textual content file contains the structure and the full text of the book. The audio and the text are synchronized.
- **Full text and some audio:** DTB with structure, complete text and limited audio. The XML textual content file contains the structure and the text of the book. The audio files contain recordings of parts of the text. This type of DTB could be used for a dictionary where only pronunciations were provided in audio form.
- **Text and no audio:** E-text with structure. The XML textual content file contains the structure and text of the book. There are no audio files.

XML provides the producer with the ability to structure a book in great detail. Compared to HTML markup, XML increases markup options and makes more detailed structure and proper nesting possible.

A DTB produced under DAISY 3 consists of some or all of the following files:

- A Package File (drawn from the Open eBook Forum™ (OEBF) Publication Structure 1.0.1), containing administrative information about the DTB, the files that comprise it, and how these files interrelate.
- A textual content file containing some or all of the text of the book with appropriate markup.
- Audio files containing the human voice recording of the book.
- SMIL (Synchronized Multimedia Integration Language) file(s) containing information linking the audio and textual content files.
- NCX, a file containing all points in the book to which the user may navigate.

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 [http://www.daisy.org/publications/guidelines/sg-daisy3/part1.htm#auto\\_0000](http://www.daisy.org/publications/guidelines/sg-daisy3/part1.htm#auto_0000)

In addition to the extensive audio supports for textual content (both digitized human voice and synthetic speech is supported), the ANSI/NISO Z39.86 (DAISY 3) standard incorporates accommodations for other media as well. Image files, pictures, charts, graphs, tables, maps, etc. can be included in DTBs along with their text equivalents (captions, long descriptions). ANSI/NISO Z39.86 incorporates Synchronized Multimedia Integration Language (SMIL), which allows for the addition of other accessible media into the Digital Talking DTB. For more information, see

 <http://www.niso.org/standards/resources/Z39-86-2002.html#SMIL>.

Because the ANSI/NISO Z39.86 standard is so complex, the Technical Panel determined that the complete standard exceeds the capabilities of publishers at this time. Consequently, the broader standard will be treated as *afterwork*, easily integrated at a later time by the appropriate entity.

### **C. Alignment with Existing Standards**

Identifying the NIMAS as an application of the existing ANSI/NISO Z39.86 standard creates alignment with all existing national and international guidelines and standards in the areas of digital formats and accessibility. As referenced by its identifying acronym, ANSI/NISO Z39.86 has been formally recognized as:

- An American National Standard Developed by the National Information Standards Organization (NISO).
- Approved March 6, 2002 by the American National Standards Institute (ANSI).

The development of ANSI/NISO Z39.86 by the DAISY Consortium has consistently built on existing standards work. Following the adoption of SMIL as a standard in 1998 by the World Wide Web Consortium (W3C), this specification, along with HTML, was subsequently incorporated into the DAISY 2.0 standard, wholly aligning the DAISY effort with the W3C. XML support (also a W3C standard) was added to the DAISY specification as version 2.01 in 1999. In 2001 DAISY version 2.02 was published, based on the W3C's XHTML 1.0 and SMIL

1.0 specifications. The ANSI/NISO Z39.86 2002 standard represents version 3.0 of the DAISY specification.

The Open eBook Forum (OeBF) was created in 1998 by publishing companies interested in the development of an open standard for electronic books, and promoted by NIST. In 1999, with the publication of version 1.0 of the eBook Publication Structure, the Open eBook Forum established accessible XML as a standard, thereby promoting interoperability between the work of the DAISY Consortium and the OeBF.

The designation of version 1.0 of the NIMAS as an application of ANSI/NISO Z39.86 2002 ensures that textbook files conforming to this specification will be structured in a manner that supports all existing standards and specifications relating to accessible digital materials.

#### **D. Limitations of and Restrictions on the National Instructional Materials Accessibility Standard**

Although the proposed NIMAS is a tremendous step forward, there are several important limitations and restrictions to recognize at this time.

- It is important to note that files produced in accordance with NIMAS, as developed by the Technical Panel, are not themselves usable by students with disabilities. *In order to be made usable by students, these files must be converted into a format appropriate for braille output, an e-book reader, or some other alternate format.* The purpose of the NIMAS is to ease these subsequent translations by enabling partial automation of the process, which would significantly decrease the time necessary to output materials in accessible formats.
- The agreed upon guidelines for NIMAS do not mandate the full markup of text necessary even for direct braille output or an electronic or talking book. The DTBook element set includes many other tags that are critical to this conversion but were deemed complex and requisite of skilled human intervention for appropriate tagging. Aligning with existing copyright law, the Technical Panel agreed to leave this additional work to third party conversion agents ("authorized entities") who in the current system provide such human intervention, preparing files for output in alternate student ready formats. Nothing in this agreement, however, limits textbook publishers from completing the full markup if they have both the intellectual property permissions and the financial incentives to do so.
- Nevertheless, concerns remains about who will perform this markup, the amount of time it will take, and the potential for duplication of efforts. Under the current system, each conversion agent would separately complete the markup of materials. In some cases, the conversion agent would extend the baseline NIMAS markup to make it fully conform to DTBook. In other cases, conversion agents may only add additional, proprietary tags (word pronunciation indicators for synthetic speech, for example), to complete the markup process at that stage. An optimal scenario would involve full DTBook mark up by conversion agents and the centralized availability of these fully marked up files.
- Without the availability of fully marked up files competing conversion agents could not be expected to share files with proprietary mark up, with the end result being that a file fully marked up for use by students in one state might not be available for use by students in another state. Each state would still have to contract for and pay for completed mark

up, which would perpetuate the problem of delays in delivery of accessible versions of instructional materials. These are issues that need to be addressed in the future. Without resolving this issue of perpetuated redundancy the goal of establishing a truly viable national standard is significantly diminished.

- The Technical Panel recognizes that NIMAS will not meet the accessibility needs of all students with disabilities. During the Technical Panel meetings, there was a tension between developing a standard that is capable of providing for the accessibility needs of all students with disabilities, and the realities of the Chafee Amendment and other provisions of copyright laws that limit provision of accessible materials, in the absence of permission from the copyright holder, to children with recognized print disabilities. The publisher members of the Technical Panel expressed concern about adopting a standard that included accessibility features for individuals outside the narrow legal definition of an individual with a print disability and that could potentially encourage violations of the copyright laws. Other members of the panel, however, wanted to ensure that the standard would address the needs of a more comprehensive group of children with disabilities notwithstanding copyright constraints.
- This dilemma affects educators as well, because in spite of the copyright exemption they have a legal obligation to provide accessible educational materials to all students with disabilities. There is no law that restricts educators from requesting and purchasing accessible versions of educational materials from publishers for use by all students, including students with disabilities. But limited market demand restricts the feasibility of this approach—few publishers have commercially available accessible instructional materials that educators may purchase. Moreover, there is not currently a standard for accessible instructional materials for use by all students with disabilities. Because it was clearly beyond the scope of the NIMAS charge by the U.S. Department of Education to resolve this dilemma, the Technical Panel did not pursue a NIMAS that would include accessibility features for individuals outside the narrow legal definition of an individual with a print disability.

## **Endnotes**

\*George Kerscher, James Pritchett and Michael Moodie

## **III. Technical Specifications Recommended by the Panel**

Subsequent to the three meetings, the Panel finalized a set of governing principles that provide the accessibility and pedagogical foundation for the technical specifications, and the technical specifications themselves. These are presented in the following sections.

### **A. Governing Principles for the National Instructional Materials Accessibility Standard**

*1. Principle 1: The NIMAS should be sufficiently extensible to support transformations into multiple presentation formats (e.g., text to properly formatted braille, text equivalents of non-text elements, etc.).*

**Rationale for Principle 1:** Files created in NIMAS are intended for transformation into formats for use by students with disabilities. At the present time this use is limited to students who qualify as "blind or other persons with disabilities" according to Section 121 of the Copyright

Act. However, it is anticipated that NIMAS will eventually serve as a basis for the provision of accessible instructional materials to all students eligible for services and/or accommodations under IDEA, Americans with Disabilities Act or Section 504 of the Rehabilitation Act. Therefore the NIMAS specification needs to be sufficiently flexible to support both present and future transformation needs.

- NIMAS should facilitate the transformation of one media type into another: text to audio, text to properly formatted braille, etc.
- NIMAS should support the inclusion of simultaneous and synchronous presentation of multiple content media: video with text captioning, video description, etc.
- NIMAS should support the inclusion of layered content elements (e.g., text, graphics, etc.) to provide adjustable degrees of content complexity.

***2. Principle 2: The NIMAS should support the inclusion of all media that are contained in the printed work (e.g., text, graphics, charts, tables, etc.).***

**Rationale for Principle 2:** The original print content may be rendered auditorily, graphically or tactilely—or in any combination of those media—depending upon the needs of qualifying students. Therefore ALL original print content should be available to be transformed and their purpose (semantics) in the instructional sequence should be clearly represented.

- The NIMAS should support the inclusion of all graphical material: photos, images, charts, flow charts, tables, etc.
- The NIMAS should support the inclusion of high-resolution graphic elements capable of being scaled.
- The NIMAS should support the inclusion of semantic information that identifies the contextual intent of non-text elements (e.g., are graphics decorative, navigational, informative, etc.).

***3. Principle 3: The NIMAS should provide for the incorporation of structural information about the print work (e.g., chapter, section, and subsections; paragraphs; page breaks and page numbers; line numbers where essential; indexes; tables of content, etc.).***

**Rationale for Principle 3:** It is assumed that digital texts will be used side-by-side with print textbooks in the classroom, necessitating common points of reference. Currently, page breaks and paragraphs serve that function. The structural integrity of this reference system needs to be maintained to enable an accurate transformation into alternate media formats.

- NIMAS should support the preservation of meaning associated with layout if present in the print work.
- NIMAS should support flexible navigation among text and non-text elements to ensure that the student using the accessible version has an experience equitable to the student using the print work.
- NIMAS should support the inclusion of semantic information relevant to learning (summary, topic sentence, etc.).

**4. Principle 4: The NIMAS format should facilitate the efficient and automated conversion of print material into more accessible formats.**

**Rationale for Principle 4:** NIMAS should be capable of being rendered into multiple presentation formats (properly formatted braille, Digital Talking Book, etc.) in as automated a process as possible. To achieve this, the NIMAS should be based on a standardized structure that includes consistent rules, supports fine detail (granularity), and provides for future modifications.

- NIMAS should support successful machine validation for DTD conformance and adherence to NIMAS structure guidelines.

**5. Principle 5: The NIMAS should accommodate all fields of study, including those that require special notation (e.g., math and music) as standards become available.**

**Rationale for Principle 5:** Widely accepted structured markup already exists for some content areas—notably language arts, social science, history, subjects where the presentation of information is primarily text based with augmenting graphics. Standardized structured markup for mathematics, musical notation and science (alphanumeric character structures: equations, algorithms, formulas, etc.) should be incorporated into NIMAS when technically feasible.

## **B. Technical Specifications**

### **1. Application of ANSI/NISO Z39.86 Standard for the National Instructional Materials Accessibility Standard**

Because the DTBook is so comprehensive, the group opted to treat NIMAS as an implementation of the DTBook standard. It is not intended to narrow the scope of the DTBook standard, but to define the minimum actions that publishers must take in order to be in compliance with the standard. Additionally, the referenced guidelines are intended to establish best practices for how the tags should be applied to instructional materials.

The Baseline Element Set details the minimum requirement that must be delivered to fulfill the NIMAS standard. It is the responsibility of the publishers to provide this NIMAS-compliant XML file along with a separate PDF file with embedded images for reference in creating descriptions, and a NIMAS-compliant package file.

Content files meeting the NIMAS must be valid to the dtbook110.dtd [see ANSI/NISO Z39.86, Appendix 1

(<http://www.niso.org/standards/resources/Z39-86-2002.html#DTBookDTD>)]. In addition, files are required to use the tags from the Baseline Element Set when such tags are appropriate. Publishers may, and are encouraged to, augment the required Baseline Element Set with tags from the Optional Element Set (see Appendix C) as applicable. For the purposes of NIMAS, appropriate usage of elements (both baseline and optional) is defined by the "Guidelines for Use" (Appendix B), derived from the DAISY Structure Guidelines. Files that do not follow these guidelines in the selection and application of tags are not conformant to this standard.

## ***2. The Baseline Element Set***

### **a. Document-level tags (required to be valid XML)**

<b>Element</b>	<b>Description</b>
dtbook	The root element in the Digital Talking Book DTD. <dtbook> contains metadata in <head> and the contents itself in <book>.
head	Contains metainformation about the book but no actual content of the book itself, which is placed in <book>. This information is consonant with the <head> information in xhtml, see [XHTML11STRICT]. Other miscellaneous elements can occur before and after the required <title>. By convention <title> should occur first.
book	Surrounds the actual content of the document, which is divided into <frontmatter>, <bodymatter>, and <rearmatter>. <head>, which contains metadata, precedes <book>.
meta	Indicates metadata about the book. It is an empty element that may appear repeatedly only in <head>.
title	Contains the title of the book but is used only as metainformation in <head>. Use <doctitle> within <book> for the actual book title, which will usually be the same.

*Usage Guidelines: please refer to Document Level Tags and Required Tags in Appendix B, © DAISY Consortium, 2002*

### **b. Structure and Hierarchy**

<b>Element</b>	<b>Description</b>
frontmatter	Usually contains <doctitle> and <docauthor>, as well as preliminary material that is often enclosed in appropriate <level> or <level1>. Content may include copyright notice, foreword, acknowledgments, table of contents, etc. <frontmatter> serves as a guide to the content and nature of a <book>.
bodymatter	Consists of the text proper of a book, as contrasted with preliminary material <frontmatter> or supplementary information in <rearmatter>.
rearmatter	Contains supplementary material such as appendices, glossaries, bibliographies, and indices. It follows the <bodymatter> of the book.
level1	The highest-level container of major divisions of a book. Used in <frontmatter>, <bodymatter>, and <rearmatter> to mark the largest divisions of the book (usually parts or chapters), inside which level2 subdivisions (often sections) may nest. The class attribute identifies the actual name (e.g., part, chapter) of the structure it marks. Contrast with <level>.
level2	Contains subdivisions that nest within <level1> divisions. The class attribute

identifies the actual name (e.g., subpart, chapter, subsection) of the structure it marks.

level3	Contains sub-subdivisions that nest within <level2> subdivisions (e.g., sub-subsections within subsections). The class attribute identifies the actual name (e.g., section, subpart, subsubsection) of the subordinate structure it marks.
level4	Contains further subdivisions that nest within <level3> subdivisions. The class attribute identifies the actual name of the subordinate structure it marks.
level5	Contains further subdivisions that nest within <level4> subdivisions. The class attribute identifies the actual name of the subordinate structure it marks.
level6	Contains further subdivisions that nest within <level5> subdivisions. The class attribute identifies the actual name of the subordinate structure it marks.
h1	Contains the text of the heading for a <level1> structure.
h2	Contains the text of the heading for a <level2> structure.
h3	Contains the text of the heading for a <level3> structure.
h4	Contains the text of the heading for a <level4> structure.
h5	Contains the text of the heading for a <level5> structure.
h6	Contains the text of the heading for a <level6> structure.

*Usage Guidelines: please refer to the Information Object references in the Structure and Hierarchy section in Appendix B, © DAISY Consortium, 2002*

### **c. Block Elements**

<b>Element</b>	<b>Description</b>
author	Identifies the writer of a work other than this one. Contrast with <docauthor>, which identifies the author of this work. <author> typically occurs within <blockquote>.
blockquote	Indicates a block of quoted content that is set off from the surrounding text by paragraph breaks. Compare with <q>, which marks short, inline quotations.
list	Contains some form of list, ordered or unordered. The list may have intermixed heading <hd> (generally only one, possibly with <prodnote>) and an intermixture of list items <li> and <pagenum>. If bullets and outline enumerations are part of the print content, they are expected to prefix those list items in content, rather than be implicitly generated.
li	Marks each list item in a <list>. <li> content may be either inline or block and may include other nested lists. Alternatively it may contain a sequence of list item components, <lic>, that identify regularly occurring content, such as the heading and page number of each entry in a table of contents.

hd	Marks the text of a heading in a <list> or <sidebar>.
note	Marks a footnote, endnote, etc. Any local reference to <note id="yyy"> is by <noteref idref="#yyy">. [Attribute - id]
p	Contains a paragraph, which may contain subsidiary <list> or <dl>.
sidebar	Contains information supplementary to the main text and/or narrative flow and is often boxed and printed apart from the main text block on a page. It may have a heading <hd>.
cite	Marks a reference (or citation) to another document.
dd	Marks a definition of the preceding term <dt> within a definition list <dl>. A definition without a preceding <dt> has no semantic interpretation, but is visually presented aligned with other <dd>.
dl	Contains a definition list, usually consisting of pairs of terms <dt> and definitions <dd>. Any definition can contain another definition list.
dt	Marks a term in a definition list <dl> for which a definition <dd> follows.

*Usage Guidelines: please refer to the Information Object references in the Block Elements section in Appendix B, © DAISY Consortium, 2002*

#### **d. Inline Elements**

<b>Element</b>	<b>Description</b>
em	Indicates emphasis. Usually <em> is rendered in italics. Compare with <strong>.
q	Contains a short, inline quotation. Compare with <blockquote>, which marks a longer quotation set off from the surrounding text.
strong	Marks stronger emphasis than <em>. Visually <strong> is usually rendered bold.
sub	Indicates a subscript character (printed below a character's normal baseline). Can be used recursively and/or intermixed with <sup>.
sup	Marks a superscript character (printed above a character's normal baseline). Can be used recursively and/or intermixed with <sub>.
br	Marks a forced line break.
line	Marks a single logical line of text. Often used in conjunction with <linenum> in documents with numbered lines. [Include in baseline element set. Use only when line breaks must be preserved to capture meaning (e.g., poems, legal texts).]
linenum	Contains a line number, for example in legal text. [Include in baseline element set. Use only when <line> is used, and only for lines numbered in print book.]
pagenum	Contains one page number as it appears from the print document, usually inserted at the point within the file immediately preceding the first item of

content on a new page. [NB: Only valid when includes id attribute].

**noteref** Marks one or more characters that reference a footnote or endnote <note>. Contrast with <annoref>. <noteref> and <note> are independently skippable.

*Usage Guidelines: please refer to the Information Object references in the Inline Elements section in Appendix B, © DAISY Consortium, 2002*

## **e. Tables**

<b>Element</b>	<b>Description</b>
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<b>table</b>	Contains cells of tabular data arranged in rows and columns. A <table> may have a <caption>. It may have descriptions of the columns in <col>s or groupings of several <col> in <colgroup>. A simple <table> may be made up of just rows <tr>. A long table crossing several pages of the print book should have separate <pagenum> values for each of the pages containing that <table> indicated on the page where it starts. Note the logical order of optional <thead>, optional <tfoot>, then one or more of either <tbody> or just rows <tr>. This order accommodates simple or large, complex tables. The <thead> and <tfoot> information usually helps identify content of the <tbody> rows. For a multiple-page print <table> the <thead> and <tfoot> are repeated on each page, but not redundantly tagged.
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<b>td</b>	Indicates a table cell containing data.
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<b>tr</b>	Marks one row of a <table> containing <th> or <td> cells.
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*Usage Guidelines: please refer to the Information Object references in the Tables section in Appendix B, © DAISY Consortium, 2002*

## **f. Images**

<b>Element</b>	<b>Description</b>
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<b>imggroup</b>	Provides a container for one or more <img> and associated <caption>(s) and <prodnote>(s). A <prodnote> may contain a description of the image. The content model allows: 1) multiple <img> if they share a caption, with the ids of each <img> in the <caption imgref="id1 id2 ...">, 2) multiple <caption> if several captions refer to a single <img id="xxx"> where each caption has the same <caption imgref="xxx">, 3) multiple <prodnote> if different versions are needed for different media (e.g., large print, braille, or print). If several <prodnote> refer to a single <img id="xxx">, each prodnote has the same <prodnote imgref="xxx">.
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<b>caption</b>	Describes a <table> or <img>. If used with <table> it must follow immediately after the <table> start tag. If used with <img> or <imggroup> it is not so constrained.
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*Usage Guidelines: please refer to the Information Object references in the Images section in Appendix B, © DAISY Consortium, 2002*


### ***3. The Optional Elements and Guidelines for Use***

Publishers are encouraged to apply markup beyond the baseline (required) elements. The complete DTBook Element Set reflects the tags necessary to create the six types of Digital Talking Books referenced in Section II and braille output. Because of the present necessity to subdivide the creation of alternate format materials into distinct phases, the Panel determined that baseline elements would be provided by publishers and optional elements would be added to the NIMAS-compliant files by third party conversion entities. In both circumstances the protocols for tagging the digital files should conform to the ANSI/NISO Z39.86 specification. For this reason the optional elements beyond the baseline set are included as an Appendix C, and content converters are directed to the DAISY Structure Guidelines

(  <http://www.daisy.org/publications/guidelines/sg-daisy3/structguide.htm>) for guidance on their use.

### ***4. Package File***

A package file describes a publication. It identifies all other files in the publication and provides descriptive and access information about them. A publication must include a package file to be conformant to NIMAS. The package file is based on the Open eBook Publication Structure 1.2 package file specification (For most recent detail please see

 <http://www.openebook.org/oebps/oebps1.2/download/oeb12-xhtml.htm#sec2>). A NIMAS package file must be an XML-valid OeB PS 1.2 package file instance and must meet the following additional standards:

The NIMAS Package File must include the following Dublin Core (dc:) metadata:

- dc:Title
- dc:Creator (if applicable)
- dc:Publisher
- dc>Date (Date of NIMAS-compliant file creation—yyyy-mm-dd)
- dc:Format (= "NIMAS 1.0")
- dc:Identifier (a unique identifier for the NIMAS-compliant digital publication, e.g., print ISBN + "-NIMAS"—exact format to be determined)
- dc:Language (one instance, or multiple in the case of a foreign language textbook, etc.)
- dc:Rights (details to be determined)
- dc:Source (ISBN of print version of textbook)

And the following x-metadata items:

- nimas-SourceEdition (the edition of the print textbook)
- nimas-SourceDate (date of publication of the print textbook).

The following metadata was also proposed as a means of facilitating recordkeeping, storage and file retrieval:

- dc:Subject (Lang Arts, Soc Studies, etc.)
- nimas-grade (specific grade level of the print textbook, e.g.; Grade 6)
- nimas gradeRange (specific grade range of the print textbook, e.g.; Grades 4 - 5)

And additional suggestion references the use of:

- dc:audience:educationLevel (for the grade and gradeRange identifiers, noting that Dublin Core recommends using educationLevel with an appropriate controlled vocabulary for context, and recommends the U.S. Department of Education's Level of Education vocabulary online at <http://www.ed.gov/admin/reference/index.jsp>. Using educationLevel obviates the need for a separate field for gradeRange since dc elements can repeat more than once. A book used in more than one grade would therefore have two elements, one with value "Grade 4" and another with value "Grade 5."

A final determination of which of these specific metadata elements to use needs to be clarified in practice.

The package manifest must list all provided files (text, images, etc.).

The package spine must reference all text content files in order. (Note: For purposes of continuity and to minimize errors in transformation and processing, the NIMAS-compliant digital text should be provided as a single document.)

## **IV. Ensuring the Success of the National Instructional Materials Accessibility Standard**


### **A. Quality Assurance**

As discussed at the final Technical Panel meeting, quality assurance can be divided into two distinct components: validation (ensuring that a file developed according to NIMAS specifications is a valid NIMAS file) and quality (ensuring that the elements -tags- applied in the validated file are done so according to recommended guidelines).

There is broad agreement that the validation process can be handled by an automatic (machine-based) procedure. NIMAS files can be parsed by an automatic *validation engine* that compares the submitted file (element existence, element hierarchy, proper use of attributes, etc.) to the required structure.

Establishing the quality of NIMAS files automatically is not felt to be currently feasible. Applying the elements and attributes with the accuracy necessary to maintain the integrity of the print work while simultaneously ensuring its accessibility is a challenging task. With respect to curriculum materials in general, and textbooks specifically, the structural components of the print

work (headings, tables of contents, sidebars, etc.) provide a means of demarcating chapters, units, sections and their respective sub-components. In addition, some of these components and others (images, glossary terms, call out boxes, etc.) provide semantic richness, and the identification and placement of these elements must support their purpose within the context of the instructional design of the print work. The transformation and tagging of these components in the process of making them accessible must support the instructional intent to the greatest degree possible.

The best practice for assuring the quality of tagged files is for content developers to follow established guidelines. In this case, NIMAS is an application of the ANSI/NISO Z39.86 standard, and its associated elements are a subset of the DTBook Element Set. The required guidelines publication is the DAISY Structure Guidelines ( <http://www.daisy.org/publications/guidelines/sg-daisy3/structguide.htm>). This document provides an element-by-element protocol for appropriate tagging, and content developers intending to submit NIMAS files should be familiar with its requirements. Beyond the delineation of each element and its application, however, content developers need to have an informed understanding of the rationale behind the recommended procedures. The DAISY Consortium has published *a Statement of Principles for the Creation and Production of Accessible Books and Materials*, reproduced below:

### **Version 1.0**

*Last Revised: June 14, 2002*

This Statement of Principles represents the minimum standard to be met by Libraries for the Blind and producers of alternate format materials.


The DAISY Consortium endorse the following: Alternative format materials should be a faithful representation of a published work to ensure that those who are blind or print-disabled have access to the same information as the rest of society. Libraries or other producers of alternate format versions who adopt these Principles assure readers that these versions, regardless of their country of origin, represent the original published work as closely as possible and are accessible.

In terms of these principles, accessible is defined as follows. The print document is rendered in an alternative format such as braille, audio, large print or e-text in such a manner as to enable the print-handicapped reader to extract information from the document as easily and fully as possible.

DAISY supports the following principles in the creation and production of alternate format materials:

- Producers will respect and maintain the integrity of the published work to every extent possible. The producer will not alter the content or omit essential components unless absolutely necessary to provide access to the information.
- It is recognized that it may be necessary for producers to alter the intended order of the published work or add explanation of visual material so as to make the content accessible to the reader.

- If it is necessary to alter the presentation of the published work solely for the purpose of accessibility any information that a producer adds or omits must be identified as such.
- It is acknowledged that some producers will be required to produce only a portion of a published work. These partial books should be identified as such.
- It is recommended that producers of digital materials apply a structure to the published work to facilitate access and navigation by the reader.

Prepared for: DAISY Consortium and IFLA: Section of Libraries for the Blind Date: January 27, 1999 (Copyright © 2002 DAISY Consortium)   
<http://www.daisy.org/publications/guidelines/sg-daisy3/principles.htm#title>)

These principles provide a clear statement of the goals of creating accessible versions of print works, and content developers should actively apply these principles when creating accessible versions.

It should be noted that the term *integrity* in the DAISY statement of principles refers to the preservation of structural components and their order of presentation. With respect to preserving the instructional purpose of these structural components (and additional semantic elements), especially within the context of facilitating not just the access, but the achievement of students with disabilities, guiding principles have yet to be articulated.

Successful implementation of NIMAS will require the combination of expertise in the area of accessibility with expertise in the realm of instructional design. This is necessary to provide equitable curriculum resources that are not only usable by students with disabilities, but actually increase their achievement.

## **B. Documentation and Training**

Because NIMAS is an application of an extant standard, considerable documentation, especially with respect to the tagging of text and structural elements already exists and is publicly available. Protocols for the use of elements, attributes and hierarchies need to be augmented with practical examples (models) of appropriate NIMAS structured markup. A number of complimentary and cooperative initiatives are currently underway to create these models and make them available to all stakeholders.

Samples of textbook transformations should be compiled across all grade ranges (PreK–12) and in as many subjects areas (language arts, social studies, etc.) as accepted mark up procedures exist. These models should be publicly available and open to ready analysis in order to encourage as widespread and uniform an application as possible.

Additional documentation needs to be developed pertaining to increasing the accessibility, placement and purpose of graphical elements in educational materials. The majority of prior accessibility initiatives aimed at utilizing the flexibility of digital media to increase accessibility have focused primarily on textual components. And so, guidelines, models and protocols for effectively rendering graphical elements in order to preserve their instructional purpose need to be developed.

### C. Distribution

Determining the optimal workflow for implementing NIMAS on a national scale is outside the Panel's scope of work and therefore not part of the Panel's formal recommendation. However, all Technical Panel members felt that discussing distribution as a part of the final report was essential to facilitate the successful adoption of the standard by publishers, states, local education agencies and schools. Considerations reflect three categories of implementation:

- **Mandated:** If the NIMAS compliance mandate for states and publishers remains in the reauthorization of IDEA, the timely establishment of an efficient, secure and quality-assured workflow will be required.
- **Voluntary:** If the NIMAS specification emerges as a voluntary standard, publishers and states wishing to become early adopters will benefit from workflow recommendations made by the Panel.
- **Free Market:** If the NIMAS specification is to be the foundation element for source documents developed by curriculum publishers for subsequent transformation into accessible presentation formats available for direct sale to states, districts and schools, both publishers and education entities will benefit from workflow suggestions.

Within each of the three implementation categories delineated above, two possible storage and delivery options exist: centralized and distributed. For example, a centralized distribution system might exist as a delivery component of mandatory or voluntary implementation of the specification. A distributed system of delivery could also apply regardless of how the specification is implemented. Thus, the workflow suggestions that follow identify both types of storage and delivery options. *Note: The following analysis of workflow processes was originally developed by Technical Panel members Dave Schleppenbach, Martin Hensel, and Rick Ferrie and submitted to the technical subgroup for consideration on April 14, 2003. Subsequent edits and additions have been made to reflect considerations that emerged following that submission.*

### D. Workflow Under Existing Copyright Restrictions

The workflow outlined below suggests a process for creating, validating and distributing NIMAS-compliant accessible textbooks within the confines of the existing Section 121 copyright exemption (Chafee Amendment). Within a Chafee-compliant distribution model the three steps referenced will be required regardless of whether the validation and delivery workflow is managed through a centralized system or a distributed system.

There are three major steps that must be taken in order for the student to get an actual accessible textbook:

- **Publisher Markup (baseline NIMAS):** this is the minimum requirement that must be delivered to fulfill the NIMAS standard. It is the responsibility of the publishers to provide this NIMAS-compliant XML file along with PDF files with embedded images for reference in creating descriptions. (Note: File nomenclature is yet to be determined.) A suggestion is the numbering of image files based on the page number that they appear in the book, followed by an ordering number for flow purposes (e.g., 13-1, 13-2, and so

forth). All images should be included; making the proper resolution images and sorting through which images need to be conveyed in an alternative format is left up to the value-add stage. This core NIMAS file may be generated by curriculum publishers utilizing internal company resources or with *base markup entities* (third party organizations or companies hired by a publisher to create the NIMAS-compliant source files).

- **Third-Party Markup (for specific implementations of NIMAS such as Braille, Digital Talking Book, Audio, etc.):** this is the step needed for actual creation of the accessible file in the traditional modes of braille, Digital Talking Book, and Audio versions. This will most likely be done by the third party value-add organizations (authorized entities under the Chafee Amendment). However, there is nothing from a technical standpoint that would prevent publishers from taking on this task themselves (or in collaboration with a base markup or value-add entity), with the purpose of selling the accessible content along with the print content at cover price. Similarly, states with XML transformation capacity might choose to complete this stage of the process themselves.
- **Delivery of Presentation Formats:** the final *student ready* accessible version of the transformed textbook is delivered to state and local education agencies for monitored distribution to qualifying students following the requirements of Section 121 of the Copyright Act (Chafee Amendment). State or local education agencies, in collaboration with the value-add organizations, will be responsible for ensuring due diligence in maintaining compliance with the Chafee Amendment requirements.

It is important to re-emphasize the fact that both Steps 1 and 2 above are required to create the source files necessary for the subsequent creation of student ready alternative accessible textbooks. The recommended baseline markup is insufficient to create these accessible versions. While the establishment of a centralized repository (see below) would provide a mechanism for combining Steps 1 and 2 into a more cohesive whole, the segmentation of the process for creating accessible versions of textbooks will continue to persist until either a logical alternative or a clear market exigency evolves. In the meantime, this segmentation will continue to create inefficiency and redundancy.

## **E. File Validation and Delivery**

Although formal consideration of the method of delivery for NIMAS compliant files is outside of the Panel's scope of work, discussion of how this process would occur was repeatedly raised during the three face-to-face Panel meetings and the intervening online and telephone discussions. The Panel believes that a centralized delivery system is essential to ensuring the provision of consistent, high quality accessible materials to blind, low vision and print-disabled students.

A centralized approach would:

- Provide an efficient method for validating the integrity and quality of publisher provided baseline NIMAS files.
- Provide for secure archiving of materials protected by intellectual property agreements, thus minimizing the potential for copyright violation.

- Provide a single point of contact for state and local education agencies.
- Increase the potential for nationwide adoption of NIMAS-compliant files.
- Guarantee equal access to instructional materials regardless of a state's technological and materials delivery capacity.

The lack of a centralized distribution system would require individual publishers, conversion houses, and state and local education agencies to each assume responsibility for ensuring the validity and integrity of NIMAS files, the maintenance of copyright compliance, and the implementation of security. An uncoordinated effort of this scope could mean great inefficiency, increased potential for copyright abuse, and wide differences in the quality of accessible materials, their timely delivery, and their availability in the nation's classrooms.

Finally, the development of a centralized distribution system holds considerable promise for eliminating the persistent redundancy created by the existing need to tag or mark up the same set of files twice. As referenced in previous sections, files provided by publishers would contain baseline NIMAS 1.0 markup, and the third party authorized entities would then add DTBook elements from the optional element set. A secure, single point of distribution offers the promise of widespread availability of fully marked up files ready for transformation into student ready versions.

## **F. Maintenance of the NIMAS Specification**

Advances in technology and curriculum publishing will combine with increased awareness in the educational community of the pedagogical benefits of flexible digital materials. These factors alone will suggest modifications and adjustments to the NIMAS specification. In addition, since the NIMAS specification is an application of ANSI/NISO Z39.86 and that latter standard is itself in a continuous maintenance cycle, regular and skilled analyses of the needs of the NIMAS specification with respect to the evolution of ANSI/NISO Z39.86 will be required.

The Technical Panel unanimously recommends that support be provided to a small (10 to 20-member) group of representatives from publishing, conversion entities, education and disability to determine maintenance protocol and versioning policies as the need for them evolves.

## **V. Additional Recommendations**

### **A. Timeframe for Implementation**

Proposed legislation that has incorporated or referenced a NIMAS (The Instructional Materials Accessibility Act; The Individuals with Disabilities Education Act) has consistently projected a two-year phase-in from the date of authorization. In the case of legislated compliance, *authorization* equals enactment of the legislation itself. In the case of voluntary compliance, authorization represents the formal designation of the NIMAS by the United States Department of Education. Thus, the Technical Panel recommends a two-year phase-in of the NIMAS specification, with voluntary delivery as soon as possible.

### **B. Improving Awareness**

From the beginning of the NIMAS Technical Panel initiative it has been very clear that the national blind and low vision advocacy organizations have accumulated significant experience and expertise in their understanding of the benefits of accessible digital materials for their constituents. Unified within the framework of the American Foundation for the Blind's *AFB Textbooks and Instructional Materials Solutions Forum*, these groups are responsible for sustaining the advocacy and the technological expertise behind the *Instructional Materials Accessibility Act of 2002 (IMAA)*, proposed legislation that first identified the need for a NIMAS. These organizations have been working for many years to enact legislation guaranteeing the timely availability of high quality accessible materials, and the deliberations of the NIMAS Technical Panel have been enriched and magnified by their previous and their present efforts.

The willingness of representatives of all of the major blind and low vision organizations not only to be actively represented on the Panel but to assist representatives from other disability organizations in understanding the importance of digital media cannot be understated. They repeatedly shared their accumulated wisdom, experience, frustration and empathy in an effort to assist other Technical Panel members in avoiding mistakes that they had already negotiated.

The depth of their understanding of the issues involved in acquiring accessible alternate textbooks underscored, in contrast, the relative inexperience of some of the other disability groups with respect to the benefits that those materials offered to their constituent students. This unevenness of experience and awareness highlighted the need to increase the expertise of representatives of other disability groups as to the considerable benefits of accessible alternate format textbooks and instructional materials.

The Panel unanimously agreed that the awareness level and the expertise pertaining to accessible alternate textbooks needed to be expanded within all disability groups in order for these organizations to promote knowledgeable advocacy in support of the NIMAS standard.

### **C. All Students with Disabilities**

As was referenced previously, the Technical Panel recognizes that the provision of publisher files that conform to the NIMAS, while a significant and necessary first step towards a comprehensive accessibility solution, will not meet the accessibility needs of all students with disabilities.

#### ***1. Copyright Constraints***

Under the current system, only those students with qualified print disabilities may be provided with accessible versions of print materials that have been converted to braille, audio, or digital text without directly seeking permission from (and giving compensation to) the copyright holder. Ironically, the Section 121 copyright exemption (Chafee Amendment), which was designed to ease the difficulties associated with providing students with print disabilities accessible and appropriate versions in alternate formats, emerges as a barrier when applied as a foundation element in an initiative designed to address the needs of *all* students with disabilities.

If the most conservative interpretation of the Chafee Amendment guidelines are applied, less than 5 percent of the nearly 6 million students who receive IDEA services and support would qualify to receive accessible instructional materials. In practice, there has been some flexibility in interpreting the Chafee Amendment guidelines. Nevertheless, the fact that the Chafee Amendment provides the only legal means of distributing accessible versions of proprietary materials to students with disabilities creates a significant hurdle when it becomes the basis for a broad-based initiative like the NIMAS.

Within the language including NIMAS as a mandate in the current IDEA reauthorization is a proposed modification to the copyright exemption that would allow publishers to provide NIMAS-compliant digital files directly to a centralized repository, conversion entities, or state or local education agencies, specifically for the subsequent provision of accessible versions of textbooks to students with qualifying disabilities. While this modification does not expand access to these materials to a broader range of students than is presently identified under existing copyright law, allowing curriculum publishers to act as authorized entities would significantly facilitate the flow of textbook files from producers to converters to users.

Beyond expanding the existing copyright exemption to include a broader number of content developers or a wider array of eligible students, it is clear that the original Section 121 copyright exemption was meant to function only as a relief valve for individuals for whom print information (including textbooks) was inappropriate. The exemption was not intended to be used as the foundation of a large scale content distribution enterprise, and attempts to make it so do a disservice to everyone involved: individuals with disabilities, intellectual property holders and publishers. Clearly a more flexible and wider-reaching alternative is necessary.

## ***2. Free Market Distribution of Accessible Versions***

The most logical and, ultimately, effective approach for the provision of accessible digital versions of print textbooks is the creation of free market distribution model. One such resolution is for publishers to create alternative and accessible versions of print textbooks for direct distribution to states, districts, schools and students at the same time that the print versions are available. Another possible solution is to improve, simplify, and expedite the process for third parties to obtain permission from, and give appropriate compensation to, the textbook copyright holders to make and distribute accessible versions, known in copyright terms as "derivative works." Under both of these approaches, the accessible digital versions could serve a broad range of students needs, beyond the needs identified in the narrow exemption from copyright laws granted by Chafee. The free market approach could eliminate the delay in the development and distribution of accessible digital versions that is now the norm, and the likely delays in distribution that continue to be associated with narrowly focused Chafee-compliant distribution. In order for a free market system to work, however, a number of conditions must be established.

First, education consumers (states, districts, schools) must demonstrate a willingness to pay for the value represented in the publishers' production and delivery of fully accessible instructional materials. If the growing array of state textbook adoption legislation—those mandating the provision of accessible versions that go beyond requiring digital text files to the inclusion of

graphical elements and easy-to-use navigation—is an indicator, the demand is beginning to be established but it must be met through a free market model rather than through statutory mandates and exemptions.

Second, publishers have to be able to reclaim the rights they have foregone under the Chafee Amendment in order to facilitate necessary production investments, including the acquisition of all rights required for reproduction and distribution of materials in digital format. While non-trivial, obtaining these rights is made much more enticing if the intellectual property holders and the publishers perceive that adequate compensation is viable.

Third, the workflow that produces print textbooks has to be adjusted to accommodate the creation of digital versions not as a deflection of core product development and manufacturing efforts but as a naturally occurring variation in the product cycle. Many of the large curriculum publishing companies have begun to move in this direction by establishing a digital workflow that can result in a number of *published* products; print textbooks and digital versions among them. Supplemental textbook publishers have not yet broadly adopted this transition, however, and these smaller production companies may need to establish partnerships with larger publishing concerns or with third party conversion entities in order to create conforming digital versions.

Fourth, third party conversion entities need to prepare to meet an increased demand for their expertise and a simultaneous shift in their client base. As commercial publishers move to establish their capability to produce accessible digital versions for sale on the open market, organizations and companies that now perform the final step in the alternative format conversion—creating braille, digital audio or otherwise accessible editions—will find an increased demand for their skills. Whereas consumers in the education system have been the primary source of demand for these specialized products, it is predicted that in a free market system demand would increasingly come from publishers and other content developers who would seek to annex both the established credibility of these third party organizations and their specialized knowledge.

Two readily apparent facts support this assessment of the potential transformation of the client base of third party conversion entities. First, during the past few years there has been demonstrable growth in the number of for profit conversion companies to meet the increased demand for accessible versions of print materials. These new firms have been joined by many established conversion companies that have developed expertise in the creation of accessible versions. Second, Kentucky's recent textbook adoption legislation allows for three levels of accessibility (minimal to optimal) for publisher submitted products. Few, if any of the curriculum publishers, have demonstrated interest in displaying products that would be identified as meeting the minimum standards for accessibility. Most have actively sought to develop products that reach or attain an optimum rating. This movement towards meeting the highest expectations indicates a willingness to develop not only competitive materials, but the most competitive materials.

None of the above referenced four conditions are felt to be unreachable, and the benefits to students with disabilities, intellectual property holders, content developers and content

conversion experts is readily apparent. Accessible digital versions would be provided to students with disabilities (who need them) and students without disabilities (who might prefer them). Intellectual property holders and content developers would be assured of adequate compensation and digital rights management. Content conversion experts would see their expertise in the development of alternative versions of instructional materials expand beyond the limited market in which they now exist into the broader educational enterprise. The NIMAS establishes an extensible foundation for moving this vision forward.

### ***3. Moving Beyond Accessibility***

While the stated purpose of determining the NIMAS was to establish a uniform specification to facilitate the timely provision of accessible materials to students with disabilities, it is important not to lose sight of the fact that it is the nation's *educational* system within which these alternative versions will be provided. With that arena in mind, the extent to which alternate, accessible versions of textbooks created from NIMAS-compliant source files enhance student *achievement* is a significant and very relevant question. Enhancing both access and achievement permeated the considerations of all the Panel members and this scope and concern is clearly documented in the Governing Principles articulated in Section III A.

NIMAS version 1.0, arrived at as a result of consensus building, and detailed in this report establishes a firm technical foundation for meeting both the access and educational needs of students with disabilities. Due to copyright constraints presented previously, it falls short of providing this foundation for all students with disabilities who could benefit from it. Students who manifest a print disability as the result of a physical or sensory impairment (blind, low vision and some learning disabled students) currently qualify, while students who may struggle equally to decipher or extract meaning from print (ADHD, deaf and hard-of-hearing, students with limited cognitive abilities, etc.) do not.

The first limitation constitutes an inequity, and the provision of accessible instructional materials to all students receiving services under IDEA or Section 504 needs to be addressed as quickly and as effectively as possible. Students who are currently eligible to receive these materials should continue to receive them, intellectual property holders and content developers should be assured compensation and control over distribution (to the extent that it does not impede accessibility), and the education enterprise should be assured timely availability.

The second limitation constitutes an uncertainty: flexible and accessible digital versions of core curriculum print textbooks have simply not been sufficiently available to measure their impact within the context of academic achievement. What is known, however, is that students with a wide range of disabling conditions—those who currently qualify as persons with print disabilities and those who do not—can benefit from technology-based instructional solutions.

A recent extensive summary of research in this area has been prepared by the National Center on Accessing the General Curriculum (Strangman, Hall, and Meyer (2003). Among many studies in this area are the following:

- Students with language-related disabilities showed positive effects for word recognition, comprehension, and fluency when using digital texts with synthetic, syllable- or letter name-level synthetic speech transformations. (Elbro, Rasmussen, Spelling (1996)
- Students with attentional, organizational and learning disabilities have shown increased academic gain when exposed to technology-supported concept mapping strategies. (Anderson-Inman, Knox-Quinn, & Horney, 1996; Herl, O'Neil, Chung, & Schacter, 1999)
- Students who are deaf or hard of hearing show consistent academic gains when provided with the sequential text highlighting and supportive captions available with digital instructional materials. (Mcinerney, Riley, & Osher, 1999; Andrews, & Jordan, 1997)
- Students with low cognitive abilities demonstrate increased functional skills when exposed to flexible technologies that maximize their strengths while helping to compensate for their weaknesses. (Wehmeyer, Smith, Palmer, Davies, & Stock, 2003; Carroll, 1993)

These findings, and many others, were articulated by Panel members in the creation of the *Governing Principals* that form the rationale for the NIMAS technical specifications. The Panel acknowledges that these benefits, which are known to be academically viable and technologically feasible are nevertheless not directly addressed in NIMAS version 1.0. This was not an oversight, but a strategic decision necessitated by the need to establish a supportable, implementable and copyright-compliant baseline upon which to build future extensions.

To support these considerations and others, the Panel strongly recommends that the NIMAS maintenance activities address the pedagogical impact of the increased availability of accessible digital textbooks for all students with disabilities.

#### **D. Research on Efficacy**

As referenced in the previous section, the impact of a National Instructional Materials Accessibility Standard on increasing the availability of alternative accessible versions of textbooks should be assessed along two primary areas of inquiry: accessibility and achievement.

##### ***1. Accessibility: Suggested Questions for Future Inquiry***

It is essential to assure that the potential benefits of NIMAS source files are realized in practice. The standard itself has little value to students; its value can be assessed only by measuring its impact on the availability of accessible educational materials for students with disabilities. Does enactment of the standard result in improved access to accessible educational materials for students with disabilities?

There are several issues that need to be addressed. They range from whether the standard itself is sufficient (e.g. are the resulting materials sufficiently accessible) to whether the implementation of the standard results in greater availability.

Questions about the accessibility of textbooks created from NIMAS source files:

- Are the alternate format textbooks created from NIMAS source files sufficiently accessible to meet the needs of the students for whom they are intended?
- Are the alternative format textbooks sufficiently accessible to meet the needs of all students with disabilities? For which students are they inaccessible?

Questions about the availability of accessible textbooks created from NIMAS source files.

- Does the availability of NIMAS source files increase the timely distribution of accessible alternate format textbooks to students with disabilities?
- Does the availability of NIMAS source files eliminate existing redundancies and inefficiencies associated with the creation and distribution of alternate format textbooks?
- Does the NIMAS source file specification sufficiently address state-level requirements for alternate format textbooks?

## ***2. Availability: Suggested Questions for Future Inquiry***


Access is a critical step in meeting the needs of students with disabilities. But in the era of No Child Left Behind, access is only a first step. In the increased accountability of NCLB, learning and achievement are measured, not access. Learning results are the desired outcome, not access. The critical research question is whether the provision of accessible versions of textbooks increases student achievement for students with disabilities.

- Does the provision of alternate format textbooks created from NIMAS source files result in increased academic performance for students with disabilities?
- Does the provision of alternate format textbooks created from NIMAS source files result in improvements in student motivation and engagement in learning for students with disabilities?
- Does the provision of accessible versions of textbooks affect students differentially (e.g., are there performance benefits for some students and not others)?
- What are the classroom conditions (e.g. teacher preparation, hardware availability, student placement, etc.) that affect the efficacy of accessible versions of textbooks?

## **VI. Resources**

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## **Appendix A: Technical Panel Detailed Meeting Summaries:**

### **Meeting 1: January 7, 2003**

The inaugural meeting of the NIMAS Technical Panel was held on Tuesday, January 7, 2003 from 8:30 AM to 5 PM at the Capital Hilton in Washington, DC. Thirty-seven panel members representing the interests of consumer/advocacy, technology and feasibility (curriculum publishers, attorneys, access specialists and standards organizations), were joined by representatives from the NCAC and the Office of Special Education Programs (OSEP). The public nature of this meeting attracted considerable national attention, and approximately thirty non-panel attendees, representing educators, the software industry and content transformation experts observed and commented on the panel's work. The goal of this initial meeting was to achieve consensus across all consumer/advocacy organizations represented, including representatives from Blind/Low Vision, Learning Disability, Physical Disability, Deaf, and Cognitive Disability support and policy groups.

Two critical elements in making the day a success were the participation of Stephanie Lee, Director of OSEP, who welcomed the Panel and re-stated the Department's commitment to supporting its work, and the comments by Robert Pasternack, Assistant Secretary of Education, re-affirming this importance and closing the meeting.

In discussions led by Professor Martha Minow of the Harvard Law School Children's Initiative and an NCAC partner, the specific objective of the meeting was to identify the necessary "features and functions" that accessible digital textbooks must afford print disabled students (Pre-school through Grade 12) via a voluntary NIMAS. In order to meet this objective, panel members were divided into four heterogeneous working groups, each of which was asked to consider the ways in which digital presentation might enhance the accessibility of the three primary components of traditional textbooks: print (text), graphical elements, and navigation/book layout. These working group sessions culminated in a whole group discussion and comment period (during which time public comment was solicited). Working group contributions were compiled into a master wish list of features and functions, which the entire panel later prioritized and a subgroup of technological members later analyzed in order to make recommendations for implementation.

Despite uneven levels of expertise and awareness, representatives from the consumer/advocacy organizations evidenced a uniform willingness to share their knowledge and listen to the concerns, frustrations, or possibilities articulated by other panel members. Members of organizations representing blind and low vision students have worked for years to promote strategies for the timely delivery of high-quality braille and electronic versions of textbooks, as have organizations representing students with physical disabilities. The emphasis of this initial meeting was, for many in these groups, a re-statement of work they had already completed. In contrast, the issue of considering and developing accessible digital textbooks was relatively new to panel members representing deaf students, and students with learning, attentional, and cognitive disabilities. To the credit of all panel participants, there was open sharing, even by

those for whom the discussions revisited previously considered work. These same participants, in turn, were afforded an expanded perspective of the needs of students outside their constituent group.

Similarly, panel members representing the curriculum publishing community, while able to articulate their concerns regarding market exigencies, intellectual property constraints, and ensuring product security in a digital environment, acknowledged the importance of generating an expansive wish list. They recognized that not doing so risked overlooking important elements that might arise from within the instructional needs of a select group of students - elements that might end up benefiting all students.

By all reports, consensus had already begun to develop, and a number of panel members, observers, and other participants noted that the process of sharing the unique learning needs of students with varying disabilities helped broaden their understanding of the barriers inherent in traditional print textbooks. The detail of the discussions was representative of the complexity of addressing all students' needs through the definition of a NIMAS. Concurrently, the discussions expanded the awareness of many participants as to the flexibility of digital versions, and how these materials can be used to address the mandates of IDEA '97, to ensure that students are given the opportunity to access, participate, and progress in the general education curriculum.

In addition to working toward the overarching goal of building consensus across the disability organizations represented at the meeting, panel participants adopted the following *assumptions* to help move the panel's work forward:

- A goal of a NIMAS is to ensure that students with disabilities are provided with access to instructional materials equivalent to that of their non-disabled peers.
- The student with a disability should be able to fully use the digital version in a manner that yields the same result as the print version affords a student without a disability.
- The curriculum materials under current consideration are textbooks and related print materials.

Some of the next steps in the NIMAS process were identified:

- Preliminary compilation of requested features and functions for re-distribution to panel members and prioritization.
- Comparison of requested features and functions with existing accessible digital book standards (i.e.; ANSI-NISO Z39.86-2002 - DAISY; IMS accessible instructional materials guidelines, etc.).
- Communication of NIMAS Technical Panel sub-project milestone dates.
- Updating of documents, reporting and postings on the NIMAS Web site.

## **Meeting 2: March 11, 2003**

The second meeting of the NIMAS Technical Panel was held on Tuesday, March 11, 2003, at the Marriott Metro Center in Washington, DC. The goal of this meeting was to review proposed technical solutions and standards. Following introductory remarks by Chuck Hitchcock, Project Director of NCAC at CAST, the panel members proceeded to review the draft generated after the February meeting of the Features and Functions necessary for student access.

Features and Functions were organized into three categories:

- **Group A:** items that were felt to be essential core components of a source file (e.g., the NIMAS).
- **Group B:** items that were felt to be essential but reflect the presentation capabilities of the client application (hardware or software) with which the source file would be used (e.g., screenreader, supported reading software, embosser, etc.).
- **Group C:** items that were felt to be desirable but extend beyond basic accessibility and represent a value-add to the existing materials; these are not within the scope of work of the Panel, but file format determinations should be sufficiently flexible as to allow for these (and other additions like them) in the future.

The discussion focused on clarifying the order and emphasis of Group A items, and panel members suggested a reclassification of items in this category following a *Governing Principles* structure. This reclassification was to be completed as soon as possible following the meeting.

Following this discussion, George Kerscher, Michael Moodie and James Pritchett of the ANSI/NISO Z39.86 ("Zed") Maintenance Committee submitted a formal proposal to accept a component of that standard, the DTBook Element Set, as the foundation for the NIMAS. George presented an overview of the work of the DAISY Consortium and its history, culminating with the formal ANSI/NISO adoption of Z39.86 as a standard in the spring of 2002. George, Michael and James provided panel members with information about the DTBook Element set, noting that many of the items that had been identified as essential in the Features and Functions discussion were already included in DTBook. However, they noted that not all necessary items were included and expressed a strong willingness to extend the Z39.86 maintenance process to Panel representatives to ensure that the specific instructional needs of PreK–12 students would be considered.

Following up on this presentation Dave Schleppenbach of ghBraille delivered a presentation of the capabilities of DTBook-conformant source (with additional custom tagging) files. He provided panel members with specific examples of how a well-structured, consistently tagged source file could be transformed into custom presentation formats depending upon student needs. He explored a number of customization possibilities, including instantaneous onscreen text-to-braille renderings for use with refreshable braille devices or print braille, flexible text-to-speech support with multiple voices and intonation, American Sign Language and finger spelling renderings of text documents, and embedding of learning supports (being able to have a word "sounded out" for pronunciation purposes, for example). This presentation proved to be very

helpful in distinguishing between a single *source* format and the subsequent *presentation* formats that could then be extracted from it.

Stephanie Lee, Director of OSEP at the U.S. Department of Education again took time to address the panel and thank them again for their contributions to the work of establishing a voluntary NIMAS.

Sheela Sethuraman of CAST initiated some preliminary in-depth discussion of the strengths, limitations, and feasibility of DTBook. She discussed the correlation between the Features and Functions list and the existing DTBook element set. More extensive discussion was deferred to a series of subgroup conference calls.

Skip Stahl initiated a discussion of the need for reform in the procurement of accessible digital instructional materials. Specifically, he emphasized that in order to create a sustainable market for high-quality accessible materials, publishers need to be compensated for their efforts. He explained that a number of state legislative initiatives require publishers to provide materials in specialized or alternative formats at no cost—an approach that limits the research, development, design and production of these materials. In contrast, digital materials which can be sold alongside print versions promise to create a market incentive for publishers, and encourage them to increase the quality and production values of accessible digital versions since the potential of reimbursement exists. In addition, the availability of digital instructional materials alongside the print versions increases the potential of widespread student use.

By all reports, panel members felt that the meeting was challenging and ultimately achieved significant momentum by reaching consensus that the DTBook Element Set is the correct foundation, subject to modifications, enhancements, and/or limits, for the voluntary NIMAS.

### **Meeting 3: June 9 & 10, 2003**

The third and final large group meeting of the Panel was held on Monday, June 9 and Tuesday, June 10, 2003, at the Marriott Metro Center in Washington, DC. Meeting activities were extensive and included amending the drafted Features and Functions list, discussing the Chafee amendment, discussing recommendations made by the technical subgroup regarding what was technically needed and feasible, reviewing a draft response to the full DTBook element set proposal, discussing the viability of envisioning a free market model for the distribution of accessible electronic instructional materials, and discussing what James Pritchett called *technical issues* beyond markup.

The panel began by working to amend the draft compilation of the Features and Function list (now referred to as *Governing Principles*) to refine the essential functionality of accessible digital versions of print textbooks for students with disabilities. The Governing Principles document identifies the accessibility features that NIMAS-compliant source files should support after they have been transformed into presentation formats (e.g., properly formatted braille, Digital Talking Books, etc.) for student use. The delineation of this functionality was ordered within five Governing Principles:

1. NIMAS should be sufficiently extensible to support transformations into multiple presentation formats (e.g., text to properly formatted braille, text equivalents of non-text elements, etc.).
2. NIMAS should support the inclusion of all media that are contained in the printed work (e.g., text, graphics, charts, tables, etc).
3. NIMAS should provide for the incorporation of structural information about the print work (e.g., chapter, section, and subsections; paragraph and line; page breaks and page numbers; line numbers where essential; indexes and tables of content, etc).
4. NIMAS should facilitate the efficient and automated conversion of print material into more accessible formats.
5. NIMAS should accommodate all fields of study, including those that require special notation (e.g., math and music), as standards become available.

The Governing Principles document gives a rationale and supporting detail for each of these five principles.

Following refinement of the Governing Principles, invited guest Jessica Brodey from Leslie Harris and Associates presented an overview of the Chafee Amendment (Section 121 of the Copyright Act). Details of this exemption are provided on the National Library Service fact sheet at <http://www.loc.gov/nls/reference/factsheets/copyright.html>.

An important focus of the Chafee discussion was reviewing the definition of the term *qualifying students*, which constrains the distribution of materials in specialized formats to a subset of students who might be identified as *disabled* under IDEA and Section 504 of the Rehabilitation Act. Qualified students are referenced in the copyright exemption as:

*'blind or other persons with disabilities' means individuals who are eligible or who may qualify in accordance with the act entitled 'An Act to provide books for the adult blind,' approved March 3, 1931 (2 U.S.C. 35a; 46 Stat. 1487), to receive books and other publications produced in specialized formats.*

The National Library Service provides additional clarification of this restriction:

### **Eligibility of Persons with Reading Disabilities**

Public Law 89-522 states that materials will be loaned to readers "certified by competent authority as unable to read normal printed material as a result of physical limitations, under regulations prescribed by the Librarian of Congress for this service." The [current federal regulation](#) for this program is set forth in the *Federal Register* for June 7, 1974, as amended October 2, 1981. **Individuals with reading disabilities are not expressly covered by this statute.** Under Public Law 89-522, only persons whose reading disabilities are **physically based** are eligible for the NLS talking-book program. Furthermore, the reading disability must be certified by competent authority, described below, as having a physical basis before an applicant is considered for the talking-book program. An individual whose reading disability does not have a physical origin is **not** eligible.

(Emphasis placed by NLS at   
<http://www.loc.gov/nls/reference/factsheets/readingdisabilities.html>)

Two interrelated issues prompted further discussion related to student eligibility. The first of these issues was the referencing in both the House and Senate versions of IDEA of state adoption of the NIMAS as a prerequisite for receipt of IDEA funds. The second issue was that of the NIMAS Panel's responsibility to ensure that the access needs of students who presently qualify under the existing copyright exemption (Blind, low vision and print disabled) and the needs of students who may be eligible for services under IDEA/Section 504 (some learning disabled, students with Attention Deficit Hyperactivity Disorder, students with low cognitive abilities, deaf students, hard of hearing students, etc.) were both supported.

Relating to the first issue, NIMAS as a requirement for IDEA funds, the publishing community and transformation house representatives noted that if the relevant language remains in the IDEA through passage, whatever the Technical Panel recommends to the Secretary of Education will become a mandate for publishers and states. With NIMAS as a mandate, publishers would be required to conform to existing copyright law. The publisher representatives did inform the Panel that a consortium of interested parties had agreed to suggest language for the Senate version of the IDEA that would allow publishers to distribute electronic files as authorized entities, a provision that is not presently allowed under Chafee. If publishers were designated as authorized entities for this explicit purpose, the present time and cost to transform materials into accessible student versions would be substantially reduced. The extent to which students qualify under the Chafee Amendment, however, would continue to remain limited to students qualified as blind, low vision or print-disabled.

This raised the subject of the NIMAS workflow process. As envisioned, publishers would submit marked up electronic files in the NIMAS format to either a centralized or distributed repository system for validation. These files would then be made available to content conversion organizations (authorized entities) for transformation into presentation formats suitable for student use. States could then obtain these files from a centralized or distributed repository or from the conversion organizations. The file provided by the publishers would constitute the core NIMAS (version 1.0), and the conversion organizations would align this with existing standards related to properly formatted braille, Digital Talking Books, and others.

Related to issue two, panel members discussed the limitations of being able to recommend NIMAS version 1.0 only to students who are Chafee eligible. In particular, representatives from the learning disabilities and cognitively impaired communities expressed deep disappointment and frustration that under existing copyright law a number of students in those categories would not be eligible for these materials. Publishers' representatives and the Association of American Publishers (AAP) did express their hope that in the near future accessible versions of core curriculum materials would be available for use by all students with disabilities. Discussion also addressed the NIMAS format itself, and the fact that nothing currently under consideration would preclude its applicability for use by many students with disabilities.

Discussion then turned to the recommendations that had been made by the technical subgroup of the Panel. Chris Wilder-Smith from CAST presented an overview of these recommendations,

initiating a discussion of both what was needed and what was felt to be feasible. The technical subgroup, after a number of conference calls and document sharing, decided to recommend that the entire DTBook element set be selected as NIMAS version 1.0. CAST proposed that elements relating to multimedia, interactivity, glossary and bibliographic information, and relational semantics be referenced as highly desirable, especially for students without visual impairments (those who could benefit from a rich and *print aligned* digital edition of a textbook). Although these element categories were acknowledged as important for future consideration, they were felt to be too ambitious and generalized for inclusion in NIMAS version 1.0 within the required time frame.

The "feasibility" subgroup of the Technical Panel, led by Pearce McNulty, Director of Publishing Technology, Houghton-Mifflin; Alex Mlawsky of McGraw-Hill, and Steve Driesler, Executive Director, of the School Division of the AAP, School Division, reported on their process of discussion and document sharing. A draft response to the full DTBook element set proposal made on Monday was distributed and reviewed.

The feasibility proposal identified a subset of the DTBook elements and the glossary/bibliography elements identified earlier in the meeting. Discussion focused on the elements proposed in the feasibility document, with special emphasis on how tables and images would be provided to conversion organizations. There was considerable debate over the necessity of receiving table data and not just a graphic of the table. The proposal was clarified, and the panel came to general agreement about it, while recognizing that additional details needed to be worked out.

Rick Ferrie from Mazer Corporation moderated a discussion of the viability of envisioning a free market model for the distribution of accessible electronic instructional materials. Discussion highlighted the factors that made this option attractive to both content producers and consumers:

1. Accessible digital versions sold under a free market distribution model would not be restricted for use by a subset of the special needs population—they could be made available to any student.
2. A number of publishing houses are moving towards a digital workflow that will enable them to produce print as well as digital versions of their materials.
3. Publishers are working to acquire digital rights for textbook materials at the same time that they acquire print rights.
4. Consumers are not adverse to paying for accessible digital versions of curriculum materials, and this allows publishers to envision adequate compensation for their efforts and to apply higher quality standards to the products that they develop for students with disabilities.

Impediments to rapid adoption of this model were identified, including:

1. The cost of transforming a print workflow to a digital workflow for those publishers who are moving in that direction incrementally and for supplemental publishing houses with limited financial resources.

2. The perceived non-existence of a market for digital instructional materials within the general education population.
3. The perception that *alternate versions* of instructional materials should be provided to consumers at no charge.

James Pritchett of RFB&D moderated a discussion of what he termed *technical issues beyond markup*. The discussion targeted 4 broad issues.

**Quality assurance:** Quality assurance can be divided into two distinct phases: validation (is the file a valid NIMAS document?) and quality (now that we know the file is valid, does the markup have integrity?). The first question, validity, can be addressed through an automatic (machine-based) process that makes certain that all required tags are present and properly structured (no paragraphs within sentences, etc.). The second question requires a more qualitative appraisal. Both are felt to be necessary to certify that a NIMAS file conforms to the standard. The Panel suggested that a review of existing procedures be undertaken (e.g., what have other standards bodies done?) and suggestions made to the panel at large.

**Documentation and training:** Documentation must be recognized as an integral part of the standard. How detailed should it be? Do we need more than one document (e.g., a technical standard plus a "best practices" document, a FAQ-type document as well)? Will documentation be sufficient by itself, or will some kind of training with semantic markup expertise be required? While discussion related to documentation and training was limited due to time constraints, the publisher representatives unanimously requested that the Panel recommend documentation and training guidelines, and that publishers be provided with properly marked up files as examples. Members of the technical subgroup agreed to develop models.

**Workflow:** Even though the issue of workflow is outside the scope of the NIMAS Technical Panel, recommendations for optimum workflow (centralized versus distributed repository, etc.) were felt to be essential to the Panel's work if the NIMAS was to achieve the greatest possible efficiency. Both the technical and feasibility subgroups have begun to address the workflow issue (within Chafee constraints and as a free market model), and these discussions have been annotated and documents combined into a draft narrative for full Panel review.

**Maintenance of Specification:** Like any technical specification, the NIMAS spec will need to change as technology and usage change. Of particular concern is the connection of NIMAS to ANSI/NISO Z39.86, which itself is under continuous maintenance. Will the NIMAS spec need to be updated after every change to Z39.86? Also, as this is a new venture for publishers, there will be any number of unexpected ambiguities, issues, and glitches that will turn up after adoption. The Panel strongly recommended that a group of individuals (perhaps ten) representing publishing, conversion entities, education and disability be identified and funded as an NIMAS Maintenance Committee to determine maintenance protocol and versioning policies as the need for these evolves.

The meeting concluded with a review of next steps:

1. The Governing Principles document would be revised and distributed to all Panel members for review.
2. A technical subgroup would meet to identify all proposed elements and markup, develop a document detailing the proposal, and circulate among all panel members for commentary. Preference would be given to the consumer/advocacy subgroup to make certain that the recommended elements and markup are satisfactory for NIMAS version 1.0. Following the receipt of commentary from the consumer/advocacy subgroup, the element list would be formally submitted to the publisher representatives for review and discussion.
3. A working draft outline of the report of the NIMAS Technical Panel to the Secretary of Education will be developed and distributed to all panel members for commentary & review.

## Appendix B

### Usage Guidelines

**NOTE:** Information in this section was excerpted from the DAISY Structure Guidelines (<http://www.daisy.org/publications/guidelines/sg-daisy3/structguide.htm#contents>) copyright the DAISY Consortium, 2002, and is used by permission of the DAISY Consortium.

Listed below are examples of expected practice relating to the use of the baseline National Instructional Materials Accessibility Standard as an application of elements from the dtbook110.dtd. Expanded documentation for the dtd may be found at

<http://www.loc.gov/nls/z3986/v100/dtbook110doc.htm>.

This listing of examples is in no way designed to supplant the Daisy Structure Guidelines and those wishing a more extensive review of the ANSI/NISO Z39.86 element set and conforming use practices should consult the DIASY Structure Guidelines directly.

---

### 1. Document-level tags (required to be valid XML)

---

#### DTBook DTD

The XML Document Type Definition (DTD) used for the textual content files of digital talking books is the DTBook DTD. Its filename is dtbook110.dtd. It is a machine-readable list of allowable tags, the attributes that may be applied to them, and rules on where the tags may be used. For example, sentence tags (<sent>) can be used inside paragraph tags (<p>), but not the other way around. To verify that a document has been marked up in accordance with a DTD, one runs a program called a validating parser that compares the markup with the DTD and lists any errors in applying tags, attributes, etc.

Because the DTD is written to be read by a computer it is not particularly easy for the average person to understand. An HTML "Expanded DTBook DTD" is available, containing the same information as the DTBook DTD but in a more user-friendly format. It contains a discussion of

DTDs, an alphabetical list of the elements (tags) included in the DTBook DTD, clear statements of what tags can be used inside a given element, where, in turn, each element can be used, and information on the attributes allowed for each element. Attributes that must be used whenever a specific tag is used are marked as "required" for that tag. Those that are optional are labeled "implied." The latest version of the DTD and its associated Expanded DTD can be found at <http://www.loc.gov/nls/z3986>.

### **Required Tags**

The following tags are required for a book to be valid to dtbook110.dtd. The complete DAISY Digital Talking book is surrounded by the <dtbook> and </dtbook> tags. Within these, the <head> and </head> and <book> and </book> tags must also be present. The <head> tags identify information about the book that is separate from the content. The <book> tags enclose the whole of the book. The following example illustrates how these tags are used.

```
<dtbook>
<head>
Information About the Book
</head>
<book>
The entire content of the book, including cover information, etc.
</book>
</dtbook>
```

---

## **2. Structure and Hierarchy**

---

### **Information Object: Front Matter**

Definition: One of the three major divisions of the interior of a book, the front matter is comprised of preliminary pages which serve as a guide to the contents and nature of the book. Front Matter may include:

- Series title, list of contributors, frontispiece or blank page
- Title page
- Copyright notice, publisher's agencies, printing history and country where printed, ISBN, CIP
- Dedication (or epigraph)
- Blank page
- Table of Contents
- List of Illustrations
- List of Tables
- Foreword
- Preface

- Acknowledgments
- Introduction
- List of Abbreviations
- Chronology

#### [Bibliographic Reference](#)

Overview: Within the frontmatter of a book, in most cases only objects with headings should be identified using a level tag and its associated heading tag. A preface would normally be a major structure that an end user would want to directly access so it should be marked as a level with the associated heading. Other items without a heading, such as the dedication, should be marked as divisions (<div>).

Markup: Frontmatter serves primarily as a container for a variety of structures and is commonly subdivided into a number of levels and divisions.

Elements:

 [<frontmatter>...</frontmatter>](#)

---

#### **Information Object: Body Matter**

Definition: Body Matter consists of the text proper of a book. It is the content per se that represents the author's thesis or story. The body of a book is most commonly subdivided into chapters and further into levels of subheadings such as sections and subsections if needed. Sometimes the text material is logically divided into sections larger than chapters with the chapters grouped into parts which are usually numbered. The body sometimes concludes with either epilogues, afterwords or conclusions.

#### [Bibliographic Reference](#)

Overview: In the body of the book all major structures should be marked as a strict hierarchy and should use the levels and their associated headings as identification.

Markup: bodymatter serves primarily as a container for a variety of structures and is commonly subdivided into a number of levels.

Element:

 [<bodymatter>...</bodymatter>](#)

---

#### **Information Object: Rear Matter**

Definition: One of the three main divisions of the interior of a print book, the rear matter (also referred to as back matter, end matter or reference matter) is the division of material that

immediately follows the text. Rear matter is usually comprised of some or all of the following parts, generally in the following order:

- Appendix
- Notes
- Glossary
- Bibliography or Reference List
- Index
- Colophon

#### [Bibliographic Reference](#)

Overview: The rear matter may contain many different major structures and these should be identified as levels with their associated headings.

Markup: Rear matter serves primarily as a container for a variety of structures and is commonly subdivided into a number of levels.

Elements:

 [<rearmatter>..</rearmatter>](#)

---

### **Information Object: Section, Subsection, and Lower Levels of the Hierarchy**

Definition: Sections are inserted by the author or editor in prose works where the chapters are long and the material complex. Sections and/or subheadings in the text function as guides to the reader. Most scholarly works require only one level of subheading throughout. Scientific and technical works frequently require further subdivisions.

When a section of text is subdivided, there should be at least two subsections and in some works the number of sections will vary from chapter to chapter, and the levels of subdivision may vary as well.

Sections and subsections may be numbered or unnumbered. Especially in scientific and technical works, the numbering of sections and subsections provides an easy reference to the reader. In print books, unnumbered sections and further subdivisions are indicated by font size and various forms of emphasis such as bolding or the use of italics.

#### [Bibliographic Reference](#)

Markup: Sections and subsections of chapters are included in the bodymatter of the book and are marked with level2, level3, or level4 tags, etc., depending on where they fall in the hierarchy. Note in the example below that the level and heading tags include a class attribute of the same name as the type of division being tagged (class="chapter", "section", or "subsection"). When books are divided below the subsection level, some creativity is required to find suitable names for those lower levels to distinguish among them.

Elements:

```
<level1 class="chapter">
<h1 class="chapter">Chapter 5</h1>
<level2 class="section">
<h2 class="section">Metadata for Mary</h2>
</level2>
</level1>
```

or:

```
<level1 class="part">
<h1 class="part">Part One: Standards</h1>
<level2 class="chapter">
<h2 class="chapter">Chapter 3: Core Services</h2>
<level3 class="section">
<h3 class="section">Circulation Systems</h3>
<level4 class="subsection">
<h4 class="subsection">Loan Periods</h4>
<level5>
<h5>Overdue Notices</h5>
```

...

```
</level5>
```

...

```
</level4>
```

...

```
</level3>
```

...

```
</level2>
```

...

```
</level1>
```

Example:

```
<level1 class="chapter">
<pagenum id="page_1" page="normal">1</pagenum>
<h1 class="chapter">Chapter 1 People as a Basic Resource</h1>
```

```
<level2 class="section">
<pagenum id="page_2" page="normal">2</pagenum>
<h2 class="section">Introduction</h2>
```

```
<p>Operating managers face unprecedented advances in technology, information and knowledge. Customers demand change constantly. Competition is no longer with someone across the street, but with someone around the world.</p>
```

```
<level3 class="subsection">
<h3 class="subsection">Demographic Trends</h3>
```

```
<p>America's population is changing dramatically. On average, an American woman gives birth to 1.8 children in her lifetime, down from 3.7 in the 1950's, at the height of the baby boom.</p>
```

...

</level3>

<level3 class="subsection">

<h3 class="subsection">Socioeconomic Changes</h3>

<p>Socioeconomic changes are also having tremendous impact on organizations. These changes are beyond management's control, but will require management's attention to cope with them productively.</p>

...

</level3>

</level2>

<level2 class="section">

<pagenum id="page\_7" page="normal">7</pagenum>

<h2 class="section"><h2>The History of Human Resource management</h2>

<level3 class="subsection">

<h3 class="subsection">Early Organization</h3>

<p>Management of society and organizations in ancient Rome 2000 years ago is a good example of how early organizations managed people. Management of people was based on several assumptions.</p>

...

</level3>

<level3 class="subsection">

<h3 class="subsection">The Industrial Revolution</h3>

<p>In the early 1800's, Western Europe and North America began to change from agricultural to industrial societies.</p>

...

</level3>

</level2>

</level1>

---

### 3. Block Elements

---

#### **Information Object: Author**

Definition: Identifies the writer of a work other than the present one. Contrast with <docauthor>, which identifies the author of this work.

Markup: Use the <author> tag to indicate the writer of each poem, story, play, chapter, etc. in works where each segment was separately authored. Use it also to indicate the source of a quotation where only the author is given. If a complete citation for a quotation is given, use <cite> instead of <author>. Use the <docauthor> tag to indicate the author of the book being marked up. Within a list of authors, use line breaks (<br/>) for formatting where needed.

Element:

 [<author>..</author>](#)

Example 1 - Author of Chapter:


```
<level1 class="chapter"> <h1>Chapter 2: Reading Aids and Devices</h1>
<author>Leslie L. Clark</author>
```

Example 2 - Author of a Quotation:

```
<blockquote>
<p>It is a certainty that the free market will always generate greater wealth for the main players
than will a planned economy. The question is, at what cost?</p>
<author>Virginia Hamilton Anderson</author>
</blockquote>
```

---

### Information Object: Quotation (Block Quotation)

Definition: A written passage drawn verbatim from another work, usually with the author credited. Longer quotations that are often set off from the surrounding text by paragraph breaks are called block quotations. Shorter quotations that are incorporated within a sentence or paragraph are called inline quotations. See Inline Elements:  [Information Object: Quotation](#).

Markup: Long quotations are marked with the <blockquote> tag. Quotations may be nested one inside the other.

Element:

 [<blockquote>...</blockquote>](#)

Example:

```
<p>So you can imagine how Samson was brought up. Shrieks and wails if a razor went near his
head, and the whole community involved. Only, as soon as he was grown into the biggest,
strongest man around, he started causing trouble by bedding and wedding Philistine girls, not his
own kind, to the distress of Manoah and "the woman" who now at least becomes "his mother"
though she still never gets to have his name.</p>
```

```
<blockquote>
And she made him sleep upon her knees, and she called for a man, and she caused him to shave
off the seven locks of his head: and she began to afflict him and the strength went from him.
</blockquote>
```

The <author> tag can be used within <blockquote> to identify the author of the quotation, if present.

---




## Information Object: Lists




Definition: A list is a sequence of two or more items. For markup purposes, there are two types of lists:

1. Ordered/unordered lists: In ordered lists, list items are numbered or lettered. Such lists are most often used for procedures (e.g., a recipe) or sequential lists (e.g., an agenda). In unordered lists, list items are unnumbered and usually marked with a bullet or other typographical device. They can also be unbulleted.
2. Definition lists: List items generally consist of term/definition pairs (a term followed by its definition).

### [Bibliographic Reference](#)

Markup:

Ordered and unordered lists are created using  [<list>](#) tags. When a list contains a heading, the heading should be included in the list and marked with the `<hd>` tag. Individual list items in unordered or ordered lists are indicated with the  [<li>](#) tag. If list items consist of two or more discrete segments that should be distinguished, those segments should be marked with the `<lic>` ("list item component") tag. A common example of the use of `<lic>` is in a table of contents to separately mark each entry and its corresponding page number. The `<lic>` tag should only be used when there are two or more segments in each list item. However, when there are more than two segments to each list item, consider using the `<table>` tag instead. See  [Tables: Information Object: Tables](#). If the information presented contains nesting (see below), this is generally an indication that it should be marked as a list rather than a table.

Definition lists are created using  [<dl>](#) tags. In addition, definition lists require the  [<dt>](#) tag to indicate the term being defined, and the  [<dd>](#) tag to mark the definition.

Nested lists: a list item can also contain within it another list, which may in turn hold another list inside it, and so forth. Such a series of lists is said to be "nested."

Elements:

 [<list>...</list>](#)

 [<hd>...</hd>](#)

 [<li>...</li>](#)

 [<lic>...</lic>](#)

 [<dl>...</dl>](#)

 [<dt>...</dt>](#)

 [<dd>...</dd>](#)

Example 1: Unordered List

```
<list class="ingredients">
<li>mango.</li>
<li>lychee.</li>
<li>carambola.</li>
<li>rambutan.</li>
<li>sugar.</li>
<li>lime juice.</li>
</list>
```

#### Example 2: Ordered List

```
<list class="steps">
<li>1. peel fruit.</li>
<li>2. cut fruit in bite sized pieces.</li>
<li>3. sprinkle fruit with sugar and lime juice to taste.</li>
<li>4. stir salad.</li>
<li>5. chill for one hour.</li>
</list>
```


#### Example 3: Nested Lists, showing use of <hd> tag

```
<list>
<hd>Tropical Fruit</hd>
<li> well-known tropical fruit
<list>
<li>pineapple</li>
<li>papaya</li>
</list></li>
<li>exotic tropical fruit
<list>
<li>rambutan</li>
<li>mangosteen</li>
</list></li>
</list>
```

#### Example 4: Definition List

```
<dl>
<dt>mango</dt>
<dd>tropical fruit with sweet golden flesh</dd>
<dt>lychee</dt>
<dd>tropical fruit with deep red leathery skin and clear white flesh</dd>
<dt>carambola</dt>
<dd>star shaped tropical fruit with tart lemon-pineapple flavour</dd>
<dt>rambutan</dt>
<dd>egg-shaped tropical fruit similar to lychees with leathery skin covered in soft red hairs</dd>
```

</dl>

 [See Major Structural Elements: Information Object: Table of Contents](#) for an example of nested list markup using the <lic> tag.

---

### **Information Object: Note (Footnote, Endnote, Annotation and Rear-Note)**

Definition: Notes documenting the text and corresponding to reference numbers in the text are called footnotes when they are printed at the foot of the page and notes or endnotes when they are at the back of a book, at the end of a chapter or at the end of an article in a journal. They are generally numbered consecutively beginning with 1, throughout each chapter or article.

#### [Bibliographic Reference](#)

*NOTE: Annotations are similar to footnotes, but normally appear in the margin.*

Markup: A note, endnote, annotation or rear-note consists of two parts: the reference number or symbol in the text called the note or annotation reference (<noteref> or <annoref>, respectively) and the note or annotation itself (<note> or <annotation>) which contains the content.

To accurately reflect the print, the <noteref> tag should be placed at the exact spot in the text where the reference number or symbol occurs. Surround the note reference number or symbol with the <noteref> tags as shown below. The attributes "idref" and "id" will normally be inserted automatically with a post-production tool. The text of the note should be left where it occurs in the original text file, whether at the bottom of the page for footnotes or the end of the chapter or book for endnotes.

*NOTE: The producer would arrange to have all of the endnotes narrated as a block. Footnotes would be narrated in the manner best suited to the production tools and processes.*

Elements:

```
<noteref class="footnote" idref="fn1"><sup>1</sup></noteref>
```

 [<note class="footnote" id="fn1">...</note>](#)

```
<noteref class="endnote" idref="en4"><sup>4</sup></noteref>
```

 [<note class="endnote" id="en4">...</note>](#)

Example 1:

```
<p>Morley's favorite vacation spot was the Bay of Islands <noteref idref="fn12" class="footnote"><sup>12</sup></noteref> on New Zealand's North Island.</p>
```

```
<note id="fn12" class="footnote"><p>12. Morley once described the area as "paradise in twenty shades of blue".</p></note>
```

Notice that <p> tags (or others such as for citations, lists, or tables) must be used within the <note> tags to mark the content of the note. Untagged text cannot be contained within <note> tags.

Example 2:

A. The footnote reference appears as follows in the print book:

When Eve bit into the apple, she gave us the world as we know the world - beautiful, flawed, dangerous, full of being.

Of the salvation she engendered she will be recipient, in heaven, where we "repent not, but smile; not at the sin, which cometh not again to mind, but at the Worth that ordered and provided."1

The footnote reference appears as follows when marked up:

<p>When Eve bit into the apple, she gave us the world as we know the world - beautiful, flawed, dangerous, full of being.</p>

<p>Of the salvation she engendered she will be recipient, in heaven, where we "repent not, but smile; not at the sin, which cometh not again to mind, but at the Worth that ordered and provided." <noteref idref="p21-fn1" class="footnote">1</noteref></p>

B. The footnote itself appears in the print book as follows:

A. Dante. *Paradiso*, translated by Philip H. Wickstead (New York: Modern Library/Random House, 1932), Canto 9:103-105, p.458.

Marked up, the footnote appears as follows:

<note id="p21-fn1" class="footnote"><cite>1. Dante. *Paradiso*, translated by Philip H. Wickstead (New York: Modern Library/Random House 1932), Canto 9:103-105, p.458.</cite></note>

Example 3:

Text containing an annotation reference appears as follows in the print book:

The speed of a sailing vessel was measured in **knots**.

The annotation reference would be marked up as follows:

<p>The speed of a sailing vessel was measured in <annoref idref="anno\_4">knots</annoref>

The annotation itself would usually be printed in the margin of the print book. It would appear as follows when marked up:

<annotation id="anno\_4=">The term "knot" is derived from the practice of counting the number of knots on a line unreeled in a set period of time from a device known as a chip log.</annotation>

---

### Information Object: Paragraph

Definition: The paragraph is the fundamental organizational unit for all prose texts. It is the most basic regular unit into which prose can be divided. Paragraphs have no firm internal structure but contain prose encoded as a mix of characters, entity references, phrases and embedded elements such as lists, figures or tables.

#### [Bibliographic Reference](#)

Markup: The paragraph is marked by the "<p>" tag which surrounds the content of the paragraph.

Element:

 [<p>...</p>](#)

Example:

<p>Of the kindness of Dr. Stephenson, he always spoke with the greatest warmth of gratitude and affection.</p>

<p>After he had followed his studies at Edinburgh for four years, on the breaking out of the Rebellion in 1745, he returned to Dumfries, where he resided with Mr. McMurdo, his brother-in-law, in whose house he was treated with kindness and affection; and had an opportunity, from the society which it afforded, of considerably increasing the store of his ideas. In 1746, he published a small collection of his poems, at Glasgow.</p>

<p>After the close of the Rebellion, and the complete restoration of the peace of the country, he returned to Edinburgh, and pursued his studies there for six years longer.</p>

---

### Information Object: Sidebar

Definition: A sidebar contains information supplementary to the main text and/or narrative flow that is positioned as if boxed and floating separate from the main text block. Sidebars may include a heading, followed by paragraphs, lists and other block-oriented elements.

#### [Bibliographic Reference](#)

Elements:

 [<sidebar>...</sidebar>](#)

 [<hd>...</hd>](#)

Example:

```
<h2 class="recipe"> Chocolate Stars</h2>
<list>
<li>4 ounces cold unsalted butter</li>
<li>1/2 cup sugar</li>
<li>1/2 teaspoon vanilla extract</li>
<li>1 cup all-purpose flour.</li>
<li>1/4 cup unsweetened cocoa powder</li>
<li>1/8 teaspoon salt</li>
<li>1/8 teaspoon baking powder</li>
<li>1/2 cup finely chopped semisweet chocolate</li>
</list>
<sidebar>
<hd class="sidebar_title">Cocoa Powder News</hd>
<p>Amy uses a "full Dutch" process cocoa called "Jersey cocoa" that has 22 to 24 per cent fat
and is available through the San Francisco based cookware chain Williams-Sonoma.</p>
<p>If you are shopping for cocoa near to home, look for the darkest unsweetened sort
available.</p>
</sidebar>
```

Usage: Sidebars may be turned on or off by the end user. That is, the end user will be able to set the playback device to play all sidebars or to skip them all. If this feature is to be supported these items must be tagged.

Note: See  [Block Elements: Information Object: Notice](#). A <notice> is similar to a sidebar but may not be turned off by the end user.

---

## 4. Inline Elements

---

### Information Object: Emphasis

Definition: A word or series of words that the author has emphasized through the use of some typographical convention such as italic or boldface type or underlining.

Markup: The <em> and <strong> tags are relative indicators of emphasis. The <em> tag indicates moderate emphasis and the <strong> tag heavier emphasis. These tags must be used with care since their application will depend upon the types of emphasis employed in a document. In a book in which italics and boldface are used for emphasis, <em> would mark the former, and <strong> the latter. However, if a book used boldface in some situations and underlined boldface in other, <em> would mark the first type of emphasis and <strong> the second.

Element:

 [<strong>...</strong>](#) or  [<em>...</em>](#)

Example:

The following paragraph would be marked up as shown below:  
"When pressing the blue button, *hold down for two full seconds*.  
And remember, **DO NOT PRESS THE RED BUTTON!**"

<p>When pressing the blue button, <em>hold down for two full seconds.</em>  
And remember, <strong>DO NOT PRESS THE RED BUTTON!</strong></p>

---

### Information Object: Quotation

Definition: A quotation is a written passage drawn verbatim from another work. An inline (or text level) quotation is integrated into the text. This process is used for short quotations which don't require paragraph breaks. For longer quotations set off from surrounding text by paragraph breaks, see Block Structures [Information Object: Quotation](#).

Markup: Inline or text level quotations are marked with the <q> element. When quotation marks are used only for emphasis, no markup is necessary since the presence of the quotation marks is sufficient notice of the author's intent.

Element:

[<q>...</q>](#)

Example:

<p>Sir Walter Scott said it best when he wrote, <q>"Oh, what a tangled web we weave, When first we practice to deceive!"</q>.</p>

---

### Information Object: Strong Emphasis

See [Information Object: Emphasis](#).

---

### Information Object: Subscript and Superscript

Definition: Subscript and superscript characters are those written below or above normal text, respectively.

Markup: These elements can be used recursively, that is you may use <sup> inside <sup>, for example; they can also be intermixed (e.g., <sub> inside <sup>).

Element:

[<sub>...</sub>](#) or [<sup>...</sup>](#)

Example:

<p>Scientists maintain that global warming is due primarily to an increase in atmospheric concentrations of CO<sub>2</sub>.</p>

<p>Perhaps the best-known formula of our day is Einstein's E=mc<sup>2</sup>.</p>

As an example of recursive use, the expression e to the x squared would be rendered as: e<sup>x<sup>2</sup></sup>.

---

### Information Object: Line Break

Definition: A line break constitutes the forcible division of text onto separate lines. Text is sometimes presented with no punctuation separating different segments but with each segment appearing on a line by itself. When it is necessary to preserve these separations a line break should be forced.

Element:

 [<br/>](#)

Markup: This is an empty element (i.e., only a single tag ending in "/" is used, rather than the usual start and end tags).

Example:

```
<code>while( i < limit )<br/>
i++;<br/>
</code>
```

---

### Information Object: Page Number

Definition: A number printed on a page of a document to uniquely identify it. Most contemporary books are paginated consecutively and pages are generally accounted for in the pagination sequence even if a number is not actually printed on the page.

 [Bibliographic Reference](#)

Markup: The intent of using markup to indicate page numbers is to provide direct navigation to a page. It is strongly recommended that pages be individually tagged in text books.

Page numbers are marked with the <pagenum> tag. There are three types of page which are distinguished in the markup through use of the "page" attribute. Page="normal" is used to indicate that the content of the number is the standard arabic numeral used in the body and rear matter of most books. Page="front" is used to mark the page numbers used in the front matter of most books (most often roman numerals but sometimes arabic). Finally, page="special" is used


to indicate variant pagination schemes used in some books, for example hyphenated numbers often used in appendices (A-1, A-2, etc.).


The page number should be inserted at the top of a page, regardless of where it is located on the print page, so that the end user will be positioned at the beginning of the page when he or she navigates to it. To ensure accurate navigation, the markup at the beginning of a major structure (part, chapter, section, etc.) must follow a precise order. The order should always be: level1-6 tag , pagenum , heading. This will ensure that if end users navigate to the beginning of the major structure (as marked by the level1-6 tag) and begin playback, they will hear both the page number and the heading of the major structure. If they navigate to the page number, they will still hear both page number and heading.

When tagging the pages of a book, all pages, including blank ones, should be marked. The end user should receive aural confirmation of the existence of blank pages, e.g., "Page 43—blank page." Pages that are part of the pagination sequence but have no page number printed on them should be tagged and the page number included. Unnumbered pages (those that are not included in the pagination sequence) should be tagged but no page number should be included within the tag.

Element:

 [<pagenum page="normal">...</pagenum>](#)

 [<pagenum page="front">...</pagenum>](#)

 [<pagenum page="special">...</pagenum>](#)

Examples: page="front" and page="normal"

```
<frontmatter>
<level1 class="preface" id="pf">
<pagenum page="front" id="fm-3">iii</pagenum>
<h1 class="preface"> Preface, Acknowledgments and a Note on Structure</h1>
```

```
<p>This is not a conventional cookbook. Though I should straightaway attach a disclaimer to my
disclaimer and say that I have nothing but the highest regard for the traditional collection of
recipes, arranged by ingredient under broad, usually geographical categories.</p>
</frontmatter>
```

```
<bodymatter>
<level1 class="chapter">
<pagenum page="normal" id="ch3-43">43</pagenum>
<h1 class="chapter">A Winter Menu</h1>
<p>Winston Churchill was fond of saying that the Chinese ideogram for crisis is composed of
the two characters which separately mean "danger" and "opportunity".</p>
</level1>
</bodymatter>
```

Example: page="special"

```

<bodymatter>
<level1 class="chapter">
<pagenum id="pt3-ch4-app1-1" page="special">W-1</pagenum>
<h1 class="chapter">Welcome to ClarisImpact</h1>
<p>ClarisImpact is a smart, integrated business graphics program that allows you to create, edit,
and communicate attractive, professional - looking business graphics quickly and easily.</p>
...
<level 2 class="section">
<pagenum id="pt3-ch4-app1-2" page="special">W-2</pagenum>
<h2 class="section">Onscreen Help</h2>
<p>ClarisImpact Help provides onscreen, step-by-step instructions and reference information as
you work in ClarisImpact. You can easily search for topics and move from one topic to
another.</p>
...
</level2>
...
</level1>
</bodymatter>

```

Example: page="normal"—blank page

```

<bodymatter>
<level1 class="chapter">
{Text of chapter omitted for purposes of brevity. Last page of chapter, which is blank, is marked
as shown below.} <pagenum id="pt3-ch5" page="normal">104</pagenum> <prodnote
render="optional"> blank page</prodnote>
</level1>
</bodymatter>

```

Prodnote and pagenum should be tagged separately so that the end user can still access one if the other has been turned off.

---

## 5. Tables

---

### **Information Object: Tables**

Definition: A table is an arrangement of data with two or more columns and one or more rows in which the information in the leftmost column relates specifically to the information in the other column or columns. The format of a table may vary depending on the project style. A table usually has column headings and may or may not have a title.

Tables normally read across from left to right, that is, information in the right columns relates horizontally to the information in the left columns.

## [Bibliographic Reference](#)

Markup: Tables are marked up using the <table> element in combination with the <caption>, <thead> (header), <tbody> (main body of table), <tr> (table row), <th> (cell containing header information), and <td> (cell containing table data) elements. The <tfoot> tag can be used to add footer information. In addition, <col> defines the alignment properties for cells in one or more columns and <colgroup> groups adjacent columns that are semantically related.

The <table> tags surround the entire table. Certain optional elements, if used, must follow in this sequence: <caption>, either <col> or <colgroup>, <thead>, and <tfoot>. Any or all of these elements may be used. The content of the table follows. In simple tables, <tr> marks each row of table data cells (<td>). In tables consisting of multiple sections, <tbody> marks each section and contains one or more rows (<tr>).

The <thead> and <tfoot> elements contain header and footer information, respectively, in rows <tr> of cells (usually <th>). Each, if used, may be used only once, but applies to all sections (<tbody>) of the table. Browsers and playback devices can duplicate headers and footers when breaking a table across page boundaries, or present them statically when sections are rendered in a scrolling panel.


A long table crossing several pages of the print book should have separate <pagenum> values for each of the pages containing that <table> indicated on the page where it starts. A <prodnote> explaining that the table spans several pages should be added.

Element:

 [<table>...</table>](#)

 [<caption>...</caption>](#)

 [<col>...</col>](#)


 [<colgroup>...</colgroup>](#)

 [<thead>...</thead>](#)

 [<tfoot>...</tfoot>](#)

 [<tbody>...</tbody>](#)

 [<tr>...</tr>](#)

 [<th>...</th>](#)

 [<td>...</td>](#)

Example 1 shows a very simple table with no caption, footer, or <tbody>:

```
<table border="1">
<thead>
<th>Parent Company</th>
<th>Divested Business</th>
</thead>
<tr>
```

```

<td>U.S. Sprint</td>
<td>Cellular phone</td>
</tr>
<tr>
<td>Union Pacific</td>
<td>Oil, gas</td>
</tr>
<tr>
<td>Viacom</td>
<td>Cable TV</td>
</tr>
</table>

```

This table would be rendered as:

Parent Company	Divested Business
U.S. Sprint	Cellular phone
Union Pacific	Oil, gas
Viacom	Cable TV

Example 2:

```

<table border="1">
<caption>This table contains both a header and a footer.</caption>
<thead>
<tr>
<th>Number</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tfoot>
<tr>
<td>Footer Number</td>
<td>Footer A</td>
<td>Footer B</td>
<td>Footer C</td>
</tr>
</tfoot>
<tbody>
<tr>
<td>1</td>
<td>A1</td>

```

```

<td>B1</td>
<td>C1</td>
</tr>
<tr>
<td>2</td>
<td>A2</td>
<td>B2</td>
<td>C2</td>
</tr>
<tr>
<td>3</td>
<td>A3</td>
<td>B3</td>
<td>C3</td>
</tr>
</tbody>
</table>

```

This table would be rendered as:

This table contains both a header and a footer.			
Number	A	B	C
Footer Number	Footer A	Footer B	Footer C
1	A1	B1	C1
2	A2	B2	C2
3	A3	B3	C3

Example 3 shows how to start a table that spans three pages:

```

<pagenum id="pg255" page="normal">255</pagenum>
<pagenum id="pg256" page="normal">256</pagenum>
<pagenum id="pg257" page="normal">257</pagenum>
<prodnote render="optional">The following table spans pages 255 to 257.</prodnote>
<table>
...

```

---

## 6. Images


---

### Information Object: Images

Definition: An image is a graphical object presented in a visual format.

Markup: The <img> element may be used alone to mark a single image. However, if there is an associated caption and/or a <prodnote> containing a description of the image, the <imggroup> tag should be used. The <imggroup> element provides a container for one or more <img>(s) and associated <caption>(s) and <prodnote>(s). The <imggroup> element may contain:

1. Multiple <img>(s) if they share a caption, with the ids of each <img> referenced by the imgref attribute on <caption>, e.g., <caption imgref="id1 id2 ...">.
2. Multiple <caption>(s) if several captions refer to a single <img>. When the <img> has id="xxx", each caption would have the same value for imgref, i.e., <caption imgref="xxx">.
3. Multiple <prodnote>(s) if different versions are needed for different media (e.g., large print, braille, or print). If several <prodnote>(s) refer to a single <img> with id="xxx", each prodnote would have the same <prodnote imgref="xxx"> but each <prodnote> would have a different value for the showin attribute to control which media it is displayed in. *See*

 [Information Object: Producer's Note](#) in Part II(b): Block Elements. If multiple <prodnote>(s) refer to a group of images, the imgref attribute would include the ids of all images in that group, e.g., <prodnote imgref="id1 id2 id3 ...">.

The alt attribute is required for all <img>(s) and should contain a short description (often the caption) of the image.

For DTB purposes, images will be tagged simply to mark their location in the book. The SMIL file(s) will control the presentation of images, so it is not necessary (nor are the requisite attributes provided in the DTBook DTD) to attempt to control image display from the markup in the textual content file.

Element:

 [<imggroup>...</imggroup>](#)

 [<img>...</img>](#)

 [<caption>...</caption>](#)

 [<prodnote>...</prodnote>](#)

Example 1 shows markup for a single image and its associated <caption> and <prodnote>.

```
<imggroup id="imggrp_2">

<prodnote imgref="img1_1" id="pnote_p3" showin="blp">Reader's note: A cartoon shows a father in his easy chair looking at the newspaper. As his small son plays with a pull toy on the floor next to him, the father says to the boy, "By the way, Sam, as someday you'll be paying for my entitlements, I'd like to thank you in advance." End of note.</prodnote>
</imggroup>
```

Example 2 shows markup for two images that share a single <caption> and two <prodnote>(s). The first <prodnote> will show only in a braille version of the textual content file, the second in either a print or large-print version.

```
<imggroup id="imggrp_43">


<caption imgref="img_12 img_13">Many young stars lie inside the mass of gas and dust that
forms the Orion Nebula.</caption>
<prodnote imgref="img_12 img_13" id="pnote_19" showin="bxx">Two images of the Orion
Nebula are shown, revealing many small points of light within the swirling mass of gas and dust
that forms the nebula.</prodnote>
<prodnote imgref="img_12 img_13" id="pnote_20" showin="xlp">The two images of the Orion
Nebula shown above reveal many small points of light within the swirling mass of gas and dust
that forms the nebula.</prodnote>
</imggroup>
```

## Appendix C

### Optional Elements

Element	Description
a	Contains an anchor, which is used to reference another location, within the same or another <dtbook>.
abbr	Designates an abbreviation, a shortened form of a word. For examples: Mr., approx., lbs., rec'd. Contrast with <acronym>.
acronym	Marks a word formed from key letters (usually initials) of a group of words. For examples: UNESCO, NATO, XML, US. Contrast with <abbr>.
address	Contains a location at which a person or agency may be contacted. By use of <line> to contain content of the individual lines, the class attribute can be used to identify the content of that <line>. For example, class values might include: name, address, region (state, province, etc.), country, location code (such as zipcode, provincial code), phone, fax, email, etc.
annoref	Marks a text segment that references an <annotation>. Each <annoref> is usually a word, phrase, or whole line that is part of the surrounding text (identified in the original print book by bolding, italics, etc.). It should not normally be allowed to be turned off in a DTB application.
annotation	Is a comment on or explanation of a portion of a printed book. It differs from <note> in that an <annotation> is usually set in the margin or on a facing page,

	often with no explicit reference to it inserted in the text. Any local reference to <code>&lt;annotation id="xxx"&gt;</code> is by <code>&lt;annoref idref="#xxx"&gt;</code> .
<code>bdo</code>	Is used in special cases where the automatic actions of the bi-directional algorithm would result in incorrect display.
<code>code</code>	Designates a fragment of computer code.
<code>col</code>	Elements define the alignment properties for cells in one or more columns.
<code>colgroup</code>	Groups adjacent columns <code>&lt;col&gt;</code> that are semantically related.
<code>dfn</code>	Marks the first occurrence of a word or term that is defined or explained there or elsewhere in <code>&lt;book&gt;</code> . Often <code>&lt;dfn&gt;</code> is rendered in italics, sometimes in parentheses.
<code>div</code>	Is a generic container for subdivisions of a book. The <code>&lt;level1&gt; ... &lt;level6&gt;</code> hierarchy, or the <code>&lt;level&gt;</code> tag used recursively, should mark the major hierarchical structures of a book, while <code>&lt;div&gt;</code> is used in less formal circumstances or when for production purposes it is desired that a structure should be treated differently. Compare with <code>&lt;span&gt;</code> , which is used in inline settings.
<code>docauthor</code>	Marks each author or editor of this work. Compare with <code>&lt;author&gt;</code> , used to mark the author of another work, within <code>&lt;blockquote&gt;</code> or <code>&lt;cite&gt;</code> .
<code>doctitle</code>	Marks the title of the book within <code>&lt;frontmatter&gt;</code> . By convention <code>&lt;doctitle&gt;</code> should appear only once. Contrast with <code>&lt;title&gt;</code> , which occurs as metadata in <code>&lt;head&gt;</code> and whose content is generally the same.
<code>hr</code>	Is an empty element, minimally <code>&lt;hr /&gt;</code> , indicating a horizontal rule. It may be used to indicate a break in the text where only blank lines, a row of asterisks, a horizontal line, etc. are used in the print book.
<code>img</code>	Marks a visual image. An <code>&lt;img&gt;</code> will always contain an <code>alt</code> and generally contain a <code>longdesc</code> , a pointer to a related <code>&lt;prodnote&gt;</code> . The <code>&lt;img&gt;</code> may be referenced by a <code>&lt;caption&gt;</code> or <code>&lt;prodnote&gt;</code> , using, for example, the form <code>&lt;caption<imgref="#yyy"&gt;the caption&gt;<="" caption&lt;="" code=""> for the <code>&lt;img id="yyy"&gt;</code>.</imgref="#yyy"&gt;the></code>
<code>kbd</code>	Designates information that the reader is to input directly into a computer using the keyboard.
<code>level</code>	Is an alternative tag for marking the major structures in a book. It may be used recursively, i.e., repeated indefinitely with each successive occurrence nesting within the previous. It may also be included in a subsequent higher level. Subordinate levels have greater depth. Contrast with the explicit <code>&lt;level1&gt;...&lt;level6&gt;</code> elements, which may not be intermixed with <code>&lt;level&gt;</code> .
<code>levelhd</code>	Contains the text of a heading within <code>&lt;level&gt;</code> . Corresponds to <code>&lt;h1&gt;</code> through <code>&lt;h6&gt;</code>

	used in <level1> through <level6>.
lic	("List item component") allows ordered substructure within a list item <li>. Used when a list item is made up of two or more components, as in a table of contents entry. The same number of <lic> should occur in each <li>. If not, correspondence of <lic> in different <li> is in order of occurrence for the current writing direction of the <li>.
link	Is an empty element appearing in the <head> section of a document that establishes a connection between the current document and another document. The <link> element conveys relationship information (for example, "next" and "previous") that may be rendered by user agents in a variety of ways.
notice	Contains a warning, caution, or other type of admonition normally found in the margin of a book. In contrast with <sidebar> a <notice> must be presented at a specific location within the text. Its presentation is not optional.
prodnote	Contains language added to the alternative-format version by the producer; commonly used to: 1) provide descriptions of one or more visual elements such as charts, graphs, etc. 2) supply operating instructions 3) describe differences between the print book and the audio version.
samp	Contains a sample of work created by the author for use as an example or template. For example, a sample business letter, resume, computer program output, or form.
sent	Marks a sentence.
Span	Is a generic container for use in inline settings when no specific tag exists for a given situation. The class attribute may describe the nature of the text it marks (e.g., a typographical error). May be used to mark a class of items to which styles are to be applied. Compare with <div>, which is used in a block settings.
Style	Provides the means to include styling information that applies to the book. It may appear only in <head>. It may include CDATA sections.
tbody	Marks a group of rows in the main body of a <table>. If the <table> is divided into several sections, each consisting of a number of rows, each section would be separately tagged with <tbody>. The same <thead> and <tfoot> apply to every <tbody> section. Use multiple <tbody> sections when rules are needed between groups of table rows.
tfoot	Marks footer information in a <table>, consisting of one or more rows <tr>, usually of <th> cells. Use <tfoot> to duplicate footers when breaking table across page boundaries, or for static footers when <tbody> sections are rendered in scrolling panel.
th	Indicates a table cell containing header information.

thead	Marks header information in a <table>, consisting of one or more rows <tr> of <th> cells. Use <thead> to duplicate headers when breaking table across page boundaries, or for static headers when <tbody> sections are rendered in scrolling panel.
w	Marks a word.

## Appendix D

### Glossary of Acronyms and Terms

**ASCII** - unformatted text with each letter represented by a number conforming to a standard developed by the American National Standards Institute (ANSI) to define how computers write and read characters.

**ANSI** - The American National Standards Institute (ANSI) is a private, non-profit organization (501(c)3) that administers and coordinates the U.S. voluntary standardization and conformity assessment system. The Institute's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity.


From  [http://www.ansi.org/about\\_ansi/overview/overview.aspx?menuid=1](http://www.ansi.org/about_ansi/overview/overview.aspx?menuid=1)

**ANSI/NISO Z39.86** - This standard defines the format and content of the electronic file set that comprises a digital talking book (DTB) and establishes a limited set of requirements for DTB playback devices. It uses established and new specifications to delineate the structure of DTBs whose content can range from XML text only, to text with corresponding spoken audio, to audio with little or no text. DTBs are designed to make print material accessible and navigable for blind or otherwise print-disabled persons. The ANSI/NISO Z39.86 standard is also known as "DAISY 3".

**DAISY** - Digital Accessible Information System. The DAISY Digital Talking Book is a collection of digital files that provides an accessible representation of the printed book for blind, visually-disabled, and print-disabled users. These files may contain digital audio recordings of human speech, marked-up text, and a range of machine-readable files.

**Digital Rights Management (DRM)** - Digital Rights Management systems are authorizing technologies implemented by rights holders and/or publishers to limit the distribution and use of proprietary content. Examples of DRM systems are: *encryption* - securing content as a locked file requiring a hardware or software-based "key" for unlocking; *watermarking* - the imprinting of identifying information on digital files; *fingerprinting* - the association of specific user data with a particular file or collection of files. DRM systems can employ one or all of these approaches.

**Docbook** - DocBook provides a system for writing structured documents using SGML or XML. It is particularly well-suited to books and papers about computer hardware and software, though it is by no means limited to them. In short, DocBook is an easy-to-understand and widely used DTD. Dozens of organizations use DocBook for millions of pages of documentation, in various print and online formats, worldwide. (Norm Walsh)

**DTBook** - An  [XML](#) element set (dtbook.dtd) that defines the markup for the textual content of a DTB (Digital Talking Book).

**Dublin Core** - A set of metadata established by The Dublin Core Metadata Initiative in order to promote the adoption of interoperable metadata standards and vocabularies. The Dublin Core metadata provides a consistent and uniform means of describing resources in order to enable more intelligent information discovery systems. The fifteen elements of the Dublin Core metadata standard provide a simple element set for describing a wide range resources.

**Metadata** - Information that refers to one or more other pieces of information that can exist as separate physical forms. In short, data about data. Any type of description can be considered metadata. Examples include library catalog information, encoded text file headers, and driver's license data. In the information technology world the term is often used to indicate data which refers to digital resources available across a network.

 <http://memory.loc.gov/ammem/techdocs/repository/gengloss.html>

**NISO** - National Information Standards Organization. A committee of the United States based National Information Standards Organization (NISO), in conjunction with the internationally known DAISY Consortium, is working on a specification for Digital Talking Books. This will serve as the next generation of information technology for persons who are blind and print disabled. At the heart of this specification is an XML DTD that incorporates the elements of structure needed to provide access to information. The specification goes on to define how the textual information can be synchronized with digitally recorded human speech through Synchronized Multimedia Integration Language (SMIL), a recommendation of the W3C. The specification identifies six classes of books that have varying amounts of text mixed with audio. Most significantly, one class of book contains only text, with no recorded human speech. Access to the information would be through synthetic speech, refreshable braille or dynamically generated large print.

**Open eBook Forum (OEBF)** - The purpose of the Open eBook Forum (OEBF) is to create and maintain standards and promote the successful adoption of electronic books. The OEBF is an association of hardware and software companies, publishers and users of electronic books and related organizations whose goals are to establish common specifications for electronic book systems, applications and products that will benefit creators of content, makers of reading systems and, most importantly, consumers. The OEBF is helping to catalyze the adoption of electronic books; to encourage the broad acceptance of these specifications on a worldwide basis among members of the Forum, related industries and the public; and to increase awareness and acceptance of the emerging electronic publishing industry. The OEBF is composed of member organizations (each of which may have one or more representatives) and a Board of Directors. The members determine the policies and activities of the organization. (from American

Foundation for the Blind at

 <http://www.afb.org/Section.asp?SectionID=44&TopicID=16&DocumentID=371>)

**TEI** - Text Encoding Initiative. Initially launched in 1987, the TEI is an international and interdisciplinary standard that helps libraries, museums, publishers, and individual scholars represent all kinds of literary and linguistic texts for online research and teaching, using an encoding scheme that is maximally expressive and minimally obsolescent.

**World Wide Web Consortium (W3C)** - The W3C is an international industry consortium founded in 1994. Its mission is to promote the evolution and ensure the interoperability of the World Wide Web. Working with the global community, the Consortium produces specifications and reference software for free use around the world. The World Wide Web Consortium established the Web Accessibility Initiative (WAI) in 1997. Changing the Web's underlying protocols, applications and, most importantly, the way content is developed can significantly improve access to the Web by people with disabilities. The WAI has working groups developing comprehensive and unified sets of accessibility guidelines for content accessibility, browser accessibility, and authoring tool accessibility.

**XML** - The Extensible Markup Language (XML) is a standardized language for marking up files containing structured information.