

# We Seek and Use Visual Structure

# 3

Chapter 2 showed how our visual system is optimized to perceive structure according to the Gestalt principles of visual perception. Perceiving structure in our environment helps us make sense of objects and events quickly. Chapter 2 also explained that when people are navigating through software or websites, they don't scrutinize screens carefully and read every word. They scan quickly for information relevant to their goals. This chapter (1) shows that when information is presented in a terse, structured way, it is easier for people to scan and understand and (2) explains *how* best to structure information.

## STRUCTURED INFORMATION IS EASIER TO SCAN

Consider two presentations of the same information about an airline flight reservation. The first presentation is unstructured prose text; the second is structured text in outline form (see Fig. 3.1). The structured presentation of the reservation can be scanned and understood much more quickly than the prose presentation.

Unstructured:
<p>You are booked on United flight 237, which departs from Auckland at 14:30 on Tuesday 15 Oct and arrives at San Francisco at 11:40 on Tuesday 15 Oct.</p>
Structured:
<p><b>Flight:</b> United 237, Auckland → San Francisco</p>
<p><b>Depart:</b> 14:30 Tue 15 Oct</p>
<p><b>Arrive:</b> 11:40 Tue 15 Oct</p>

**FIGURE 3.1**

Structured presentation of airline reservation information is easier to scan.

<p><b>Unstructured:</b></p> <p><b>Here is what I plan to do this week: clear out the garage, pull up the weeds in the back yard, repaint the back fence, plant the garden, call parents, buy birthday gift for Susan.</b></p> <p><b>Structured:</b></p> <p><b>To do this week:</b></p> <ul style="list-style-type: none"><li>• <b>clear garage</b></li><li>• <b>pull back yard weeds</b></li><li>• <b>repaint back fence</b></li><li>• <b>plant garden</b></li><li>• <b>call parents</b></li><li>• <b>buy birthday gift for Susan</b></li></ul>
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**FIGURE 3.2**

Structured (bulleted) list is easier to scan.

### Driver License Renewals, Duplicates, and Changes

#### Immediate Attention:

You will need a federal compliant card such as a passport, military ID, or REAL ID to board a domestic flight or access some federal facilities beginning October 1, 2020. The DMV started offering [REAL ID driver licenses and ID cards](#) on January 22, 2018. A field office visit is required to apply for a REAL ID.

#### Renewal



- How to renew your driver license by mail
- How to renew your driver license by internet
- How to renew your driver license in person
- How to renew your instruction permit
- How to renew your identification (ID) card

**FIGURE 3.3**

Driver License Renewals, Duplicates, and Changes page of the California Department of Motor Vehicles (DMV) website (January 2020) buried important information in a wordy prose paragraph and repetitive list.

Next, consider two ways to present a list. As above, the first presentation is unstructured prose text; the second is structured using bullets (see Fig. 3.2). The bulleted list is faster to scan and understand than the prose paragraph. That would also be true if the list were numbered.

The more structured and brief the presentation of information, the more quickly and easily people can scan and comprehend it. Look at the Driver License Renewals, Duplicates, and Changes page from the California Department of Motor Vehicles (see Fig. 3.3). Even with a bulleted list, the wordy, repetitive links slow users down and “bury” the important words they need to see.

**Driver License Renewals, Duplicates, and Changes**

**REAL ID, passport, military ID, or other Federal-compliant ID required**

- starting October 1, 2020
- for domestic flights and some federal facilities

**How to get REAL ID driver licenses and ID cards**

- only at DMV field offices (not online)
- since January 22, 2018

**Renew**

- Driver license:    in person    by mail    internet
- Driver **Instruction** permit
- Non-driver **ID** card


**FIGURE 3.4**

Possible (fictional) improvement of the “Driver License Renewals, Duplicates, and Changes” page of the California Department of Motor Vehicles (DMV) website, eliminating unneeded text and making it easier to scan.

Compare that with a less wordy, more structured hypothetical design that factors out needless repetition and marks as links only those words that represent options (see Fig. 3.4). The revision provides the same information and options as the website’s actual page but is easier to scan.

Displaying search results is another situation in which structuring data and avoiding repetitive “noise” can improve people’s ability to scan quickly and find what they seek. In 2006, search results at HP.com included so much repeated navigation data and metadata for each retrieved item that they were useless. Recent HP websites eliminate the repetition and structure the results, making them easier to scan and more useful (see Fig. 3.5).

Of course, for information displays to be easy to scan, it is not enough merely to make them terse, structured, and nonrepetitious. They must also conform to the rules of graphic design, some of which were presented in Chapter 2.

For example, a prerelease version of a mortgage calculator on a real estate website presented its results in a table that violated at least two important rules of graphic design (see Fig. 3.6A). First, people usually read (online or offline) from top to bottom, but the labels for calculated amounts were *below* their corresponding values. Second, the labels were just as close to the value below as to their own value, so proximity (see Chapter 2) could not be used to perceive that labels were grouped with their values. To understand this mortgage results table, users had to scrutinize it carefully and slowly figure out which labels went with which numbers.

The revised design, in contrast, allows users to perceive the correspondence between labels and values without conscious thought (see Fig. 3.6B).

(A) Screenshot of HP.com search results for "color laser printer" in 2006. The results are repetitive and noisy, showing multiple entries for the same printer model with slight variations in the date. A thumbs-down icon is present.

Result 1	Result 2	Result 3
Buy HP Color LaserJet 1600 Printer(CB373A#ABA), HP color laser printers, HP LaserJets, HP printers, Printers direct from the HP Home & Home Office Store. On a budget but want ... 2006-12-05	Buy HP Color LaserJet 1600 Printer(CB373A#ABA), HP color laser printers, HP LaserJets, HP printers, Printers direct from the HP Home & Home Office Store. On a budget but want ... 2006-12-05	Buy HP Color LaserJet 4700n Printer(C7493A#ABA), HP color laser printers, HP LaserJets, HP printers, Printers direct from the HP Home & Home Office Store. Get ready to deliver ... 2006-12-20

(B) Screenshot of HP.com search results for "color laser printer" in 2019. The results are clean and organized, with a clear title bar and a sidebar for recommended links. A thumbs-up icon is present.

**FIGURE 3.5**

In 2006, HP.com's site search produced repetitive, "noisy" results (A), but later (2019) was improved (B).

(A) Mortgage summary presented by a software mortgage calculator. The design is cluttered with many small numbers and lacks clear sectioning. A thumbs-down icon is present.

<b>Mortgage Summary</b>	
\$1,840.59	\$662,611.22
Monthly Payment	Total of 360 Payments
\$318,861.22	Sep, 2037
Total Interest Paid	Pay-off Date
\$93,750.00	\$0.00
Total Tax Paid	Total PMI Paid

(B) An improved mortgage summary design. It uses a clear grid structure with alternating light and dark rows for readability. A thumbs-up icon is present.

<b>Mortgage Summary</b>	
<i>Monthly Payment</i>	\$ 1,840.59
<i>Number of Payments</i>	360
<i>Total of Payments</i>	\$ 662,611.22
<i>Interest Total</i>	\$ 318,861.22
<i>Tax Total</i>	\$ 93,750.00
<i>PMI Total</i>	\$ 0.00
<i>Pay-off Date</i>	Sep 2037

**FIGURE 3.6**

(A) Mortgage summary presented by a software mortgage calculator; (B) an improved design.

## VISUAL HIERARCHY HELPS PEOPLE FIND RELEVANT INFORMATION

One of the most common ways to structure information presentations is to provide a visual hierarchy—an arrangement that:

- breaks the information into distinct sections and breaks large sections into subsections;
- labels each section and subsection prominently and in such a way that content is clearly identified;

<p><b>(A) Create a Clear Visual Hierarchy</b></p> <p>Organize and prioritize the contents of a page by using size, prominence, and content relationships. Let's look at these relationships more closely. The more important a headline is, the larger its font size should be. Big bold headlines help to grab the user's attention as they scan the Web page. The more important the headline or content, the higher up the page it should be placed. The most important or popular content should always be positioned prominently near the top of the page, so users can view it without having to scroll too far. Group similar content types by displaying the content in a similar visual style, or in a clearly defined area.</p>	<p><b>(B) Create a Clear Visual Hierarchy</b></p> <p>Organize and prioritize the contents of a page by using size, prominence, and content relationships. Let's look at these relationships more closely:</p> <ul style="list-style-type: none"> <li>• <b>Size.</b> The more important a headline is, the larger its font size should be. Big bold headlines help to grab the user's attention as they scan the Web page.</li> <li>• <b>Prominence.</b> The more important the headline or content, the higher up the page it should be placed. The most important or popular content should always be positioned prominently near the top of the page, so users can view it without having to scroll too far.</li> <li>• <b>Content Relationships.</b> Group similar content types by displaying the content in a similar visual style, or in a clearly defined area.</li> </ul>
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**FIGURE 3.7**

Find the advice about prominence in each of these displays. Prose text format (A) forces users to read or skim everything. Visual hierarchy (B) lets users skip irrelevant content and go straight to the information most relevant to their goals.

- presents the sections and subsections as a hierarchy, with higher-level sections presented more strongly than lower-level ones.

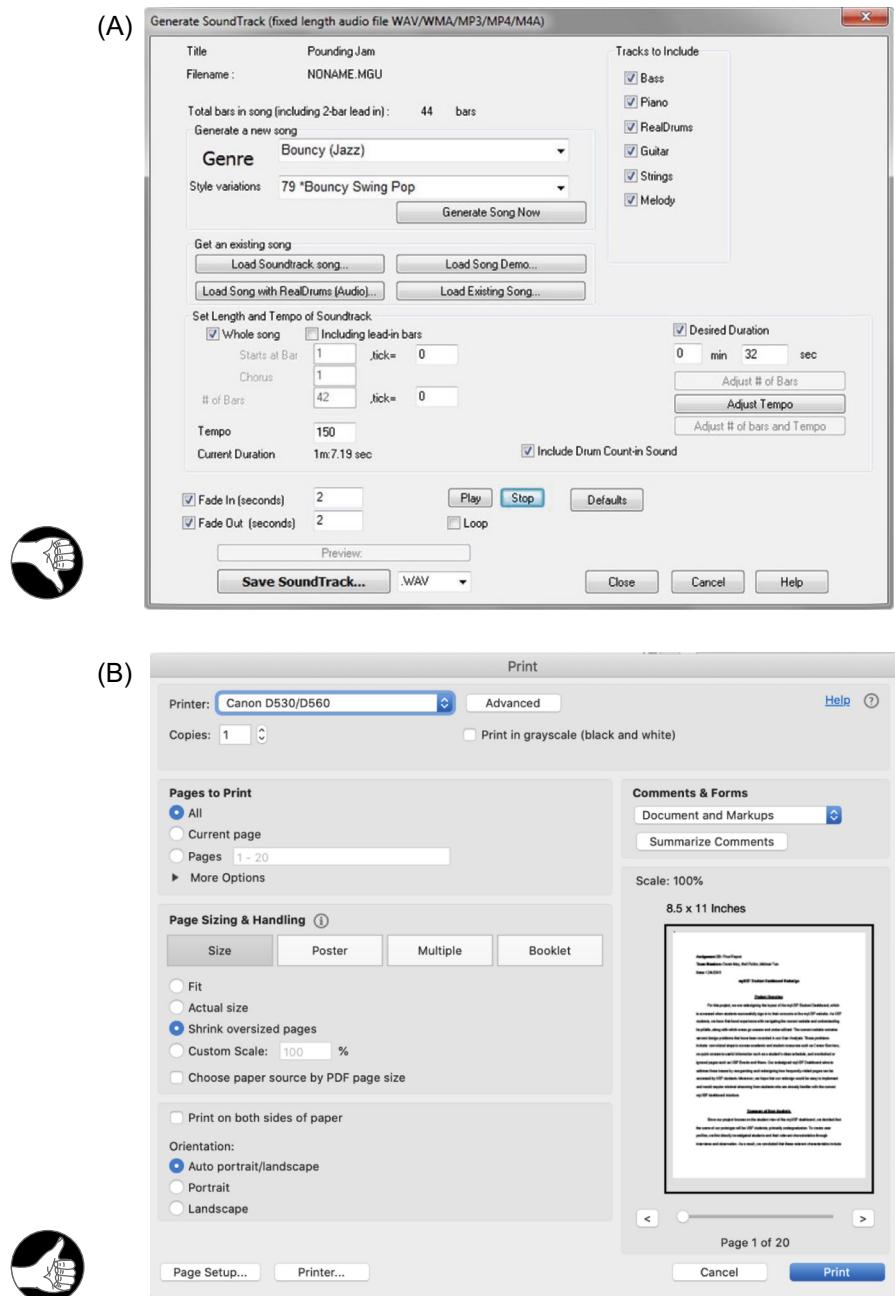
A visual hierarchy allows people, when scanning information, to quickly separate what is relevant to their goals from what is irrelevant and to focus their attention on the relevant information. They find what they are looking for more quickly because they can easily skip everything else.

Try it for yourself. Look at the two information displays in Fig. 3.7 and find the information about prominence. How much longer does it take you to find it in the nonhierarchical presentation?

The examples in Fig. 3.7 show the value of visual hierarchy in a textual, read-only information display. Visual hierarchy is equally important in interactive control panels and forms—perhaps even more so. Compare dialogue boxes from two different software products (see Fig. 3.8). The “Generate SoundTrack” dialogue box of the music app Band-in-a-Box has poor visual hierarchy, making it hard for users to scan it and find settings quickly. Adobe Acrobat Pro’s “Print” dialogue box, by contrast, has better visual hierarchy, so users can quickly find the desired settings.

## BEYOND VISUAL HIERARCHY: INFORMATION HIERARCHY

Visual hierarchy should actually be called “information hierarchy” because the basic design principle applies more broadly than just visual design. Organizing information hierarchically, using headings, subheadings, and other groupings to define sections



**FIGURE 3.8**

Visual hierarchy in interactive control panels and forms lets users find settings quickly: (A) Band-in-a-Box (2017—bad) and (B) Adobe Acrobat Pro (2019—good).

and subsections, can help even sight-impaired and blind users find what they are looking for.

Consider a blind person using a screen reader to search the screens shown in Fig. 3.7 for the information about “prominence” or trying to find a particular setting on the dialogue boxes shown in Fig. 3.8.

With Fig. 3.7A, blind users would have to command their screen reader to read methodically through most of the information before reaching the desired content, but with the information separated with headings into sections as in Fig. 3.7B, blind users can have their screen reader read just the section headings, skipping content in irrelevant sections. That would get them much more quickly to the information about “prominence.”

Similarly, with Band-in-a-Box’s “Generate SoundTrack” dialogue box (see Fig. 3.8A), blind users would have to laboriously tab through most of the settings to find the one they want, but with Acrobat Pro’s “Print” dialogue box (see Fig. 3.8B), assuming the area headings are marked as headings, they could quickly find the relevant section, then look in it for the control they want.

To help Web developers and designers create information displays that are useable by people with visual impairments, the World Wide Web Consortium (W3C) created the Web Content Accessibility Guidelines (WCAG 2.0) (W3C, 2008a). The WCAG 2.0 guidelines advise designers to use cascading style sheets to mark text sections and subsections, and screen divisions and subdivisions, with appropriate-level headings (W3C, 2008b).

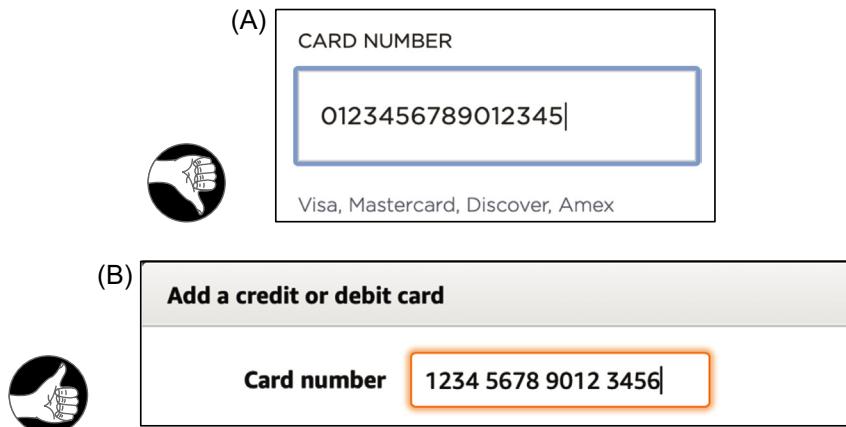
## “CHUNKING” HELPS PEOPLE SCAN AND ENTER DATA

Even small amounts of data can be made easier to scan if they are structured. Two examples are telephone and credit card numbers (see Fig. 3.9). Such numbers should be broken into parts—often called “chunks”—to make them easier to scan and remember. The right size for chunks was determined by psychologists and human-factors researchers decades ago when telephone numbers and credit card numbers were introduced (e.g., Miller, 1956). It is based on the capacity of human short-term memory (Moran, 2016) (see also Chapter 7).

<b>Hard:</b> 4155551212
<b>Easy:</b> 415-555-1212
<b>Hard:</b> 1234567890123456
<b>Easy:</b> 1234 5678 9012 3456

**FIGURE 3.9**

Telephone and credit card numbers are easier to scan, understand, and remember when separated into “chunks.”

**FIGURE 3.10**

(A) At KP.org (2020), credit card numbers cannot include spaces or other punctuation, making them hard to scan and verify. (B) At [Amazon.com](#) (2020), spaces are added automatically as users enter the number.

**FIGURE 3.11**

BankOfAmerica.com (2020) chunks phone numbers into three parts, making it impossible to enter an incorrectly formatted number.

Unfortunately, many of today's digital presentations of phone and credit card numbers neither chunk the numbers nor allow users to include spaces, hyphens, parentheses, or other punctuation (see Fig. 3.10A). This makes it harder for people to scan a number or verify that they typed it correctly and so is considered a user-interface design blooper (Johnson, 2007).

To be more user-friendly, a user interface should support chunking of numbers by letting users separate them into parts using spaces or other punctuation (see Fig. 3.10B).

Alternatively, designers can support chunking of long numbers by providing a separate field for each part of the number. Separate data fields can provide useful visual structure even when the data to be entered is not, strictly speaking, a number. Dates and phone numbers are an example of situations in which segmented fields can improve readability and help prevent data entry errors (see Fig. 3.11).

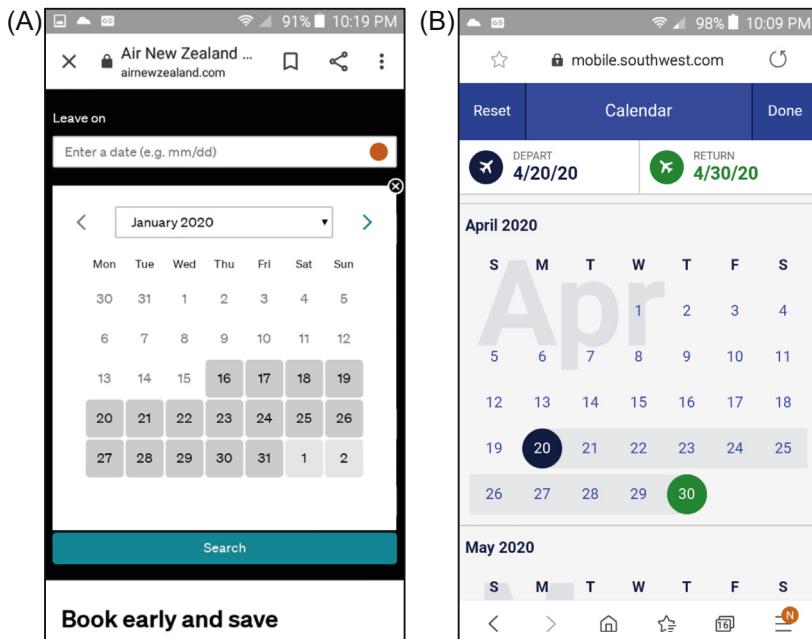
“Chunking” data helps people scan, comprehend, and recall not only long numbers but also other types of data. It makes data conform better to the limitations of human memory and attention, which are discussed more fully in Chapters 7 and 8.

## EVEN MORE STRUCTURE FOR INPUT: DATA-SPECIFIC CONTROLS

A step-up in structure from segmented text fields is data-specific controls. Designers can combine text fields and other controls to create hybrid controls for getting values of specific types from users. With data-specific controls, users cannot enter invalid data, so one possible type of user error is eliminated.

For example, most airlines these days use a text field and a calendar control to let customers choose flight dates (see Fig. 3.12).

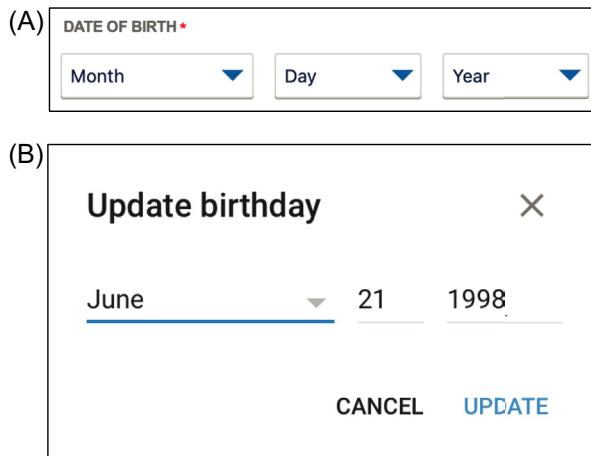
Structured data-specific controls can also be constructed from menus. For example, Southwest.com used Month, Day, and Year menus to build a date-of-birth control (see Fig. 3.13A). Menus can also be combined with text fields, as in Google’s date-of-birth control (see Fig. 3.13B).



**FIGURE 3.12**

For getting flight dates, most airlines use a hybrid control: text field + calendar.

(A) [AirNewZealand.com](http://AirNewZealand.com) (B) [mobile.Southwest.com](http://mobile.Southwest.com).

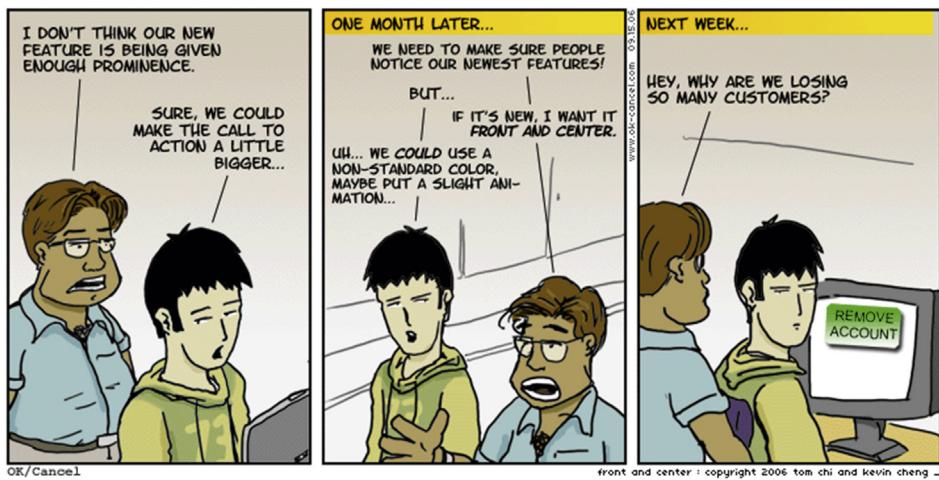


**FIGURE 3.13**

Birthdate control: (A) built with menus on [Southwest.com](#) (2020); (B) built with menus+text fields on [Google.com](#) (2020).

## IMPORTANT TAKEAWAYS

- Presenting information in a terse, structured manner makes it easier for people to scan, understand, and remember. Eliminate needless words and repetition. Use bullets and numbered lists instead of paragraphs of text.
- Visual hierarchy—breaking content up into clearly labeled sections and subsections—is a “best practice” way to structure information.
- Hierarchical structuring of information, using section headings and labels that screen readers can recognize as headings, helps people with visual impairments find their desired content.
- Chunking data—such as phone numbers, credit card numbers, serial numbers—helps people scan, enter, and remember it.



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