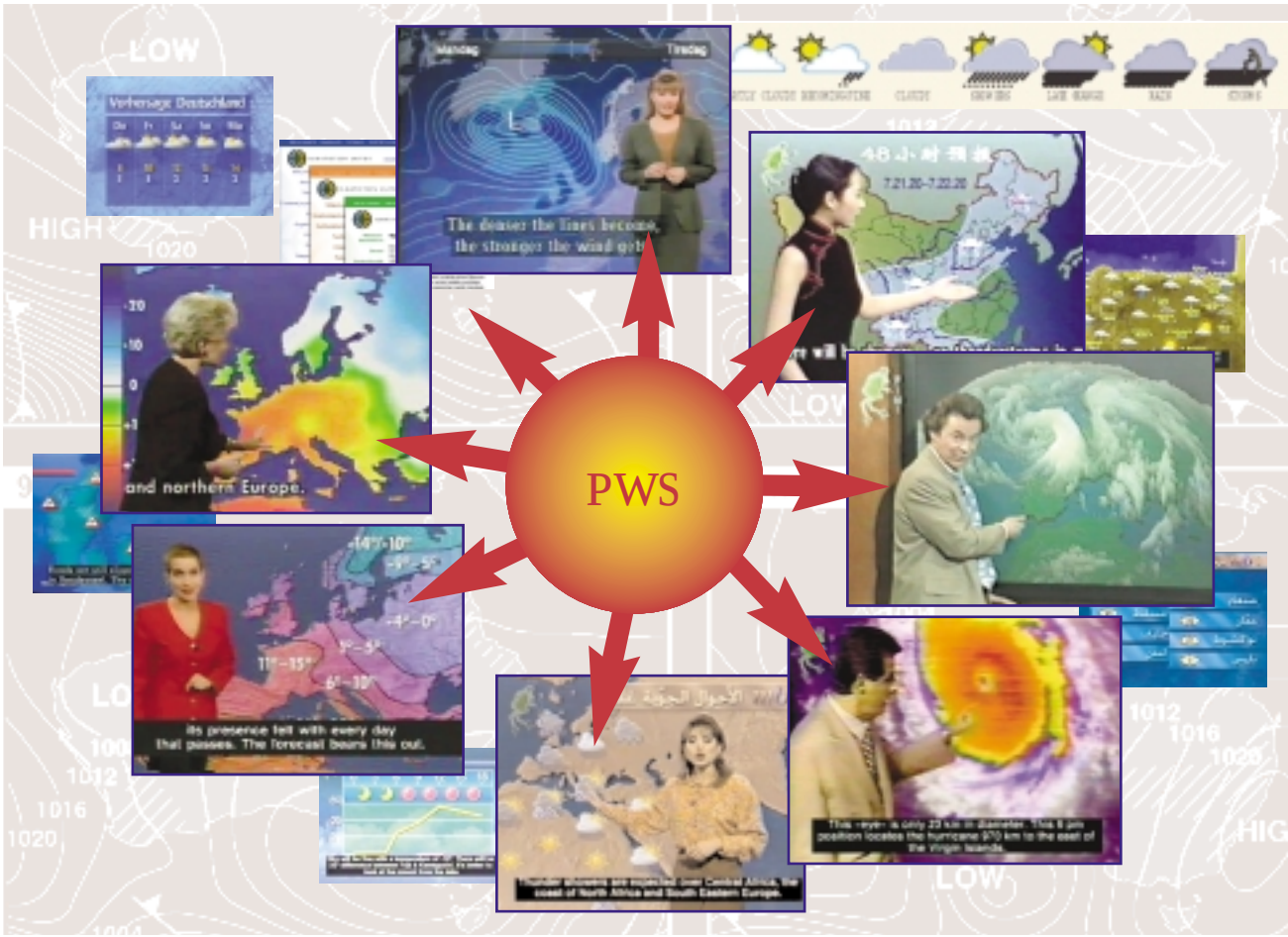
World Meteorological Organization

GUIDELINES ON GRAPHICAL PRESENTATION OF PUBLIC WEATHER SERVICES PRODUCTS

PWS-4 WMO/TD No. 1080



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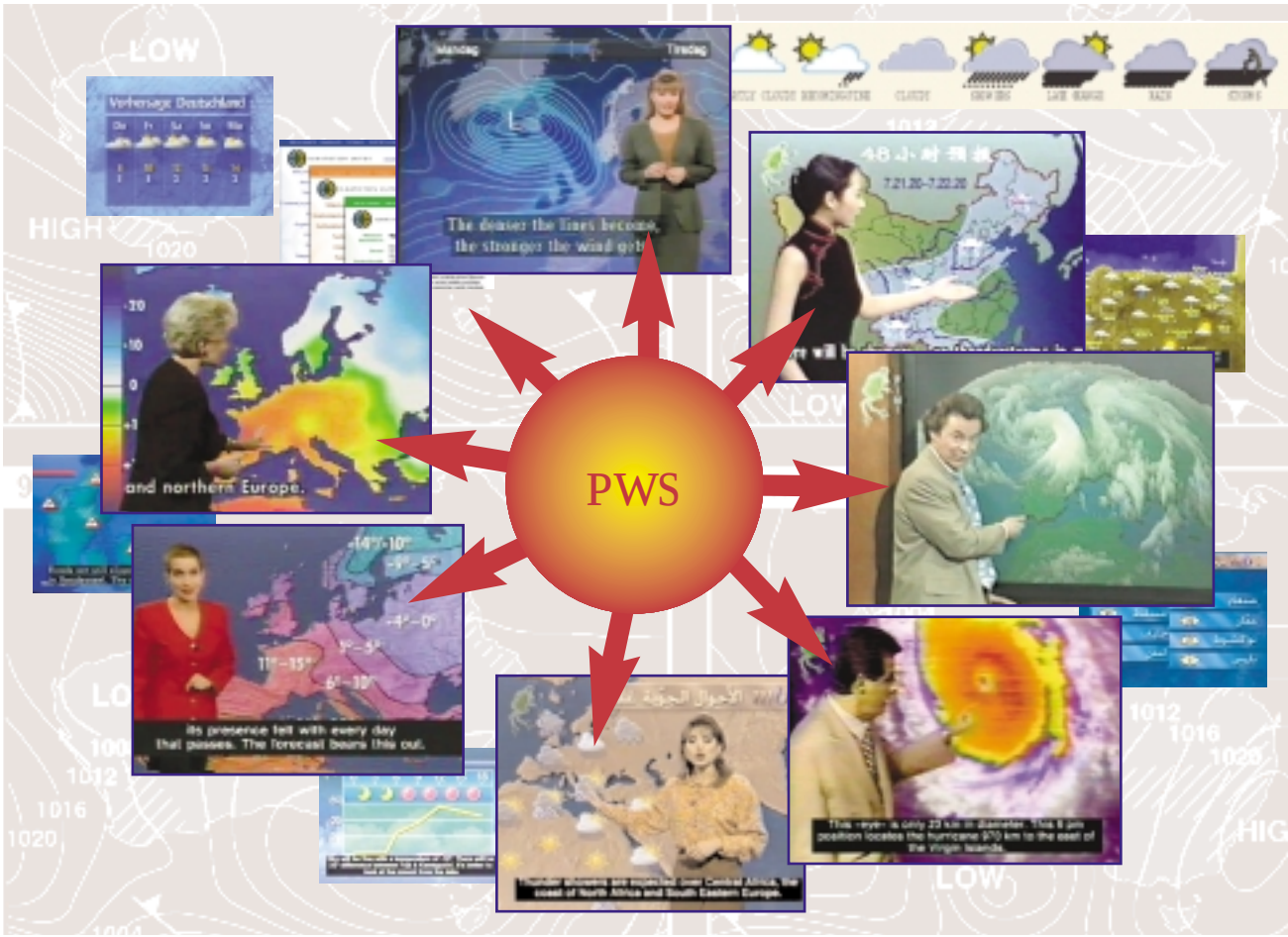

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NOTE

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of any of the participating agencies concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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Chapter 1
INTRODUCTION

Meteorological warnings and forecasts are highly perishable products and should be disseminated rapidly to the public while they are still valid, if they are to be of value to users. With modern communications technology developing rapidly, the issue is no longer how to spread the information, but how to do it in the most efficient way. Timely and efficient dissemination can only be achieved by effective use of the broadcast and print media, which are important partners of the National Meteorological or Hydrometeorological Services (NMSs) where public weather services are concerned.

However, rapid and efficient dissemination by itself does not guarantee successful communication with the target audiences. To ensure that people will read or listen, the packaging in terms of format and content is an important consideration. The effective presentation of weather warnings, forecasts and information employing techniques which use voice, text, graphics, animations or gridded fields to enhance viewer appeal, is essential if the products are to assist the intended audiences with their decision-making process. The preparation of high-quality broadcast and print-ready material by the NMS can significantly enhance the presentation and dissemination process by retaining the attention of audiences and influence them to respond appropriately to the NMS message. This successful communication process not only optimizes the efficiency of the forecast or warning product, but also promotes the NMS in a positive light and hence adds to its credibility and visibility.

Developments in communications technology and infrastructure, particularly television and the Internet, have not only permitted improvements in the quality and quantity of graphic information, but have also broadened and expanded its distribution. Visual media in general, and television in particular, are very popular for all public communication. Television immediately engages attention because of its powerful visual impact and enables viewers to assimilate complex information quickly. The advent of digital radio has also enabled wider distribution of graphical information and will find application in NMS communication.

A major downside to the rapid developments in communications technology, however, is in the area of graphics. On the one hand, developments in computer technology enable production of a vast array of graphic material, and on the other hand, lack of formal training to produce expertise in communication graphics has resulted in a scarcity of individuals with design capabilities.

These guidelines attempt to bridge this gap. They are intended to provide information and assistance on how to develop graphics to suit the unique needs and circumstances of NMSs. They identify relevant graphic design principles and issues, and a range of resources and processes to help facilitate visual communication of meteorological information using the Internet, television, print and other visual media. The guidelines also present processes and technology solutions that attempt to address the special situation and needs of smaller Services which have limited resources, but which wish to improve their internal capability to produce graphic material. Cross-references are made to related information in the *Guide to Public Weather Services Practices* (WMO-No. 834) and its complementary set of CD-ROMs, *Technical Framework for Data and Products in Support of Public Weather Services* (PWS-1, WMO/TD No. 1054), WMO *Guide on Internet Practices* (http://www.wmo.ch/web/www/reports/Internet-Guide.html), and *Guidelines on Performance Assessment of Public Weather Services* (WMO/TD No. 1023).

Chapter 2
SCOPE OF GUIDELINES ON GRAPHICAL REPRESENTATION OF PUBLIC WEATHER SERVICES PRODUCTS

These guidelines identify fundamental design principles for effective graphic communication of weather information across visual media. They also include practical development issues for the presentation of Public Weather Services (PWS) products for print, television and the Internet, particularly for low budget production. To demonstrate how design principles apply to NMS products, the guidelines include discussion and examples of NMS material and reference further examples from the CD set accompanying the *Guide to Public Weather Services Practices* and also Internet URLs. In addition, a graphic design check list for print, Internet and television have been included to help NMSs in the design of graphical PWS products.

These guidelines are not all-inclusive and do not address every aspect related to the production of communication graphics for NMSs. Cross-references should be made to the *Guide to Public Weather Services Practices* and the WMO *Guide on Internet Practices*, particularly for essential information relating to legal and copyright issues, and to the T*echnical Framework for Data and Products in Support of Public Weather Services*, for an overview of relevant products, systems and technical requirements. Included also are additional references for specific media.

Chapter 3
USER REQUIREMENTS

Users, in the case of NMS communication graphics, include both the target audience as well as the various media publishers, producers and broadcasters who are the active intermediaries involved in distributing the NMS public weather services products. Prior to product development, it is essential to find out what products and services the broad spectrum of users requires in order to facilitate the end-to-end product development process. Through on-going communication and consultation with them their product requirements, communication channels for product reception and the extent to which they can interpret the products and put them to optimum use can be identified. Thereafter, the NMS must check with users to confirm their level of satisfaction and obtain feedback on the effectiveness, accuracy and continuing relevance of the products.

A good example to illustrate this point are Website designs that commonly fail to address some key user requirements. This is usually evident from the first page and includes slow loading, an oversized interface, content that represent what staff or the organization feel is important, and design that reflects the makers' tastes and interests. Website navigation can sometimes be particularly testing. As a preliminary to Website design, and for easy navigation, the organization should clearly identify the user groups, their reasons for accessing Website information, what they hope to find, and their level of understanding and appreciation of meteorology.

Media providers have their respective and unique technical, content, design and scheduling requirements. These are relatively easy to identify in consultation with the NMS media partners who may be quite willing to help plan and implement suitable production processes within the NMS. The following gives a brief overview on the particular requirements of the different media.

For the print media, the focus is on the design of scheduled ready-to-print content for newspapers and fax. Content featured includes summary, forecast, special forecast and warning products for local, national and regional distribution. Among technology issues discussed are pre-press preparation, font handling, colour and PostScript and PDF files. Software solutions range from common word processors and Linux software to popular industry packages.

The Internet is a relatively new and complex medium involving direct publication by many staff and therefore design issues are prevalent. As such, the information included in the section on the Internet is more extensive than that of other sections and focuses on ''front end'' designs, or what the users see. Issues include navigation design and information structure, as well as screen layout and graphic design. Technical information mostly addresses configuration, independent design and file size minimization, while technology identified includes Freeware, Shareware and popular industry Web design and graphics software.

In order to succeed, television presentations require display of information in a simple and yet engaging form. For television, information in these guidelines includes design and production issues for static and motion graphics for scheduled reports, unscheduled warnings and also some basic ''ready-for-air'' presentation options. Processes identified range from handmade graphics to slide shows and basic digital effects.

A short section is also included in these guidelines to draw attention to the development of new graphical media. While France pioneered the Minitel network in the 1980s and some NMSs already provide telephone and portable device formats like WAP, other technologies may soon become practical. Technologies suitable for telephones, portable devices, public kiosks, Internet radio and WebTV are evolving rapidly. The most appropriate source of information for most of these developing media is the World Wide Web Consortium. The Web Design and Development URLs in the Reference section also address new media.

Further detailed information on these aspects is included in the relevant media sections that follow.

Chapter 4
CONTENT OF GRAPHICAL PRODUCTS

These guidelines identify the suitability of products to particular media and describe examples of products with appropriate content for the respective media. Reference should be made to the *Technical Framework for Data and Products in Support of Public Weather Services* (PWS-1, WMO/TD No. 1054) for a more comprehensive identification of graphical products, and to CD 2, *Instructors' Resources*, that accompanies the *Guide to Public Weather Services Practices* for lists and samples of appropriate content for graphical products.

Product suitability is determined by the type of media, scheduling and audience. As the most transient media, television is suited to simplified observations, summaries and forecasts applying to immediate periods, as well as extended forecasts. It is highly effective for presenting warnings, as attention can be focused and action directed for an extensive audience. Unscheduled urgent warnings can be presented as scrolling text tickers in some circumstances. Graphic products such as satellite images and simplified synoptic charts and graphs are desirable and may be suitable for animation. Summaries and forecasts are suitable for representation with geographically located pictographs or text. It may also be possible with longer segments to include human-interest features, public education content or extended content like climate information.

The content of products for daily or weekly newspapers will target mostly local, national or regional audiences. The space available will constrain the range and presentation of material and there will be a need to achieve a desirable balance of text and graphic. Daily newspapers will present information on the previous and current days and forecasts for the next day, as well as an extended forecast. Local and regional information should be placed in context with the inclusion of broader national content. Larger publications may also include special interest content such as information relating to tides, sunrise and sunset, snow and pollution reports. Weekly publications are suitable for both forecasts and weekly summaries, while monthly magazines may offer the opportunity for special climate or public information stories.

A Website can present a huge range of products including warnings, for diverse audiences at low cost. In addition, it offers the opportunity to present press releases, archival material, specific interest content, public education content and special features, as well as information about the organization. Content should be prioritized and decisions may need to address what not to include. Problematic products include graphic files with large file sizes like animation loops, and images requiring fine definition or large scale. Portable Web devices like telephones are more suited to brief information and the most simple graphics.

Chapter 5
GENERAL POINTS ON DESIGN OF WEATHER GRAPHICS

5.1 CROSS-MEDIA DESIGN

Graphic information is highly effective because it can instantly communicate a variety of concepts such as urgency, importance, measurement, association and relationships over time and space. General graphic design principles are common to all visual media and determine communication effectiveness. Where practical, related content should be presented consistently across each media, to maintain familiarity for users and to facilitate efficient development processes. Effective design solutions must recognize all constraints, including resources, expertise, scheduling requirements and specific media limitations.

5.2 USING GRAPHICS FOR COMMUNICATION

User perception including cultural factors underpin the way graphics communicate. Because successful design is usually subconsciously understood, it is a powerful and efficient way of communicating. Design that demands a too-intense level of concentration or interrupts attention flow usually needs improvement. Until recently, graphics have been developed by professionals, with years of training and practice in understanding how to communicate effectively by using them. Graphic production has become practical for non-specialists only since the advent of desktop computing, so many professional and technical staff of NMSs have not received formal training on how to analyse and apply this implicit language. People commonly assume that graphic design is easy and comes naturally but, in most cultures, when non-professionals design, problems are caused when they confuse the functions of visual communication with the separate, natural desire for visual ornament. This is currently most evident in Web pages, where graphic elements are often distracting decoration with limited communication purpose.

5.3 COMMUNICATION OF CORPORATE IMAGE

The style and quality of design, as well as product packaging, communicate corporate identity and credibility. Poor communication design does not enhance the opportunity to build public confidence in the NMS and may reinforce a common perception that science is remote from people's needs. Well-presented, consistent, accurate and useful content will consolidate the value of the NMS to the public, private and government organizations. All public weather services products should be clearly identified with the NMS name and logo, including content such as Web graphics that may be re-used in other contexts. Other content providers also need to be identified. Print, fax and Internet pages should also include contact details and copyright identification.

As well as using a logo and name, it is advisable to apply, where possible, a recognizable presentation style to public weather graphical products.

5.4 SIMPLICITY IN DESIGN

The most import rule for effective design for all media is simplicity. Good design strips away all unnecessary content and gives clear structure to the remaining essential information to show their order and relative importance and how the different pieces of the information are related. Furthermore, design structure needs to facilitate rapid scanning so users can locate relevant material at a glance. Simplicity also includes consistency, as familiar design structure and consistent graphic concepts make reading and comprehension easier. This applies to screen and page layout design and the individual graphics within them.

5.5 READABILITY

Readable information can be scanned and understood easily. A readable page must appear to be simple even though it may contain complex content. Layout design requires clear structure to avoid seeming cluttered or chaotic and to carefully sequence the reader's attention through the page or screen. Elements need to be placed in logical order, aligned and grouped, to help indicate where to look next and what information is related. Levels of contrast in size, colour and tone should indicate the relative importance of graphic and text elements but avoid distraction. A sense of completeness or page unity can be created with elements that suggest borders, a clear start, focus and end to the content, and repeated use of similar elements to create a theme. Individual graphics depend on simplicity, accuracy, clear detail, obvious or logical meaning, adjacent captions, legends and support information to make their meaning apparent.

5.6 INFORMATION SEQUENCING

The location of elements in a layout contributes significantly to ease of reading and how information will be understood. Established cultural reading conventions underpin how information flow should be set out in visual media. Additional elements such as lines can direct attention towards subsequent content. Titles are best started from the top corner, rather than centred, and content should form a logical flowing sequence in the direction readers scan text.

Cultures using different text formats should address relevant conventions.

Pages and screens can benefit from some emphasis "closing" the bottom corner of the layout (Figure 1). This helps draw attention down through the content to the end. The organization's logo, navigation links or a border may be appropriate.

5.7 ALIGNMENT AND PAGE STRUCTURE

Alignment of text and graphic elements gives layouts clear form and facilitates scanning, sequencing and grouping of components. For example, left alignment is an essential reference for readability when using the Latin alphabet. Similarly, long pages of text benefit from vertical left alignment guides such as a wide gutter or a strip of colour. Space should always be left between text and bordering elements such as images or table borders so that they do not distract from the start of the line and recognition of the words. Columns of text or figures need precise vertical alignment. Line spacing may need to be slightly increased so each row is logically separated. Alignment can produce the appearance of simple and ordered structure in each page, and create design unity across Websites and television sequences. It is essential for organizing dense pages and is also one of the most useful design elements for television where simplicity is required. A guideline or grid should be used to produce consistent page and screen alignment for all graphic media. Vertical and horizontal alignment of all elements must be considered and checked during production. Print documents will also need to align and balance text rows in adjacent columns and adjust text for effective justification.

In Figure 2 the left-hand page is an example of a disorganized and cluttered page. The right hand page, however, uses vertical and horizontal alignment to simplify the information structure by grouping related information and making sequencing clear. It also appears unified with the page boundaries defined and has a clear start, middle and end.

5.8 GROUPING

Items that are close together are perceived as a group. Grouping can make content seem simpler and reinforce the meaning of associated elements. For example it is more effective when pages present synoptic, satellite or radar images aligned adjacently, using the same scale and mapping projections. Information groups should be clearly separated from other content by space, borders, colour or other design devices. This is vital for complex Web interfaces and newspaper presentations where an extensive variety of information has to be simplified into a minimum number of logical groups.

5.9 CONTEXT

Specific information makes more sense when it is placed in context with related content. For example, local forecasts could be followed by regional and national information to allow the audience to identify patterns. Satellite images presented with matching synoptic charts can help users understand what they are seeing in each image. Within Websites, navigation groupings should make the relationship of different products apparent.

5.10 SYMBOLS

Icons or pictographs need to be explicit and clearly differentiated from each other. They should also be supplemented with narration, text and figures on television, and with text labels or a legend in print or on the web. Design detail needs to be kept minimal for clear legibility, and small elements like raindrops will need to be enlarged for screen presentation. This will cause problems for subtle variations such as line width. Differentiation on screen can be addressed using colour and slight animation for selected icons.

Pictographs can successfully represent literal associations such as sun, rain and lightning, though they can easily become ambiguous if they try to represent additional concepts.

In the example from "The Age", Figure 3, two of the icons differ from the others by relating to time. The "Becoming Fine" and "Late Change" icons depend upon their legend labels to convey their meaning. They would seem slightly more "logical" if each image was reversed horizontally. They are read from left to right, so left is assumed to precede. Becoming fine should have rain on the left, followed by the

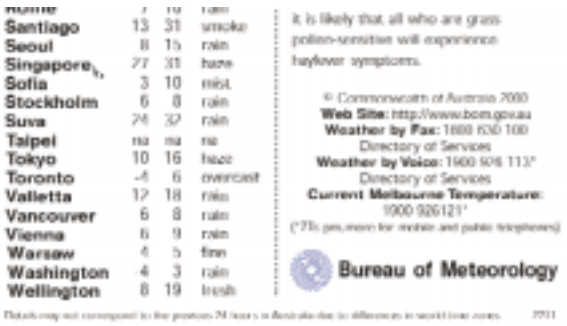


Figure 1 – Contact details and logo closing Australian Bureau of Meteorology segment

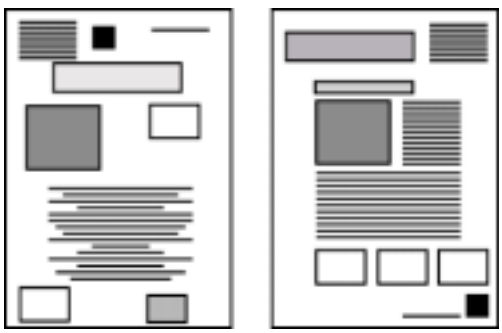


Figure 2 – An unstructured and a structured layout

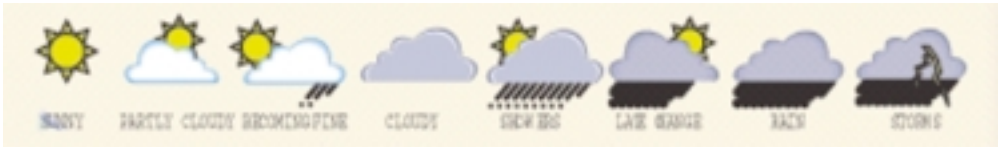


Figure 3 – Icon examples "The Age" newspaper

sun clearly on the right. However, if position is used to have a particular meaning in one or two icons, it may be understood to apply to all of them. Colour could present a better solution, for example, graduating suitable cloud colour from left to right in combination with reversed horizontal positions could suggest change more clearly.

Pictographs offer one of the best opportunities for introducing some engaging and decorative relief into otherwise dry presentations. As long as their clarity of meaning is not compromised, any style that complements the rest of the presentation and the organization's corporate identity can be used.

5.11 USING COLOUR FOR COMMUNICATION

Use of colour

Colour is a simple yet powerful design component for graphics and should be used where possible. However, care must be taken for all media to make sure colour images can also communicate successfully when translated to greyscale. This is especially important when it is considered that, besides allowing the graphic to be re-used for black and white media such as basic newsprint or fax, up to 7 per cent of all viewers have levels of colour blindness. In addition, poor television reception and monochrome computer screens will lose colour information. The solution is to use colour tonally. Adjacent colours need to vary in lightness or darkness, preferably in distinct steps rather than gradually. Where boundaries are not clear, contrasting outlines should be added. This is particularly important for indicating geography and distinguishing measures, text and icons. Halos, shadows or background colour can be used to clarify small elements such as the text or icons, particularly for television.

Figure 4 is boldly colourful but also translates successfully to greyscale, as is shown in the example below.

Figure 4 – From Météo-France

Conveying meaning with colour

Colour associations can be used to reinforce concepts and relationships. Blue areas for sea and green for land allow fast recognition of relevant areas. Darker blues are even more effective for sea because people associate dark areas as negative or background space and lighter colours as foreground. In addition, since people perceive so-called warmer colours (less blue) as closer, they notice the green more easily. To differentiate between adjacent land areas, lighter, warmer colours should be used for focal areas and a borderline if needed.

Colour association with temperature allows rapid recognition when used in charts and diagrams. Blues are cool, green less cool, while yellows are warm and red is hottest, or simply blues are less, and red is more.

Having applied a colour logic in a graphic, it is important to avoid confusing viewers by re-using the colours to represent concepts without direct correlation. For example, temperature and rainfall charts should use quite different colour schemes. If blue is used to indicate high rainfall, paler shades of blue could be used for lower levels rather than warm colours. Where perceived correlation is evident, such as UV levels and temperature, the same colour logic may be useful. Colour is also useful for differentiating night with a dark background, showing cloud density, representing pressure variation and making details such as icons, text and fine lines stand out. Any colour ambiguity may be resolved with additional associations, like including the moon with a dark background to indicate night rather than overcast sky.

Some colour ranges cause perception problems so should be avoided. Primary, pure or intense colours are not comfortably perceived so they should be confined to small detail; pure reds adjacent to blues are particularly problematic. Primary colour palettes available in common software need to be customized or avoided!

Colour constraints for each media

Each media has a range of colour constraints. To ensure the most reliable display and maximize image compression, design for the Web should use a minimal number of flat colours, with large areas and links confined to the 216 palette of Web safe colours. Background colour generally reduces readability and consumes an expensive quantity of ink if printed out.

Intensely coloured, light or dark areas can be problematic for television. Low-resolution, distant viewing and

temporal images demand extremely simple design with strong use of colour contrast. Text is best presented using white or yellow against a dark background. Projected television graphics should use some colours similar to colour key backgrounds so they match any colour reflections on the presenter.

Design for colour print needs to use the relatively limited CYMK colour space. Pale colours are practical as they use less ink, dry faster, bleed less and can be clearly overprinted with black detail and text. Colour intensity is limited with newsprint.

5.12 TEXT

Fonts need to be selected to create focus, information hierarchy and to make the information easy to scan and read.

Creating emphasis and hierarchy

Font styles should be used to identify the information structure to help readers find and scan information easily and understand context. Consistent special styles should be used for content like captions, citations or footnotes. For Internet pages, logical font tags, particularly for headings, are necessary in addition to any design formatting.

Distinct logical hierarchies of contrast need to be used for headings and subheadings. Contrast can be established using size, weight, font style, position of the text, colour, tone or rendering of the text or background area. The contrast between the headings and text needs to be significant, particularly where a different font style is used. Combining more than two or three types of font in a layout should be avoided and they should be selected from different font groups, for example, using a **sans serif** for headings with a serif style for copy text.

Contrast, particularly using colour, can become distracting if it is too visually dominant or frequently used in the page. A single colour or contrast style should be selected that is not too intense and it should be used consistently. Subheadings can be identified by reducing the scale of the contrasting style or by simply using bold text. It can be useful to look at layouts from a distance to check that the information hierarchy is clear without being too busy.

The use of underlines or ALL CAPITAL LETTERS for emphasis should be avoided where practical as they significantly diminish readability. Limited use of simple labels in all capitals can be acceptable. Lower-case letters using a larger size and weight are, however, much easier to read. Underlined hypertext links may be a useful convention for inexperienced web users, but any site-wide consistently differentiated text can be effective, especially where rollover feedback is used. Navigation menus can become awkward to read with tight spacing and underlines.

This sample text below is shown first in upper case, then lower case. The lower case is much easier to read rapidly.

> MINOR STREET FLOODING WAS REPORTED IN SOUTHERN SARASOTA COUNTY EARLY MONDAY AFTERNOON. AT 5 PM MONDAY ... HARDEE COUNTY REPORTED A DOZEN ROADS UNDER WATER AND A HALF DOZEN MORE CLOSED ... PRIMARILY OVER THE EASTERN HALF ... DUE TO A COMBINATION OF SMALL STREAM AND POOR DRAINAGE FLOODING. ADDITIONAL RAINFALL OCCURRED MONDAY AFTERNOON IN WESTERN HARDEE COUNTY ... BUT NO RAIN FELL EAST OF HIGHWAY 17.
>
> Minor street flooding was reported in southern Sarasota county early Monday afternoon. At 5 pm Monday ... Hardee county reported a dozen roads under water and a half dozen more closed ... primarily over the eastern half ... due to a combination of small stream and poor drainage flooding. Additional rainfall occurred Monday afternoon in western Hardee county ... but no rain fell east of highway 17.

Source: IWIN (http://iwin.nws.noaa.gov/iwin/national-warnings.html).

Font styles

Serif fonts like "Times" significantly improve the readability of printed text, by helping close the proximity of letters so they read clearly as separate words, and by reinforcing scanning by horizontal emphasis. San serif fonts can provide useful contrast for labels, headings or small separate blocks of text. Their simplicity makes them suitable for low-resolution screen design for television and the Internet. Scripts, decorative fonts, condensed fonts and fonts with very fine detail have limited use for functional communication. Font styles with a very small "x" height or limited contrast between "x" heights and ascenders also limit readability and should not be used, particularly for screen design (Figure 5).

Font sizes

Excessively large as well as very small type degrades readability. This is a particularly common error on the Internet. Text should be just large enough to be read allowing for people with slightly reduced vision. Headings only need to be large enough to add contrast and differentiation. Standard footers like copyright and disclaimer links are an exception, needing only to be legible, as they have become a recognized convention linking to readable information. All television text needs to be large enough to be readable quickly, from a distance, possibly with reduced reception quality.

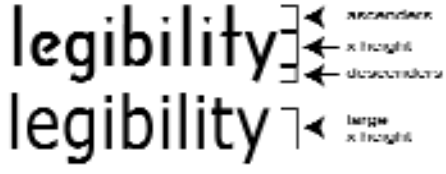


Figure 5. –"x" heights

5.13 TEXT ALIGNMENT AND SPACING

Text blocks

All text blocks (when using the Latin alphabet) should use left alignment and generally avoid justification. Page or column widths should aim to constrain sentence length to an average of no more than 12 words for optimal reading. Web pages present a significant problem that can be addressed by restricting page width or introducing columns.

While separate content elements are easier to scan when separated by "white" space, newspaper layouts need to be extremely condensed, where small font sizes, reduced leading and narrow columns are used, with clear space or line separators between columns and sections. Contrast headings are a particularly useful scanning aid in such condensed presentation.

Internet pages need to condense information vertically to minimize scrolling and allow enough content to fit into the extremely shallow area of a standard small monitor display. Title and navigation graphics, headings and space between paragraphs need to be minimal.

Text spacing

"Leading" is the space between lines of text. The default setting in most word processing, graphics and layout software is 1.2 × the font size. This setting will need to be reduced for large fonts, particularly where headings wrap or it will look awkward and the text will not read easily. When presenting tabular information or navigation columns, it may need to be significantly increased so each line is logically separated.

"Tracking" is the space between words and letters. This often requires adjustment when justifying text into columns to avoid hyphenation or extremely extended spacing. It is also useful for adjusting headings to improve alignment. Fonts used in screen graphics for television and particularly for the Internet, where smaller sizes are used, are likely to need tracking extended to prevent font smoothing merging letters.

"Kerning" is the adjustment of space between individual letters. Quality fonts have some built in automatic adjustment, but further adjustment is usually required for large sizes. While this is not practical for most text, large headings generally need adjustment between letters like "v","o","r" and "i" that do not fill a rectangular area. Rectangular shaped fonts will need less adjusting so they are practical for large type, including headings.

In the example in Figure 6, the gap between the "A" and the "T", in the top unkerned example, looks so big that the word reads almost like two separate parts. Notice the letters that required adjustment in the example beneath it.

Figure 6 – Kerning

5.14 ANIMATED TEXT

Sentences need to be static to be read easily. Scrolling text should be constrained to slow moving television tickers presenting unscheduled emergency warnings during other broadcasts. On the Web, scrolling, blinking or animated text must be avoided as it is extremely difficult to read and will distract attention from any other content presented. Text needing particular emphasis, like warnings, should draw attention by the use of emphatic icons or strongly contrasting labels.

5.15 TABLES AND TABULATED DATA

Tabulated information is much easier to scan vertically and horizontally with regular guides, such as spaces, line weight, or colour stripes inserted to help users align information. This is particularly useful for reading accuracy on screen, where column headers may be scrolled off screen or where rows are very wide.

5.16 GRAPHIC FORMATS AND SOFTWARE

Bitmap and vector graphics are the two main types of graphic file formats.

Bitmap graphics

Bitmap files describe the colour value of each pixel so they tend to be large. They are necessary for satellite and radar images, photographs, scans and any images with significant colour variation. Bitmaps can be edited with any robust bitmap software and translated into file formats suitable for final output for all media. Editing may include cropping, removing the black backgrounds from satellite images, adjusting colours, contrast, sharpening detail or creating stepped colour values. Images can be combined and additional content like text, symbols and diagrams can be created or imported from vector files. Images need to be made using the required resolution for output. Scaling, particularly enlargement, is problematic as quality is always lost. All images must be converted to bitmaps for television and for the common Web formats, GIF and JPEG. Image sequences can be exported for animation. Bitmap software is suitable for producing graphics but it cannot be used for page layout for print. Images are commonly exported as TIFF, EPS or PDF format for printing and require CYMK colour space.

Bitmap graphics software

Photoshop is the most fully featured bitmap imaging software for print and other publication media. It has no competition in the design industry. PaintShopPro and PhotoDeluxe are popular options for smaller budgets. Basic free software is available from the Web, with the best options likely to be the Linux version of Corel's PhotoPaint or the Linux program Gimp.

Vector graphics

Vector files describe images using outlines and fills. They are most suitable for developing graphics such as maps, charts, diagrams and can also be used for print layout. Vector software can import bitmaps and either convert them to outline graphics or leave them as bitmaps within the vector files. Files can be exported in a variety of formats, including bitmaps, for any media. Vector graphics have many production advantages. Images can be scaled any number of times without losing quality. Elements of the graphic can be easily selected and modified for a variety of formats and media outputs. This makes it an ideal format for outputting graphic variations for each media from the same base file. Most vector software can also be used for print layout. Other practical advantages include animation and file size. Vector elements can be "tweened" to produce smooth image sequences. Current software can produce many of the rich bitmap effects, including shading, textures and levels of transparency, while file sizes tend to be much smaller allowing faster electronic dissemination and requiring less storage. Vector files are ideal for the Internet because they can maintain compact file size while presenting scalable detailed images. Unfortunately, they require browser plug-ins. The Flash browser plug-in is currently the most practical way to view vector images, although a Web vector standard, SVG, has been developed and is likely to become commonly used.

Vector graphics software

Adobe's Illustrator remains the dominant vector design program and its file format is widely recognized. Recent versions introduced good Web export functionality, and Illustrator 9 introduced PDF as its native format. It will also export the recent Web vector standard format, SVG. Macromedia's Freehand is increasingly popular; its practical advantages include multiple page layout, good animation, a tracing engine and Web export functions, including Flash format. CorelDraw is bundled with a suite of useful graphics tools, including the bitmap program PhotoPaint. It is relatively inexpensive and increasingly popular having resolved some previous print industry incompatibilities. It is the first common industry design program to be ported to Linux. As with other major draw programs it can also be used for layout work. Although an extremely economic package, compatibility with the NMS printers should be checked before purchase.

Converting bitmaps to vectors

Images like forecast charts often need to be converted from bitmaps to vectors for graphics production. Hand tracing is slow so automatic tracing is preferable. Adobe's Streamline allows reasonable tracing control. However, many draw programs like Macromedia Freehand have a serviceable trace function included. Tracing usually requires manual cleaning up.

Animation

Moving or transforming a single graphic can be done with most basic slideshow software. Morphing images is always more time consuming. If details like isobars are drawn as vectors, steps can be "tweened" to produce smooth sequences automatically. Software like Flash or Freehand may be suitable.

File processing and translation

The following Shareware and Freeware programs may be useful for some image editing and batch conversion functions. They are widely available on the Web.

ImageMagick - Unix
Graphic Converter-Macintosh
Graphic Workshop 2.0a- Windows
CDH Image Explorer Pro 5.2-Windows

Chapter 6
WEATHER GRAPHICS FOR THE PRINT MEDIA

6.1 USER REQUIREMENTS

The printers must identify any specific technical and scheduling needs but, generally, requirements are consistent, with the major differences being manifested in the colour and final output file type. In some cases, the NMS may have to deal with a third-party business that develops content for the paper.

Content

Design, layout and content will need to be customized for each media provider. Relevant content will depend on whether the paper has national, regional or local distribution and daily or less frequent publication. Content should include a balance of graphics, descriptive text and data tables.

Local and regional papers need to place local content in context with regional and national information and may add special interest content where it is relevant for most of the readership. Non-daily publications will focus on forecast information. Previous weather, including satellite imagery will generally be less relevant, with exceptions such as precipitation for agricultural regions. Sunset and sunrise information may be of interest to the general population and some industry sectors.

National daily papers are likely to have the most extensive content range to address, including regional groups, major centres and special interest groups, as well as presenting a national weather overview and some world data. CD Volume 2 from the *Guide to Public Weather Services Practices* identifies the following range of suitable content for national newspapers:

Essential content

- Forecast weather map either with isobars and fronts or streamlines or with pictograms
- Tables of forecast temperature and weather for cities in the country and a selection from around the world
- Regional text forecast in detail for the next 24 hours
- National outlook in less detail for the next 2 or 3 days
- The NMS logo and contact details to show originator and source of more information.

Highly desirable content

- Tables of yesterday's weather for major cities across the country
- A satellite picture only if can be produced quickly since it will be out of date when the newspaper appears
- Outdoor activities forecast-particularly just before the weekend
- Weather map of surrounding region can be useful to show the weather systems approaching
- Climatological statistics but perhaps appearing only once a month
- Sunrise and sunset times
- Times of high and low tide.

Scheduling

When a large range of products is to be provided, automation will be required for as much of the production process as possible, to allow for timely completion. While scheduling should cater for the inclusion of relevant current information, it should be borne in mind that most daily newspapers require their files in time for night print runs.

6.2 TECHNICAL REQUIREMENTS

Printers usually require technical specifications that differ significantly from the NMS desktop-publishing requirements. Files generally need to be PostScript compliant and they may need to address print settings like trapping, screening, dot gain and others requiring sound print knowledge. The NMS graphics must use CMYK colour space, or specified spot colours, appropriate resolution, and fonts will need to be supplied. Most printers will request files with default software settings for other print information and do these adjustments themselves. Prepress preparation can be problematic so it is extremely practical to enlist the support of the media services being supplied to assist in setting up efficient and reliable processes. The NMS computer's colour display has to be calibrated to match printer output and the relevant printer descriptions and fonts have to be installed.

Working cross-platform

Macintosh computers, having been designed for publication work, are popular within the print industry. Their advantages include built-in colour management, printer descriptions and monitor resolution matching the font-point scale. Macintosh computers can read and write Windows file and compression formats, but file name formats need to be Windows-compliant. File incompatibilities can arise where different software versions are used, occasionally for functions within specialist software and particularly where fonts are not matched. Some publishing software is now available for Linux but compatibility issues will need to be tested thoroughly.

Fonts

The NMS files will need to use the fonts specified by the printers. To match a font, the name, font maker and font technology need to be identical. Font foundries produce variations of established styles. Subtle style difference is distracting and where width and spacing vary this can cause significant layout problems when the file is processed by the media service. Any special fonts can legally be included with the file for printing purposes. It is likely that PostScript fonts, will be needed, while the fonts on the computer will be TrueType. Some common PostScript fonts are supplied with specialist print and graphics software. Keeping TrueType and PostScript fonts with the same name on the computer should be avoided. If there is a large number of fonts to be organized, shareware or commercial font management software can be used.

PostScript

PostScript is a page description language. It is used by specialized print software to enable printing on PostScript printers. Many PostScript production errors will be avoided by using PostScript fonts, and also by avoiding complex vector graphics and manipulating bitmap graphics within PostScript software. The publishers and the Adobe Website (http:// www.adobe.com) will be the best references in this regard.

6.3 DISSEMINATION

Files sent for printing need to include any linked graphics and special fonts. The printers may require files in a native software format, PostScript, Encapsulated Postscript (EPS) and — increasingly — in PDF format. Portable Document Format can be exported directly from most print software, embed all relevant fonts and include graphics and other display information. The NMS should consult with publishers for correct settings, particularly if compressing files.

Print files tend to be large so electronic distribution should use FTP or direct file sharing, otherwise portable storage like cartridges or CD will be most convenient. ISO 9660 standard CD file formats can introduce file-name incompatibilities, which can be addressed with software utilities or adapting naming conventions.

Further detail is identified in the publication *Technical Framework for Data and Products in Support of Public Weather Services* (PWS-1, WMO/TD No. 1054).

Print design constraints

Newspapers use low-resolution printing on coarse, uncoated paper. This limits image and text quality, the amount of detail that can be represented and the range of tones and colour. Many newspapers will use only black ink. Colour printing will either use "process" or "spot" colour. Spot colour printing tends to be economic, generally using tints of a single highlight colour in addition to black. When using colour, light tints should predominate with most detail overprinted in black. Saturated colours need to be confined to small highlights and contrast areas.

6.4 LAYOUT AND GRAPHICS

Information structure

Newspaper layout is extremely dense, presenting a challenging design task to make the information clear and easy to scan. Clear information hierarchy and logic are critical and interest and design structure need to be created by the content to minimize the need for additional graphic elements. In the example Figure 7 developed by the Australian Bureau of Meteorology for the regional Australian newspaper "The Age", the information is introduced with the page number, a title large enough to lead a broad-sheet page, followed by the date. The most popular information, a summary forecast for the capital city, is graphically presented in the leading page position in the top left. The information for the current day is emphasized by scale and position. Text for each day and temperature is emphasized with a larger bold font, while the information already represented in the pictographs uses smaller text.

Layout structure and sequencing

In Figure 7, the dominant large central map of the state daily forecast anchors the overall layout. The top edge colour, which is reproduced in greyscale in Figure 7, creates a "frame" for the layout and the irregular map outline extends beneath adjacent information blocks, linking them and introducing contrast into the otherwise rectangular layout. The space beneath the map helps the page seem less cluttered. Displaying pictographs on a map allows readers to rapidly find relevant locations and appreciate patterns across the region. In turn, the state weather is placed in context in an integrated sequence of national maps presenting the previous afternoon's satellite image with isobars overlaid, followed by the current and next day's synoptic charts. The sequence allows readers to identify relationships across Australia and over time. The satellite layer provides a recognizable reference to reinforce readers' understanding of the more abstract synoptic charts.

Identification

All information groups, including graphics, are clearly captioned and graphic symbols are qualified in legends. Other graphic presentations include a daylight index, temperature and air-quality graphs. Their wide formats and contrasting section banners help distinguish them from the underlying vertical columns and unify the overall layout. The format is "closed" in the bottom right corner with the NMS logo, copyright identification and information service contacts details.

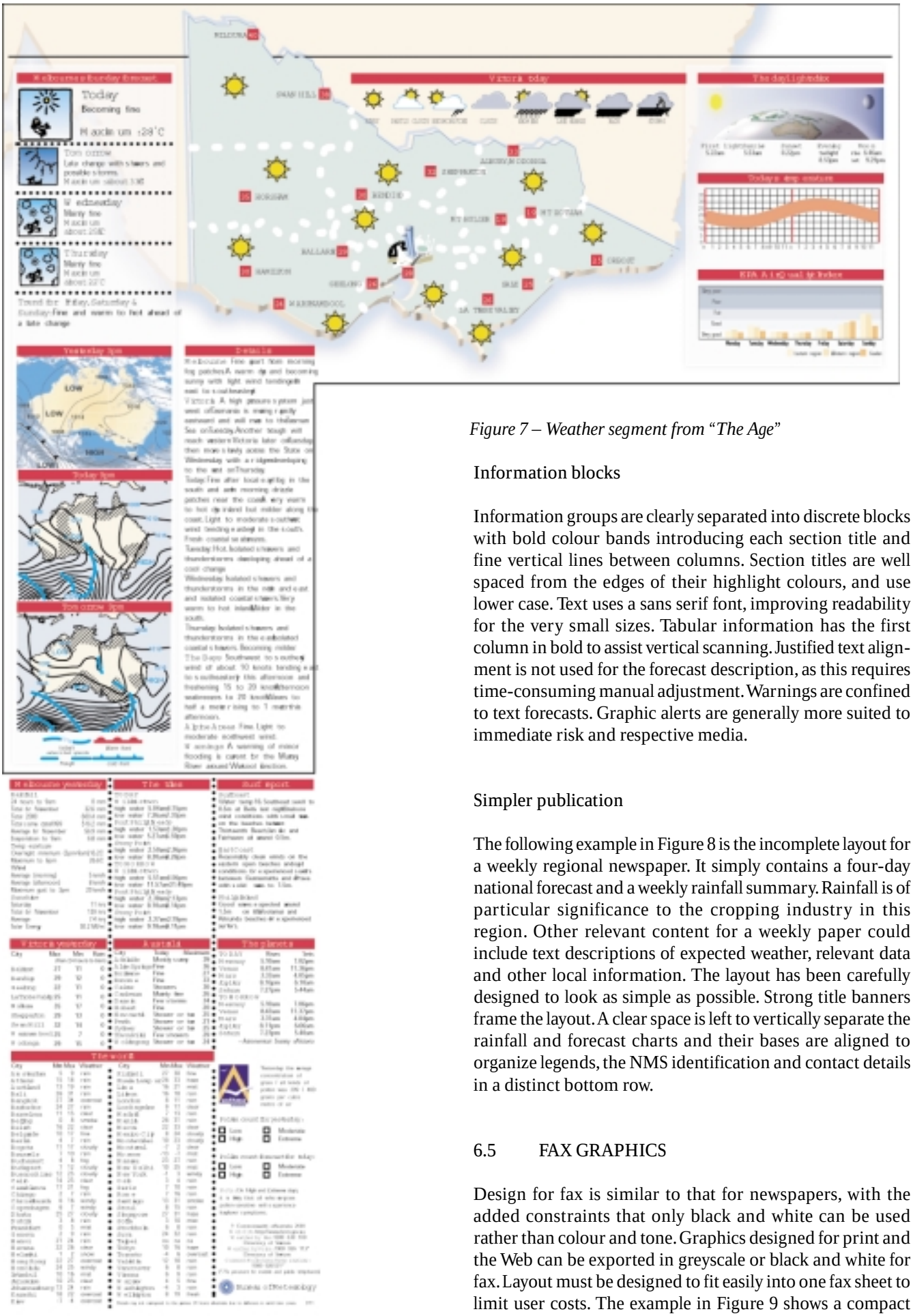


Figure 7 – Weather segment from "The Age"

Information blocks

Information groups are clearly separated into discrete blocks with bold colour bands introducing each section title and fine vertical lines between columns. Section titles are well spaced from the edges of their highlight colours, and use lower case. Text uses a sans serif font, improving readability for the very small sizes. Tabular information has the first column in bold to assist vertical scanning. Justified text alignment is not used for the forecast description, as this requires time-consuming manual adjustment. Warnings are confined to text forecasts. Graphic alerts are generally more suited to immediate risk and respective media.

Simpler publication

The following example in Figure 8 is the incomplete layout for a weekly regional newspaper. It simply contains a four-day national forecast and a weekly rainfall summary. Rainfall is of particular significance to the cropping industry in this region. Other relevant content for a weekly paper could include text descriptions of expected weather, relevant data and other local information. The layout has been carefully designed to look as simple as possible. Strong title banners frame the layout. A clear space is left to vertically separate the rainfall and forecast charts and their bases are aligned to organize legends, the NMS identification and contact details in a distinct bottom row.

6.5 FAX GRAPHICS

Design for fax is similar to that for newspapers, with the added constraints that only black and white can be used rather than colour and tone. Graphics designed for print and the Web can be exported in greyscale or black and white for fax. Layout must be designed to fit easily into one fax sheet to limit user costs. The example in Figure 9 shows a compact

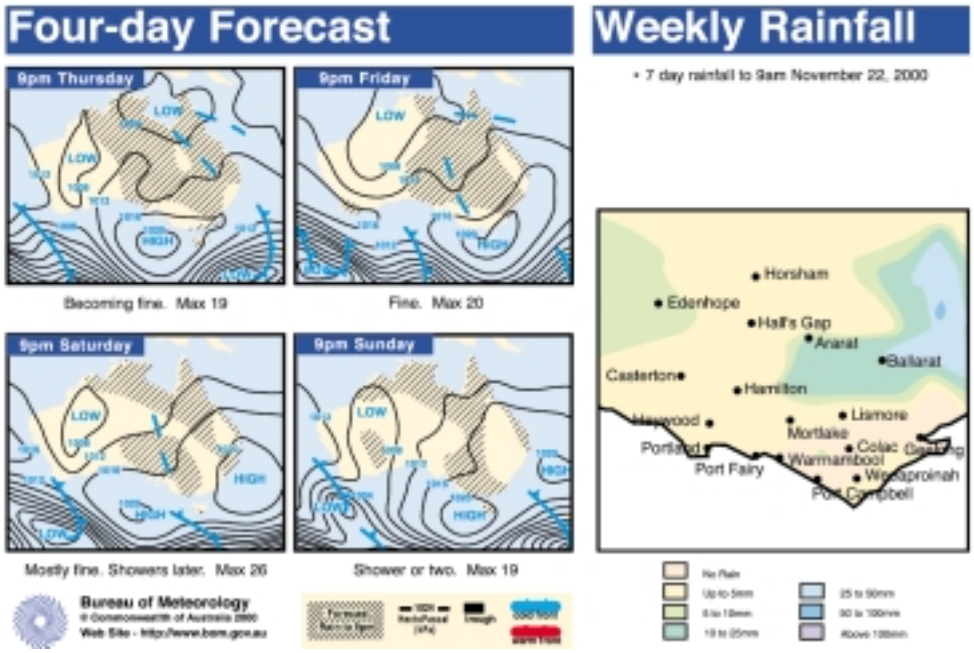


Figure 8 – Weekly regional newspaper layout

graphic layout for a four-day forecast in greyscale for fax (colour version at http://www.bom.gov.au). These were actually made using adjacent templates with the overlay details pasted onto the grey map then converted to black to improve tonal contrast. The Web navigation bar, seen in the right-hand image, was designed to fit within a standard monitor display and onto an A4 page if printed. The dimension of the graphic is clearly ideal for both media. The graphic leaves room on the fax sheet for additional data and text.

6.6 SOFTWARE

It is most efficient to develop the content for print media in respective specialist software. Text is best typed in a word processor to ensure accurate spelling, with bitmaps, vector graphics and document layout produced in dedicated packages. Where these are too expensive, commonly available software, Freeware, Shareware, and an increasing range of Linux software can be used.

Basic software

There are many commercial and non-commercial word-processor software packages capable of formatting print documents. Efficient development will require the use of "text boxes", "styles", templates, prepared image libraries, macros and automation scripting where possible. Graphics should be prepared in the correct size and resolution and linked or inserted at 100 per cent scale. If using Word, Adobe Acrobat 4 will enable reliable PDF export. Again it is important to speak with publishers to ensure compatibility.

Specialized software

It is generally an expensive commitment to purchase and upgrade specialized software regularly. Some software, particularly bitmap programs, demand high processor speed and large amounts of RAM and storage. They offer extensive control and productivity features and may be bundled with PostScript fonts, colour management and calibration software, printer descriptions and other utilities. They can also demand extensive skill development. Before purchasing such software, the availability of technical and training support, as well as compatibility with the publishers being supplied by the NMS, should be checked. Graphics software is detailed in the general graphic design section. Some common software used in publishing is described below. The websites indicated can be consulted for more information.

QuarkXpress

QuarkXpress is the dominant software used for general print publication. It provides excellent control for layout and pre-press functionality (http://www.quark.com).

Adobe PageMaker, InDesign and FrameMaker

PageMaker is simpler than QuarkXpress but also offers automation functions and scripting. It is widely accepted in the print industry. InDesign is more expensive and was developed recently to compete with Quark's functionality. It is not widely established yet but introduces the possibility that PageMaker could be superseded. FrameMaker is preferred for technical and very long documents (http://www.adobe.com/products/main.html).

Corel Ventura

While not as robustly functional as Quark or Adobe's software, Corel Ventura may offer an economic alternative for print preparation. All Corel's print and graphics software have been ported to Linux, offering significant economy. It is

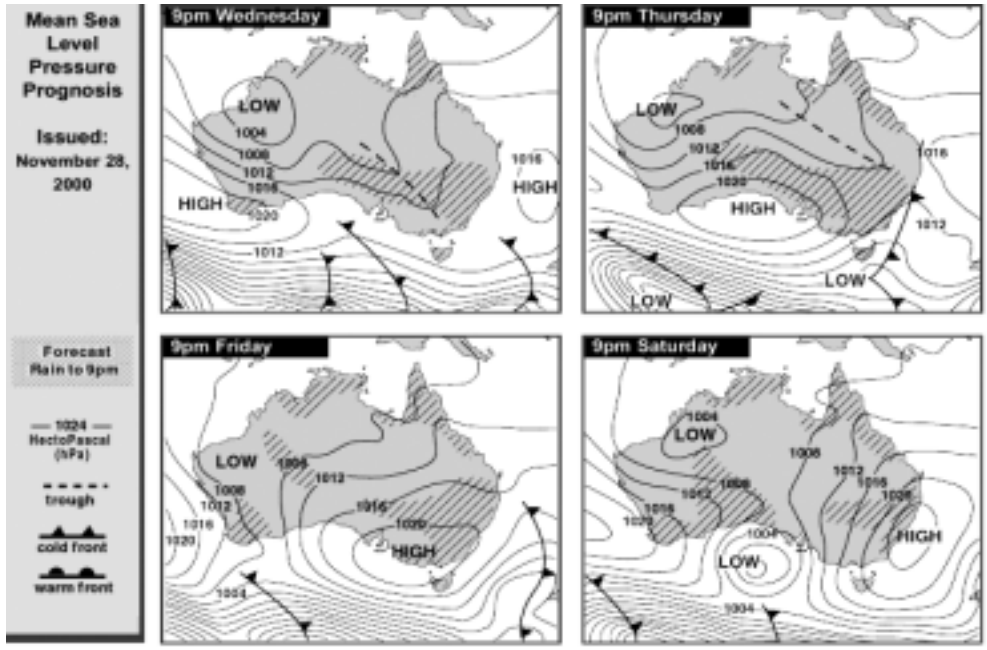


Figure 9 – Four-day forecast charts from the Australian Bureau of Meteorology

advised to test a demonstration version before purchase and check with publishers for compatibility issues.

Adobe Acrobat

Acrobat is used to convert files to software-independent documents, which display and print consistently for electronic distribution. PDF files produced for print should maintain image and font information. PDF files produced for the Web, however, need to be compressed significantly using "Acrobat Distiller".

The vector graphics programs Macromedia Freehand, Adobe Illustrator and Corel Draw can also be used for page layout but offer less specific functionality and limited automation. Corel Draw should be tested for printer compatibilities.

6.7 PRINT DESIGN CHECKLIST

The following checklist is provided as a guideline for the consideration of essential points when preparing products for print media:

- ✓ Do the style and layout match the rest of the publication?
- ✓ Is the layout as efficient as possible?
- ✓ Have the graphics been designed for easy adaptation for a variety of publications and other media?
- ✓ For Fax, does the whole layout fit on one page?
- ✓ Are the NMS's identity and style well presented and clear contact details included?
- ✓ Does the content range suit the scheduling and readership?
- ✓ Is additional special content relevant?
- ✓ Is the content easily understandable for the readers?
- ✓ Has all content been proofed?
- ✓ Will the content be current by the time it is read?
- ✓ Is all content legally included or protected?
- ✓ Is the information flow and hierarchy clear?
- ✓ Is specific information placed in context with information about wider areas or time spans?
- ✓ Is related information clearly grouped by proximity and alignment?
- ✓ Are sections of information clearly separated using the simplest design components like space, fine lines or column wide-highlights for section titles?
- ✓ Are repeated elements, a strong focus, "framing" or alignment used to create design unity?
- ✓ Is contrast used without becoming distracting?
- ✓ Is related information (e.g. map projection and scale) presented using matching design format?
- ✓ Are all graphics made in the correct resolution and dimension?
- ✓ Are all graphic elements essential and as simple as possible?
- ✓ Is the meaning of all graphic elements clear and logical?
- ✓ Will fine detail remain clear when printed?
- ✓ For Fax, are details clear in black and white?
- ✓ Are symbols identified in legends?
- ✓ Do all graphics have captions or titles?
- ✓ Is there any spare space to make the design feel less crowded?
- ✓ Is all text easy to read?
- ✓ Is all text left-aligned? (in the case of Latin alphabet)
- ✓ Does tabulated data include selected vertical or horizontal guides, emphasis or space to help scanning?
- ✓ Are all fonts and graphics included with the file?
- ✓ Have all the printer's technical specifications been addressed?
- ✓ Is the work backed up?

Chapter 7
WEATHER GRAPHICS FOR THE INTERNET

7.1 USER REQUIREMENTS

Content used in other sites

Where other sites have made arrangements to use the NMS information without reformatting, the design may need to be bland so as not to conflict with the host page. Graphics should include the NMS name, logo and copyright symbol and data should also be identified.

Access location and content

Where most user access is limited to public and work environments, brief weather and climate content will be the most relevant. Colour versions of content prepared for newspapers may be suitable and the immediacy of Web publication makes current information updates, including warnings, appropriate. As home and school access increases, a greater level of detail and variety of content, including public education material, will become more practical.

Audience

Identifying the needs of the Web audience requires observation and prediction. Web audiences are continuing to grow rapidly in many countries, as the necessary infrastructure and technology become accessible. Significant audience increase is likely when the public can access the Web through their televisions and portable devices rather than having to use a computer. While there are many user survey statistics available on the Web, these are unlikely to reflect the NMS audience. Although accurate surveys can be resource-intensive, a minimal sampling can be useful. Local Internet service providers may be able to help identify the potential user base and access trends.

The NMS Web audience will include regional, national, international, general public and specific users. Server log statistics and carefully designed, simple "feedback" forms will provide efficient and useful information about the needs of established users.

In addition to providing content to address audience requirements, it is essential to understand the way the users of the site think, so as to enable the design of site navigation and information structure to make sense to them. Talking with users and watching them use the NMS site is an essential part of the development and testing process.

Evaluation

The newness of this media accentuates the need for evaluation to determine quality and usefulness. Site statistics will provide ongoing information about the number of users and the content that they access. User feedback forms will provide critical appraisal, information on user questions and requests and help identify technical, product and communication issues. Surveys of the public, schools and particular user groups, like weather-dependent industries and related support services, will be useful to clarify the uptake and effectiveness of the information and also to help promote the NMS.

Public education

The Web provides an excellent opportunity to present public education content. Support and background information can be linked from general pages, and additional sections can be developed for particular interest groups and use in schools. Identifying a collection of references or links can offer a practical resource until there is time to develop particular content. An essential site resource includes a glossary of the technical terms and acronyms used in the site.

7.2 DISSEMINATION

Detailed information on technical issues is given in the WMO publication *Technical Framework for Data and Products in Support of Public Weather Services* (PWS-1, WMO/TD No. 1054).

Audiences need to know about the existence of the NMS site, how to find it and access it. Cross-media promotion and special events can be used to inform potential users about the site. It should be registered with relevant search engines and directories, and other commercial and service sites should be encouraged to provide links. The NMS homepage should be used to promote and link to new or updated content or custom services.

User access will be compromised if the site does not address audience technology constraints. File sizes must be kept minimal and content should be configuration-independent. In order to ensure broad access to the site, it would be safer to assume basic technology standards on the part of the users.

7.3 LEGAL, COPYRIGHT AND CODES OF PRACTICE ISSUES

While these are fundamental issues for all publication media, the Web introduces additional factors that must be addressed. Codes of practice developed by standards bodies, governments and WMO need to be checked. Publication standards, data sourcing and identification and accessibility issues are

particularly relevant. Essential references include the WMO *Guide on Internet Practices* (http://www.wmo.ch/web/www/reports/Internet-Guide.html#LEGAL-ETHICAL) relevant government departments and the World Wide Web Consortium (http://www.w3c.org).

7.4 CORPORATE DESIGN

The ease and directness of publication on the Web have revolutionized the publication process, allowing anyone to quickly develop content. This tends to produce two major corporate presentation problems. Without time for properly planned development and professional input, design quality is compromised. Where many staff add content independently, overall design unity and functionality can become eroded. Resources need to be allocated to design and develop a professional-looking functional site, and to ensure that ongoing content additions maintain consistency. Users should immediately recognize all pages as belonging to the NMS by the inclusion of the NMS logo and name. Identity is also made evident by a consistent overall design style and page format. This should include cross-site navigation, and may include heading styles, colour themes, and graphic style. To maintain consistent corporate design, where many staff produce publication material, a specific style guide, templates, graphic libraries and checking procedures are needed.

Professional presentation demands strong functionality as well as attractiveness. The first page of the Website should clearly be the "front door" to the rest of the site and should establish the design and structure, including the navigation. It may introduce the NMS logo and name in a larger size than subsequent pages but other graphic elements need to be minimal to allow fast download for this first page. Content needs to provide direct user access to the most urgent and popular material. It is best to link mission statements and information about the NMS. Distracting elements like technical gimmicks, background textures, excessive text colours, bullets, clip art, animated GIFs, table borders and blinking, scrolling or animated text, diminish communication effectiveness and presentation.

In the Finnish example in Figure 10 corporate identity, design unity and information groups are established clearly with the logo, name, and a consistent format differentiating each section. The design of the logo is also repeated in a subtle background image behind the left-hand navigation.

7.5 WEB DESIGN CONSTRAINTS AND ADVANTAGES

The web differs significantly from other media because users determine access times and how they will select the information they want. The communication design requires considerable understanding of the requirements of the audience. There is a need to design the interface and information structure cognizant of the way users are thinking, their preferred or familiar terminology and what they may need to know or need guiding to. Also, it should be kept in mind that, being such a new medium, there are few established

Figure 10 – The Finnish Meteorological Institute (http://www.fmi.fi/)

communication design conventions that users may know. The NMS will rely upon these conventions and consistent clear information design to help users learn how to access the content of its site.

Websites can include an extremely broad range of products and content, such as organizational, archived, research and educational information. It is extremely challenging to design an interface to enable people to find what they want quickly. Good navigation and information structuring are the priority. Well-designed site maps, indexes and search functions are useful for large sites but they should be considered secondary navigation for commonly accessed content.

Quality graphic design is an essential but challenging component. Designs must have minimal file size and work in a range of viewing contexts, on all types of computers, monitors, browsers and, increasingly, portable devices. In addition, page coding has to account for early browsers and the possibility of users having JavaScript and Java disabled.

7.6 SIMPLICITY, LAYOUT AND SCREEN DIMENSIONS

Simplicity is central to successful Web design. Visitors have to sort through all the information, usually in a small screen area, and identify and access what they need rapidly.

Typically, users scan to identify relevant content and leave the site within seconds if it is not evident. Content needs to be carefully distilled, with unnecessary elements removed, text and graphics displayed at the smallest possible and yet easily legible size, and information structured into discrete logical sections accessible with a minimum of mouse clicks. Complex Websites commonly use devices like cookies to enable users a customized view of content when they return. This is especially useful for multiple language sites.

Page layout requires a clear structure and a generous amount of space to separate content components. Information hierarchy needs to be obvious, with key information highlighted and related information grouped by proximity or design. Summaries can link to more detailed information and explanations.

Currently, the most practical way to structure page layout uses HTML tables. Tables enable columns, placement of separate components like graphics, specification of "white" space, line length and background colour to highlight sections. Tables can also be used to limit the width of a page for layout integrity. The table is an inherent layout grid, and should be consistent throughout the site with some minor variation for sections that require it.

In Figure 11 a four-column table structures layout and separates content groups. Simple graphic elements are used to emphasize the structure of the page, establish corporate identity, draw attention to warnings and present the primary information of the national forecast. Colour contrast (which can be seen on the website) is isolated to key information and the warning icon. Careful text grouping, spacing and alignment help create the design clarity.

Tables do, however, create accessibility problems for people with sight disabilities who are using text readers. Some countries require government departments to comply with Web accessibility guidelines. As soon as it becomes practical, style definitions offer more efficient and accessible formatting design.

Small, dynamically generated sites could address this issue by providing alternative views.

Layout design must be flexible enough to fit into smaller monitor displays, commonly 640 × 480 pixels as well as the larger standard 800 × 600 pixels and even higher display resolutions of 1280 × 1024 pixels and more. Page dimensions also need to allow for the edges and menus in browsers. This commonly leaves a constrained area of approximately 600 × 300 pixels. Critical content, particularly navigation, needs to fit into this display area without the need to scroll.

The imagemap in Figure 12 linked to regional forecasts, but the graphic as presented was too large to fit into the standard public monitor resolution, cutting off the view to the bottom of the map.

Small display devices like mobile phones and portable organizers, and WebTV will present a further challenge when they become popular for accessing the Web.

The use of relative widths for some table columns can enable suitable content to expand into areas available at higher resolutions. Centring the tables will balance the remaining space. Default or 100 per cent table width specification should be avoided, because it will produce unreadable long lines of text or data on large displays. Very long tables should be split horizontally to increase the speed of page loading. Where users will want to print pages, the page width should be limited to less than 600 pixels wide so they will fit on standard paper or generate a page format for print. This can be seen on The Finnish Meteorological Institute site (http://www.fmi.fi/). Some non-HTML content like PDF documents, Flash and SVG graphics, can be scaled for individual viewers but these formats are not currently practical for essential content.

7.7 USER-CENTRED NAVIGATION DESIGN

Navigation includes anything that leads the audience to contents. Effective navigation relies upon grouping the site content into a small number of logical linked sections. Sometimes, an organizing concept may be suitable. Appropriate grouping and labelling are critical tasks and need to reflect user perspective rather than the structure of the organization. The navigation will have to suit the types of user groups, anticipate what they will be looking for, what terminology they will use and how they expect to find them. Links must be obvious, and back up methods for locating content, like a search function and a site map, are useful.

The navigation bar in Figure 13 appears at the top of every page in the site. General information and support sections are grouped on the top two right hand "tabs" clearly differentiated by colour (which can be seen on the website) and position from product areas on the bottom light grey tab.

Navigation needs to enable users to find information with a minimum of clicks. Including a navigation bar on each page enables users to move quickly to other sections and

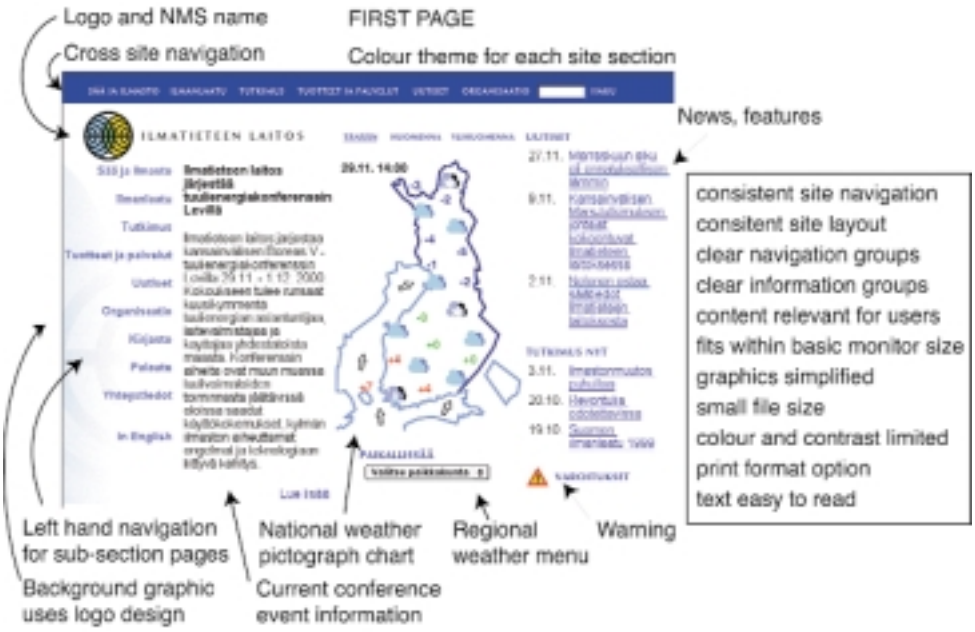


Figure 11 – Web layout from The Finnish Meteorological Institute (http://www.fmi.fi/)

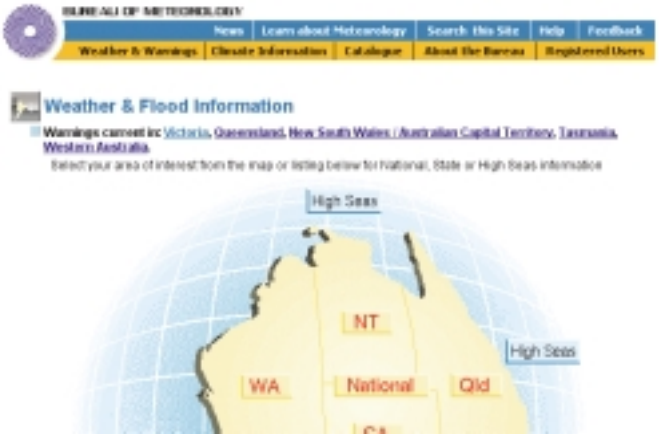


Figure 12 – Imagemap from (previous) Australian Bureau of Meteorology website (http://www.bom.gov.au)

reminds them about sections they can go to or have seen already; if the section that each page belongs to is evident, they are less likely to become confused. Highlighting the section link on the navigation bar or identifying each page with a section label, or a colour theme, like the Finnish example, is recommended.

Common navigation devices include bars, columns or clusters of linked labels or "button graphics", imagemaps and form options like selection menus. A search field, index page or sitemap, should be unnecessary for accessing most frequently used content, but can be useful back up for accessing other content on a large site.

Consistent navigation design

It should be ensured that all navigation is consistent. Links, particularly to the same content, should look, be located and behave identically throughout the site. Design conventions, like blue underlined hyperlinks and left-hand section navigation should be used if many of the audience are likely to be inexperienced Web users.

Long information pages should have links from a top of page contents list, to each section, and back to the top of the page at the end of each section.

Text links

Text link labels need to be brief, descriptive and meaningful to the user. The use of jargon and technical terms as well as large numbers of in-line text links should be avoided, as they will distract from reading. They should be placed in a separate section at the end or side of the document. Links should be obvious and differentiated from other text contrast like headings. Link style definitions can be used to give user feedback in newer browsers.

Icon and graphic links

Where icons are used, their meaning must be explicit and a label provided. While it is becoming a convention to use the organization's logo in the top left corner of the navigation bar as a link to the home page, new users may need to be told.

It is common to use JavaScript to produce "roll over" feedback but this will increase file size and some browsers may not use JavaScript. Sound is not practical for feedback.

Maps with linked "hotspots" can provide rapid recognition and selection of relevant regions. New users need to be directed to click on the area they want information for.

Alternative text links

All graphic links need alternative text links provided for users with text browsers or who have turned off the images. It is conventional to locate them within the main content on the home page and on the bottom of other pages.

Imagemaps

Imagemaps use a graphic, like a map, with "hotspots" over particular areas linking to related pages. They need to fit well within the screen size, and have text link alternatives. The images need to have a clear logical association with linked content.

7.8 WEB GRAPHICS

Image "Alt" values

All graphics should have "alt" values coded. Many users rely on these rather than the graphical display, or use them to determine whether to load graphics. They are compulsory in some countries. Image dimensions also need to be specified to increase load speed and to prevent other content like text, shifting when each image loads.

Dimensions

Graphics need to fit into the appropriate standard screen resolution without scrolling in either direction and also leave some white space around the edges. It is preferable that related captions, legends and basic information can be seen in the same view.

Figure 14 includes the caption and legend within the graphic, and links to support information and alternative sizes or black and white, adjacent to the graphic.

Figure 13 – Australian Bureau of Meteorology navigation bar (http://www.bom.gov.au)

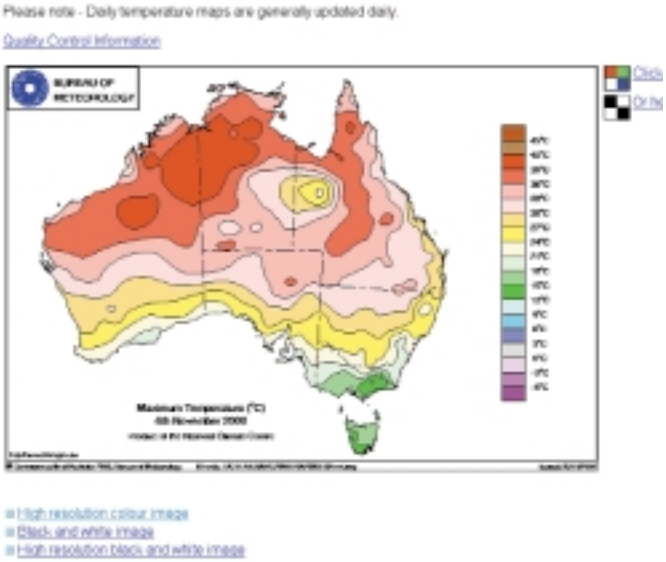


Figure 14 – From The Australian Bureau of Meteorology (http://www.bom.gov.au)

Some graphics may lose essential detail when reduced to standard monitor dimensions. It may be appropriate to link a small graphic to enlarged sections rather than requiring scrolling. Navigation images, however, should always be made to fit.

7.9 FILE SIZE

The file size of each Web page is critical for download speed. People will not wait more than a few seconds, which generally limits files to less than 20Kb to 30Kb per page. Front pages including navigation bars made from graphics as well as images in the page content, may become too large and deter access. In regions with limited Internet infrastructure, graphics will need to be used sparingly.

If graphics are carefully designed and made for the Web, they can have remarkably small file sizes.

There are four basic ways to constrain graphic file size:

- Use of screen resolution (between 72 and 96 pixels per inch).
- Cropping or editing irrelevant content, including unnecessary detail in or around the edges.
- Scaling JPEG images. Reducing the dimension often reduces file size.
- Compressing the graphics. The two current common Web file formats are GIF and JPEG.

JPEG compression

JPEGs use "true colour" or greyscale and are suitable for photographic pictures, or images with gradual changes of colour and limited sharp detail. The level of compression however, being a lossy compression type, can be varied to balance size against quality. Low to medium quality is usually adequate for most images other than portraits. Some graphics software, like earlier versions of Photoshop, save thumbnail preview images and print and colour information in files by default. This can almost double some file sizes so, where possible, suitable settings need to be specified.

GIF compression

GIF is the format used for most graphics. GIF compression is not lossy and works best with graphics that have areas of horizontal contiguous colour. It uses an indexed palette of up to 256 colours, but maximum compression is gained by designating a minimum number of colours. Black-and-white images need to be saved as 1 bit (2 colour) GIFs. Charts and diagrams are best designed with less than 16 colours, with 4 to 8 colours commonly adequate.

Small graphics like icons, as well as graphics containing text like navigation "buttons", should be saved as GIFs. They will be both clearer and smaller in file size.

Shading and patterns

Horizontal gradients, the application of shading effects like shadows, bevels and patterns will significantly add to file size and display poorly on 256 colour monitors. Where they are used, their area and contrast should be minimized.

Edge smoothing, called anti–aliasing, will also increase file size. It should be constrained to detailed icons and graphic text over 11 points in size where it can improve legibility.

7.10 GRAPHIC DESIGN ISSUES

Colour

Colour is one of the most powerful and dominant design components for screen graphics. It can help to focus attention, communicate meaning and relationships and enliven content at no additional cost. Colour needs to be confined to key areas or it will become distracting. Pure or primary colours are acceptable for some small details but they are so dominant and harsh for larger areas or repeated heading styles that complex colours should be chosen instead.

As with other media, colour graphics for the Web should be designed so that they will still be effective if seen in greyscale. Clear tonal and colour contrast should be used and lines can be added at the edge of adjacent colours of similar tone.

Colour displays differently on every monitor. Variation depends on colour resolution, monitor type, calibration, gamma, individual settings, operating system and even the light where the monitor is located. The variation can be extreme enough to destroy usability and design integrity.

To constrain variation, "Web safe" colours should be used for most components, particularly large areas of solid colour and also the links. The Web safe palette is a reduced set of basic system colours that will display similarly on various computer configurations without dithering. Colours should be specified by hexadecimal numbers, rather than by name. This palette is provided in many recent graphics programs and visual page

editors, including newer versions of Netscape Composer. The pattern of useable hexadecimals numbers is easily recognizable. Schematic graphics like maps should be designed using flat areas of colour, where possible from the Web safe palette. These should be saved as GIFs with a minimal colour palette. Images, generally photographs, with considerable colour variation, should be saved as JPEGs. The most efficient compression can be determined by experimenting.

Graphic readability and use

Problems with understanding Web graphics often arise from poor labeling. This can include illegible text or symbols within images, and missing captions, legends or associated information from the same screen view. It is worthwhile to include adjacent links to explanatory information or relevant public education content.

Small screen size generally makes it difficult to present related images together. Navigation pages can help the audience understand the context of graphics by indicating how they are associated. Thumbnail images may be particularly useful for rapid comparison and identification. Presentation style, scale, mapping projections, labelling, caption and legend locations should be consistent.

Where graphic elements are used sparingly, they will automatically become the focal point in any screen. This is most useful for reinforcing information hierarchy and particularly for drawing attention to warnings or feature information.

Pages with many focal elements, including graphics, colour and contrasted text, need to be simplified or they will confuse information hierarchy and become difficult to scan.

7.11 TEXT, TABLES AND WRITING

Text requires restrained treatment for Web design. The most efficient solution is to leave all text as the browser default except for tabular data, which requires a monospace font. Variation will be introduced with logical heading tags. Styles can be used efficiently to set the font, colours, size, weight and alignment for recent browsers. The most generic system fonts should be specified, along with alternatives to ensure they are available on the user's computer. The fonts Georgia and Verdana were developed by Microsoft for the Web. They are very easy to read on screen and increasingly common as system fonts. Long pages of information may be more readable with "Georgia, Times New Roman, Times, serif" specified. If the site has only short sections of text, then "Verdana, Arial, Helvetica, sans-serif" will be more suitable. The use of italic text should be minimized, as it is difficult to read on screen, and decorative fonts should be confined for selective use in graphics.

Text in graphics

The large "x" height and squareness of the letterforms makes Verdana the clearest font for small text sizes. This is particularly relevant for text within graphics. Text under 11 points should have no edge smoothing. Large text will be more legible with smoothing and the tracking increased slightly. Colour effects for titles, like bevels and shadows, will reduce legibility. Offsets and blurs should be limited to three pixels.

Text sizes

It is extremely common- but poor information- design to use inappropriate text sizes. Text needs to be presented at sizes we have become accustomed to reading at close distance: not too small and not too big. Heading tags should have the sizes specified and reduced from the default. Where using style sheets, relative sizes and conditional scripts should be specified in order to enable suitable display size across browsers and platforms.

Text colour

Text colour needs to contrast strongly with the background colour. The most readable colours are black text on a white background. Other coloured text and backgrounds need to be applied sparingly and are best used for small areas of contrast.

Text alignment

Left alignment (for Latin alphabet) provides the best readability. Centred text is much harder to read and should rarely be used, even for navigation columns. Right alignment should be used to tabulate numbers to the decimal point. Justification should be used conservatively as it can cause spacing problems, particularly in narrow columns. Lines of text should be kept short. Lines over 12 words long, typically running the width of a medium resolution monitor, tend to be very hard to scan.

Tables

Tables of data should be designed to fit into a standard monitor size. Information spaced too widely is difficult to scan. Periodic horizontal and vertical guides will assist users to align data and headers. Bold columns of text, spaces, colour or lines can be effective. Regular table borders are quick but less effective and should generally be avoided. At least 3 pixels of cell spacing should be specified with 6-8 preferable. Figure 15 uses bands of slight colour variation (which can be seen on the website) and selected bold text columns to aid scanning.

Writing

The structure of Web writing needs to differ from writing for print. The use of bold or highlighted subheadings breaks text into succinct blocks and helps the user scan quickly.

Place	Temperature	Humidity	Conditions	Updated
Beitbridge	29° C	55%	fine	06:00 utc
Binga	27° C	66%	fine	06:00 utc
Buhera	0° C	0%	-00-	06:00 utc
Bulawayo	25° C	47%	fine	06:00 utc
Chinhoyi	22° C	69%	fine	06:00 utc
Chipinge	26° C	51%	fine	06:00 utc
Chiredzi	31° C	43%	fine	06:00 utc
Chivhu	22° C	65%	fine	06:00 utc
Gokwe	0° C	0%	-00-	06:00 utc
Guruve	23° C	61%	fine	06:00 utc
Gweru	22° C	69%	fine	06:00 utc
Harare	22° C	61%	fine	06:00 utc
Harare	30° C	46%	fine	06:00 utc
Hwange Natl. Park	25° C	57%	fine	06:00 utc
Kadoma	25° C	61%	fine	06:00 utc
Kariba	30° C	49%	fine	06:00 utc
Karoi	22° C	69%	fine	06:00 utc
Kezi	27° C	51%	fine	06:00 utc
Kwekwe	24° C	61%	fine	06:00 utc
Masvingo	26° C	54%	fine	06:00 utc
Matopos	24° C	61%	fine	06:00 utc
Mbondoro	23° C	61%	fine	06:00 utc
Mount Darwin	24° C	69%	fine	06:00 utc
Mukandi	0° C	0%	-00-	06:00 utc
Mutoko	23° C	61%	fine	06:00 utc
Mvurwi	22° C	65%	fine	06:00 utc
Plumtree	25° C	47%	fine	06:00 utc
Rusape	23° C	61%	partly cloudy	06:00 utc
Tuli	0° C	0%	-00-	06:00 utc
Victoria Falls	0° C	0%	-00-	06:00 utc
Wedza	23° C	65%	fine	06:00 utc
West Nicholson	0 ° C	0%	-00-	06:00 utc

Figure 15 – Zimbabwe Department of Meteorological Services (http://www.utande.co.zw)

Summary information can be linked to expanded detail. Where relevant, the active voice should be used to make communication feel more direct and personal. The public may at best, only guess the meaning of acronyms and meteorological terms, so their use should be limited and be qualified with a linked glossary. It should be ensured that images are adjacent to referring text.

7.12 FRAMES

Frames can make site production simpler, reduce server load and allow the navigation to remain static while the content changes or scrolls, but they also have significant disadvantages. Some search engines do not find the frames' content files and users find frames confusing to bookmark and print. Care must also be taken to avoid loading external links into the frame set. Major Websites tend to avoid using frames because of the usability issues.

7.13 PRODUCTION

The simplest way to make a Web page, is to copy one that has a suitable format and edit the code in any plain text editor. Otherwise a lot of current authoring software will allow the export or saving of files as HTML and increasingly as XML. Connecting pages to a database and producing dynamic content will require scripting. There is an abundance of Websites with support information, instruction and available scripts for modification.

For designing interfaces a visual Web editor is strongly recommended. After resolving the interface design on paper or using a graphics program, a visual editor can be used to construct the Web page. Such editors are particularly useful for precise formatting and making complex tables. Code should always be validated and cleaned up after using visual editors. Most visual editors have a code window, or integrate with other code editors. Visual editors can be used for prototyping or general Web page production. Some of them have extensive functionality, including useful site-management tools. Code that is complex or not recognized by some of the browsers accessing the site should be avoided.

7.14 TOOLS

Web pages can be exported from most current authoring programs. Microsoft Word and Excel will export simple HTML pages. Complex page layouts can be generated quickly by making a suitable table in word then saving the document as HTML. The code can be modified in any text or code editor. Print publication programs like PageMaker and QuarkXpress can also convert files to formatted HTML documents, although content developed in these programs may be more suitably presented as PDF files. All conversion programs generally require some further work to adjust or clean up the HTML code and customize any graphics. Some common software packages, however, export unsuitable Web files, particularly where they convert whole pages to images or require browser plug-ins.

Visual editors

Freeware and shareware editors are available, including Netscape Composer which is included with the free Netscape Communicator. It is basic but efficient for simple pages.

Common specialized software

Microsoft's Frontpage is one of the cheaper commercial visual editors. Macromedia's DreamWeaver has an extensive range of functions that can be customized, using JavaScript. It has a range of useful productivity functions, Web support resources, user groups and additional free code available. It can be linked to a preferred code editor. Adobe's GoLive would be the most suitable tool for dedicated designers working with other Adobe publication software like PhotoShop and Illustrator.

Graphics

Commercial programs like Adobe Photoshop and ImageReady, and Macromedia Fireworks offer highly efficient image compression and some batching functions. Most graphics programs offer GIF and JPEG export, but compression control and quality vary.

There is a variety of good Freeware and Shareware graphics software available for most platforms, especially Windows and Linux. Sites like http://www.tucows.com allow convenient searching and download.

7.15 WEBSITE DESIGN CHECKLIST

- ✓ Have you checked the WMO *Guide on Internet Practices*?
- ✓ Does the first page load in less than 5 seconds using a dial up modem?
- ✓ Does the layout fit horizontally within standard monitor resolution?
- ✓ Is the content accessible for most audience platform and browser configurations?
- ✓ Is the NMS identity and style well presented and its contact details included?
- ✓ Is this style consistent on every page?
- ✓ Is there weather and warning content on the first page?
- ✓ Is information about the organization like mission statements and structure linked rather than detailed from the front page?
- ✓ Can all popular content be accessed in less than four clicks?
- ✓ Is the content accurate and current?
- ✓ Is all content legally included or protected?
- ✓ Does the site comply with the government Internet publication guidelines?
- ✓ Is there cross-site navigation from all pages?
- ✓ Does the layout use a consistent grid?
- ✓ Are all the graphic elements essential?
- ✓ Are the animations (including text) confined to relevant charts and satellite loops?
- ✓ Are all graphic interface elements as small as possible to remain legible?
- ✓ Are logical text tags used?
- ✓ Are all fonts suitable for the screen and available cross-platform?
- ✓ Is the text a comfortable reading size; not too big or small?
- ✓ Is all text left aligned?
- ✓ Are line lengths kept short?
- ✓ Is the information hierarchy clear?
- ✓ Is contrast used just for selected focal elements on each page?
- ✓ Is the background white?
- ✓ Do the tables provide vertical or horizontal guides for scanning?
- ✓ Is there generous cell padding?
- ✓ Is <table border=”0”> specified for most tables?
- ✓ Do all graphics and data pages have captions and linked support information including data sourcing?
- ✓ Do all graphics have “alt” names and dimensions specified?
- ✓ Are most pages including all graphics less than 20Kb?
- ✓ Have issues relating to frames been addressed?
- ✓ Is there a linked glossary of terms and acronyms?
- ✓ Is there included a feedback form?
- ✓ Are there other ways to evaluate user needs?
- ✓ Has the site been tested and backed up regularly?

Danger checklist – a yes indicates need for design revision:

- ✓ Does the first page take more than 8 seconds to load completely using a dial up modem?
- ✓ Is most of the first page about the organization?
- ✓ Is the layout larger than a small standard screen display?
- ✓ Is it necessary to click to the next page before getting any content? (Multiple language sites excepted)
- ✓ Does the interface include any of the following: animated GIFS, scrolling, blinking or animated text, bevelled buttons, large buttons, lots of buttons, metallic effects, a page counter, more than one horizontal rule, background patterns, background colour, any effects that have no function?
- ✓ Does it use frames?
- ✓ Do any of the frames other than the content page have scroll bars or borders?
- ✓ Do all tables have borders and no cell padding?
- ✓ Is the text centred?
- ✓ Are the colours really bright or dark?
- ✓ Are any of the link or text colours almost the same as the background?

Chapter 8
WEATHER GRAPHICS FOR TELEVISION

8.1 USER REQUIREMENTS

Preparation of television graphics can help facilitate accurate and consistent weather broadcasts on local stations. Direct broadcasting is only practical where no alternative broadcasters are established and where adequate resourcing can fund a basic studio and broadcast equipment. The stations may use the NMS graphics as supplied or repackage them for presentations. Alternatively, they may require a ready-for-broadcast presentation. Each station will have particular content, style, scheduling and technical requirements. These need to be clearly identified and specified in agreements before production is commenced. With the exception of ready-for-broadcast material, the format needs to complement the contexts it will be presented in. Television stations may supplement the material, or add logos or subtitles requiring space at the top and bottom of any screen (see Figure 16 on page 27). Colour and detail in these areas must be compatible, allowing enough contrast for the additional elements to be legible.

Audience

The style and content of the material will vary according to the type of audience identified. Presentations must be engaging and easy for the general public to understand and remember. Presenters or narration and captions need to explain what is being seen, what specific terms mean and weather impacts need to be personalized. While some stations will require formal report, others will want a human-interest focus, and possible inclusion of public education content.

8.2 CONTENT

Suitable products for television are identified in the *Technical Framework for Data and Products in Support of Public Weather Services*. Weather broadcasts tend to be televised with regular news broadcasts. The need for brevity and the scheduling of the material determine the most relevant content. Morning shows will focus on the day ahead, while evening shows will tend to be longer and include regional, national and perhaps international summaries, warnings, next-day and extended forecasts. Sometimes there may be the opportunity to present climate forecasts or a human-interest story. The presentation of material may include summary data, forecast data, synoptic maps, satellite and radar images, pictographs, schematic graphics, relevant photographs and video footage. There should be agreements with the station for prioritizing the broadcast of unscheduled warnings. These are commonly presented as scrolling text "tickers" over scheduled shows.

8.3 CORPORATE DESIGN

Presentation and production values need to compare well with other programming material and the NMS identity needs to be clearly evident and distinct. Identity can be established with a consistent graphic design style including elements like the NMS logo, and an introductory screen or animation.

The example in Figure 17 on page 27 introduces a blue colour theme and the iconic mesh globe in an introductory sequence. The forecast summary page reiterates these elements in the background and adds subtle design interest to the screen.

Figure 18 below uses simple animation of the title graphic to introduce and identify the presentation. Corporate style does not need to be "high tech." The examples in Figure 19 (see page 27) successfully uses a simple drawing style and "torn paper" as repeated design elements.

Whether using complex special effects software or basic graphic technology, experienced design skills are required to produce an appropriate style. If resources permit, a designer should be employed or at a minimum, consulted, for the development of the corporate graphics. If this is not possible, a simple conservative design should be used and technical gimmicks avoided.

8.4 MEDIA CONSTRAINTS

Design for television needs to be particularly simple and bold because it will be seen briefly, and it is generally accompanied with narration. Being a dynamic media, the use of animation or frequently changing graphics are needed to sustain attention. The sequencing of information needs to be logical and provide both continuity and contrast. Good sequencing sustains attention, reinforces understanding and focuses attention to warnings and necessary action.

The impact of television results from the combination of images, voice and demonstration. This reiteration helps the audience notice and remember effectively. Narration needs to explain and expand upon the graphics.

Figure 18. From CD Volume 2, morocco.mpg

Elements including text need to be large, detail kept minimal, and adequate colour and value contrast used, to allow visibility from some distance from the screen. It should be remembered that screens use low resolution and may be small and black and white.

8.5 SCREEN FORMAT

The current screen aspect ratio for television is 4:3. Stations should specify if they require a different format for graphics or where the introduction of digital broadcasting requires alteration of the format. It is possible that border areas of the screen may be clipped. It should be ensured that set content, particularly labels and titles, is well within the bounds of the "frame" so that it is within this "safe zone" and leaves some room between the edge of the screen (see Figure 20 on page 27).

All content should be set out using grid guidelines or a template to ensure precise consistency between screens. Small variation can be very distracting, for example in CD 1, Austra~1.mpg. The margins of the grid should define the safe zone.

8.6 POSITION AND SIZE OF SCREEN

Because design for television needs to be simple, position, alignment and colour will be significant design components. The example in Figure 21 (see page 27) uses highlight colours behind the text to emphasize the alignment and create page and information structure. It is practical to run bands of highlight colour through the safe zone and off the screen to avoid awkward cropping. Elements in this example are right-aligned to read right to left.

The position and size of screen elements must reinforce the information hierarchy and flow, with titles largest at the top leading position. Alignment and highlighting of selected columns can help vertical scanning. The information will become unclear if there are too many contrasting elements cluttered tightly on screen. Pictographs or data placed on maps require ample space to separate them and background map detail needs to be absolutely minimal with details low in contrast to prevent distraction. Low image resolution and viewing from a distance make fine detail in graphics difficult to see. Lines, fonts and icons need to be bold and simple. Maps are best identified using colour areas rather than line. Place names are usually unnecessary, unless featured. Clutter and lack of contrast will also reduce readability.

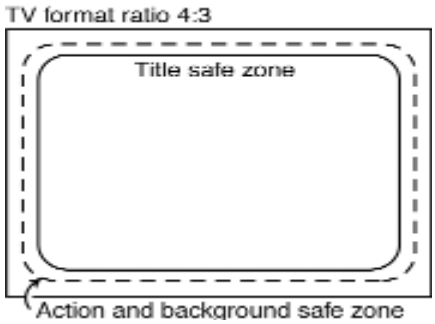


Figure 20. TV screen format and safe zones

8.7 COLOUR

In addition to 7 per cent of people with degrees of colour blindness, colour information may be degraded with poor broadcast reception and will be lost on black-and-white televisions. While colour can be a powerful communication component for television, it cannot be used in isolation and is best used where adjacent colours contrast clearly in tone or value. Outlines can be used to clarify areas of similar tone.

Unlike the reflective colours of print, television graphics tend to look best with darker backgrounds and light features including text. Common colour associations of darker blues to indicate sea, lighter greens for land, and white clouds work effectively. Detail and overlays need to contrast in colour and tone to the underlying graphic.

In Figure 22 (see page 27), colour harmonies using blues, greens, grey, white and some yellow look attractive and also contrast land from sea clearly, showing temperature and clouds. White arrows are used to indicate wind.

The video represented in Figure 23 on page 27 presents an excellent example of how reduced colour vision requires attention. The colour version of the image shows distinct colour areas. On the other hand, when seen in shades of grey, it depends entirely on the black and white lines for differentiation as the colours are tonally similar.

In the presentation represented by Figure 24 on page 27, the grey values of the original satellite image have been stepped and translated to colours to differentiate cloud density clearly and dramatically.

Figure 25 on page 27 presents an interesting application of colour logic. This map uses colour to indicate temperature. The top darker blues represent the coldest temperatures, the bottom darker reds show relative warmth, and white indicates 0°C. The scale on the left, while inverting our common logical expectation of the lowest numbers at the bottom to the highest at the top, aligns approximately with the temperature distribution. The colour in this image is still informative in greys as colours get lighter in value towards 0°C but the commentary would need to indicate the positive and negative areas.

Problem colours

Very light or very dark graphics and saturated colour, especially red and blue, can cause problems. Reds may tend to bleed when reedited. White can flash and produce strobing in patterned fabrics, light areas can appear burnt out and dark images, or those lacking tonal contrast, may appear dull. While pattern strobing needs to be avoided, small areas of intense colours can be acceptable. For ready-to-air presentations, colours in front of the projected image, particularly the presenter's eyes and clothes, also need careful checking to avoid matches when colour keying is used.

8.8 TEXT

People prefer to hear narration than read text on screen. Text needs to be minimized. It should be confined to necessary

screen captions, warnings, and summaries. Where text is read, this must be accurate.

Text colour

Screen fonts need to be large, simple in form, and heavy in weight. Font screen size should be no less than 1/10 to 1/25 of picture height. Serifs and decorative fonts and fonts that have narrow characters or tight letter spacing should be avoided.

Lower case is faster to read, but a small number of words in ALL CAPITALS is acceptable. White or yellow text against a dark background is most readable. Narrow black shadows or outlines may be added to the text if the background is patterned or lacks enough contrast. Black text seems comparatively flat so it should be used less.

Placement of text

The position of the text on the graphic adds meaning and design structure. Title positions should be logical with the title at the top, and any subtext at the bottom of the screen. Information needed first should appear near the top left (for Latin alphabet), with subsequent information to the right, for ease of scanning and reading.

Crowding of the text should be avoided. For example, if the summary figures cannot be fitted onto a map with plenty of space between the information, a different presentation solution will have to be found.

Lists of text or numbers may be supplemented with corresponding icons.

Care must be taken to keep all text far enough inside the display safe zone to allow some "gutter" space.

If the presentation is to be subtitled, enough space must be left at the bottom of the screen for text. Subtitles should have a background to improve legibility.

In Figure 26 the numbers are extremely large, well spaced and, being yellow, stand out most. Location names are much smaller with white used for Switzerland and black for neighbouring regions. This example is unusual, as a decorative font has been used successfully.

Animation of text

As a rule, scrolling should not be used. Scrolling text is hard to read and distracts from other screen content. Text can animate into its screen position but, when in position, should remain static to be read.

Time on screen

The text should be left on screen at least as long as it takes to read it aloud slowly, twice. If the commentary relates to the text it should remain while relevant.

8.9 THE MEANING OF GRAPHICS

All graphics need to convey clear and unambiguous meaning. Pictographs indicating weather need to be sufficiently different from each other when viewed on television. Where detail is similar, colour variation or subtle animation can help to differentiate. With legends inappropriate, it is essential to reinforce the meaning of pictographs in narration or text summaries. Diagrams and graphs such as in Figure 27, need to be simple and can be made clearer and more interesting with the addition of pictographs or associated colours, as well as being explained by narration. If included, synoptic charts need to be kept simple. In the example in Figure 28, only a low-pressure symbol and animated isobars, with colour areas to indicate snow, are used. The presenter explains their significance for viewers in very simple language.

8.10 SEQUENCING

Dynamic media are very effective for helping people understand information relationships. Sequencing still images or simple animations can be used to show variations over time and geography or different information sources. Sequential overlays of maps, synoptic charts and satellite or radar images can help the audience understand what they are seeing. This may even assist them to understand these graphics presented in other media like print.

The graphics in Figure 29 show the sequential overlays of satellite images, followed by fronts and finally isobars over the same map.

Introducing and closing the presentation

This will need to be compatible with the presentation style of the host station. A brief formal greeting before introducing the first graphic may be suitable for most stations. Some stations in their presentations introduce the weather with a "human-interest" focus, which is then linked during the presentation.

In Figure 30 the presenter introduces an image of Mt. Fuji. "This is the best time of the year …" A comparison is made with this location during the presentation, then closed with a "goodnight" reiterated with a background night image.

Warnings

The most effective way to focus attention on warning information is to position a warning at either end of the presentation.

In Figure 31 the warning is presented at the end of the show. It uses images and bold highlighted summaries of relevant information. This is followed by an explanation of what terms like "serious" mean in relation to impacts on individuals and actions to be taken.

Figure 16 – Example with subtitles and logo from CD 1, uk-mide.mpg

Figure 17 – From CD Vol. 1, germany3.mpg

Figure 21. From CD 1, additional examples, UK-mide.mpg

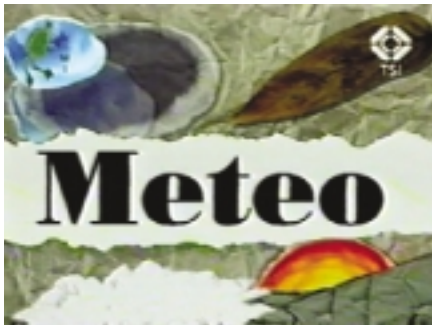


Figure 19. From CD 1, additional examples, switze~1.mpg

Figure 22. From CD 1, additional examples, Brit.mpg

Figure 23. From CD 2, Video 1, Switze~1.mpg

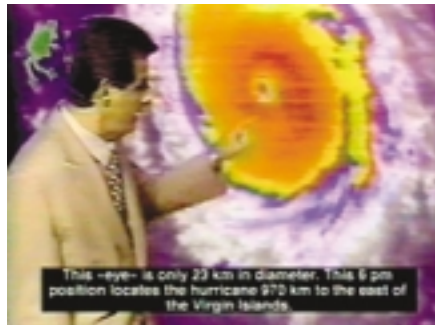


Figure 24. From CD 1, additional examples, Cuba.mpg

Figure 25. From CD 1, additional examples

Figure 26. From CD 1, additional examples, switz~1.mpg

Figure 27. From CD 1, additional examples, Japan.mpg

Figure 28. From CD 2, Norway.mpg

Figure 29. From CD 1, additional examples, spain.mpg

Figure 30. From CD 1, additional examples, Japan.mpg

Figure 31. From CD Vol. 1, switze~1.mpg

Figure 32. From CD Vol. 1, Denmark.mpg

Figure 33. From CD Vol. 2, Switze~1.mpg

Figure 34. From CD Vol. 2, Germany.mpg

The colour red, contrasting strongly with the background and associated with danger, is used with recognizable roadside symbols in Figures 32 and 33.

Public education

Presentations can successfully integrate public education content, either as separate features or by expanding explanation of regular content. The example pictured in Figure 34 uses graphics and narration to explain influencing system patterns.

Continuity

The design of sequenced frames needs to balance the provision of enough continuity to create flow and unity with enough contrast to allow variation and sustain attention.

To give a television presentation design unity and make the change from one image to the next flow comfortably, there is a need to link the graphics. The example in Figure 35 uses the same style of relief map and consistent colours throughout the presentation (see CD-ROM for colour version). Where detailed regional information is needed, the larger map is displayed first, then zoomed to a close up. Subsequent regions are panned. Zooming and panning present comfortable transitions because they are similar to our natural observation processes. They can be achieved using simple animation methods. Presenters also link images by walking to a new position, indicating a particular region, or introducing information in narration.

Contrast

Effective contrast between frames helps to maintain attention and allows the introduction of material using different formats. Small changes between frames can best be presented with a transition effect or through the use of greater contrast. Transitions between similar graphics can also use animation to introduce the changed elements. New material can simply appear, or animate onto the screen over the same background.

Transitions

The changes between different images are called transitions. There are a variety of ready-made transitions available in common software packages. Otherwise, the transitions can be custom tailored. The most effective transitions are usually so subtle or fast that they are not noticed; for example, fading the current image out, while fading the new one in over a short number of frames.

"Slide" effects are popular because they are easy to implement, but they can be awkward and distracting. It is preferable to use horizontal rather than vertical slides and their movement should be kept fast. In Figure 36 a map appears to wipe out the presenter.

Storyboard

Presentation templates should be planned using a storyboard and script. The storyboard is a series of annotated rough images to indicate each section of the presentation sequence. The storyboard will help with the design continuity, contrast and logic.

The images on the following page represent most of the sequence steps from a presentation. They help to indicate presentation logic, continuity and where contrast is introduced.

8.11 ANIMATION

Animation is particularly useful for showing change over time. Satellite loops are effective when enough images allow smooth animation. Figure 37 taken from a presentation on CD 2, indicates highly effective animation of isobars (see the animated version on the CD). Animations are also used to add interest and emphasis to a static screen.

Simple animations can be made, by moving the position of a static graphic across a map. Any animation will draw attention and may be suited for highlighting warning graphics. Small icons can be made from animation loops, but unless they are warnings they need to be subtle. Too many animations create competing distractions.

Figure 35. From CD 1, additional examples, spain.mpg

Figure 36. From CD 1, additional examples, uruguay.mpg

Figure 37. From CD 2, Norway.mpg

STORYBOARD showing the sequence of information and contrast and continuity between sections ref. CD 1, additional samples, Spain.mpg

Title animation.
The style of this image could be better linked with the rest of the show.

Quick introduction, static graphic.
Hands closed and still when facing the camera.

Turns to map and explains satellite animation. Directs attention with hands.

Turns to face, introducing national summary of today's weather.

Map animates to 3D view and rotates to present broad regions. Narration describes today's weather.

Turns to face,
Map animates square to camera again.

Turns to national map, indicating today's temperatures. Narration forecasts similar next day temperatures.

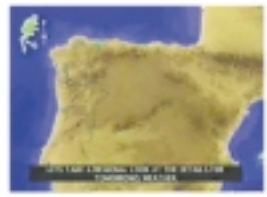
Transition (dissolve) to next smaller map.

Returns to forecast introduced by satellite animation.

Satellite image fades to graphics indicating fronts.

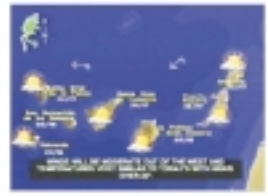
Explanation of fronts and overlaid isobars and expected national and regional changes for the coming weekend.

Turns to introduce regional forecasts.



Large blank map first.

Closer view with next day forcast indicated by pictographs and temperature ranges.

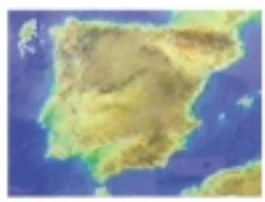


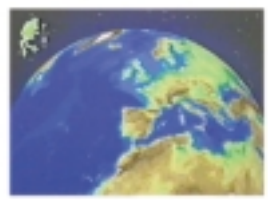
Dissolve transition to separate each of the regions. Adjacent regions sequenced.

Notice that text, figures and pictographs are kept inside the "safe zone"

European next day forecast.

Return to first image presentation with general forecast summary.

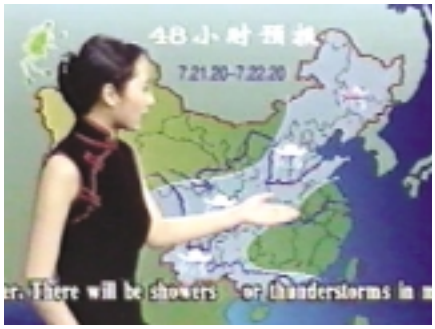




Closing animation sequence. Large map of Spain zooming out to world view and finally the presentation name is overlayed.

Figure 38 (right). From CD 1, additional examples, china.mpg

Figure 39 (far right). From CD 1, additional examples, spain.mpg



The example shown in Figure 38 has animated icons and scrolling subtitles which are distracting and difficult to read. The Figure 39 example uses animated rain icons, which add subtle interest during long display time, and may differentiate similar icons.

8.12 TECHNICAL ISSUES

If digital content is being prepared, it will need to be compatible with the region's video standard. There are a number of broadcast quality standards with PAL, SECAM and NTSC being the most common. Some small broadcasters may use lower standards; however, quality will be significantly reduced. The colour space of each of these standards varies. Professional software like Photoshop will allow the matching of the relevant colour profiles, otherwise RGB should be used. Since RGB has a wider colour range than most other standards, some colour change may be experienced. In any case, advice should be sought from the local broadcaster.

Broadcast-quality digital files are huge, requiring immense storage capacity and hardware support. Digital editing of content other than a few seconds of introductory sequence is unlikely to be practical.

Supplying slides

If slides, graphics for slides or slide shows are being supplied by the NMS, checks should be made with the station to establish the most convenient file output. This may vary from 35mm slides to various digital formats.

Fonts

If digital slide shows that refer to system fonts rather than converting them to images are being provided, it should be determined beforehand whether the client has the fonts, or if he requires to be supplied by the NMS.

8.13 SOFTWARE AND HARDWARE

While the software identified below can do some graphics editing, it is best to import ready-made images. It should be remembered that colour space for various video formats differs but that RGB may be acceptable.

As for the use of slide shows in graphics, it should be kept in mind that they are simply a form of animation. There are a number of commercial and non-commercial packages for developing slide shows. Some Shareware image editors also have basic slide show functions. While Microsoft's PowerPoint is the most popular, some rival packages offer advantages. Corel's "Presentations" is now free to down load for Windows and may purchased for Linux.

PowerPoint

PowerPoint is included in the widely used Microsoft Office software package. It is used for making slide presentations and requires limited user knowledge so it can be a practical option. Built-in animation effects and transitions need to be used conservatively. PowerPoint's limitations include basic graphics, animation, and automation control. Graphics need to be made using graphics software and imported into the program. For this reason, efficiency will be improved by developing a template including all regularly used graphics. Graphics should be made in the correct pixel dimensions for the final display screen. Synchronized video and some animation may be included. If narration is recorded, a reasonable quality microphone is necessary. Fonts used must be available on the display computer and make sure font smoothing is active on the computer.

An example of the use of PowerPoint to create weather graphics can be seen in the example from the Cook Islands on CD 2, *Instructors' Resources*.

Macromedia's Flash

Macromedia's Flash is more expensive but offers wider functionality and demands more user skill. It was originally developed as a vector animation tool for Web publication but now has a broad range of multimedia functionality that is useful for broadcast media.

While essentially a vector graphics environment, it can import and export an extensive range of formats. Its drawing tools are simple and inclined to smooth detail. Animation, including screen changes, and layout are easily controlled and production is facilitated by features like project libraries. Tweening shapes like isobars, for smooth animations is relatively straightforward. Files for projection will need to be exported as executable players and set to display full screen. Flash is limited however, for playing video. Satellite loops can be tackled as a sequence of JPEGs. The display computer will

need an adequate processor and a videocard for demanding animation. Narration can also be imported and syncronized.

Director

Also made by Macromedia, Director has more extensive functionality than Flash, particularly for handling video, and it is more expensive and complex to learn.

Animation

Animation frame rates must match the video rate of 25 frames per second or strobing will result. Animation that is processor-intensive may not be able to run at the correct speed at full screen size. For projecting the animation rather than incorporating it in the video, a computer with a fast processor and adequate graphics card will be required. If animation software is not available, vector sequences can be exported from some drawing packages like Macromedia Freehand and bitmap sequences can be exported from many bitmap graphics software.

Digital video editing

While many modern PCs come with some video capture and editing software as standard, they are unlikely to be suitable for capturing broadcast quality video. High-quality video requires massive storage and hardware assistance. While this has become much more affordable over the last five years, it is still a significant investment. Developing introductory animations lasting a few seconds may, however, be feasible.

For producing video using computer graphics and existing digital files like satellite loops, most standard current PCs and, at a minimum, fairly basic software can be used.

Adobe Premiere is one of the popular basic editing packages. It enables simple editing of sequences, sound, titles, graphics, transitions, some effects and masks and exports files in a variety of formats.

More complex compositing and effects can be done using software like Adobe AfterEffects.

3D image effects and animation are produced using 3D software. Video can be mapped onto 3D shapes for special effects. 3D files are generally exported as video or images then composited into backgrounds using video editing software. Satellite images can be made to look 3D by using a copy of the images to automatically generate the "texture" from the tonal values. Satellite loops can be applied to spherical surface over an image of the world to produce effects like those in Figure 40.

Figure 40. From CD 1, additional examples, Brit.mpg

8.14 LOW-BUDGET READY-FOR-BROADCAST PRODUCTION TIPS

Hand-drawn graphics

If computer graphics resources are not available, a quick and effective presentation method requires a large display board with a simplified coloured map of the region. General design principles apply. Graphic symbols can quickly be attached to the map to show weather conditions for each broadcast. Any reliable temporary means that will not mark the map or graphics may be used to attach the graphics. Options include using a metal map panel with magnetic graphics, using "velcro", rubber cement or even small hooks.

Care needs to be taken to protect the surfaces from damage, fingerprints and gloss marks. Matt colours should be used. Surfaces need to be flat and textures avoided.

Lighting flat displays

Lighting needs to be even. "Hotspots", shadows, back and side lighting should be avoided. If there is only one light available, it should be placed near the camera axis. Needless to say, two lights are much better. They should be set up between 30°-45° either side of the camera axis. The display mount needs to be rigid to prevent wobbles and it should hold the map flat and vertical. If parts of the display appear shiny, it may be necessary to tilt the display slightly from the vertical.

Lighting the presenter

The standard arrangement uses three lights. The main key light at 45° angle to the horizontal and the camera axis, a soft fill light to fill the shadows on the other side, and a back light to "separate" the presenter from the background.

Camera position

A fixed camera position is adequate for weather shows. The display should be set up square to the camera to avoid image distortion. The image size should be planned so as to avoid the need to zoom but the camera should be placed far enough to allow full visibility of the map and presenter. A standard lens and a secure mount or tripod will be sufficient to ensure a smooth show.

Focus

Suitable focus will allow enough depth of field to keep the graphic in focus, as well as the moving presenter. The required range should be determined and the focus tested beforehand.

Using a projector

There are many options for filming projected images. The simplest arrangement uses back projection onto a translucent sheet. This offers the advantage of enabling the presenter to move freely in front of the screen. It is important to remember that in this case the slides will need to be reversed.

Narration and presentation

Useful tips for presenting are included in the CD *Instructors' Resources* where plenty of examples allow the comparison of presentation styles. The positions and gestures of the presenter featured in the storyboard example of this publication will also assist in developing good presentation techniques.

8.15 EVALUATION PROCEDURES

As with other media, quality assurance procedures need to be part of the ongoing production process. To determine the effectiveness of presentations, periodic user surveys and focus groups will be of value to identify how the information is being accessed, understood and applied. Broadcast stations should also provide feedback, ratings and other data.

8.16 TELEVISION DESIGN CHECKLIST

- ✓ Has it been checked that users understand the presentation?
- ✓ Has the content been proofed?
- ✓ Is all content legally included or protected?
- ✓ Is the work backed up?
- ✓ Is the corporate style and identity evident in graphics and narration?
- ✓ Can the presentation be simplified in ANY way?
- ✓ Is the layout the correct 4:3 format?
- ✓ Does the layout use a consistent grid?
- ✓ Is all necessary information visible on the screen?
- ✓ Is the text clearly legible from a distance in black and white?
- ✓ Is there enough time for reading?
- ✓ Are the graphics clearly legible from a distance in black and white?
- ✓ Do the colours display well?
- ✓ For maps, can the land be identified from the sea at a glance, or from bordering regions?
- ✓ Is the meaning of the graphics clear?
- ✓ Is there enough contrast between icons?
- ✓ Are the graphics clearly explained?
- ✓ Is the sequence of information logical?
- ✓ Is specific information placed in context with information covering a wider time or region?
- ✓ Are contrast, continuity and transitions in the sequence?
- ✓ Is attention carefully directed to focus on warnings?

Chapter 9
NEW MEDIA TYPES AND FORMATS

The fast pace of development in communications and computing technology makes it important to be aware of new visual media technology, formats and distribution with potential application in weather service delivery. France was a pioneer in this regard with its Minitel network system. More recent developments which are becoming more common include WebTV and telephone and portable device Web formats. The Finnish Meteorological Institute (http://www.fmi.fi/), for example provides WAP products. Development of specific technologies is practical only where a substantial reliable local user base exists or where relevant standards are becoming firmly established. New technologies need to be watched carefully and implementation strategies developed well in advance of demand.

XML and other mark-up languages, new compression technology and file formats are increasing the range of media presentation options. Flash files are currently mostly used to present entertainment or promotional glamour for corporate sites. They may become practical for NMS graphics because, using vector graphics, scalable detailed images can be presented while their file sizes remain very small. Alternatively, the World Wide Web Consortium's recent Scalable Vector Graphics standard, (SVG), may become the most practical graphic format. SMIL, MPEG-4, 3DXL and WebCGM, and other standards introduce the opportunity for new product packaging. Access and infrastructure will however, continue to constrain Web services around the world for some time, particularly for technologies like Web casting. The best source of current information is available from the World Wide Web Consortium site (http://www.w3.org/). An abundance of other developer and design resources for new digital media are available on the Web. WebReference and WebMonkey are practical starting points.

Some of the major developments in print technology include the increasing use of Portable Document Format files, and the introduction of digital printing. PDFs are used for disseminating work to printers and the public. Increasingly, organizations are providing Web links for clients to download and read or print their own files.

The television industry is facing issues like media convergence and digital broadcasting. A consequence of these developments may concern the availability of analogue equipment.

Chapter 10
PRODUCTION SETUP

10.1 TECHNICAL ASPECTS

Having established audience and media requirements to determine relevant content, available resources, including data, products, staff expertise and technology, have to be identified. Data and products need to be available on time to meet production schedules and must address legal, copyright, and required data-source identification. The design of the production system will involve compliance with the NMS standard systems, compatibility with media providers, scheduling, quality assurance, risk management, backup, archiving and dissemination procedures. These issues are addressed in the WMO publication *Technical Framework for Data and Products in Support of Public Weather Services* (PWS-1, WMO/TD No. 1054).

10.2 LEGAL, COPYRIGHT AND CODE OF PRACTICE REQUIREMENTS

Before further development, legal and copyright requirements need to be resolved. Reference should be made to the *Guide to Public Weather Services Practices* and WMO *Guide on Internet Practices* (http://www.wmo.ch/web/www/reports/Internet-Guide.html#LEGAL-ETHICAL).

In addition, government bodies may have their own publication and broadcast regulations. International standards organizations such as the World Wide Web Consortium also recommend codes of practice.

10.3 PRODUCTION PROCESSES

Preparation

Once the content is identified, graphic production will involve determining appropriate development formats, layouts and output requirements. Next, templates and image libraries need to be developed. Image libraries may include vector and bitmap images. Bitmaps, however may require the production of duplicate sets in colours and resolutions to suit each media. Graphics should allow for the design constraints of each media. Similarly, the layouts need to be suitable or adaptable for print, Web and 4:3 television format if necessary.

Before going ahead with full productions, a prototype should be developed and tested with users to check that they understand the communication design. In addition, technical functions and production work flow need to be rehearsed and back-up systems developed.

Streamlining daily work flow

When developing graphics for a range of media and providers, it is necessary to integrate and automate the process as far as possible. Daily production will be most efficient if many of the same graphic files can be used to generate images for all media. The best way to output the variety of formats needed for different media requirements, while maintaining image quality, is to use vector graphics until final output. In an ideal system, source graphics like synoptic charts would be produced as vector images. These charts are more likely to be bitmaps or hand drawn and will require tracing for conversion to vectors for multiple output. If vector graphics software is not available, the initial images will need to be in the highest required resolution. In addition, colour space, colours and designs will need to be suitable for all formats. This applies especially to radar and satellite images which will also require editing to remove backgrounds and adjustment to fit the NMS format. The satellite image is likely to determine the mapping projection used for all the charts as it is difficult to adjust the projection without introducing inaccuracy.

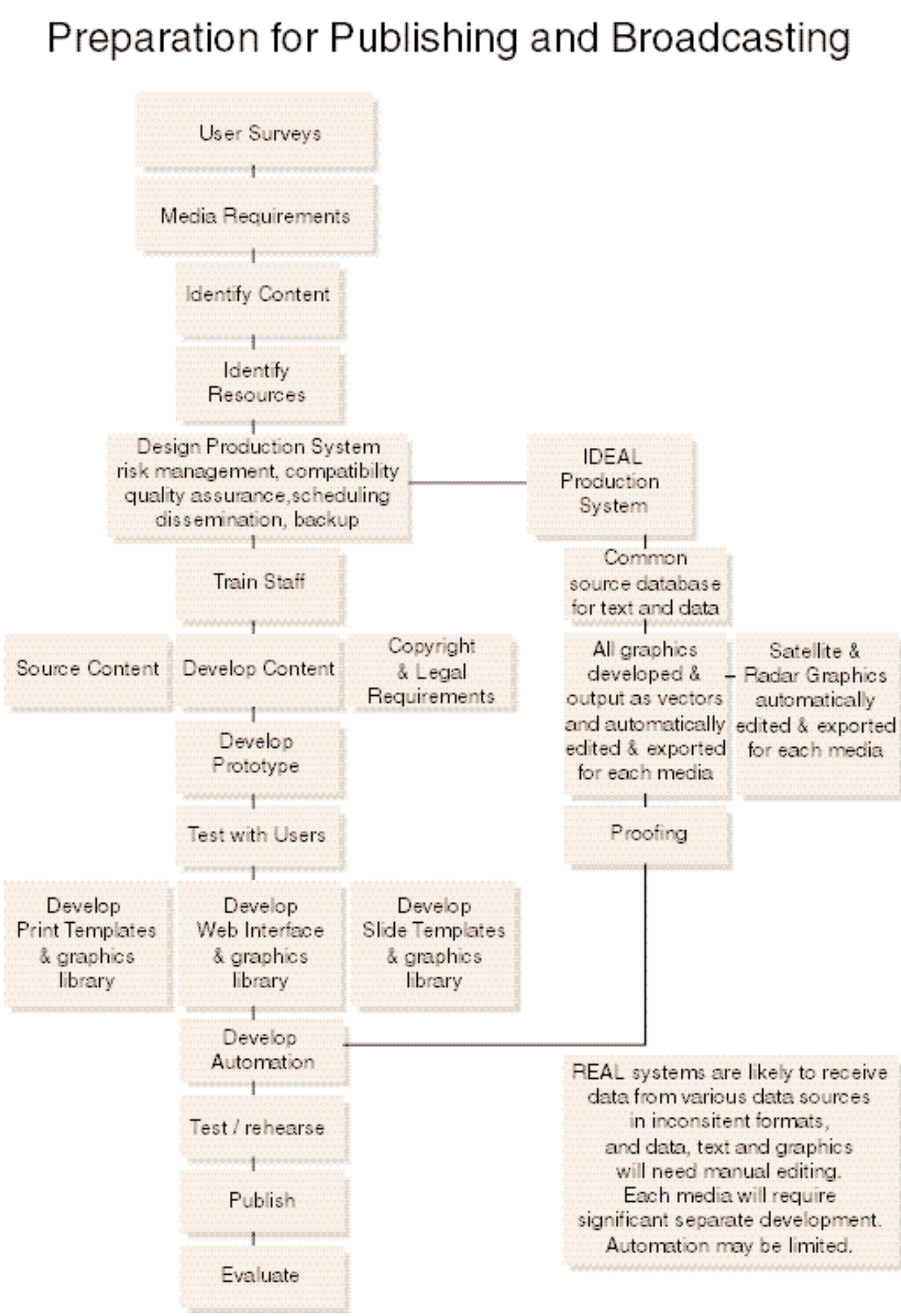
In preparing television graphics for slide shows, some general graphics may be used but these may need to be output before the addition of fine detail such as text. Appropriate content detail can be manually added in the template afterwards.

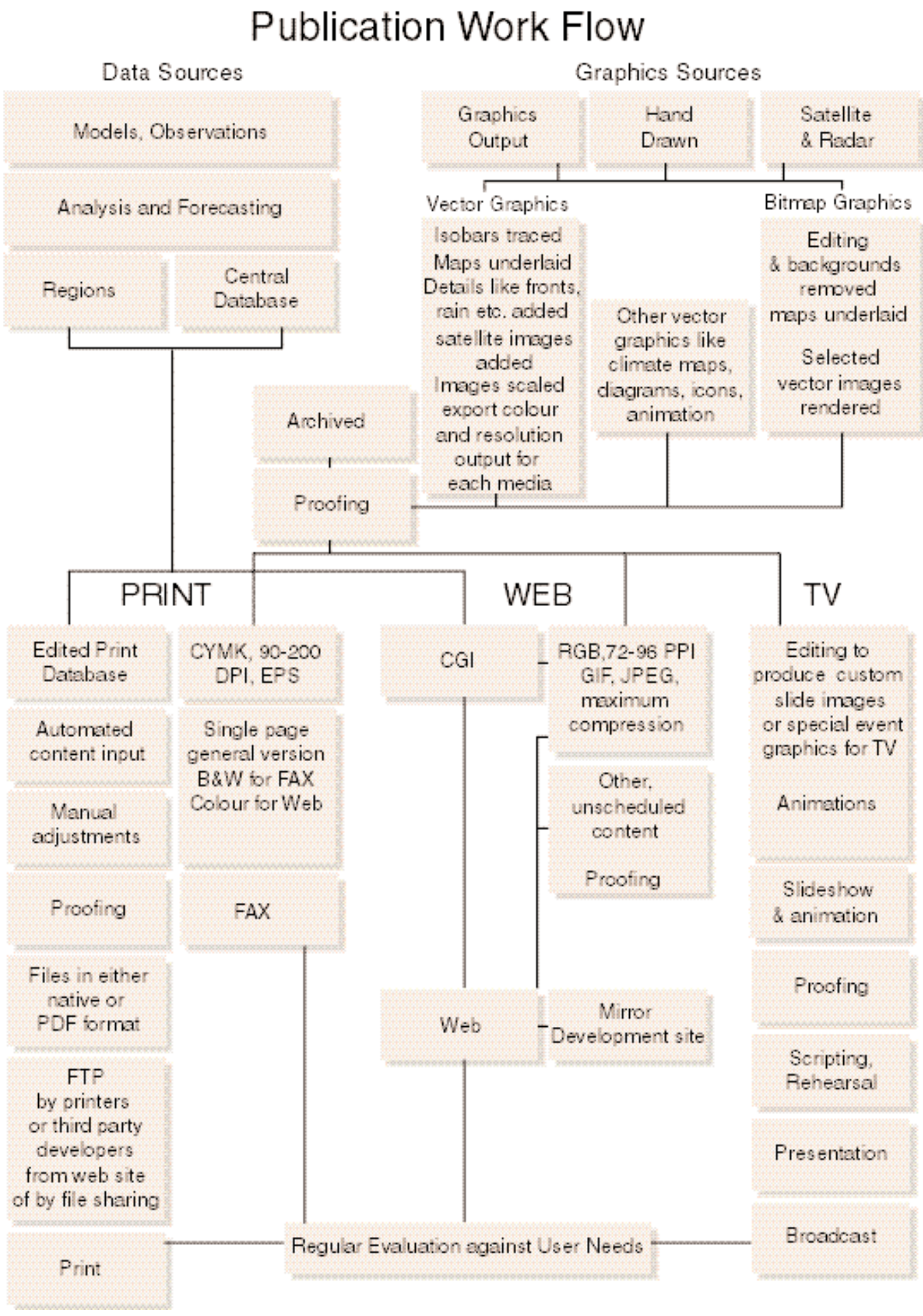
For limited publication output, most work can be done manually. For extensive work, many software packages include automation and batch processing functions to streamline repetitive graphic tasks or to import content from databases. In addition, scripting can be used to link software output. Some manual work will always be necessary, particularly to develop the initial graphics, to proof and make minor adjustments.

10.4 EVALUATION

The final stage of the publication process returns to the initial task of identifying user needs, to check that they have been addressed successfully. This needs to involve surveying the NMS audience.

Thorough user evaluation can demand a lot of time. Where resources are constrained, even limited informal audience sampling is invaluable. Information gathering can serve the dual purpose of research and promotion of the Service. Collaboration with relevant services, such as emergency management, fishing and agricultural services, may also provide valuable input, as well as focusing and


Preparation for Publishing and Broadcasting
User Surveys
Media Requirements
Identify Content
Identify Resources
Design Production System risk management, compatibility quality assurance,scheduling dissemination, backup
IDEAL Production System
Train Staff
Common source database for text and data
Source Content
Develop Content
Copyright & Legal Requirements
All graphics developed & output as vectors and automatically edited & exported for each media
Satellite & Radar Graphics automatically edited & exported for each media
Develop Prototype
Test with Users
Proofing
Develop Print Templates & graphics library
Develop Web Interface & graphics library
Develop Slide Templates & graphics library
Develop Automation
REAL systems are likely to receive data from various data sources in inconsitent formats, and data, text and graphics will need manual editing. Each media will require significant separate development. Automation may be limited.
Test / rehearse
Publish
Evaluate


Publication Work Flow
Data Sources
Graphics Sources
Models, Observations
Analysis and Forecasting
Regions
Central Database
Graphics Output
Hand Drawn
Satellite & Radar
Vector Graphics
Bitmap Graphics
Isobars traced
Maps underlaid
Details like fronts, rain etc. added
satellite images added
Images scaled
export colour and resolution output for each media
Other vector graphics like climate maps, diagrams, icons, animation
Editing & backgrounds removed
maps underlaid
Selected vector images rendered
Archived
Proofing
PRINT
WEB
TV
Edited Print Database
Automated content input
Manual adjustments
Proofing
Files in either native or PDF format
FTP by printers or third party developers from web site of by file sharing
Print
CYMK, 90-200 DPI, EPS
Single page general version B&W for FAX Colour for Web
FAX
CGI
RGB,72-96 PPI GIF, JPEG, maximum compression
Other, unscheduled content
Proofing
Web
Mirror Development site
Editing to produce custom slide images or special event graphics for TV
Animations
Slideshow & animation
Proofing
Scripting, Rehearsal
Presentation
Broadcast
Regular Evaluation against User Needs

reinforcing the reach and application products. It is necessary to assess who accessed the content; how much they understood and remembered; what they transferred to practical outcomes.

Distributing media services will be able to provide useful feedback, appraisal and audience data. Finally, consideration should also be given to how to extend the audience and consequently the scope of the material.

REFERENCES

WMO resources

Guide to Public Weather Services Practices, WMO-No. 834

Technical Framework for Data and Products in Support of Public Weather Services (PWS-1, WMO/TD No. 1054)

Guidelines on Performance Assessment of Public Weather Services (WMO/TD No. 1023).

WMO *Guide on Internet Practices* (http://www.wmo.ch/web/www/reports/Internet-Guide.html)

Television references

"The Techniques of Television Production", Gerald Millerson, Focal Press, London and Boston.

Design references

The Non-Designers Design Book, Williams, Robyn. Peachpit Press, 1994. This book is clear and concise. There are also a number of other excellent books related to print and web publication by the same author.

There are numerous excellent design guides on the web.

Basic graphics software guides

There are many useful relevant tutorial, tips and newsgroup sites on the web. Some of the best and most affordable learners' books are the "Visual QuickStart" books by Peachpit Press. They are widely distributed and available for most common design software packages.

Print references

The Adobe website (http://www.adobe.com) is one of the most useful graphics and print references.

Agfa publish specific booklets in a number of languages (http://www.agfa.com/).

Web design and development resources

"World Wide Web Consortium" (http://www.w3.org/). This is the web standards body. It is essential browsing for web developers and also includes some development tools.

"WebReference" (http://www.webreference.com). This site is one of the largest web development, design and production resources.

"Web Monkey" (http://www.webmonkey.com). This has an extensive collection of web design and production information, tutorials, code and other resources.

"Web page design" (http://www.wpdfd.com/wpdres.htm#Business). A directory of web design links.

"Web pages that suck" (http://www.webpagesthatsuck.com/). Learn good web design by analysing bad web design. This is actually a very useful website.