Data Communication - Emerging International Trends and Practices of the Australian Bureau of Statistics

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EXECUTIVE SUMMARY

Results of a survey recently conducted by Statistics Canada suggest that many National Statistical Offices (NSOs) are in different stages of progress in migrating from a paper-based publishing regime to a web-based publishing regime, and the common theme and challenges faced by them today are to make the World Wide Web an effective medium for the on-line communication of statistics.

Like many other NSOs, the Australian Bureau of Statistics (ABS) is positioning itself to use the internet as the principal channel for data communication. There are a number of strategies in place to fulfil the ABS goal of web publishing. These are:

 a. improving communication of statistics to facilitate user discovery of information and assessment of its fitness-for-purpose;
 b. broadcasting and proactive dissemination of information such as through Real Simple Syndication and email notification;
 c. improving self help; and
 d. writing once/publishing many times to improve the efficiency and consistency of released information.

In this paper, the strategies and techniques used by the ABS to improve statistical communication are discussed.

INTRODUCTION

In a survey conducted by Statistics Canada (Roy, 2005) on the twenty two National Statistical Offices (NSOs), mainly from Europe and North America, participating in the September 2005 International Conference on Marketing and Output Databases on practices in data dissemination, a number of interesting trends have been identified. The more noteworthy trends are as follows:

a. almost all NSOs are in different stages of migrating from a paper-based publishing regime to an electronic publishing regime;
b. the World Wide Web is predominately used as the tool for electronic publishing;
c. about two thirds of the responding NSOs have developed a strategic vision to guide the development of their web sites;

d. the top five web site concerns nominated by NSOs were, in order of importance: development of web site content and related standards; implementation of information management and data presentation tools; on-line presentation of meta data; facilitation of electronic publishing; and measuring satisfaction of web site visitors;

e. the top five web site concerns raised by web site visitors were, in order of importance: ease of web site navigation; effectiveness of on-line search capabilities; availability of regional level data; documented statistical methods used in analyses; and effectiveness of on-line information retrieval;

f. over half of the NSOs predicted an increasing pace with the following developments in the coming years: streamlining and improving web site navigation; development of thematic based web site structure; and improving the search capabilities of web sites;

g. only about one third of the NSOs have developed publishing standards for web site information; and

h. about 80% of NSOs have made the transition to providing all published information on the web site free of charge - about half of those who have done so had also reported rising servicing costs due to increased access to information.

2   Whilst the findings of the survey covered many different aspects of the business of publishing/disseminating/communicating statistics, the one common theme amongst them seems to be making the NSO web sites an effective medium for disseminating statistical information. No doubt the NSOs will conduct their own investigation and research into how to publish effectively on the internet, it is, however, believed that a lot can be learnt from newspapers. After all, their business is in disseminating news effectively using the mass media and many, if not all, have made a very successful transition from paper to web publishing. One reason for their success is that, when they first used the internet, they did not produce a PDF of the newspaper on the web site but rather used the power and capability of the internet to hotlink and bundle related stories together.

3   Whilst some producers of statistics may think that their job is done by publishing the information on the web site, this paper argues that the job of a statistician is not done until the messages in the statistical release, together with the limitations of the information, are communicated to the users, in order to assist them make informed judgements about fitness of purpose of the statistics for relevant decision making. How statisticians present the statistical stories, the statistical data and meta data will largely determine how effective the information is communicated to the users.

4   In this paper, we discuss the strategies and techniques used by the ABS to improve the on-line communication of statistics (Tam, 2005a).

ABS AS AUSTRALIA's CENTRAL STATISTICAL AUTHORITY

5   ABS' enabling legislation, the Australian Bureau of Statistics Act (1975), establishes the ABS as Australia's central statistical authority, responsible for providing statistical services to all Australian governments, and the community more generally.

6   Consistent with the functions prescribed in the Act, the ABS has responsibility to provide the range of official statistics that serve the needs of governments. It also has a responsibility to provide information on contemporary Australia. Provision of such
statistics is a key element of the democratic process. These activities comprise ABS' role as a statistical producer.

7   In carrying out its mission to "... assist and inform decision making, research and discussion within governments and the community, by leading a high quality, objective and responsive national statistical service...", ABS ensures that it fulfils its community service obligation by providing a diverse range of statistics to the community free of charge; by making sure that everyone has equal opportunity to access our statistics at the time when they are officially released; by announcing beforehand, adhering to, and widely publishing, its statistical release timetables;by presenting ABS statistics without fear or favour in a an accurate and balanced way; and by being open about its statistical methods and practices.

ABS DIRECTIONS FOR THE ELECTRONIC DISSEMINATION OF STATISTICS

Current Situation

8   The ABS web site currently consists of approximately 320,000 web pages and some 120,000 downloadable files. In 2004/05, there were 60 million pages viewed from the web site and the ABS is consistently ranked eighth (behind the Australian Taxation Office, Centrelink etc.) as the most frequently accessed Australian Government web site.

9   Since 2000, all ABS publications, spreadsheets, data cubes, research and information papers dating back to at least 1998, have been available from the ABS web site. The web site also includes other statistical support material e.g. Statistical Concepts Library, Directory of Statistical Sources and extensive school curriculum materials for teachers and students. In addition, the ABS provides a number of avenues for clients to purchase ABS products on-line. Clients can subscribe to an email notification service which provides details of ABS daily releases in subject areas nominated by the client. Furthermore, the ABS has introduced a service (Real Simple Syndication (RSS)) which allows subscribers to access ABS statistical headline news from their desk top.

10   To assist in meeting the ABS' community service obligations, since December 2005, access to all statistical information on the ABS web site has been made free of charge. For many years the ABS has also run the Library Extension Program (LEP) as a means of disseminating its statistical publications on paper, and in the last couple of years, electronic publications, free to the general community via some 500 plus libraries throughout Australia.   Users who do not have access to the Internet at their homes could access ABS statistics via the LEP, or by calling the National Information and Referral Service contact centre.

11   The ABS has also taken strategic steps towards making its unit record data readily available to the tertiary education sector for teaching and research purposes. An agreement struck with the Australian Vice Chancellors Committee now provides every student, lecturer and university researcher with access, subject to approval to the Australian Statistician, to ABS Confidentialised Unit Record Files (CURFs).

12   Traditionally, the ABS only released CURFs via CD-ROMs. In 2004, the ABS launched its Remote Access Data Laboratory (RADL) whereby clients can (batch) submit programs via the internet to the ABS. These programs are automatically run against a CURF within the ABS environment, with the results, in most cases, automatically returned to the user. There are also checks in place to ensure no identifiable information is available in the results.

Aims of electronic dissemination

13   Given its wide spread use and convenience of 24 hour/7 day access, ABS has been positioning itself to use the internet as the principal channel for dissemination. The ABS objectives for electronic dissemination are to:

- increase the users and uses of statistics for informed decision making;
- increase user understanding of the content, caveats, contexts and limitation of statistics, i.e. the fitness for purpose of the statistics; and
- improve cost effectiveness by maximising the opportunities available from the internet.

14   A major challenge for the ABS is to complete the transition from a paper-based statistical publishing regime to a web-based publishing regime. This includes ensuring:

- a greater uptake of electronic dissemination by subject matter areas in a way that improves communication;
- continuous improvements in the useability, navigability and accessibility of the ABS web site, and the visibility of statistics; and
- providing more self-help facilities for users.

Strategic directions

a.   Improving communication of statistics

15   The ABS' goal is to increase use of statistics and to improve understanding of the content, caveats, contexts and limitations of the data to assist user assessment of fitness for purpose of the data.

16   To achieve this we are working to provide more relevant, understandable and interesting content. We are also working on effective presentation of information on the web site by utilising opportunities available from web technology.

17   The ABS has recently reviewed literature on cognitive psychology and developed principles and guidelines for content preparation and on-screen presentation (Kraayenbrink, 2004). These address the three fundamental cognitive processes - perception, attention and learning. For a more detailed discussion of the application of cognitive psychology to improve the on-line communication of statistics, see Attachment 1.

18   Using the outcomes of our research, we have developed the following strategies for improving the communication of statistics on the ABS web site:

    i.   using a layered approach for the presentation of information;
   ii.   developing basic guidelines for presenting/writing for the web;
  iii.   contextual linking of metadata with statistical data; and
  iv.   using the concept of web magazines to ensure that statistical stories are visible to web surfers.

These strategies are consistent with the practice adopted by newspapers in web publishing.

i.   Adopting a layered approach

19   Our research on cognitive psychology suggested that using a layered approach is pivotal in reducing cognitive load, improving communication and supporting a diverse range of on-line users with different levels of statistical sophistication. The approach requires setting up information in layers, with the simplest information presented first, and the most complex information last, suitably hyperlinked to allow easy navigation from one layer to the next, and vice versa.

20   Whilst our web site has already been designed with the following data/information layers:

- Statistical Headline News;
- Simple story of the data (Main Features);
- Detailed story (Detailed Publication) and Detailed statistics (Spreadsheets, Data Cubes and Time series); and

● Related data,

consistency in populating the layers across the diverse subject matter fields within the ABS, and visibly presenting the layers on the web site, were only achieved through the development of a new web page design rolled out in late January 2006. For more information, visit www.abs.gov.au.

ii.   Presenting/Writing for the web

21   Our research suggests that many users of web sites consume information on-screen. For effective communication of information, one of the important issues to consider is to ensure that the mind is able to handle the cognitive load. This requires, amongst other things, information to be presented in digestible but self contained chunks - ABS calls these "information nuggets" - with the nuggets suitably hyperlinked to allow interested users to pursue further details; reduction in the "density" of the information, reduction of "propositional complexity" i.e. the number of propositions in a sentence; and presenting information in an easily scannable form etc.

22   In addition, the presentation of the materials on the web site has to support visual perception (i.e. ability to attach meaning to objects presented on the web site) and the content written in a manner to support language comprehension (i.e. ability to connect to, and interpret, the written language). Information presented for on-screen reading should not be too dense, nor verbose, and should also be amenable to scanning for key words by web users. Our directions here are to develop good practice guides and training courses for presenting/writing for the web to achieve effective communication.

iii.   Contextual linking of metadata

23   With the exception of electronic publications, the current ABS approach for disseminating ABS metadata on the web site (e.g. Directory of Statistical Sources) is based on a "big bang" approach - we give users a lot of the information, and let the user help themselves to the parts they need to know. Our cognitive research suggests that this is not an effective approach.

24   A more effective approach for communicating metadata is to adopt an approach similar to the one used for communicating statistical data - follow a layered approach and tailor to the needs of the statistical user - whilst ensuring contextual linking between statistical data and metadata. In doing so we aim to minimise cognitive load and improve communication of statistical caveats. Contextual linking is important to ensuring that statistical data will be used in the right contexts and are fit for purpose.

25   We are developing facilities on the ABS web site to provide linked web pages in our publications and in all of our time series spreadsheets and

data cubes to contextually link metadata to statistical data . At the collection level, the web pages will provide information on the "Quality Declaration". At the statistical product level, these web pages will appear whenever the information icon next to statistical terms is clicked to provide information on definitions, statistical classifications, questions used in the collection etc.; or the information icon next to statistical data to provide information about statistical errors ie quality statements . The web pages will, as required, contain links to more detailed data or metadata. An example of this is shown in Attachment 2. A prototype for this has been built and is available at http://www.abs.gov.au/about/ePublication.

iv.   Publishing web magazines

26   With the ability to hyperlink information on the web site, there are new and innovative ways for effective communication of ABS information. By merely reproducing our paper summary statistical releases electronically, there is a risk that users may omit reading important information, and experience a high cognitive load. This is because "context shrinks when reading on screen". Refer to Attachment 1 for further details.

27   An example to illustrate this point is provided by the Main Features of the publication 8501.0 Retail Trade, Australia (see http://www.abs.gov.au/ausstats/abs@.nsf/mf/8501.0). The Main Features step through "Key Figures", "Key Points", "Notes" and then provide some further key points under the headings "Industry Trends" and "State Trends". With no upfront indication that industry and state trends analyses follow the "Notes" section, it provides a "presentational cue" to the readers that the statistical stories are coming to an end, and could result in the industry and state trend analyses being missed.

28   A better way to present the information involves providing clearly visible and interesting information first. This provides the needed stimuli to draw readers' attention to these "stories" and entice them to read them by clicking the links. An example of how this may be presented is provided in Attachment 3. Note that we have, similar to the treatment by newspapers, "bundled" the three stories together to provide an organisational cue that they come from the same statistical collection, and are related in some way, in this case, different dimension of the analysis.

29   This method of presentation can be extended, of course, to not only summary publications, but detailed publications and compendium publications as well.

b.   Broadcasting of ABS data

30   Broadcasting in this context is defined as the proactive ("push") dissemination of information using the web site to suit a diverse range of user interests in a manner that facilitates communication. To do this

effectively, we must ensure the information provided on the ABS web site is relevant to the diverse range of web users e.g. "visitors", "harvesters" and "miners". Reaching the potential audience will require some "pushing" of relevant data/information to the relevant users.

31   Email notification and RSS are current tools for "pushing" ABS data to subscribers. RSS is used to push Statistical Headline News whilst email notification is used to push hotlinks to publications. For the latter, we plan to refine the tool to provide better options for users to tailor the publication to their needs i.e. select targeted individual publications rather than targeted groups of publications. We are also keeping an eye on other "push" technologies that may be available for effective broadcasting of ABS data, such as the opportunities available from Personal Digital Assistants which increasingly have built-in wireless access to the internet.

32   The layered approach is fundamental to the ABS broadcasting strategy. "Tourists" who have limited knowledge of the types of statistical information available from the ABS web site, can browse the Statistical Headline News to look for interesting leads that will entice them to read more. On the other hand, experienced users, "harvesters"/"miners", can bookmark the relevant web page, thereby bypassing the common navigation paths and reducing the number of clicks required. Note that expert users of a particular field of statistics may well be a "tourist" in another field.

33   Animation and interaction are valuable options for enhancing communication of statistics and we will be looking for suitable opportunities to apply these techniques to more statistical material on the ABS web site. Traditionally ABS uses static graphs, charts etc. to give graphical representations of data. Recently we have included an animated population pyramid on the ABS web site, which demonstrates dynamically how the structure of the population changes from 1971 and
2051 (
http://www.abs.gov.au/websitedbs/d3310114.nsf/home/population+pyramid+preview). For the 2006 Census, we plan to provide facilities on the web site for production of interactive thematic maps. Plans are also in place to use animation and interactive techniques for presenting statistical training materials on our Education Resource web pages.

c.   Improving self help

34   Whilst cost recovered services like information consultancies will continue to be provided, our strategic direction is for ABS services to focus more on the high value adding and complex information consultancy, leaving the simpler data extraction tasks to "self help". Self help facilities need to be easy to use. Ideally, self help facilities should provide users with the flexibility to select ("slice and dice") and format tabular data on-line, before having to decide what to purchase/download.

35   The strategy for achieving this is to make more detailed, but confidentialised, data cubes available on the web site, supported by on-line data catalogues, meta data search and manipulation tools.

36   Other areas of self help that we will be pursuing are:

- the provision of spatial data services (e.g. Web mapping services) and geography services (e.g. aggregating Mesh Blocks to higher level Australian Standard Geographic Classification (ASGC) units, or non-ASGC boundaries);
- the extension of our self managed subscription system to allow for ordering of print-on-demand publications; and
- the development of a self help knowledge database. With similarities to an on-line national information service, the self help knowledge database will provide advice on frequently asked, or encountered, questions relating to statistics.

37   The ABS has aspired to provide Web Services - a facility to automatically provide up-to-date statistics to statistical/econometric models used by "harvesters". Two prototypes have been developed to illustrate the concept for a coding service and a table service (see http://www.abs.gov.au/webservices).

d.   Writing once/publishing many times

38   Writing once/publishing many times is an important direction for statistical publishing. It improves efficiency and ensures that statistics on the same socioeconomic and environmental phenomena published by the ABS are consistent. The latter is an important issue as increasingly the same statistics are published in different dissemination channels such as paper publications, CD-ROM, and web site, and in different formats such as Excel or ASCII. The key to mitigating against the risk of publishing inconsistent data is to use the same input source for outputting in different channels/formats. Over the past 10 or so years, the ABS has developed and established good data management principles and practices, and supporting infrastructure including the ABS Information Warehouse which provides the source of statistics, and the Publication Production Workbench which supports the production of source documents in HTML, PDF and Excel formats, to support this direction. The work by an international group to develop an international standard protocol for exchanging data and converting data to multiple output formats i.e. Standard Data and Metadata Exchange (SDMX) for time series data, will provide another effective world wide tool for data exchange.

CONCLUSION

39   This paper argues that the main game in statistical releases is communicating statistical stories and their associated meta data, in a manner

that allows users to understand the statistical messages, as well as the contexts, caveats and limitation of the statistical data to allow them to make informed judgements about fitness of the intended use of the statistics.

40   Obviously selecting the right statistical content is key to communication, but how the statistician presents the stories and data on screen will also determine, to a large extent, how effective the communication will be. Cognitive psychology research by the ABS suggests that choosing layouts, presentational techniques and organisation cues to minimise users' cognitive load is key to effective on-line communication of statistics. Strategies that are being pursued by the ABS to achieve this include adopting a layering approach to present the information from simple concepts to more complex information, writing for the audience taking cognizance of the behaviours of on screen readers, making the stories less dense, visible and cross linked on the internet. Another very important strategy for communicating meta data is contextual linking. Not only will this minimise cognitive load, but also it will ensure that the relevant meta data are provided at the same time with the statistical data when users are reading or accessing statistical information on-line.

41   Finally, a cognitive laboratory was set up in the ABS premises for conducting testing of competing web designs. By observing how subjects in the laboratory go about carrying out the statistical tasks, and interpreting the information from subjects' feedback, ABS is in a good position to make an informed choice of the final design that best meets the communication objective.

References

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Attachment 1 - Applying Cognitive Psychology to Data Communication

What is data communication?

Communication is defined, for the purpose of this paper, as the sharing of information between statisticians and users in a way to maximise understanding.

Why data communication?

2   Principally to maximise use of information to fulfil the mission of national statistical offices; to minimise misuse of statistics by ensuring the contexts, caveats, and other limitation of the information is understood.

How to communicate?

3   To maximise communication, we will need to understand how the mind comprehends information. ABS research into cognitive psychology suggests there are three **key** cognitive processes involved in comprehension, namely perception, attention and learning.

4   Whilst the cognitive psychology theory is of general applicability, a number of issues need to be borne in mind for web communication, as follows:

Web surfers are users, not readers

5   They scan and skim read the material on-line to look for the information they are after. The term "satisficing" was coined by cognitive psychologists to describe the behaviour that they will stop looking once they come across something they think satisfy their needs (Simon, 1957). Accordingly, we must design our statistical releases to aid on-line users of the information eg concise writing, information in dot points to assist scanning;

Context shrinks when accessing information on screen

6   Unlike holding a hardcopy publication, web users do not generally know if they are at the end of an electronic publication, and will be looking for presentational cues to tell them where they are in the publication. Cues could be as misleading as useful e.g. metadata information between statistical stories could be misread as cues signalling the end of the publication, and product designers have to be mindful of these types of pitfall.

Cognitive load and overload

7   The mind can only handle limited "chunks" of information at one time

- the literature suggests 5-9 chunks of information (seven plus minus two) where a chunk is any meaningful unit (Miller, 1956). If there is more information available than the mind can handle, filtering occurs. To avoid filtering, information needs to be presented with cognitive load in mind.

Cognitive processes for comprehension (Tam, 2005b; Kraayenbrink, 2004)

Perception

8   Perception is about attaching meaning to sensory information e.g. symbols, icons and information on the web site.

9   So how does the mind perceive? The cognitive psychology theory suggests that using presentational cues, the mind attempts to recognise the sensory information, by transforming it into an internal pattern and comparing it with other patterns stored in long term memory. If it matches an existing pattern, then meaning is attached. If it resembles a memorised pattern, then the meaning is guessed. If not learning takes place once the mind discovers the meaning of this new piece of information, sometimes through trial and error for skilled based learning.

10   For visual objects, how the materials are organised to assist the mind to carry out pattern recognition is the key to maximise perception. Strategies to deal with this include the use of Gestalt Laws (see Guideline 2.3 below) and minimisation of cognitive load. As an example, the Gestalt Law of Proximity suggests that items/objects placed close together are perceived as being related conceptually. An application of this law will be to "bundle" related statistical stories together, as they do in electronic newspapers, to provide a visual relationship between the stories.

11   Additional consideration is required for perceiving texts. Clearly a non-native speaker of e.g. Chinese would not be able to understand a Chinese passage which underpins the importance of language familiarity. Providing the context for texts is also key to reducing ambiguity (eg the word "bank" can mean the edge of a river, or a financial institution). In addition, reducing the number of propositions in a sentence will also help (ie reducing propositional complexity) in communication (Kitsch and Keenan, 1973).

12   Furthermore, the presentation of information in layers, ranging from simple to complex concepts, is supported by the Elaboration Theory (Reigeluth, 1992), and Given-New strategy (Haviland and Clark, 1974) for layering out information.

Attention

13   Attention is about focusing the mind on a limited number of stimuli – the things one wants the users' mind to focus on.

14   As the capacity for sensory and working memory is limited, the Filter Theory (Broadbent, 1958) states that when there is cognitive overload, the mind will only allow some information to go through and block out the rest.

15   The issue for web designers is to focus the mind of web users on the things with which we want to communicate. A few strategies can be suggested:

a. Minimise cognitive load eg ensure the information is not dense, and provided in 5-9 chunks of information; the information is easily scannable etc.;
b. Ensure that the information one wants to release is visible eg chunking up long stories into smaller stories, and bundled them together using presentational cues suggested by the Gestalt Laws; and
c. Use alerting techniques eg use rotating headlines, animation etc. to capture attention on the things that matter. See the Statbox on the home page at http://www.abs.gov.au for an example of alerting technique.

Learning

16   Learning is about acquiring skills, e.g. to master the web site to find information, or acquiring knowledge, e.g. statistics on contemporary social/economic conditions.

17   Learning is achieved via encoding the information into long term memory. The information processing activity of comparing patterns recognised by the sensory organs with memorised patterns is important for the mind to determine what to be encoded. If it is already a memorised pattern, no new information is acquired and so no learning takes place. Otherwise, learning takes place once it has been worked out what the new piece of information means.

18   For acquiring skills to master a web site, publishing standards and consistency are the key. Surely one does not want to confuse the mind by continually changing the layouts/patterns/symbols on the web site. Even if there is a proven need to change the web elements, one may want to do so sparingly and stockpile the changes.

19   Another useful strategy is to adopt international well recognised designs and signs on the web site, e.g. adopting a three column (Sklar) design for web pages (Sklar, 2001), or the icon "*i*" for finding out more information.

20   When there is a change in the design of the web site or any of its associated elements, the mind will have to discover, more often than not, through trial and error, the new meaning, and through which new learning takes place. Of course, learning can be reinforced by practice and once the mind has mastered the skills, automatic processing of the information can take place with little or no cognitive load (Best, 1995).

21   For acquiring knowledge on statistics, we want the learning to be insightful i.e. a good understanding the contexts, caveats and the limitations behind the statistics for determining fitness of use. Contextual linking of metadata to statistical data is the key here, as otherwise there is an imposition on the mind to link different pieces of information together. The corresponding load imposed will generally be a deterrence to users except for those who are really determined to find out the story behind the statistics.

ABS guidelines for the development of web-based products and services

22   Based on our cognitive psychology research to date, and learning from newspaper web publishing, ABS has formulated the following guidelines (Kraayenbrink, 2004)**:**

1. Structure - Organisation of Content

Guideline 1.1. Grouping of information into meaningful units
- Group conceptually related items together
- Limit the number of items per group
- Limit the "chunks" of information to 5-9, where a chunk is any meaningful unit

Guideline 1.2. Present content so that users can orient themselves and comprehend new information on a page
- Provide informat**ive** page titles at top of each page
- Use a breadcrumb trail on all pages
- Include an introduction or introductory section announcing the topic

Guideline 1.3. Use organisational cues to make text visually accessible and easily scannable
- Provide headings and subordinate headings
- Provide introductions
- Provide overview (preview) and topic sentences
- Provide lists or tables
- Provide explanatory link labels
- Provide site map
- Use dot points
- Avoid distracting readers with unnecessary cues

Guideline 1.4. Create order within and across grouped content
- Place known information before new information in sentences, paragraphs or pages
- Use deductive organisation - i.e. place important information near the top of paragraphs and pages

2. Presentation - Visual appearance of content

Guideline 2.1. Strive for consistency in everything
- Use the same relative positioning of repeated elements on different screens
- Use identical physical appearance of repeated elements

Guideline 2.2. Minimise the amount of information per page
- Provide a balance between positive and negative elements on the screen
- Draw attention to important elements by surrounding them with greater amounts of white space (e.g. headings)
- Use white space to differentiate between different groups of information
- Use short pages instead of long pages in general

Guideline 2.3. Encourage users to perceive the intended relationships between elements on the screen by using Gestalt organisation principles in presenting screen layout (Wertheimer, 1924 cited Chang, Dooley, and Tuovinen, 2002**)**
- Proximity : Put related elements close together on the screen. An easily perceivable space between unrelated elements is also important
- Similarity : Use similar look and feel for related elements (including text and icons), use distinct and easily perceivable differences for unrelated elements.
- Figure ground : Ensure the figure is easily distinguishable from the background
- Simplicity : Minimise the amount of information presented on the screen. Avoid complexity
- Balance/Symmetry : Ensure the visual screen design appears visually balanced
- Focal Point : Ensure every visual presentation has a focal point, called the centre of interest or point of emphasis. This focal point catches the viewer's attention and persuades the viewer to follow the visual message further
- Isomorphic Correspondence : Recognise that people perceive and interpret the objects in different ways, based on individual experiences. Design based on common conventions
- Law of Unity/Harmony : Ensure there is harmony and unity between the visual elements on the screen.

Guideline 2.4. Ensure that objects afford the actions that are intended to be performed on them
- Follow conventional usage, both in the choice of images and the allowable interactions
- Follow a coherent conceptual mode. Once part of the interface is learned, the same principles apply to other parts

Guideline 2.5. Use spatial and temporal cues to direct attention
- Position important elements on the prominent positions of the screen
- Use colour to draw attention to elements
- Use alerting techniques (such as animation and sound)

Guideline 2.6. Create colour harmony
- Avoid excessive use of colour (i.e. colour pollution)
- Exaggerate lightness differences between foreground and background colours.
- Use dark colours from the bottom half of the hue circle with light colours from the top half of the hue circle
- Avoid contrasting hues from adjacent sections from the hue circle, especially if colours do not contrast sharply in lightness

Guideline 2.7. Use typography to maximise readability and legibility
- Avoid mixing of font styles (i.e. No more than two font faces; no more than two font colour and no more than three font sizes - regular, large and small)
- Use a suitable font size (preferably 12 point)
- Use sans serif fonts such as Arial, Helvetica or Verdana
- Use sufficient line, letter and paragraph spacing
- Follow common conventions (e.g. standard link colours for visited and unvisited links
- Provide sufficient contrast between text and background colours.

3. Content - Selection of content

Guideline 3.1. Select content that is relevant to the audience
- Choose information of interest to audience
- Avoid unnecessary provision of information
- Provide layers of information (from simple to complex) to suit audience types

Guideline 3.2. Use words that can be easily understood by the target audience
- Use concrete and meaningful words
- Use words that frequently appear in language
- Use short words (with fewer syllables)
- Use link labels that clearly explain the linked content
- Avoid jargon. When acronyms or abbreviations have been used, explain in the first instance and/or link to a 'glossary of terms' page

Guideline 3.3. Use syntactical structure (structure of sentences) that can be easily understood by the target audience
- Avoid links embedded within sentences
- Avoid ambiguities in language

Guideline 3.4. State ideas concisely
- Use concise wording
- Use short sentences
- Reduce proportional complexity within sentences (i.e. decrease the number of ideas conveyed within sentences)

- Omit unnecessary information

References (Attachment 1)

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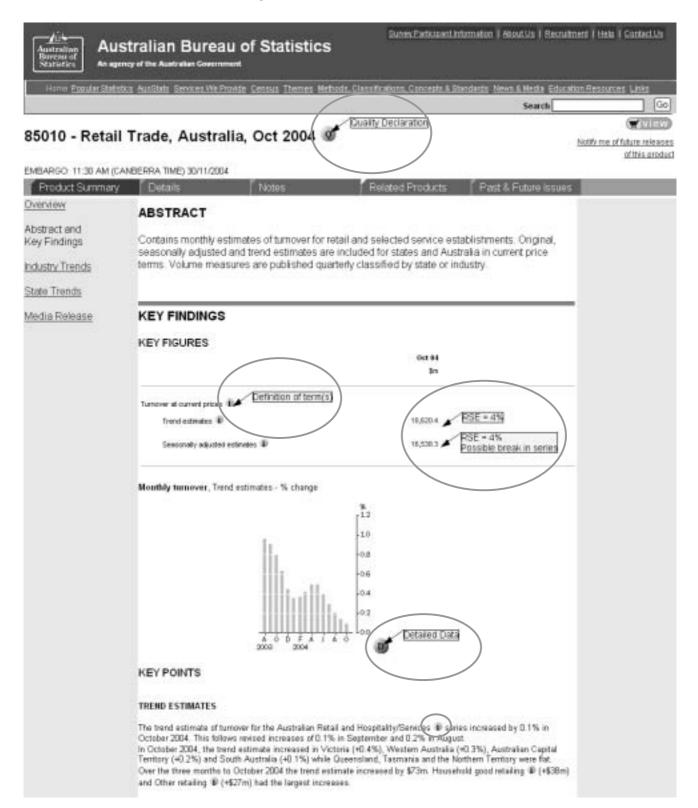
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Attachment 2 - Contextual linking of metadata with statistical data.

Attachment 3 - Focusing attention on stories