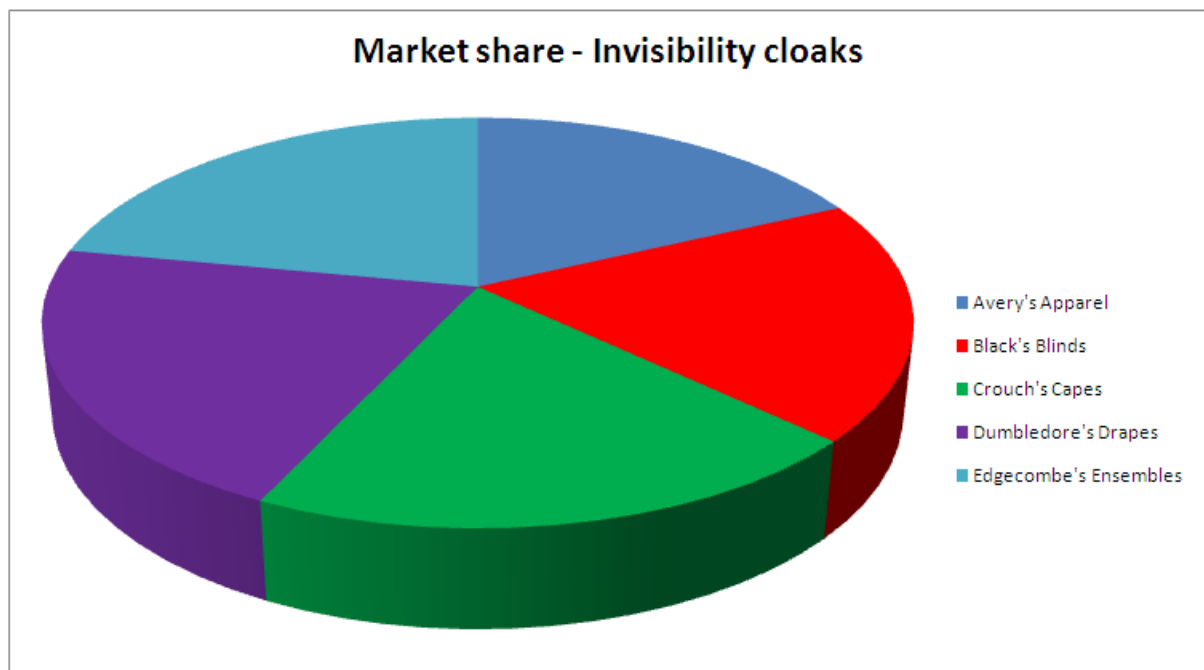


Illustration of Edward Tufte's "First Rule to Live By" in "The Visual Display of Quantitative Information" – and an example of how Microsoft Excel violates it by default. As a refresher, Tufte's Rule #1 states: "The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities represented."

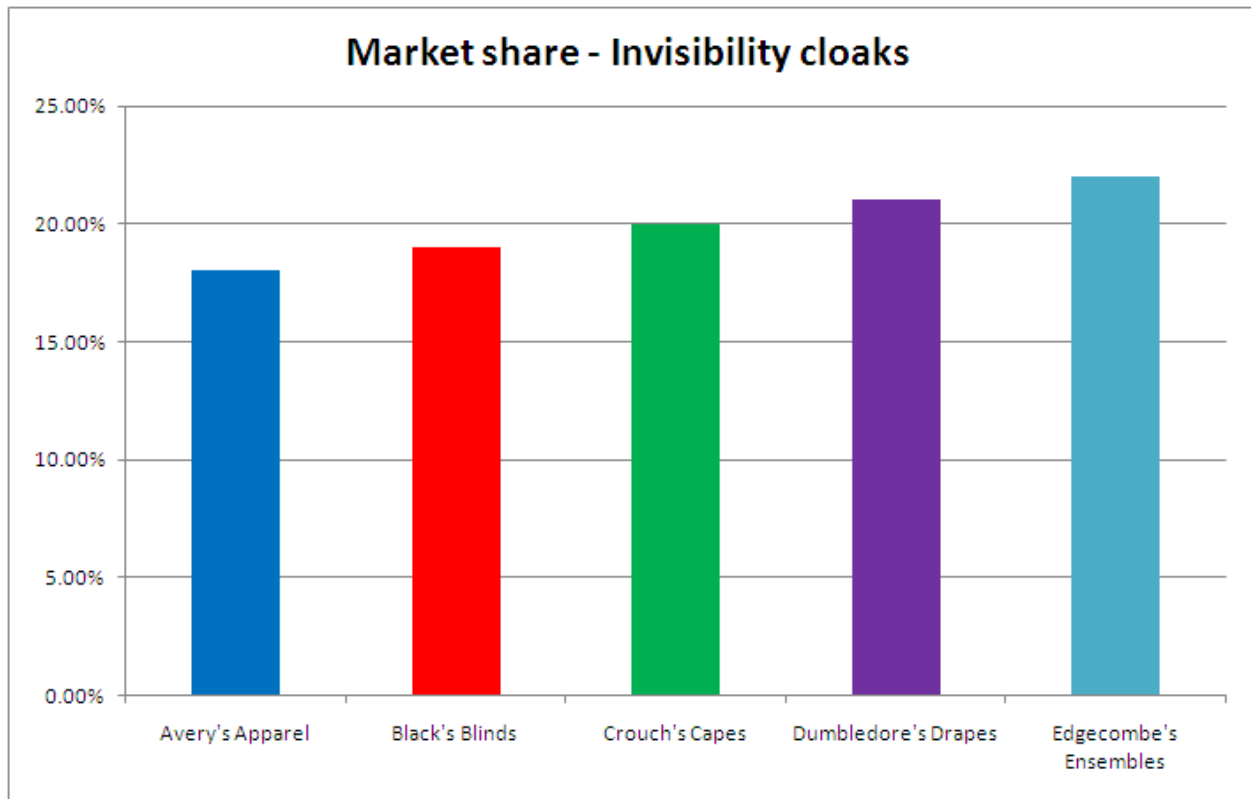
The situation:

The students in this class have been selected to form a venture capital firm. You have each been given \$1M to invest. You need to decide as a group where to invest the group's money. You have decided that you want to invest in a company that is developing an invisibility cloak (think Harry Potter – yes, it's really happening – google "Invisibility cloak" & research & 2009)\*\*. There are five companies in the nascent invisibility cloak market. You want to invest your money in the company that will become king of invisibility cloaks – making you all very, very rich. Your selection process is very simple – you will invest in the company with the largest market share. So which company is that? To help you get a feel for the data, you ask Microsoft Excel to illustrate the data using a pie chart. Here's what you get:

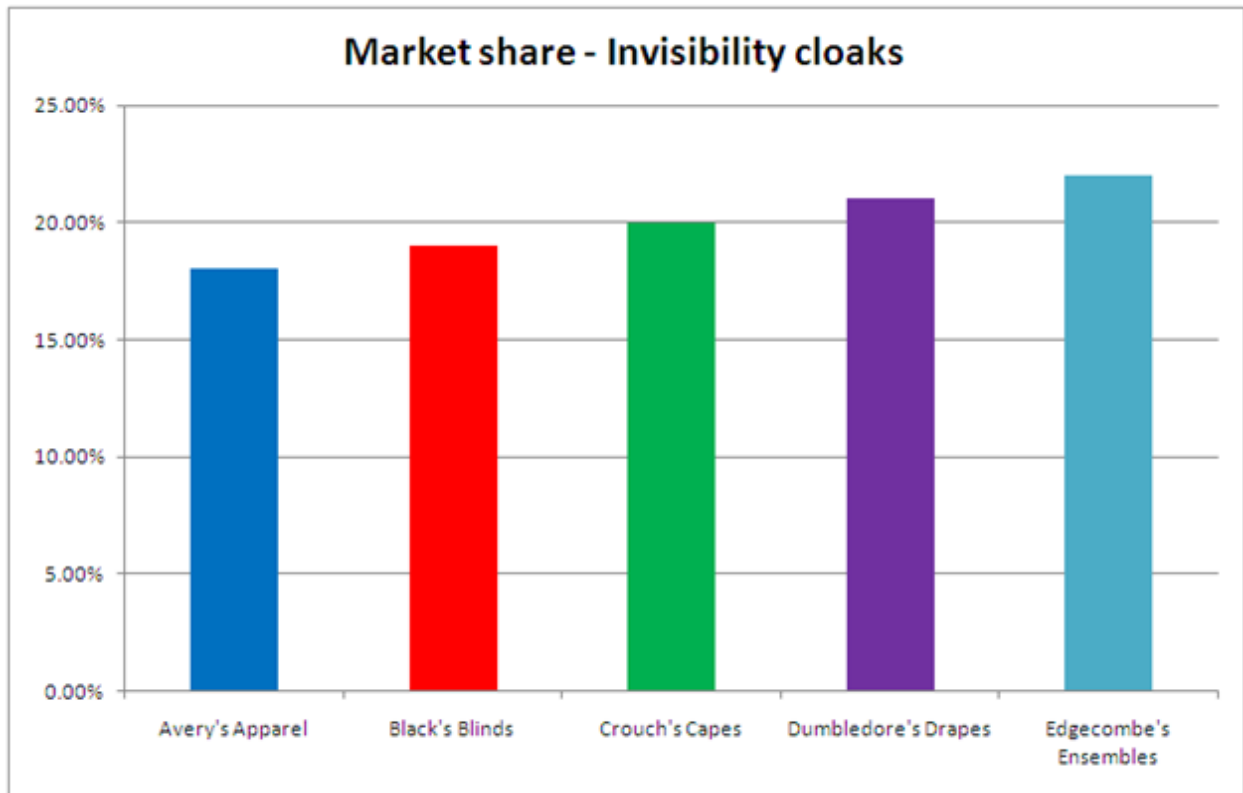
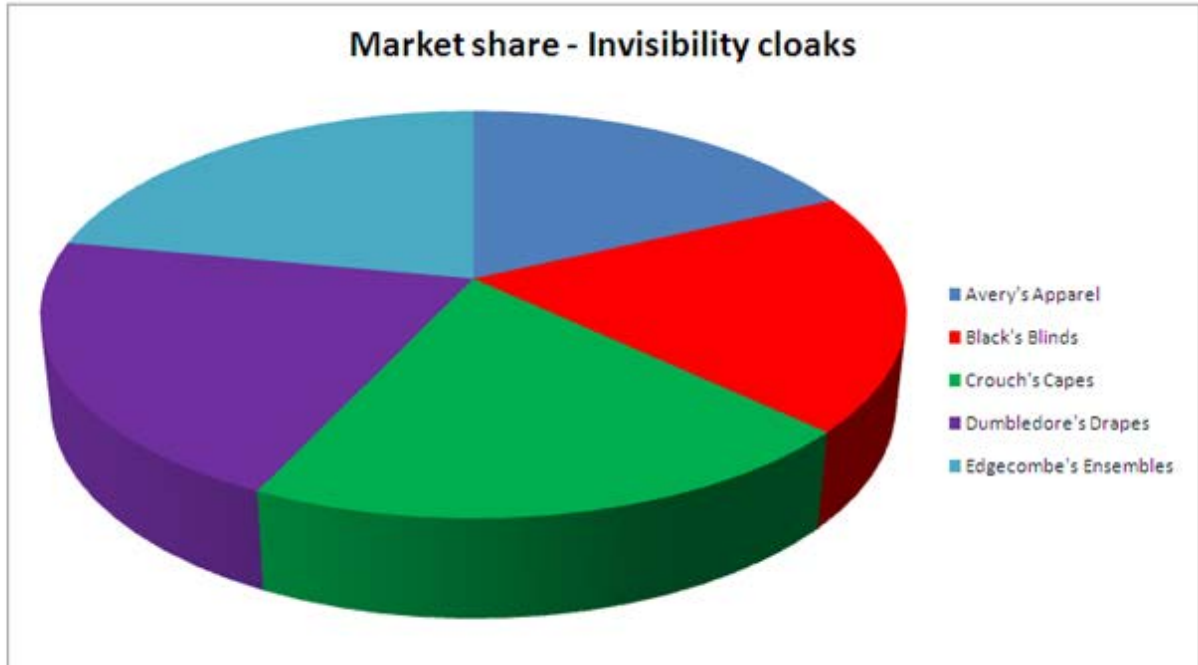


So it's easy to determine which company has the largest market share – right? It's Crouch's Capes. Remember, this pie chart was generated using Microsoft Excel's 3-D Pie Chart Tool using default settings – the only customization performed was to select colors that were more readily distinguishable.

It just so happens that one of the researchers who invented the invisibility cloak (Xiang Zhang) is in the room and has read Edward Tufte's "The Visual Display of Quantitative Information" and recognizes a problem with three-dimensional pie charts. So he asks if the same data can be displayed as a bar chart. The result is on the next page:



Wait! How can that be? The numbers changed! Let's compare the two charts a little closer (see next page):



How can it be that Crouch's Capes looks like the winner in the 3-D pie chart and Edgecombe's Ensembles looks like the winner in the bar chart? Let's look at the actual data:

Company	Market share
Avery's Apparel	18.00%
Black's Blinds	19.00%
Crouch's Capes	20.00%
Dumbledore's Drapes	21.00%
Edgecombe's Ensembles	22.00%

So Edgecombe's Ensembles is the winner. It's just that in the 3-D pie chart, Crouch's Capes looks larger for two reasons:

1. Because you see the "front" of the Crouch's slice in addition to the top – something you don't see for the other slices (or at least not as much).
2. The way the "top" of the chart is angled causes some distortion – although less distortion than that cause by item #1 above.

Students should remember this when presenting data, as violating the rules of data display can lead to incorrect conclusions. Remember – be wary of data display software!

\*\*Note: The research currently being done that could eventually lead to an invisibility cloak is at the "proof of concept" level. The basic concept has been proven. There are no reliable estimates for if and when an invisibility cloak might be commercializable.