

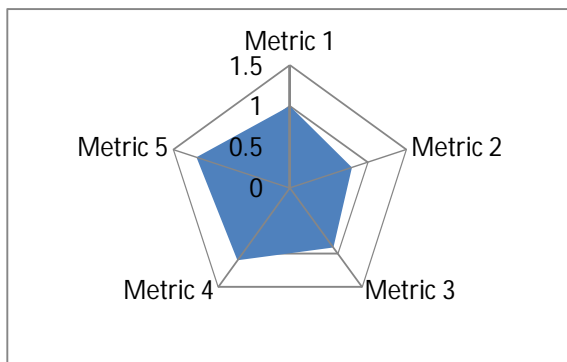
## 3 Things to Think About – A Warning Label for Radar Charts

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Let's talk about radar charts—or spider charts as they are sometimes called. They are gaining popularity in knowledge management, HR, and many other areas. This will come as a shock (not really): **they aren't perfect**. Three drawbacks—the warning label—are:

- Radar charts visually overstates the effect of a change
- Different scales skew results
- Radar charts don't represent trade-offs well<sup>i</sup>

### What is a radar chart?



Radar charts are a powerful way to visualize multiple variables at the same time, for example the performance of a team or a process against several different metrics—time and cost, quality and efficiency, among others.

Performance is measured by the area of the shape marked by the blue pentagon in this chart. **The bigger the shape, the better the performance.** Radar charts are useful because:

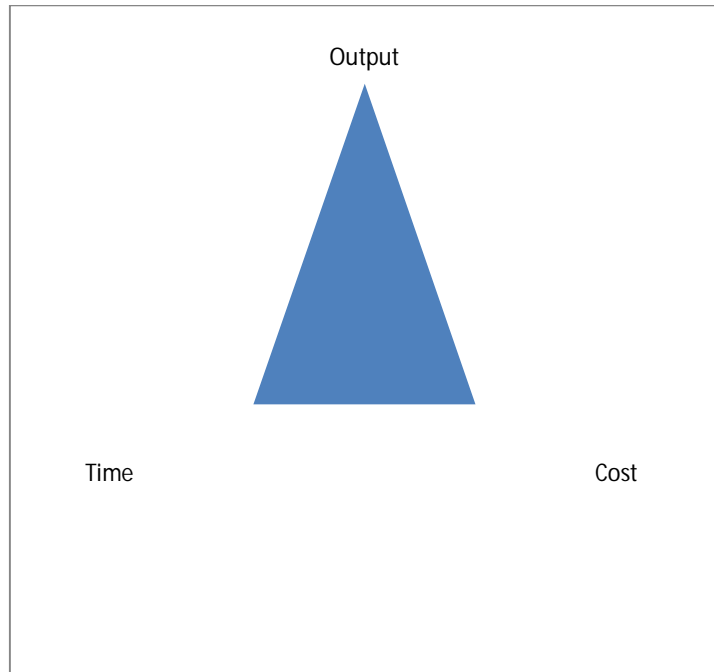
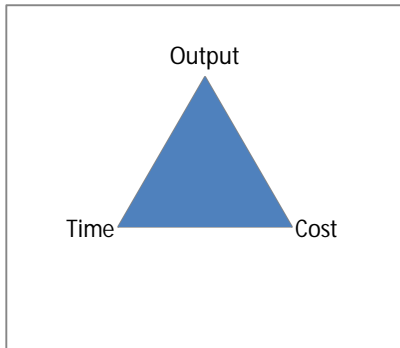
**They help focus on several different measures that all contribute to an outcome<sup>ii</sup>**

**As a result, they are a useful tool to help organizations align to broader outcomes<sup>iii</sup>**

### The Warning Label

*Limitation 1: Radar charts visually overstate the effect of a change*

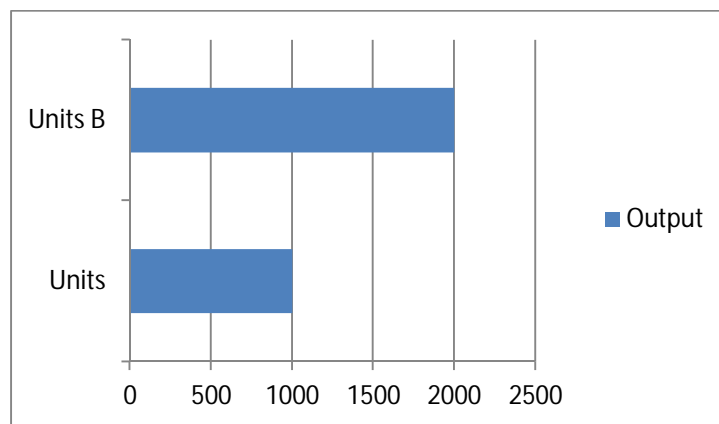
If you use radar charts, you might feel more proud of the amount you accomplished than you should. Let's look at two different visualizations of a change in only one measure in a radar chart, doubling output from 1,000 units to 2,000 units.



The change in output looks bigger than you expect. The reason is that the visual change is not only height (the triangle grows taller by 100%), but also area. The area of the first triangle is .5 units squared (it is a 1x1x1 triangle), while the area of the second is 1 unit squared. The triangle is twice as big, but **measured in square units, not units.**

### So what can we do about it?

The key is to **use other visualizations when you are evaluating the magnitude of change.** A line graph or bar chart does a much better job representing a change in magnitude than a radar chart. When you need to show the extent of a change, you should show it as a line graph (for multiple data points) or a bar chart (for fewer than three data points).



### Limitation 2: Different scales skew results

Second, radar charts don't tell a story well if you are comparing different scales. If we compare wait time in a hospital clinic (in minutes) to patient satisfaction (in a 1-10 score) to staffing cost per hour (in currency), the chart is very difficult to use. A change in satisfaction will be visually under-represented while a change in staffing costs would appear overstated.



### So what can we do about it?

One way to address different scales is to normalize them. If you normalize the goal/baseline/target to 1, then you show the results as a percentage variance from the baseline. Different scales can now be easily compared.



Unfortunately, this normalized version of the radar chart creates the opposite effect of the first version of this radar chart. Changes to small numbers will appear much greater than changes to large numbers, because you are now looking at **percentage changes**, rather than actuals.

Because of this limitation, you should have separate representations for each variable to show their progress, in their respective scales. Percentage changes, though, are very effective in managing processes and behaviors at an operational level. Use the radar charts for organizational focus on the vital behaviors and **show outcomes with different visualizations** (line and bar charts are still very effective).

### *Limitation 3: Trade-offs are not represented well*

Finally, radar charts represent related measures poorly. If one measure is related to another positively, then the shape will grow accordingly in the radar chart.

In a software engineering division, we understand that improving the time to fix a bug will positively affect our customer satisfaction. What happens when other measures trade off one another?



Often, if we improve the time it takes to fix a bug, we increase staffing costs (if satisfaction stays the same). Our outcome isn't better than our starting point (and the normalized performance shape is the same size as the goal shape).

### **So what can we do about it?**

Representing two measures that trade off in a radar chart is an exercise in futility. In the short term, **drop one of the measures that trade off and add another that might have a different relationship**—in our example, spending on new technology projects. Because two measures trade off, you actually don't need both. You know that the effect on one will have the opposite effect on the other. In the long term, you can add your dropped measure back in to see if the relationship has changed (technology advances might make the trade-off less or different).

### **The Last Word (for now)**

Even with their limitations, radar charts are valuable tools. They help focus an organization on the bundle of behaviors necessary to achieve critical objectives. Executives can focus on outcomes while line managers/engineers can look at the behaviors and processes that drive the outcomes.

Just read the warning label for radar charts and call me in the morning.

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<sup>i</sup>There are several very good critiques of radar charts. One of the best is by Graham Odds, "A Critique of Radar Charts," and some of these limitations described draw on his discussion <http://www.scottlogic.co.uk/blog/graham/2011/09/a-critique-of-radar-charts/>

<sup>ii</sup>For example, in a mature company, one of the most important outcomes is maximizing profitability. Maximizing profitability requires work on several metrics at once (cost, speed, quality), zeroing in and triangulating the right position to get to this outcome. The Consortium for Service Innovation advocates the use of radar charts for just this kind of "triangulation." See the *Knowledge Centered Support Practices Guide*, specifically the section on "Measures for Individuals and Teams"

[http://www.serviceinnovation.org/included/docs/kcs\\_practicesguide.pdf](http://www.serviceinnovation.org/included/docs/kcs_practicesguide.pdf)

<sup>iii</sup> See Philip Verghis' "Measures, Metrics, and Madness" article for his foundational treatment of the approach that we teach <http://www.verghisgroup.com/wp-content/uploads/2010/05/Measures-Metrics-and-Madness.pdf>