



Four Cognitive Design Guidelines for Effective Information Dashboards



Following cues from cognitive science can help you create information dashboards that users can process reliably and quickly.

Article No :1256 | June 18, 2014 | by Shilpi Choudhury



Effective [data visualization](/topics/data-visualization) supports cognition in many ways. It reduces cognitive load on the user, aids in problem solving, and facilitates discovery of insights. Poor visualizations, on the other hand, confuse and lead to wrong conclusions.

Since cognitive science has given us tremendous understanding of the mechanisms and processes by which we perceive things, comprehend them, and use them for decision-making, it's reasonable to assume that

such findings are very relevant to dashboard design issues. How users interpret data, what demands our designs place on their attention, what knowledge they need for making effective decisions—all these factors need to be considered while designing an information dashboard. Here are four guidelines derived from studies on human cognition that can be applied while designing information dashboards:

1. Put an Emphasis on Readability

To perform any kind of analysis using a dashboard, the user must be able to extract and process visual stimuli reliably and quickly. The [interface \(/topics/interface-and-navigation-design/\)](/topics/interface-and-navigation-design/) should be such that it guides visual processing and doesn't deter it.



Image source: [Smashing Magazine \(http://www.smashingmagazine.com/2010/05/10/imagine-a-pie-chart-stomping-on-an-infographic-forever/\)](http://www.smashingmagazine.com/2010/05/10/imagine-a-pie-chart-stomping-on-an-infographic-forever/)

In the visualization above, the busy background image makes the chart cluttered and reduces its readability. To enhance readability, there should be proper contrast between the chart background and the data plots.

Also, prioritization of information helps make the dashboard more readable. As Amanda Cox, Head of *The New York Times* Graphic Department once noted, “Data isn’t like your kids. You don’t have to pretend to love them equally.” Know where to focus your user’s attention.

Using a dashboard, the user must be able to extract and process visual stimuli reliably and quickly

[tweet this](#)

([https://twitter.com/intent/tweet?text=Read on @uxmag: Using a dashboard, the user must be able to extract and process visual stimuli reliably and quickly&url=http://uxm.ag/1mz](https://twitter.com/intent/tweet?text=Read+on+@uxmag:+Using+a+dashboard,+the+user+must+be+able+to+extract+and+process+visual+stimuli+reliably+and+quickly&url=http://uxm.ag/1mz))

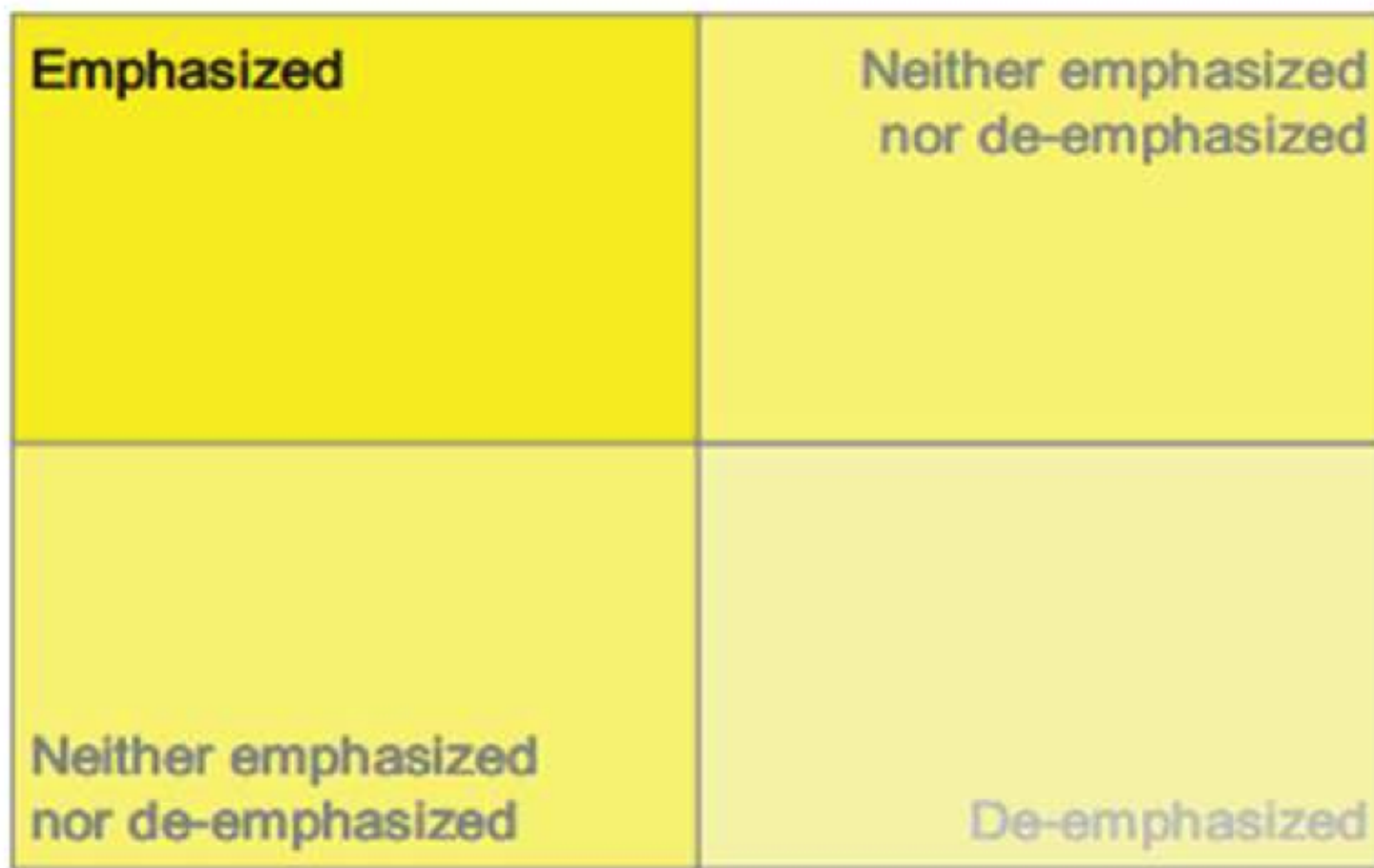


Image Source: Stephen Few, With Dashboards Formatting & Layout Definitely Matter

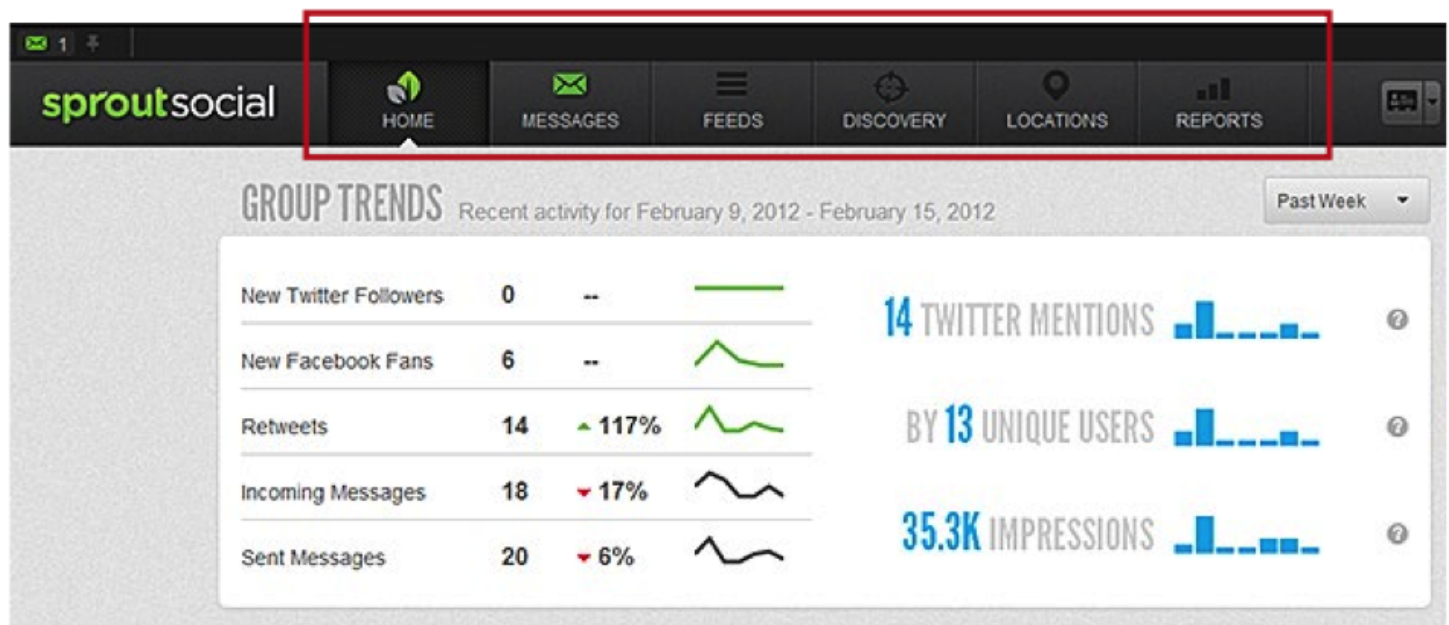
The layout of the dashboard can be roughly divided into four quadrants based on the importance it accords to its respective content. The top-left quadrant is the section that gains the maximum attention from the user so the most important metrics should occupy this section. The other metrics should then be distributed based on their order of importance.

2. Minimize Cognitive Load

Theoretical insights into cognitive architecture emphasize the memory constraints of humans. These lessons have been learned by the HCI community who argue that interaction sequences should be designed to minimize short term memory load. Since recognition memory is superior to absolute recall, the dashboard should provide all the information that the user needs for a specific analysis in front of his or her eyes. (The details of how a dashboard can reduce the dependence on short term memory are covered in my article ["The Psychology Behind Information Dashboards"](http://uxmag.com/articles/the-psychology-behind-information-dashboards) (<http://uxmag.com/articles/the-psychology-behind-information-dashboards>).)

3. Use Graphical Representation

We are wired for visualization. Whether it's graphs putting raw data into a perspective or the use of icons, which helps to overcome issues of limited real estate, we do [value a picture \(/topics/visual-design\)](#) over a thousand words.



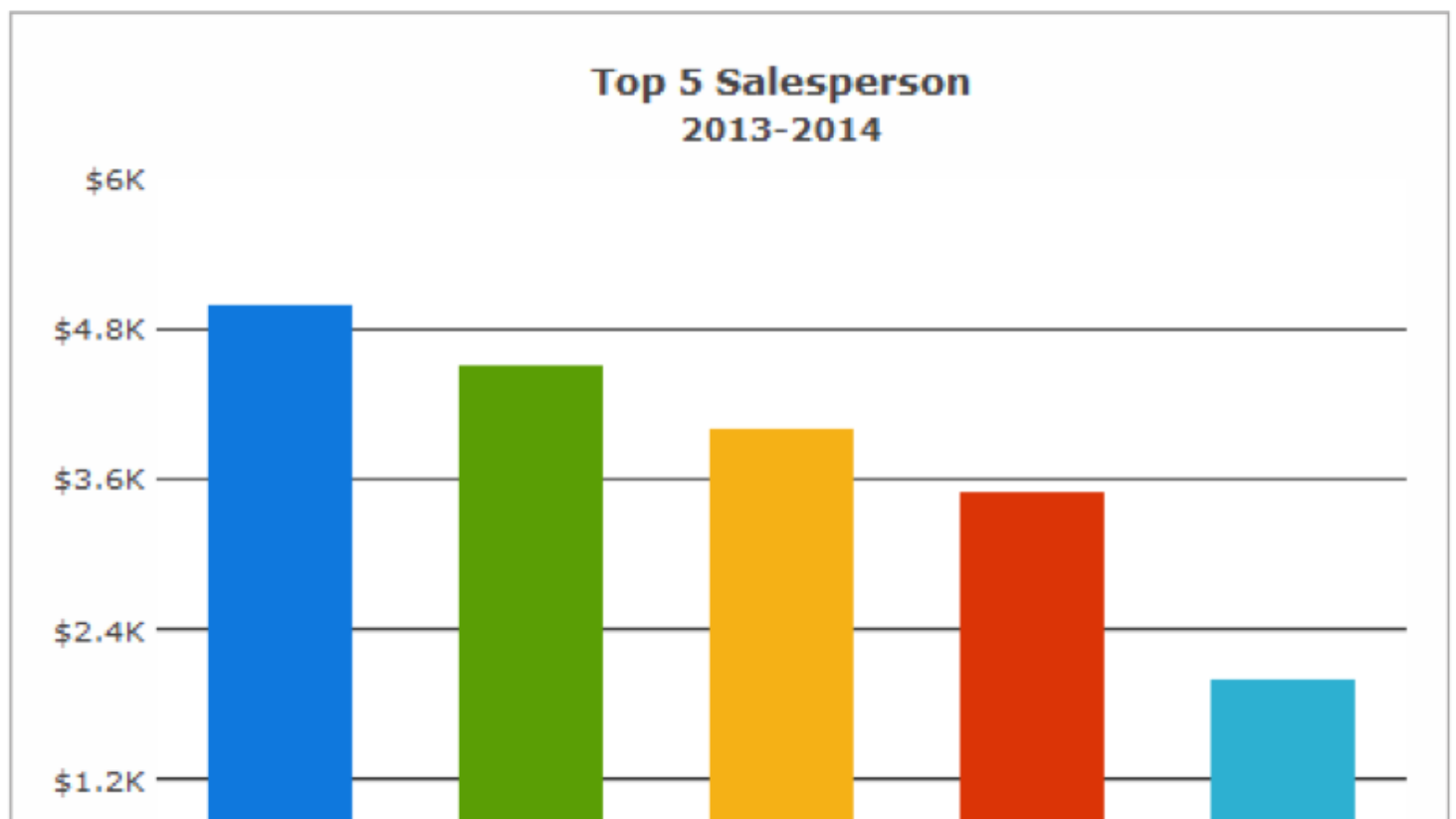
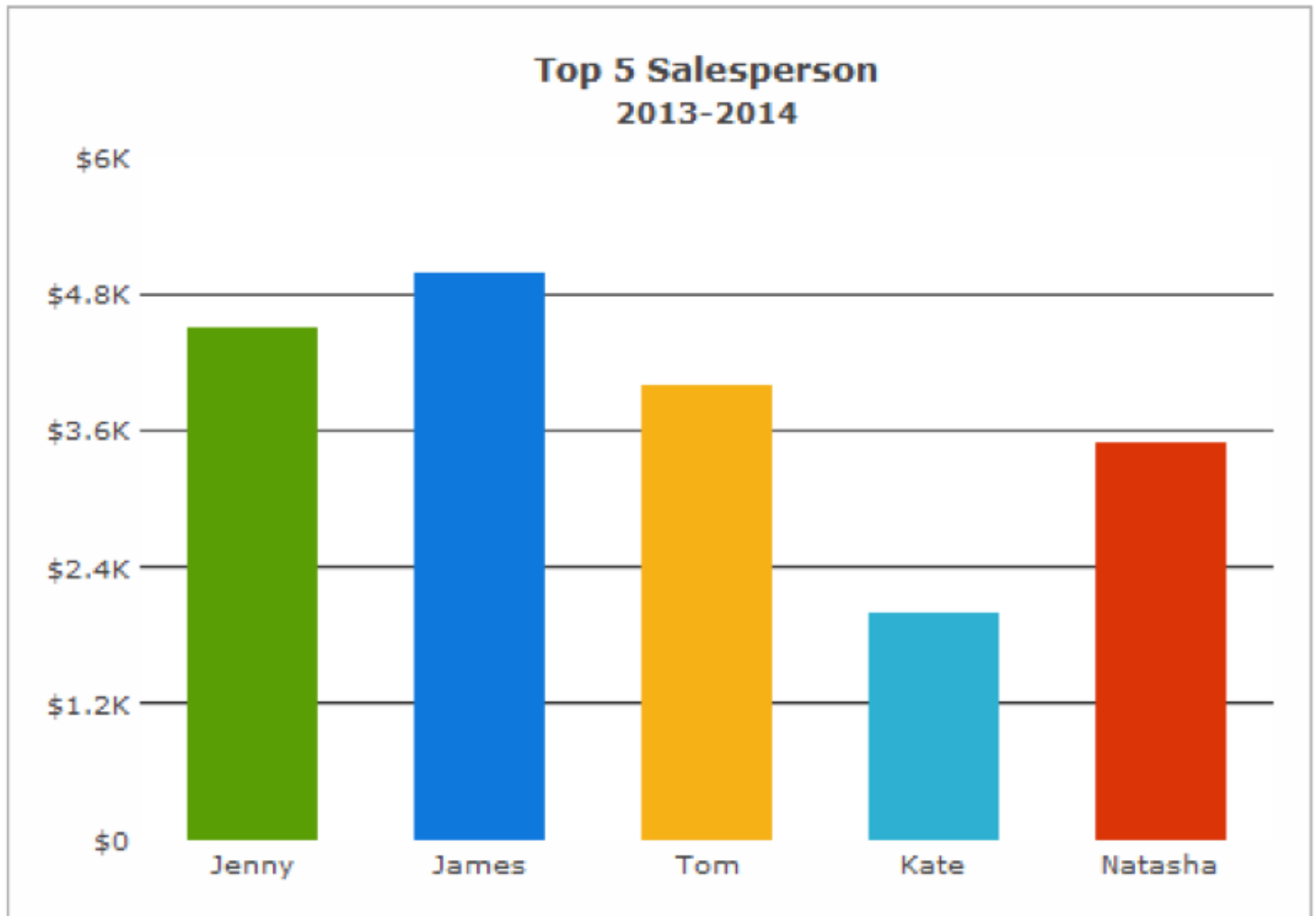
To make dashboards easier to comprehend, couple icons with one-two word text labels (pop-up or otherwise) that explain the meaning to users who find the representations difficult to decipher.

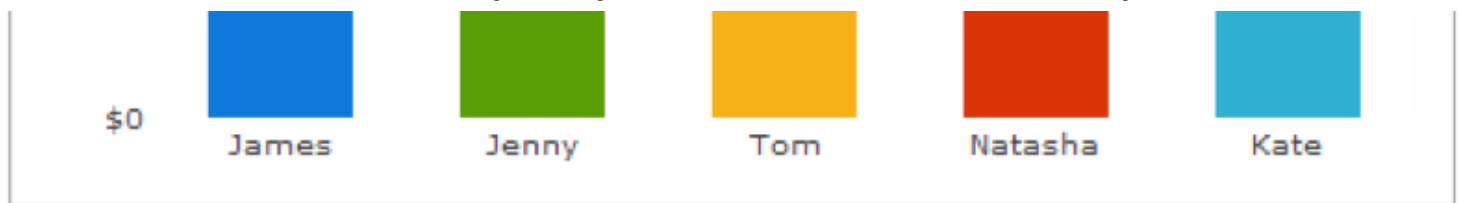
4. Follow Gestalt Laws

Gestalt [psychology \(/topics/psychology-and-human-behavior\)](#) offers a set of laws that explain how we perceive or intuit patterns and conclusions from the things we see. Applying these laws to charting and data

visualization can help users easily identify patterns in their data. Some of these laws are:

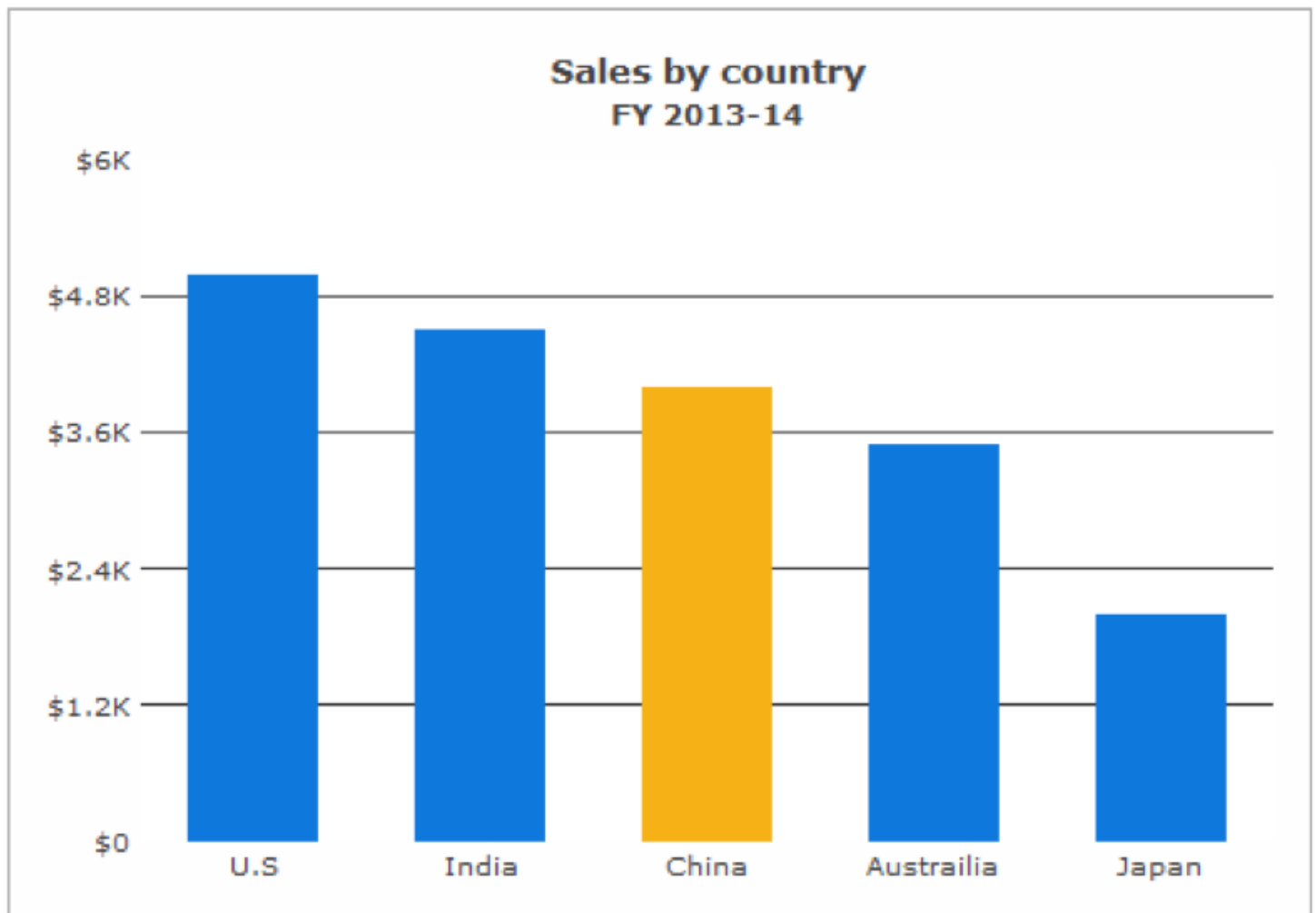
Law of Prägnanz: This law states that the human brain tends to process simple patterns—patterns that are regular, even, and orderly—faster than patterns that are more complex. To understand this, consider the two charts below. If you were asked to find the top performer from these two charts, which chart would you find easier to get the data from?





It is easier to see that James is the top performer in the second chart because the data plots are ordered here. If the data is name or category-based, and not time-based, it is a good idea to arrange the data in descending/ascending order.

Law of Focal Point: This law states that in a visual presentation, distinctive objects create a focal point. For example, if you want to focus your user's attention on a specific data point, you can create a focal point by using a different color.



In this chart, China is the focal point due to its difference in color from the other data plots.

Further reading: [How to Make Data Visualization Better with Gestalt Laws \(http://sixrevisions.com/usability/data-visualization-gestalt-laws/\)](http://sixrevisions.com/usability/data-visualization-gestalt-laws/)

Conclusion

Information dashboards aim to augment human cognitive abilities and aid in decision-making. The challenges of designing an effective dashboard are many, but the potential benefits make this a challenge worth pursuing. The key is not in finding what's most exciting or what's most outside-the-box but in applying simple concepts which we know but still tend to overlook.

Image of [colorful brain](http://www.shutterstock.com/pic-171180725/stock-vector-colorful-concept-of-the-brain-eps-vector.html) (<http://www.shutterstock.com/pic-171180725/stock-vector-colorful-concept-of-the-brain-eps-vector.html>), courtesy Shutterstock.

Article No. 1 153 | December 4, 2013

The Psychology Behind Information Dashboards ([/articles/the-](/articles/the-psychology-behind-information-dashboards)

[psychology-behind-information-dashboards](/articles/the-psychology-behind-information-dashboards)).

by ([Shilpi Choudhury](/contributors/shilpi-choudhury)) **Shilpi Choudhury**

(</contributors/shilpi-choudhury>).

Information dashboards give users the control over our environments that we crave on a psychological level.

Article No. 1 243 | May 22, 2014

Making Mountains of Data Rewarding to Roam ([/articles/making-](/articles/making-mountains-of-data-rewarding-to-roam)

[mountains-of-data-rewarding-to-roam](/articles/making-mountains-of-data-rewarding-to-roam)).

by ([UX Magazine Staff](/contributors/ux-magazine-staff)) **UX Magazine Staff**

(</contributors/ux-magazine-staff>).

A closer look at the results in the Bringing Order to Big Data category of the international Design for Experience awards, featuring the winner: Roambi.

Article No. 1 200 | March 5, 2014

The Future of Information Dashboards ([/articles/the-future-of-information-](/articles/the-future-of-information-dashboards)

[dashboards](/articles/the-future-of-information-dashboards)).

by ([Shilpi Choudhury](/contributors/shilpi-choudhury)) **Shilpi Choudhury**

(</contributors/shilpi-choudhury>).

Five things that will change the way we experience data using information dashboards.

About the Author(s)

Shilpi Choudhury (</contributors/shilpi-choudhury>).

I am the Co-Founder & Chief Storyteller at [Lemonade in Summer](http://lemonadeinsummer.com/) (<http://lemonadeinsummer.com/>), a design and communications agency

Key topics in this article

Analytics and Tracking (</topics/analytics-and-tracking>)



(</contributors/shilpi-choudhury>).

based out of
Bangalore, India.

[Content and Copy \(/topics/content-and-copy\)](/topics/content-and-copy)

[Data visualization \(/topics/data-visualization\)](/topics/data-visualization)

[Design \(/topics/design\)](/topics/design)

[Interface and Navigation Design \(/topics/interface-and-navigation-design\)](/topics/interface-and-navigation-design)

[Psychology and Human Behavior \(/topics/psychology-and-human-behavior\)](/topics/psychology-and-human-behavior)

[Technology \(/topics/technology\)](/topics/technology)

[Visual Design \(/topics/visual-design\)](/topics/visual-design)

Getting started in UX

Our contributors and staff recommend these articles on for developing an understanding of experience design and jumpstarting your career.

[Hiring the Right Designer \(/articles/hiring-the-right-designer\)](/articles/hiring-the-right-designer)

[How Much UX have You Put into Your UX Portfolio? \(/articles/how-much-ux-have-you-put-into-your-ux-portfolio\)](/articles/how-much-ux-have-you-put-into-your-ux-portfolio)

[How Mature is Your Organization when it Comes to UX? \(/articles/how-mature-is-your-organization-when-it-comes-to-ux\)](/articles/how-mature-is-your-organization-when-it-comes-to-ux)

[The UX Team Starting Lineup \(/articles/the-ux-team-starting-lineup\)](/articles/the-ux-team-starting-lineup)

[Seven Things Your Boss Needs to Know About UX \(/articles/seven-things-your-boss-needs-to-know-about-ux\)](/articles/seven-things-your-boss-needs-to-know-about-ux)

[Why UX Designers Need to Think like Architects \(/articles/why-ux-designers-need-to-think-like-architects\)](/articles/why-ux-designers-need-to-think-like-architects)

[Five Customer Experience Lessons Coffee Taught Me \(/articles/five-customer-experience-lessons-coffee-taught-me\)](/articles/five-customer-experience-lessons-coffee-taught-me)

[Four Things I Learned about UX at Universal Studios \(/articles/four-things-i-learned-about-ux-at-universal-studios\)](/articles/four-things-i-learned-about-ux-at-universal-studios)

[The \(Sometimes\) Giddy Experience of Learning Design \(/articles/the-sometimes-giddy-experience-of-learning-design\)](/articles/the-sometimes-giddy-experience-of-learning-design)

Comments



james
May 11, 2017

What is the best way to measure user computer experience?



Danielle
June 19, 2014

Just wanted to point out that the word "data" is plural. "Data are..." would be proper grammar.



Joan
June 19, 2014

On the 'data is plural' thing - it is generally accepted that using 'data is' is ok when the usage could be substituted with the word 'information'.

<http://www.onlinegrammar.com.au/top-10-grammar-myths-data-is-plural-so-must-take-a-plural-verb/>



[Jose M. Torres Gomez \(/readers/jose-torres/\)](/readers/jose-torres/)
June 19, 2014

Nice reading. I am not UX expert, but I think the example used in point 3 could be better. Icons used for feeds and reports are not clear and I think they are confusing. When I see the icon used for feeds what it looks like to me is to show/hide a menu in mobile apps, there is a very used icon for feeds (example ; <http://goo.gl/WNFmSD>). Also the report icon is confusing, it looks more like a wireless level signal than reports, I would use a with paper sheet with a pie chart over it or just the pie chart (example: <http://goo.gl/aDRbLZ>), after see it for some time I understood it could be a bar chart (i think) so a pie chart could be more clear and void confuse it with wifi signal indicator.



Shira Kates
June 20, 2014

Jose, I agree with you about that particular icon. It is confusing. The feed icon used in that example is also known as a hamburger menu and it's generally used to denote a menu of some kind. A feed is different. When icons are used inconsistently, they become confusing, just like words. Whenever there is space to include both, this is ideal, so I agree with Shilpi's overall point. Shrinking screen sizes makes doing this this increasingly difficult. An internationally accepted icon standard would be pretty amazing, in my opinion. All that said, Sprout's product offers a delightful user experience overall. I used it quite a bit in a previous role.

