

Using Basic Data Visualization Methods to Explore LibQUAL+[®] Data

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Graphs help us comprehend data more thoroughly and effectively

- Reveal patterns, trends, and exceptional values
- Enable quick and repeated comparisons of large collections of data.
- Facilitate a “feel” of the data

“[Graphs] extend the capacity of our memory, making available in front of our eyes what we couldn’t otherwise hold all at once in our minds. In simple terms, information visualization helps us think.”

- Stephen Few (2009)

Radar Charts

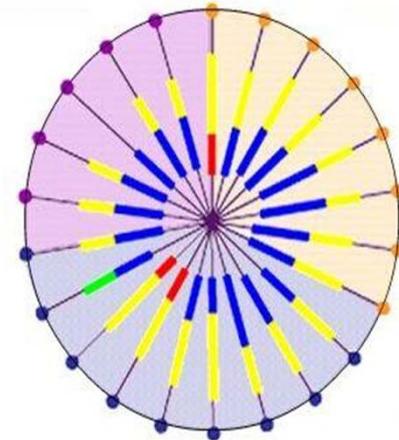
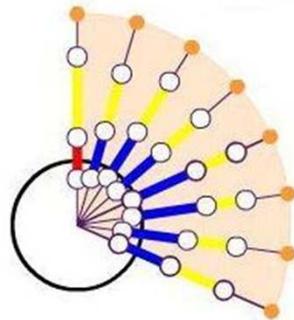
- Hallmark LibQUAL+[®] graphic
- Rich summary of mean service quality findings
- Positive and negative adequacy and superiority gaps encoded in yellow/blue/red/green scheme

Radar Charts

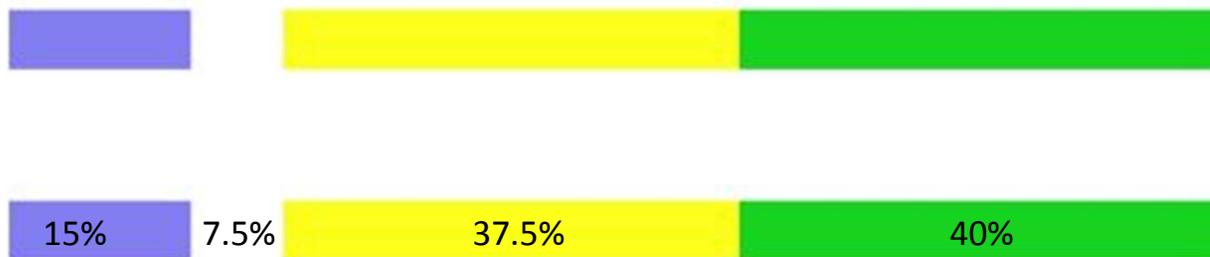
- Complexity can make them difficult to interpret
- Unfamiliar style may discourage novices from examining the charts closely
- Visual comparisons must be made along spokes of the radial

Radar Charts

Spokes are actually 'stacked bars'

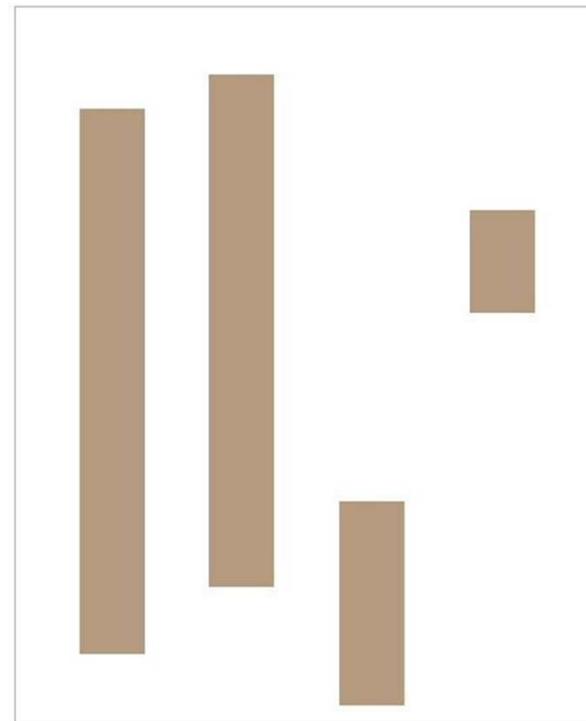
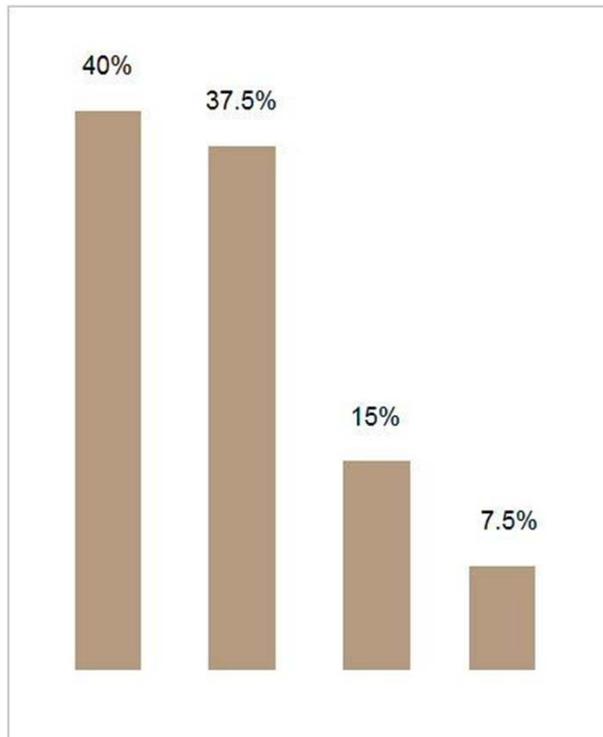


Stacked bars not ideal for visual estimation of length



Colors also can interfere with perception of bar lengths.

Monochrome, parallel, aligned bars (or lines) are the optimal format for visual comparisons of lengths



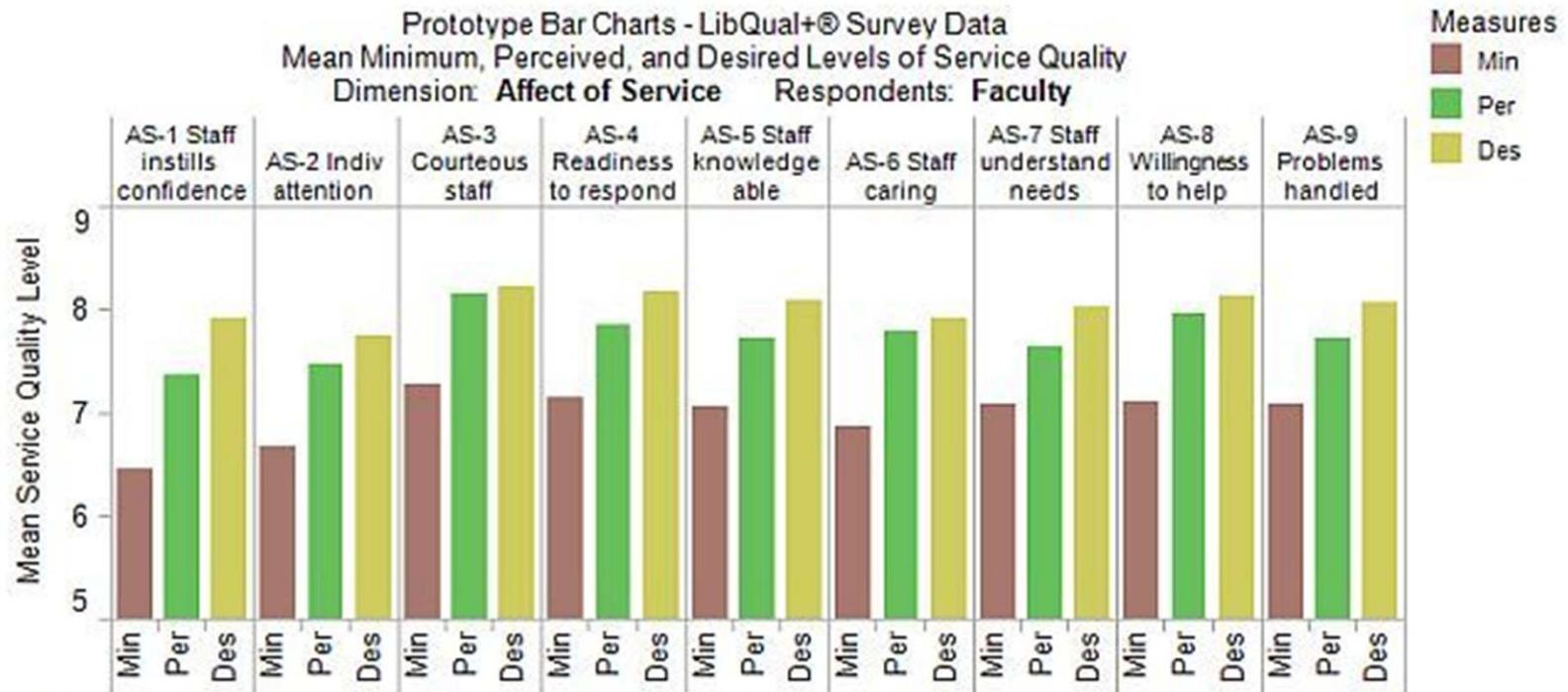
Bar charts can supplement radar charts

- Allow more accurate assessment of detailed comparisons
- Allow 'drill down' to see details
- More comprehensible format for beginners

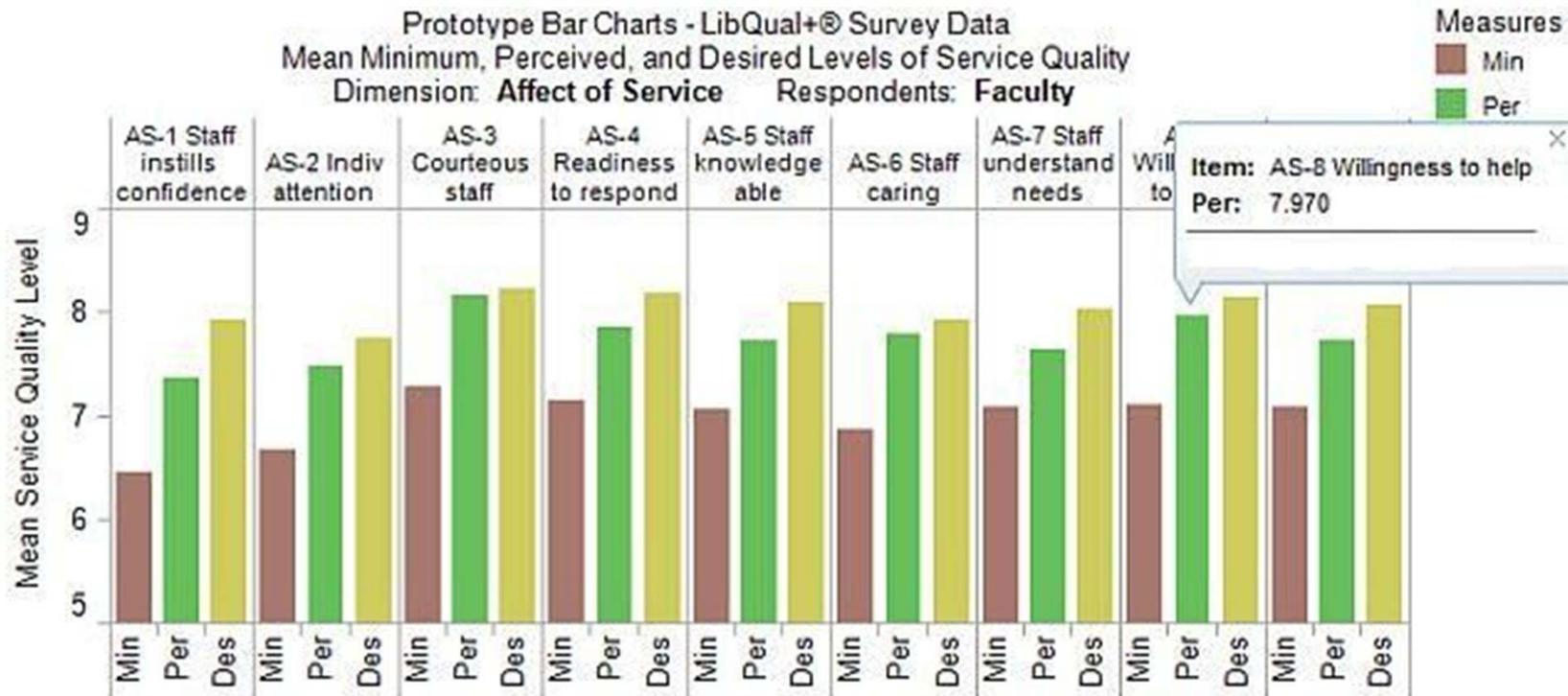
Charts presented here developed using Tableau Software (public version)

- Quick chart development; advanced features set
- Includes interactive graphic features

Example bar chart: Items 1 - 9

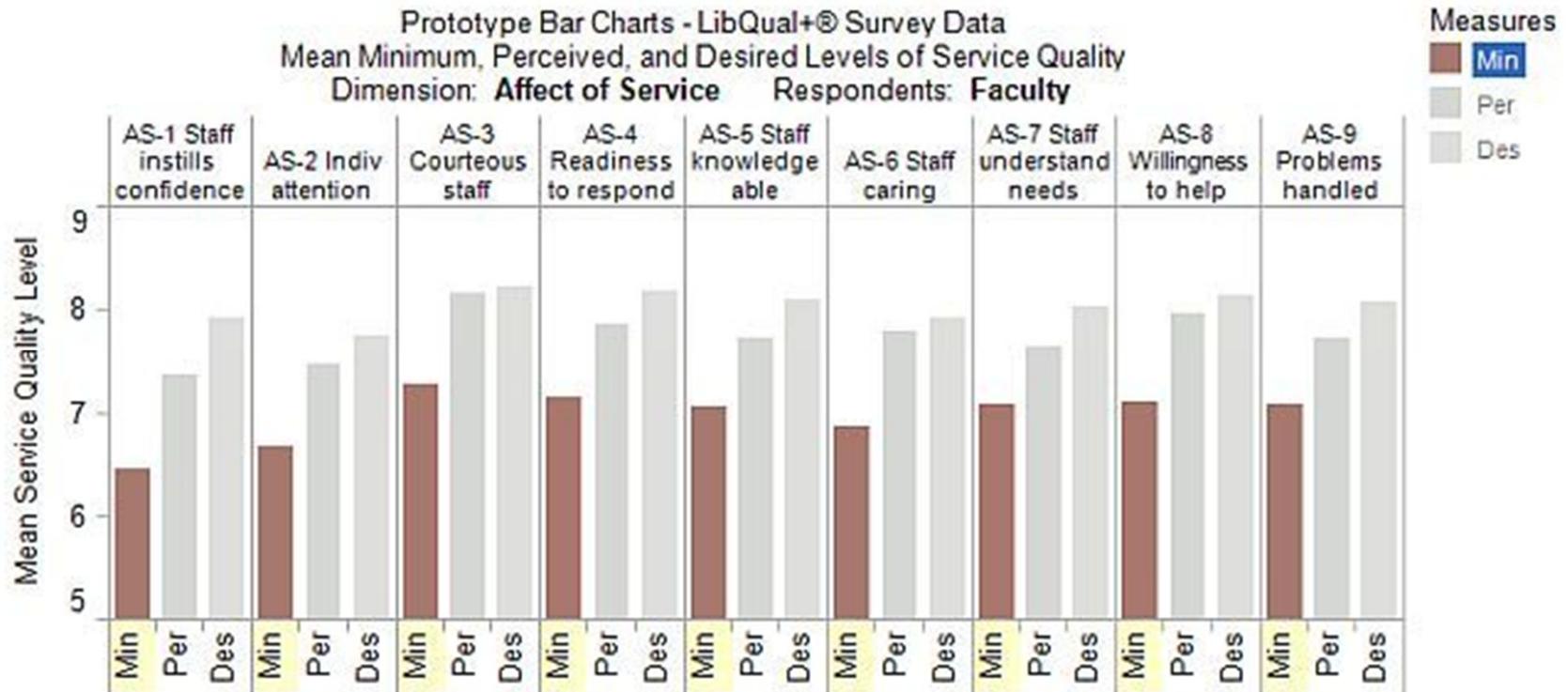


Example interactive feature



Hovering cursor over bar reveals bubble with data values.

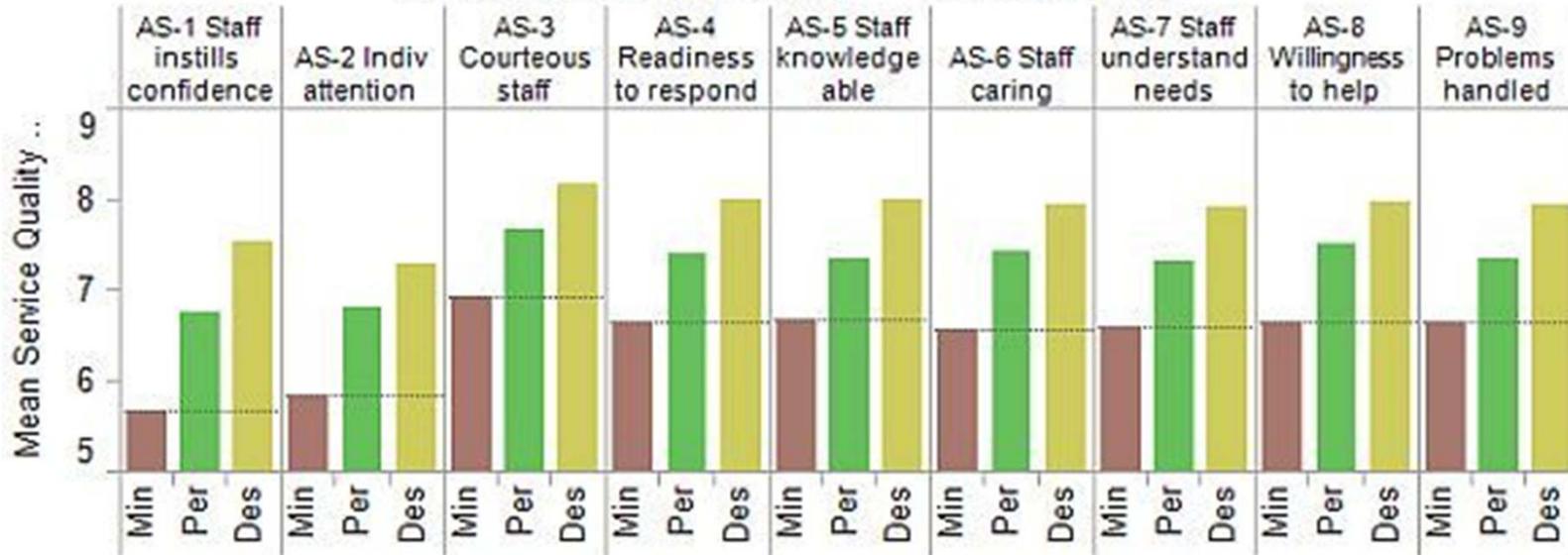
Example interactive feature:



Selecting Min(imum) in chart legend highlights that measure; other bars grayed out

Prototype Bar Charts - LibQual+® Survey Data
 Mean Minimum, Perceived, and Desired Levels of Service Quality
 Dimension: **Affect of Service** Respondents: **All**

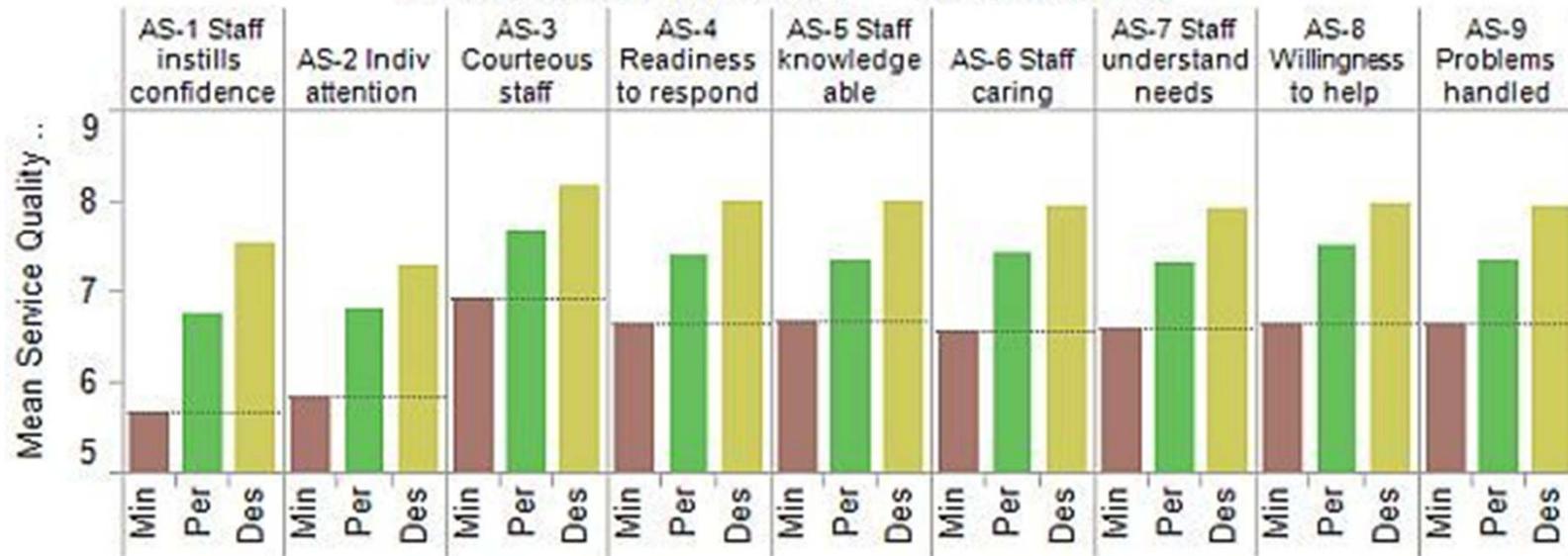
Measures
 Min
 Per
 Des



Dotted horizontal line helps visual assessment of heights of Per(ceived) and Des(ired) measures relative to Min(imum)

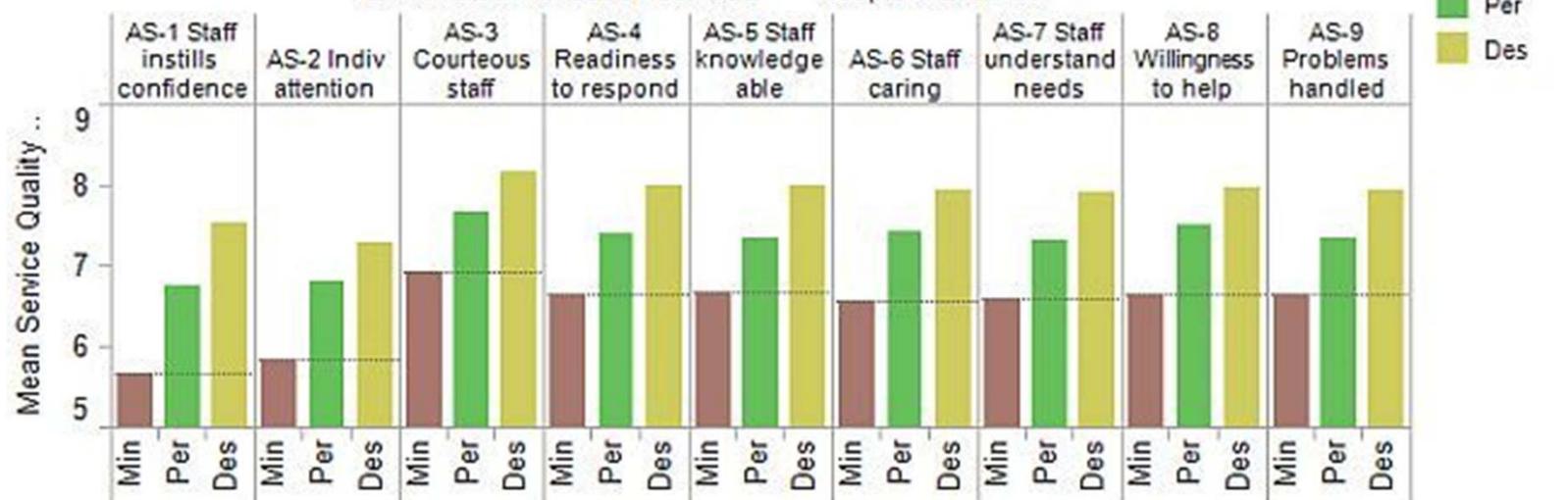
Prototype Bar Charts - LibQual+® Survey Data
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Measures
 Min
 Per
 Des

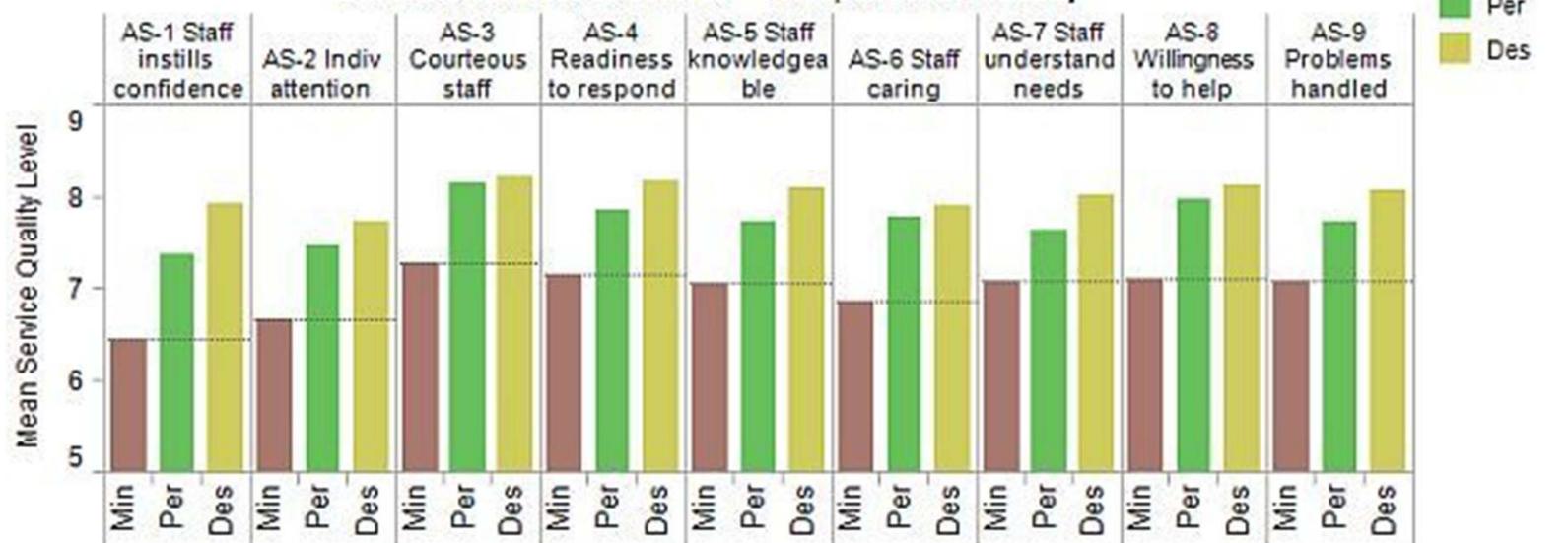


Caution: Zero point omitted from this style of chart. Use them to compare distances only between bar tops, not entire bar lengths.

Prototype Bar Charts - LibQual+® Survey Data
 Mean Minimum, Perceived, and Desired Levels of Service Quality
 Dimension: **Affect of Service** Respondents: **All**



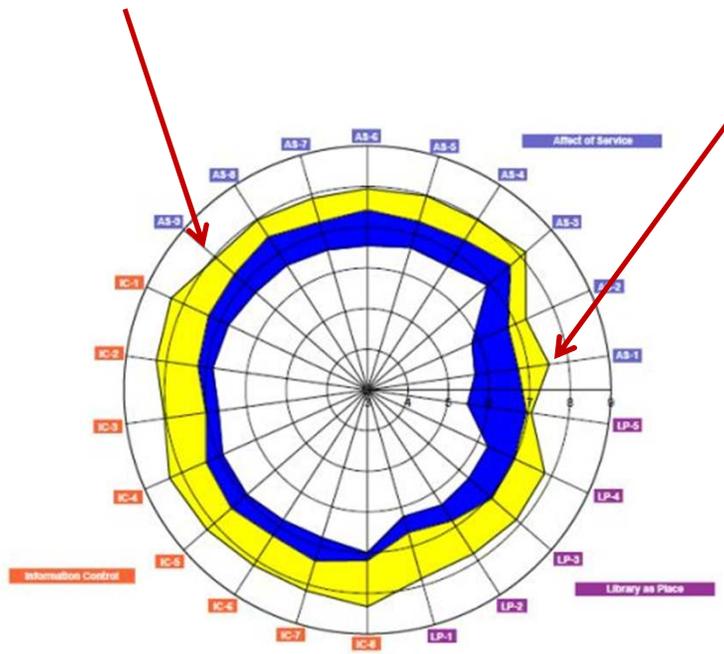
Prototype Bar Charts - LibQual+® Survey Data
 Mean Minimum, Perceived, and Desired Levels of Service Quality
 Dimension: **Affect of Service** Respondents: **Faculty**



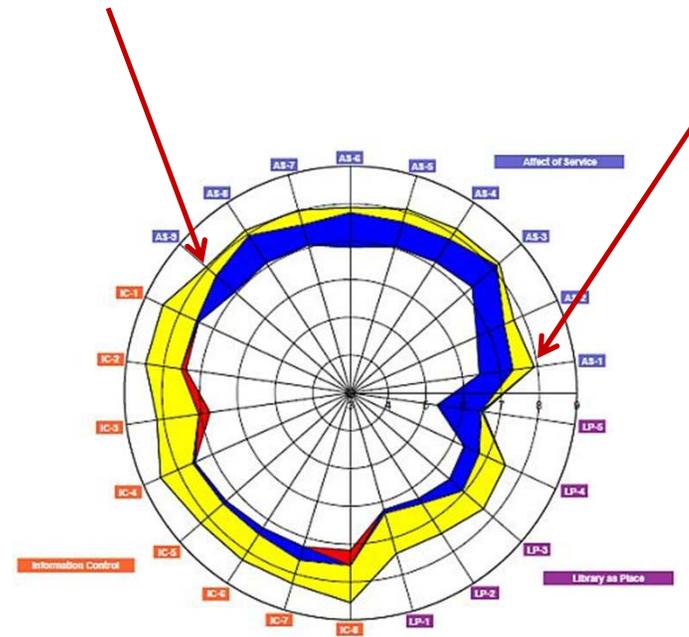
Example patterns identifiable in charts*

- *Faculty report about the same levels of desired quality as all respondents.*
- *Faculty mean minimum expectations are slightly (about 0.3) higher than all respondents*
- *Faculty rate for the first two affect of service items higher*
- *Faculty report consistently (about 0.4) higher mean perceived levels than respondents.*

* See prior slide showing All and Faculty respondents



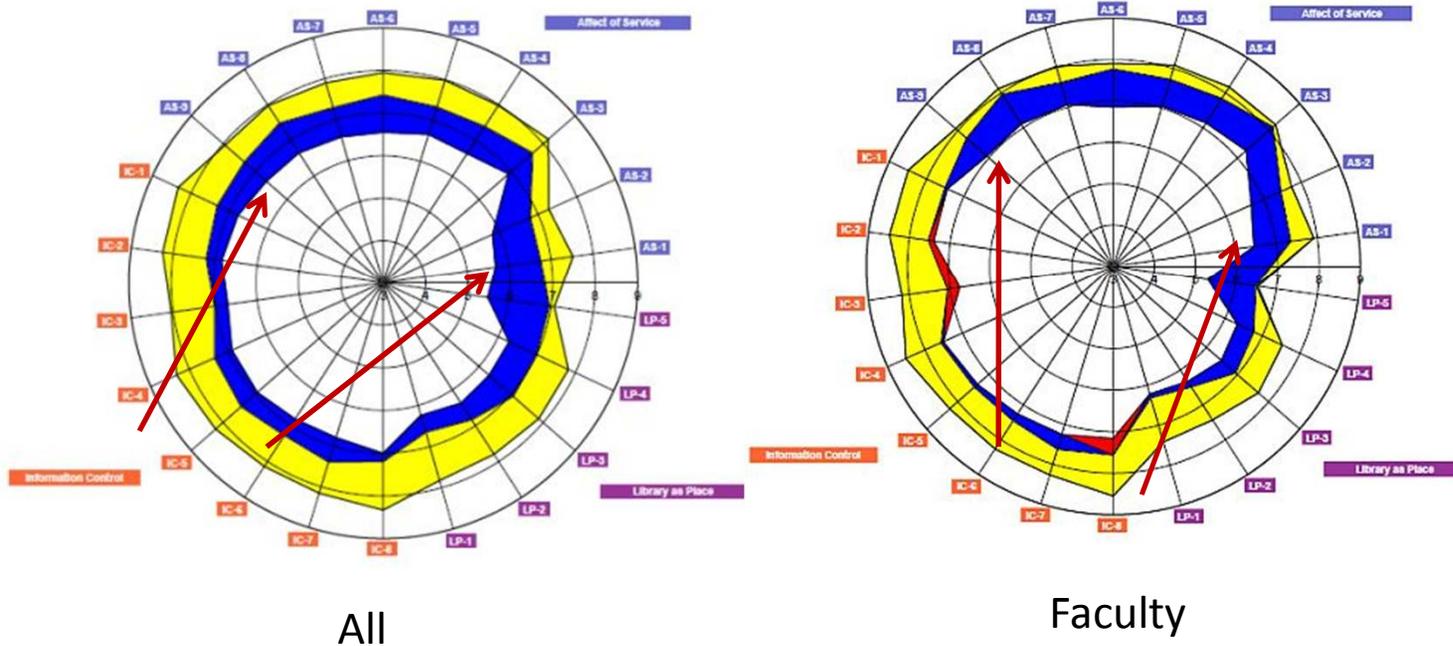
All



Faculty

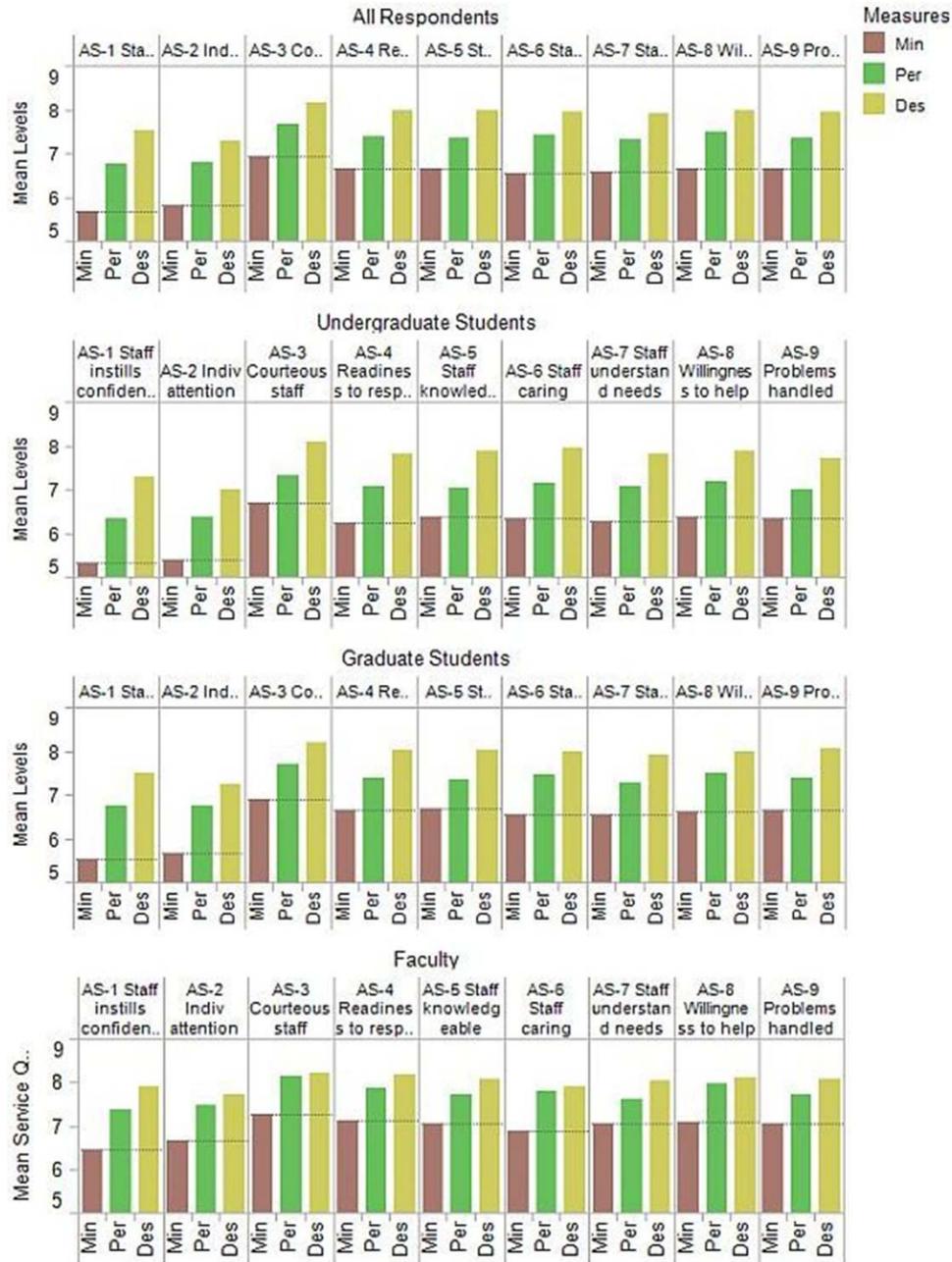
Pattern: For affect dimension items, upper edge of yellow areas in two charts nearly identical

Interpretation: Faculty report about the same levels of desired quality as all respondents

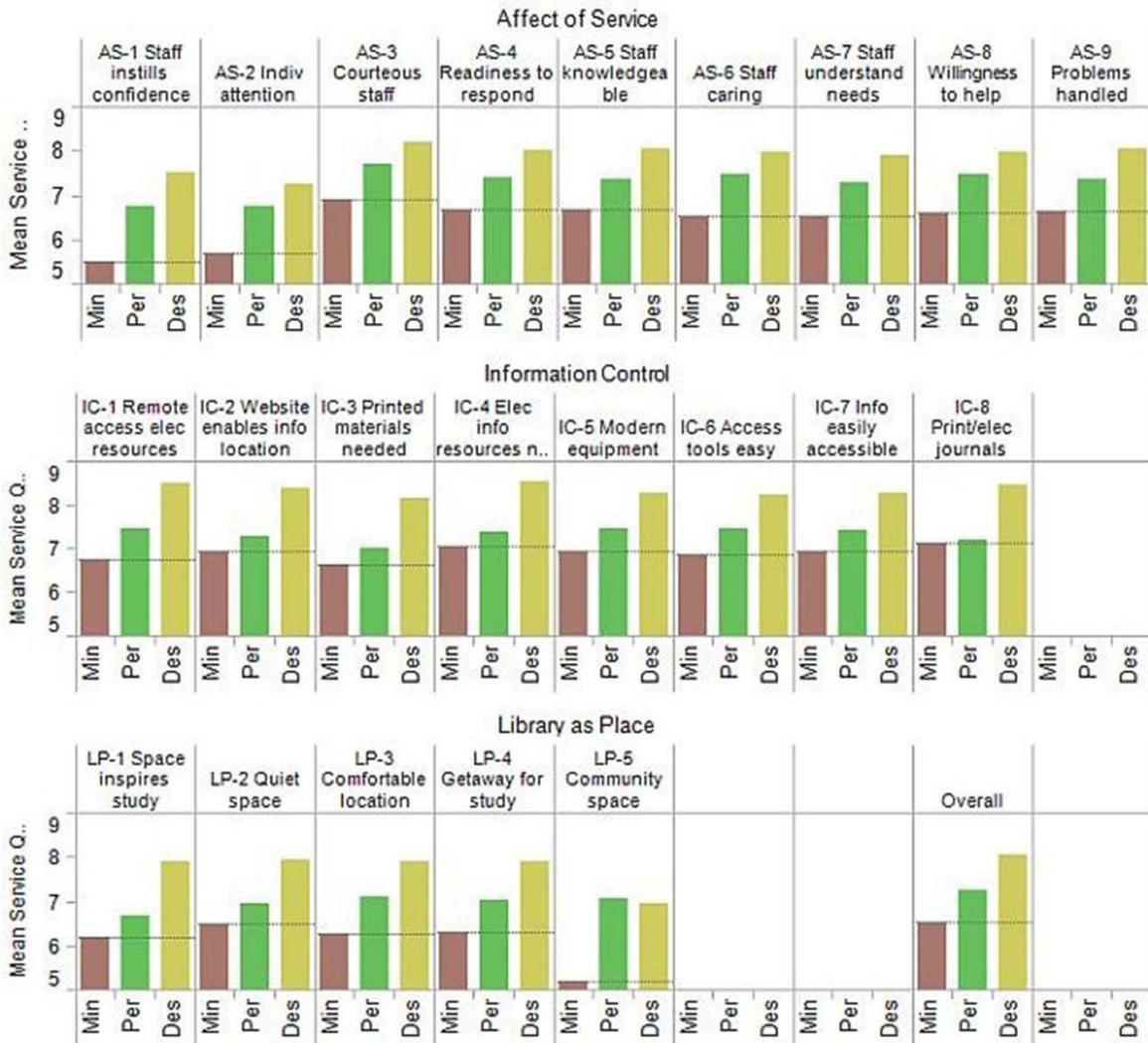


Pattern: In Faculty chart, for affect dimension items, lower edge of blue areas is further from center than corresponding blue edge for All respondents

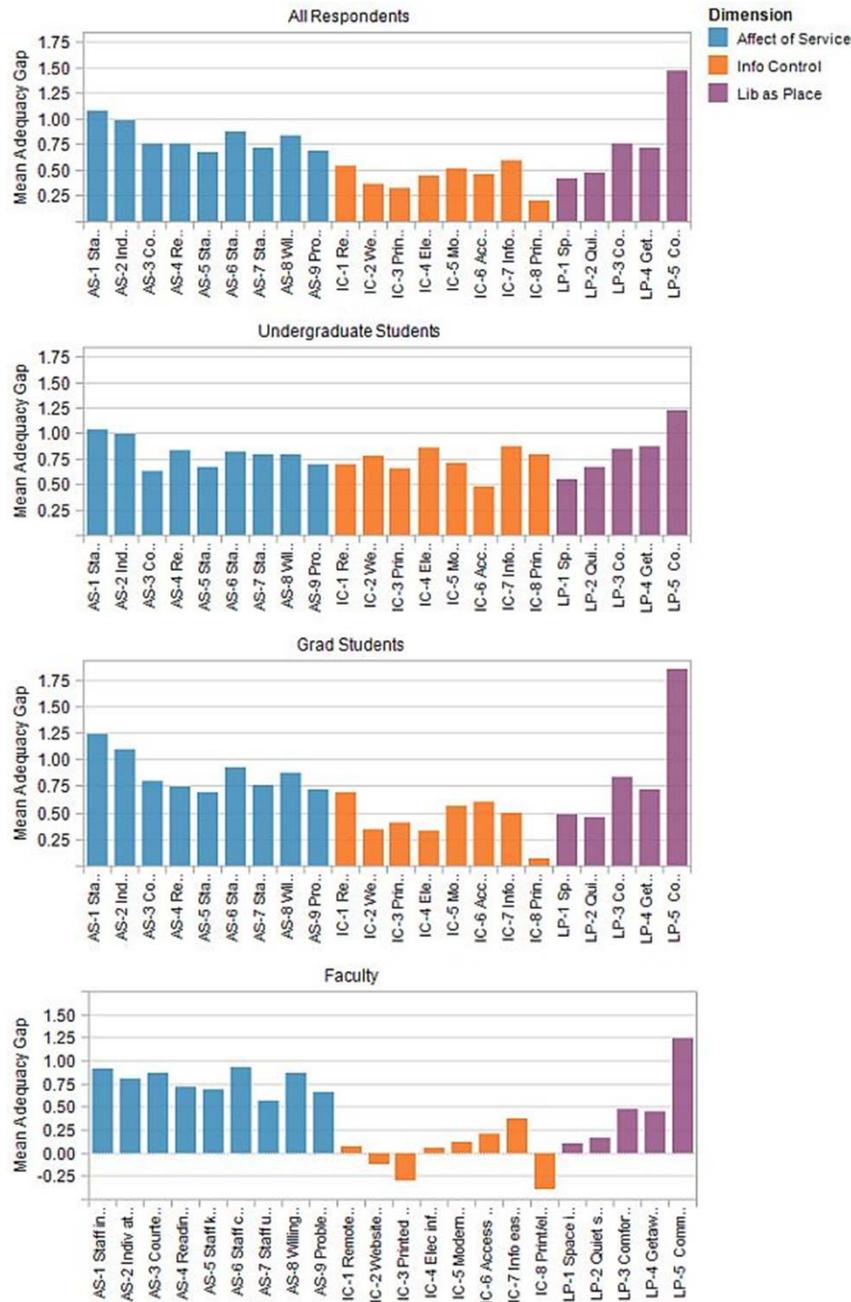
Interpretation: Faculty mean minimum expectations are slightly (about 0.3) higher than all respondents



Different groups' responses on one dimension can be visually compared in a single arrangement of bar charts (aka a *trellis display*)

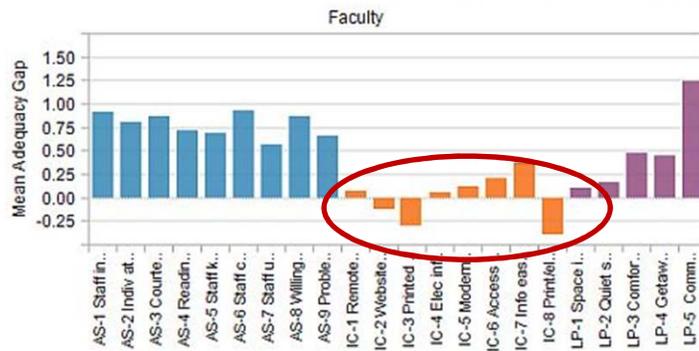
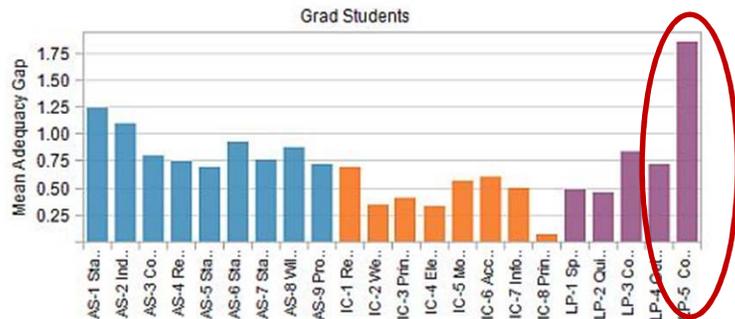
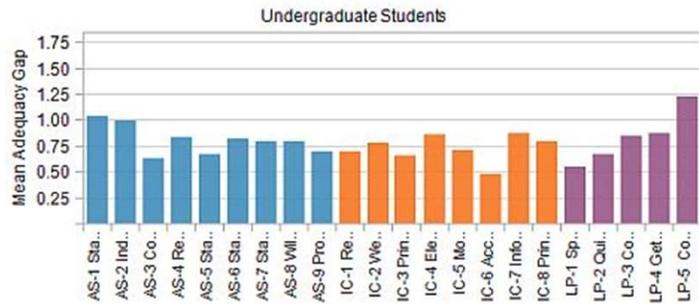
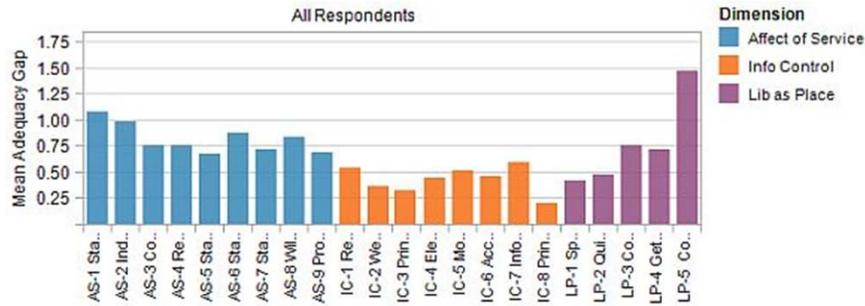


Responses on all dimensions for one respondent group can be visually compared in a single arrangement of bar charts

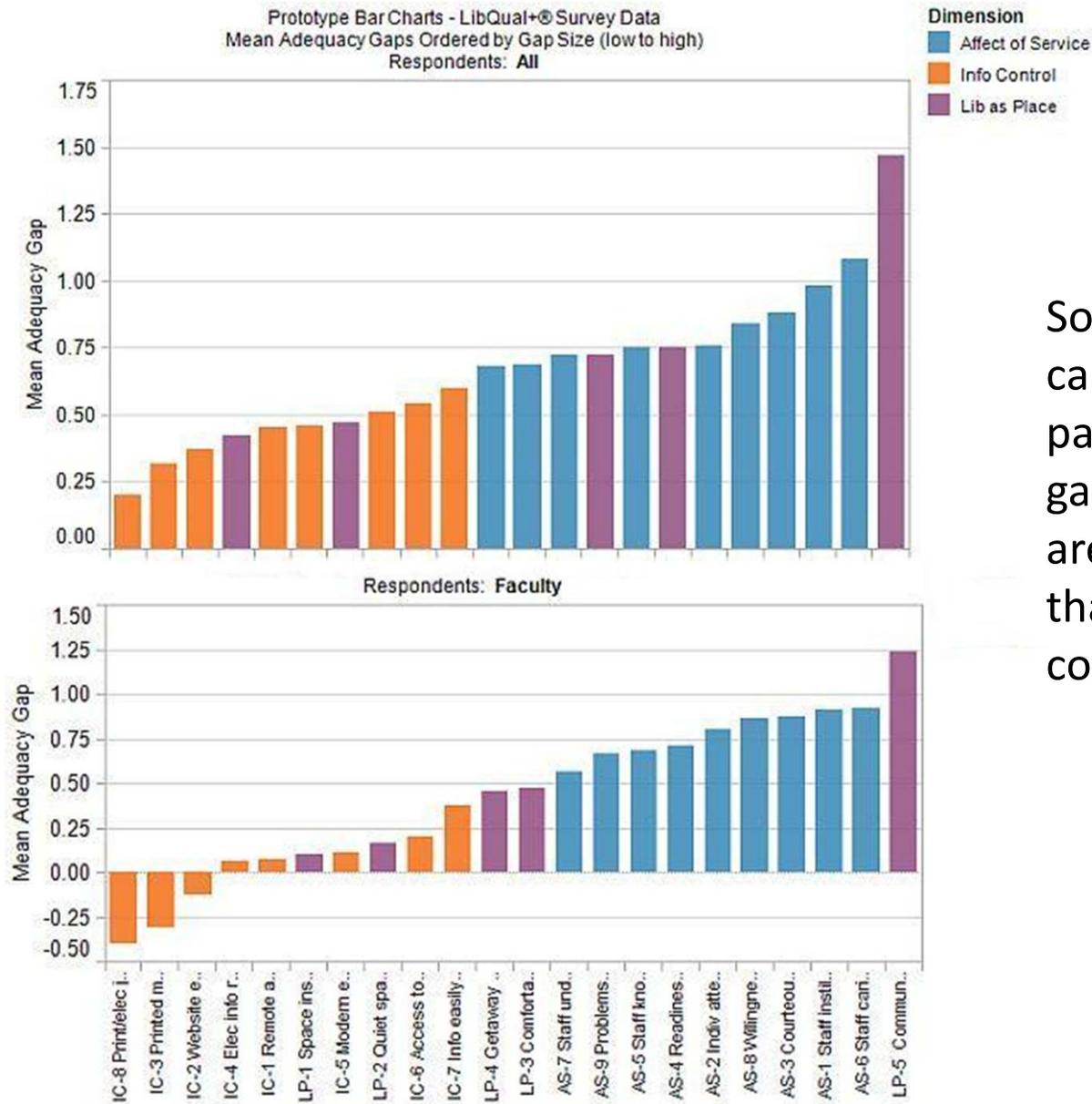


Adequacy gaps on all dimensions for multiple respondent groups can be visually compared in a single arrangement of bar charts*

* Unlike radar charts, these charts do not simultaneously depict respondents ratings of service quality level and adequacy and superior gaps

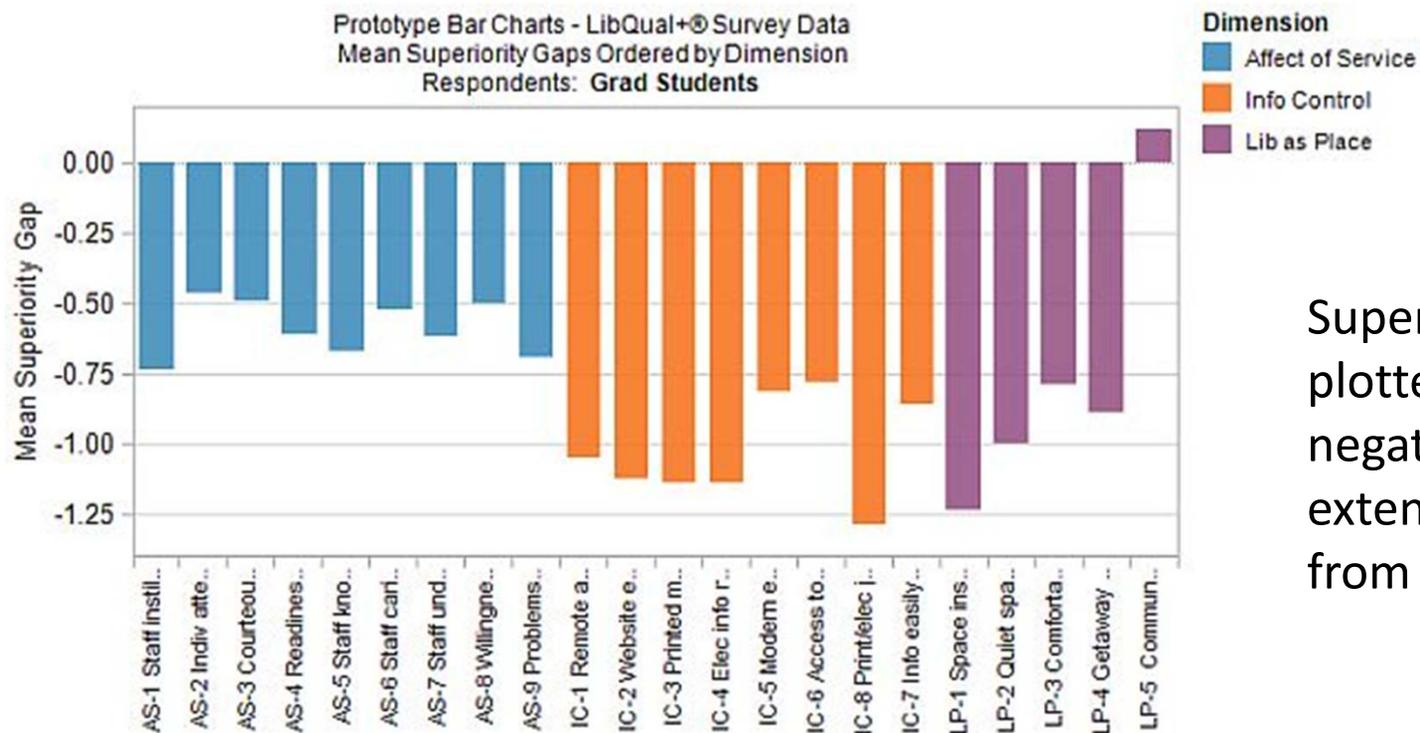


Exceptional values are readily visible in a bar chart format

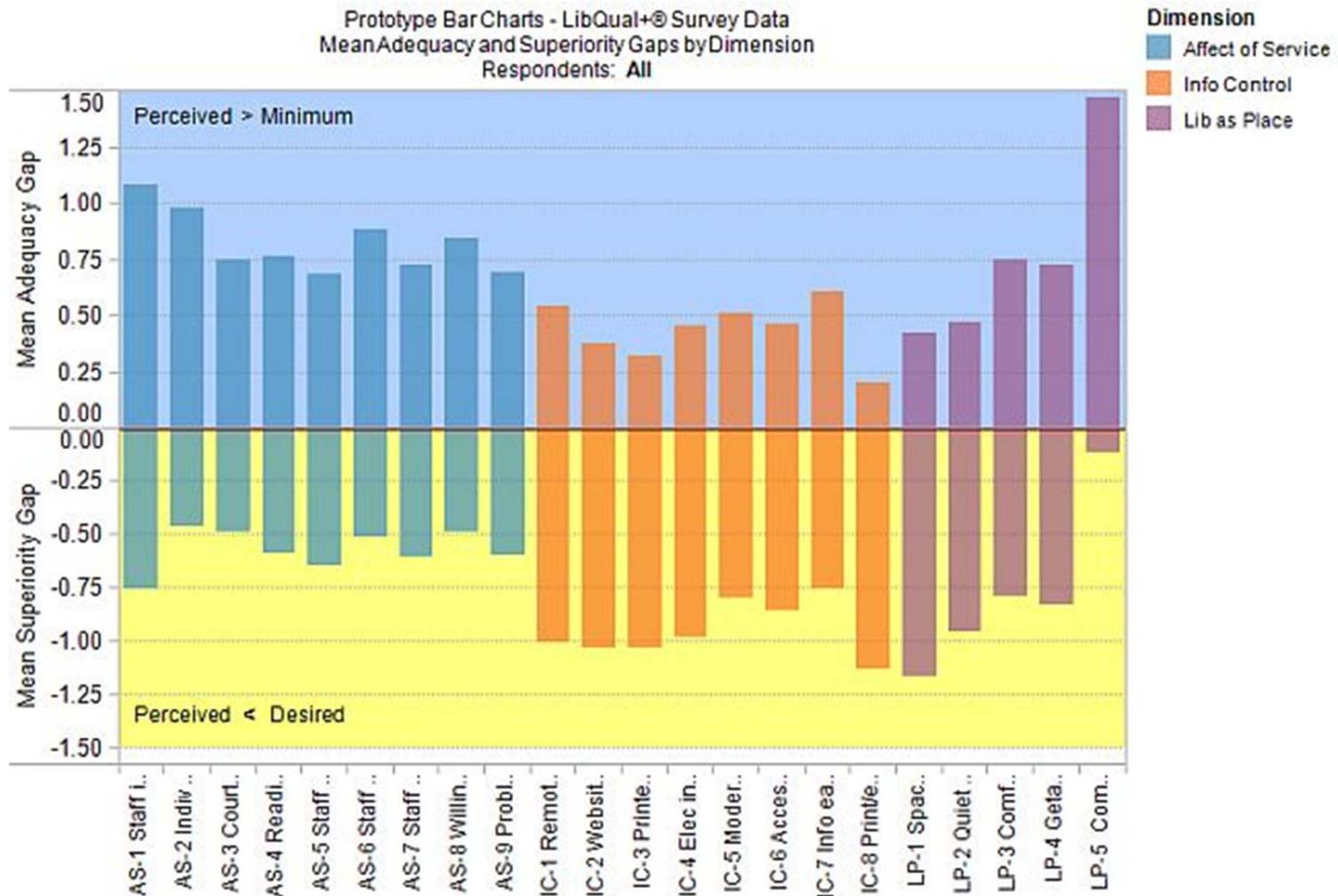


Sorting adequacy gaps can reveal important patterns. For both groups, gaps for affect of service are considerably larger than those for information control.

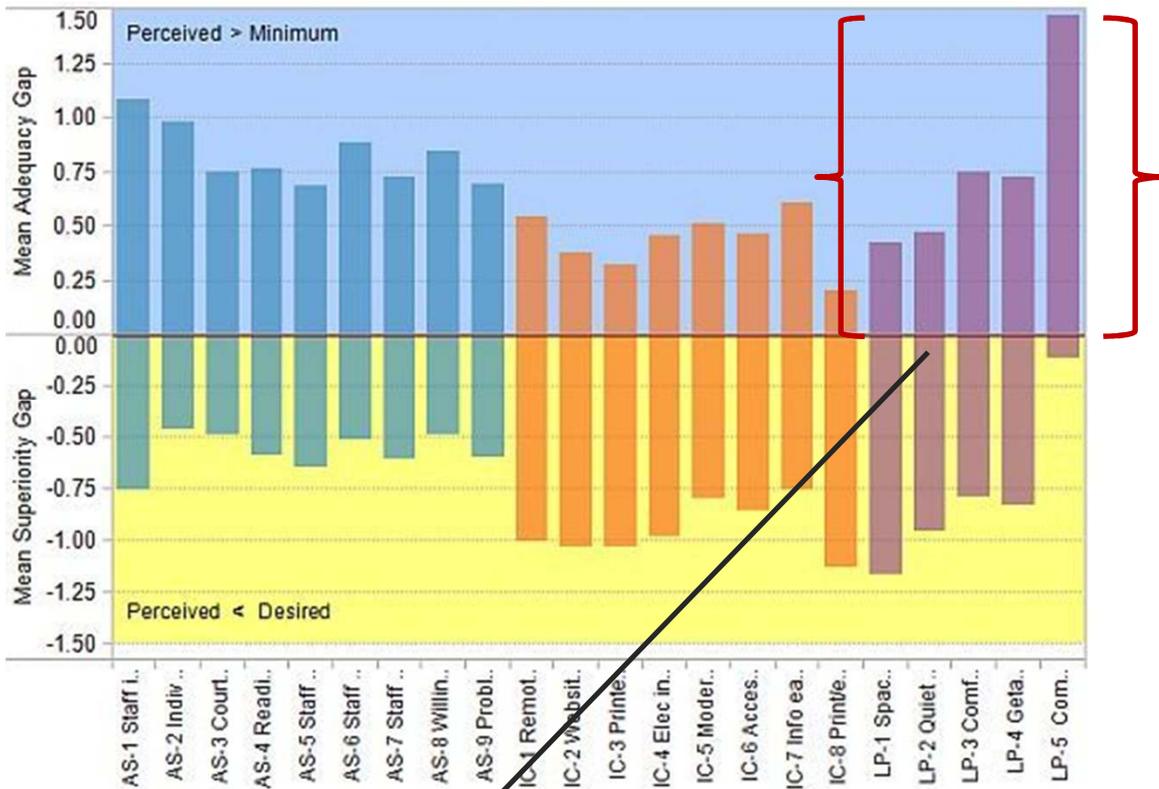
Prototype Bar Charts - LibQual+® Survey Data
 Mean Superiority Gaps Ordered by Dimension
 Respondents: Grad Students



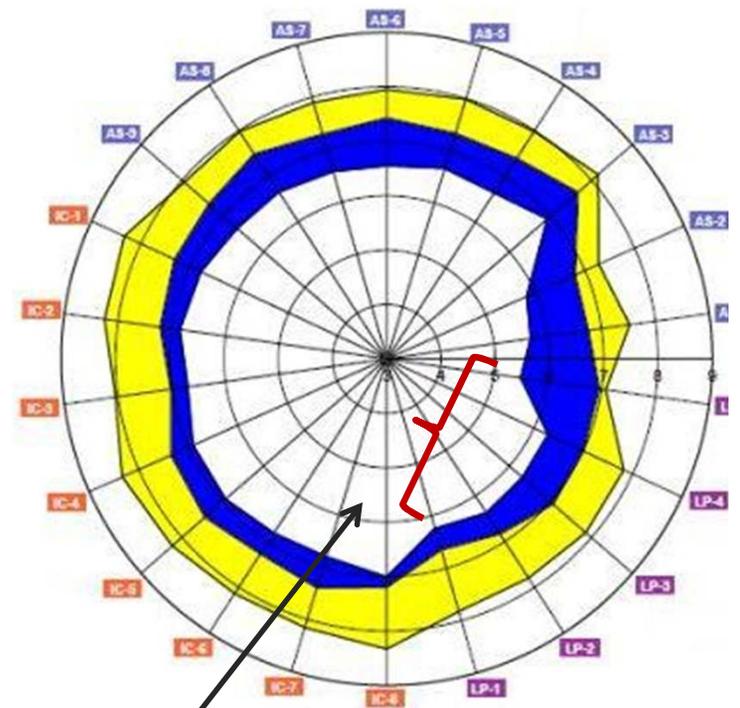
Superiority gaps are plotted here as negative numbers, extending downward from the zero line



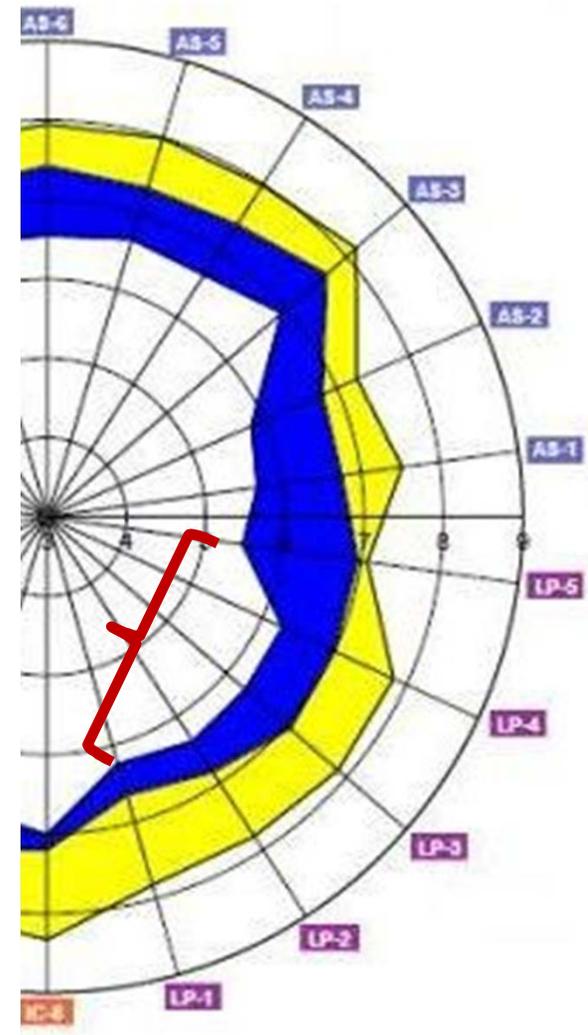
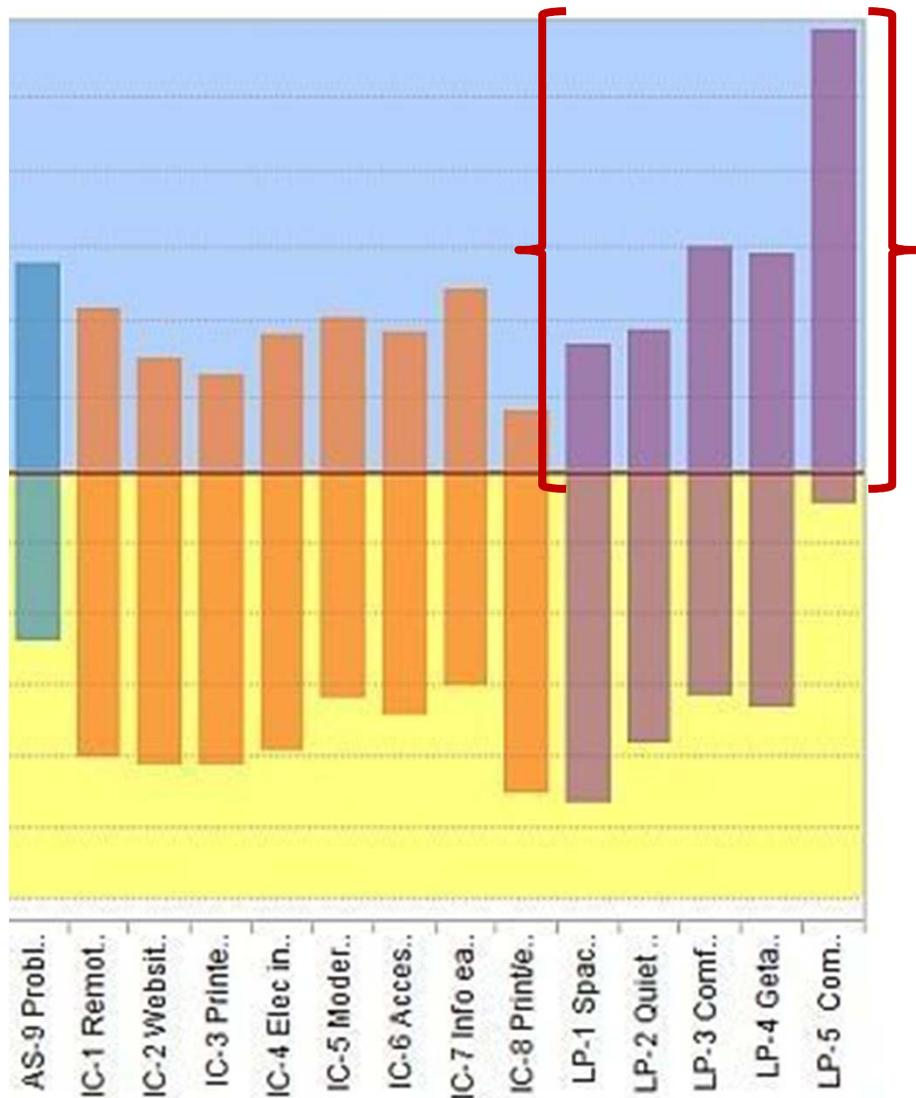
Adequacy and superiority gaps plotted on a single chart



Lengths of these Library as Place gaps correspond with ...



... the thickness of blue Library as Place region here

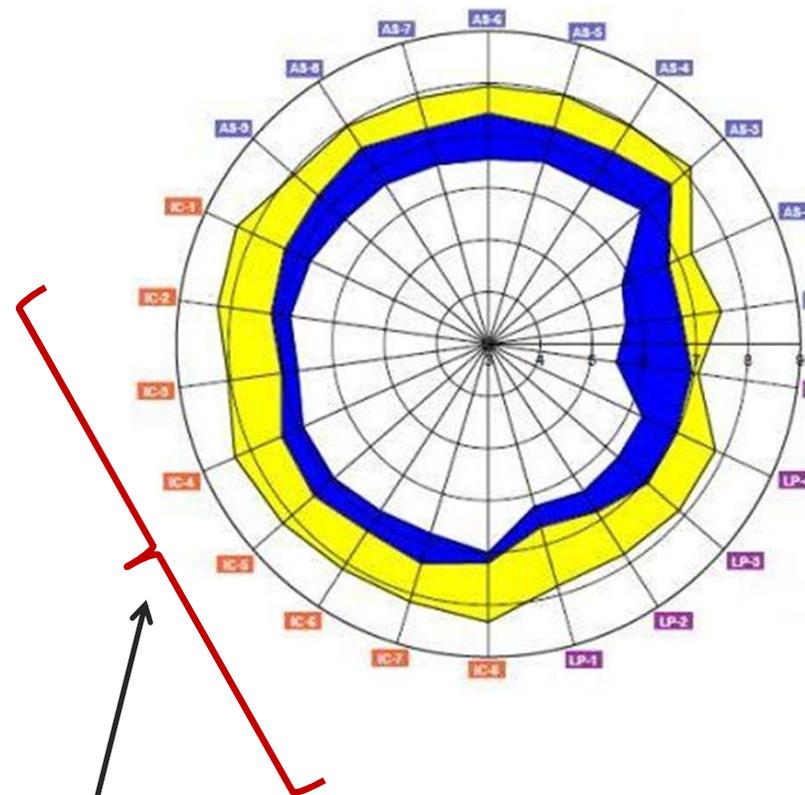


A closeup view from the previous slide...



Lengths of these Information Control gaps correspond with ...

... the thickness of yellow Information Control region here



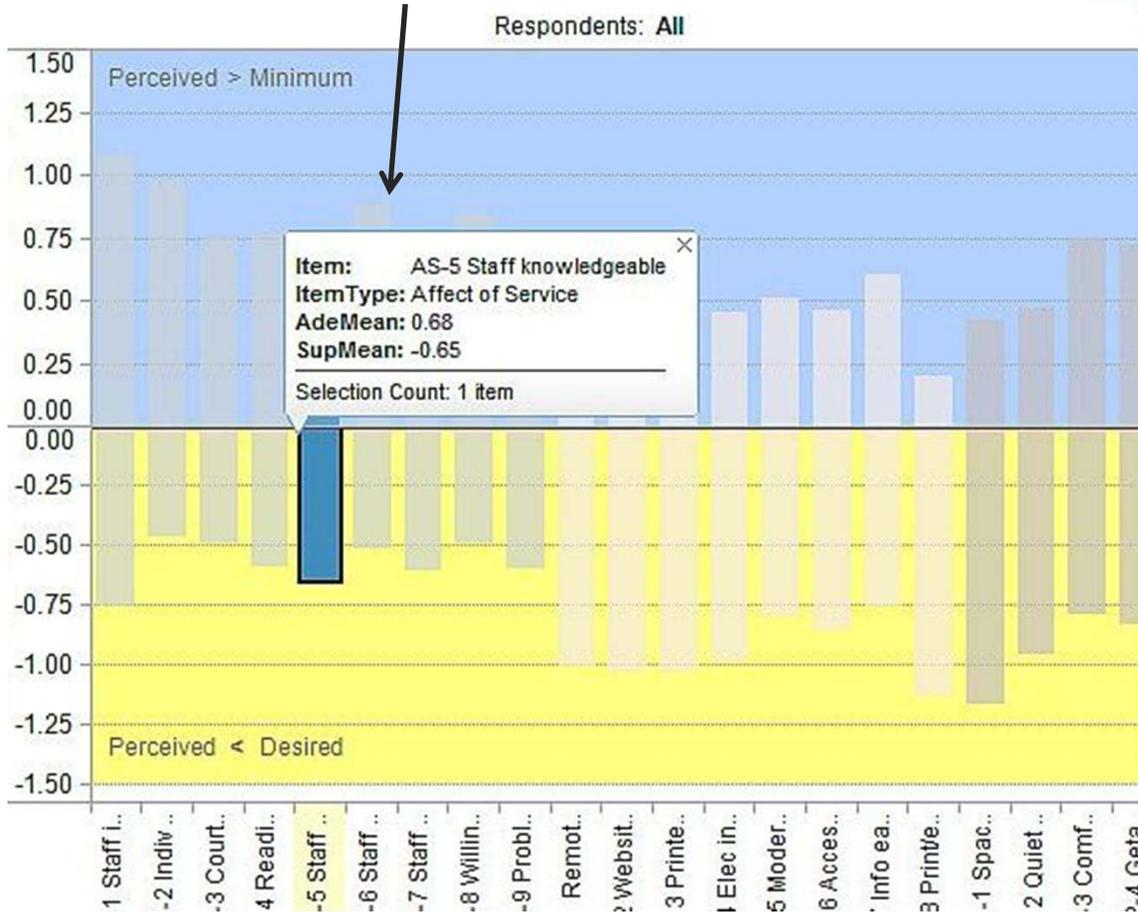
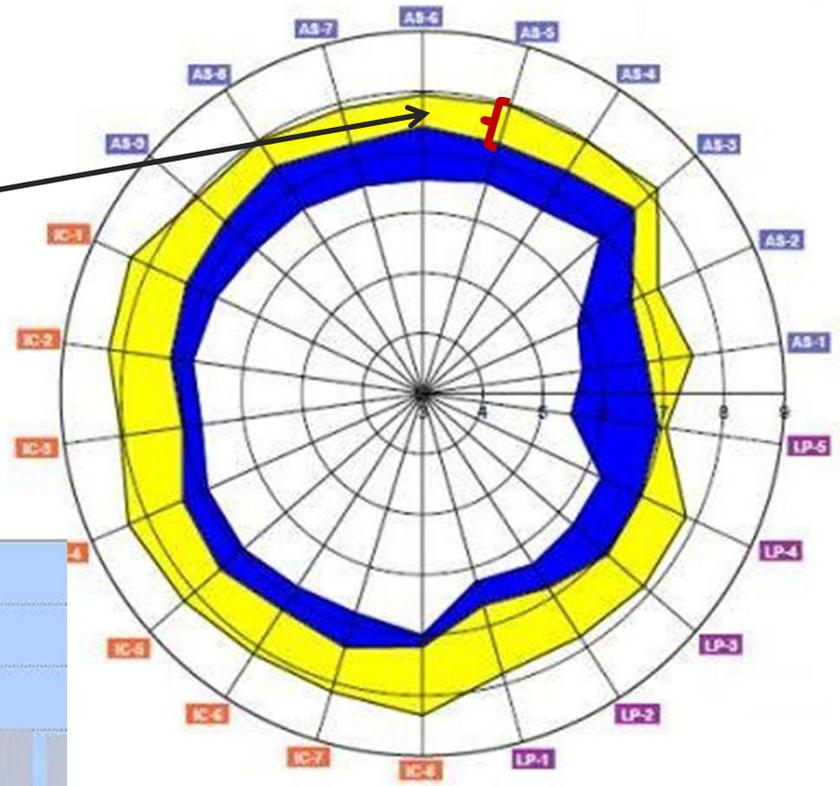
Linked Highlighting

- Interactive graphic technique
- Causes a user selection in one chart to be reflected in related chart
- Facilitates data exploration by guiding user to alternate depiction of the same data
- Link may be to data details or data summaries

Linked Highlighting Example

Clicking on yellow region of AS-5 spoke here ...

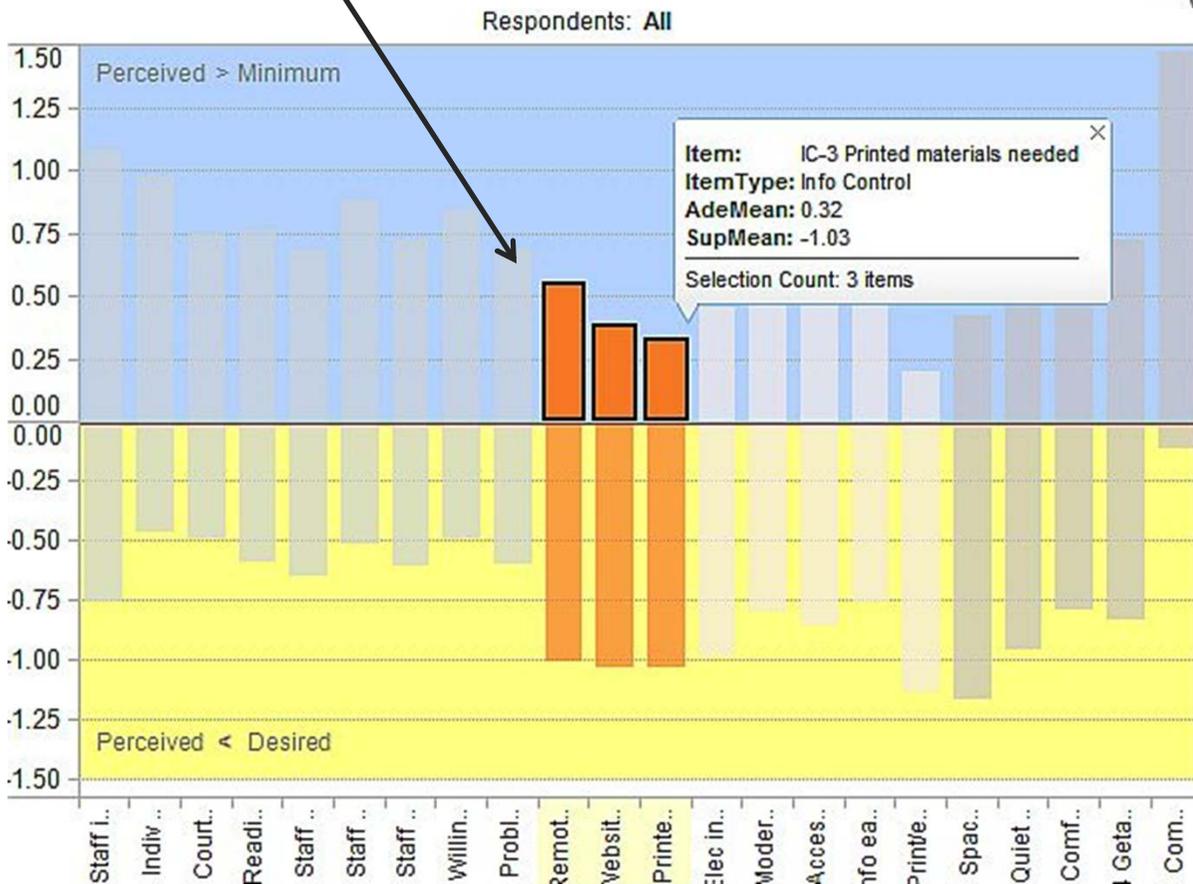
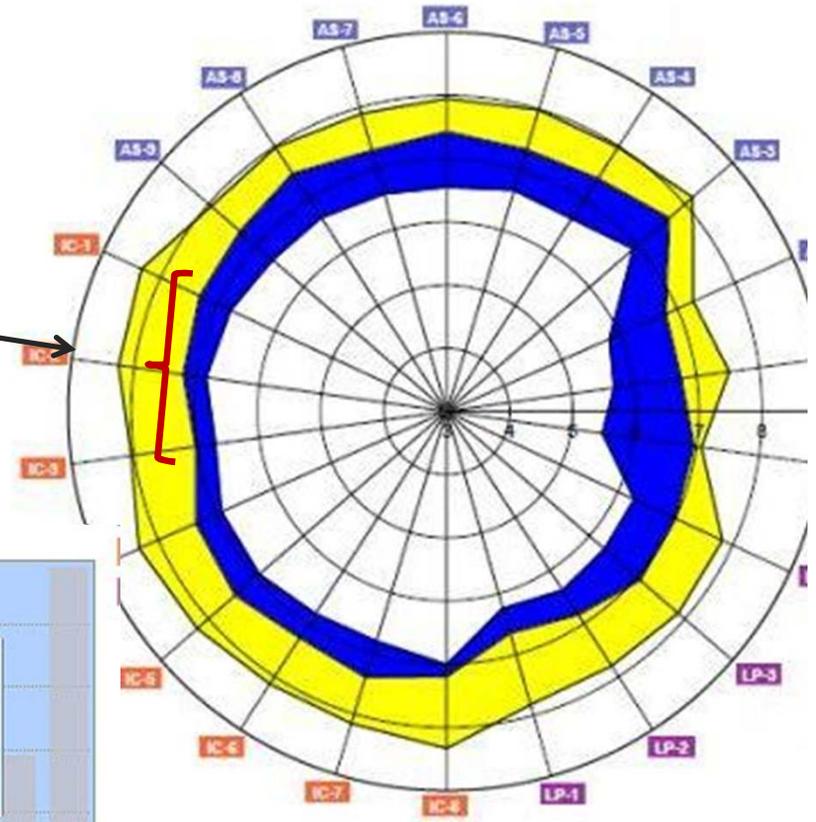
... highlights same item in bar chart.



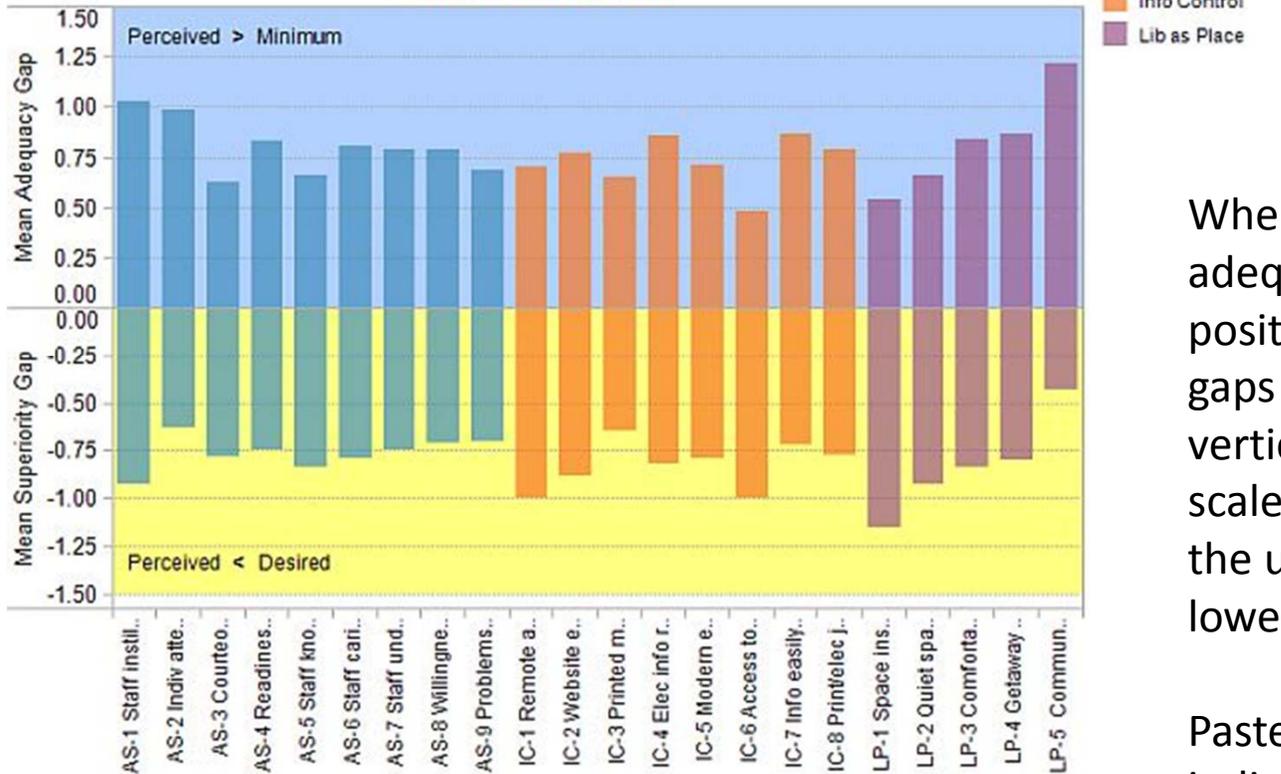
Linked Highlighting Example

Clicking on blue region for items IC-1, IC-2, and IC-3 here ...

... highlights same items in bar chart.



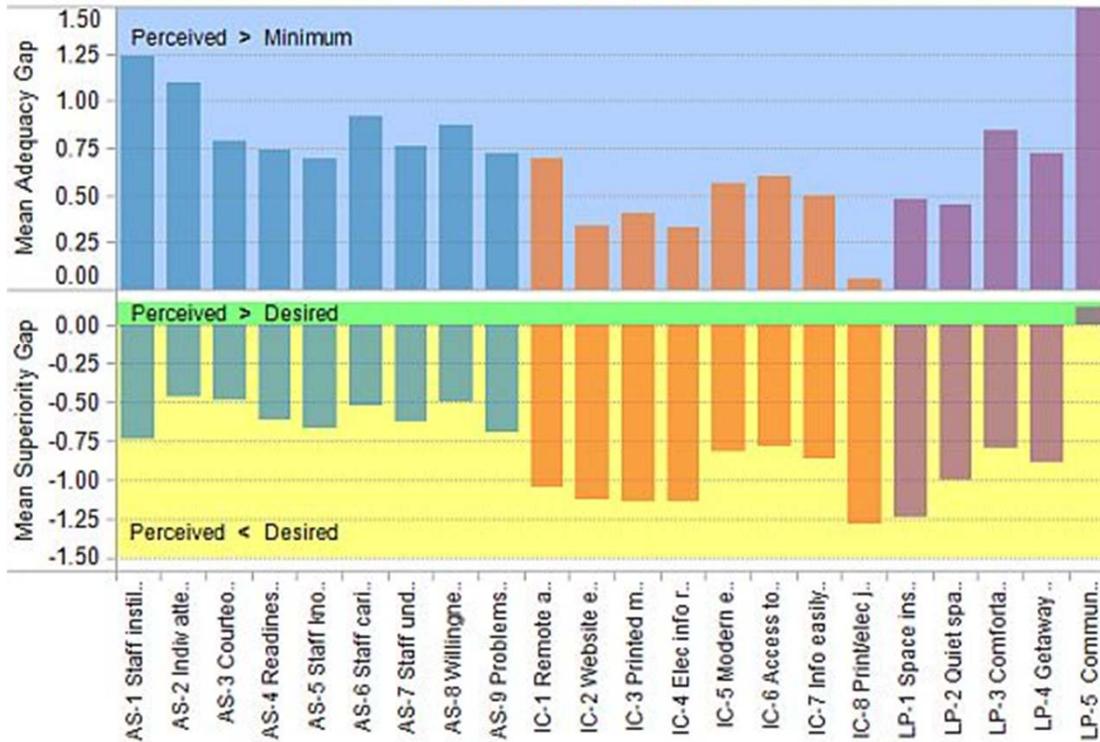
Prototype Bar Charts - LibQual+® Survey Data
 Mean Adequacy and Superiority Gaps by Dimension
 Respondents: Undergrads



When a respondent group's adequacy gaps are all positive and its superiority gaps all negative, the chart's vertical axis is a continuous scale with zero separating the upper half from the lower half.

Pastel blue and yellow indicate positive adequacy gaps and negative superiority gaps, respectively.

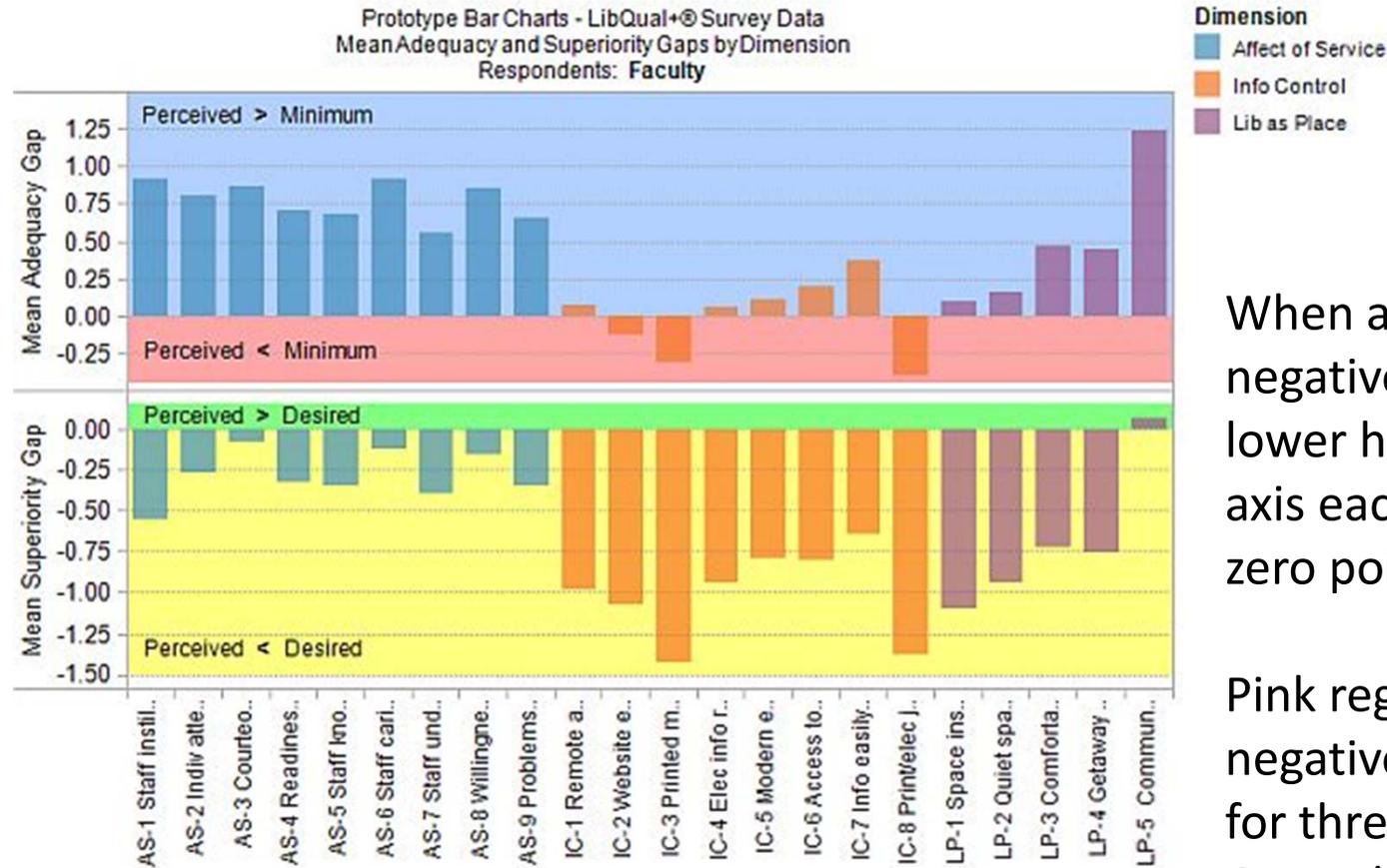
Prototype Bar Charts - LibQual+® Survey Data
 Mean Adequacy and Superiority Gaps by Dimension
 Respondents: Grad Students



When a superiority gap is positive, the chart's vertical axis is not continuous. Instead, two zero points are visible in the middle of the axis, one in the upper half one in the lower.

This thin green region here denotes positive superiority gap for item LP-5.

Prototype Bar Charts - LibQual+® Survey Data
 Mean Adequacy and Superiority Gaps by Dimension
 Respondents: Faculty



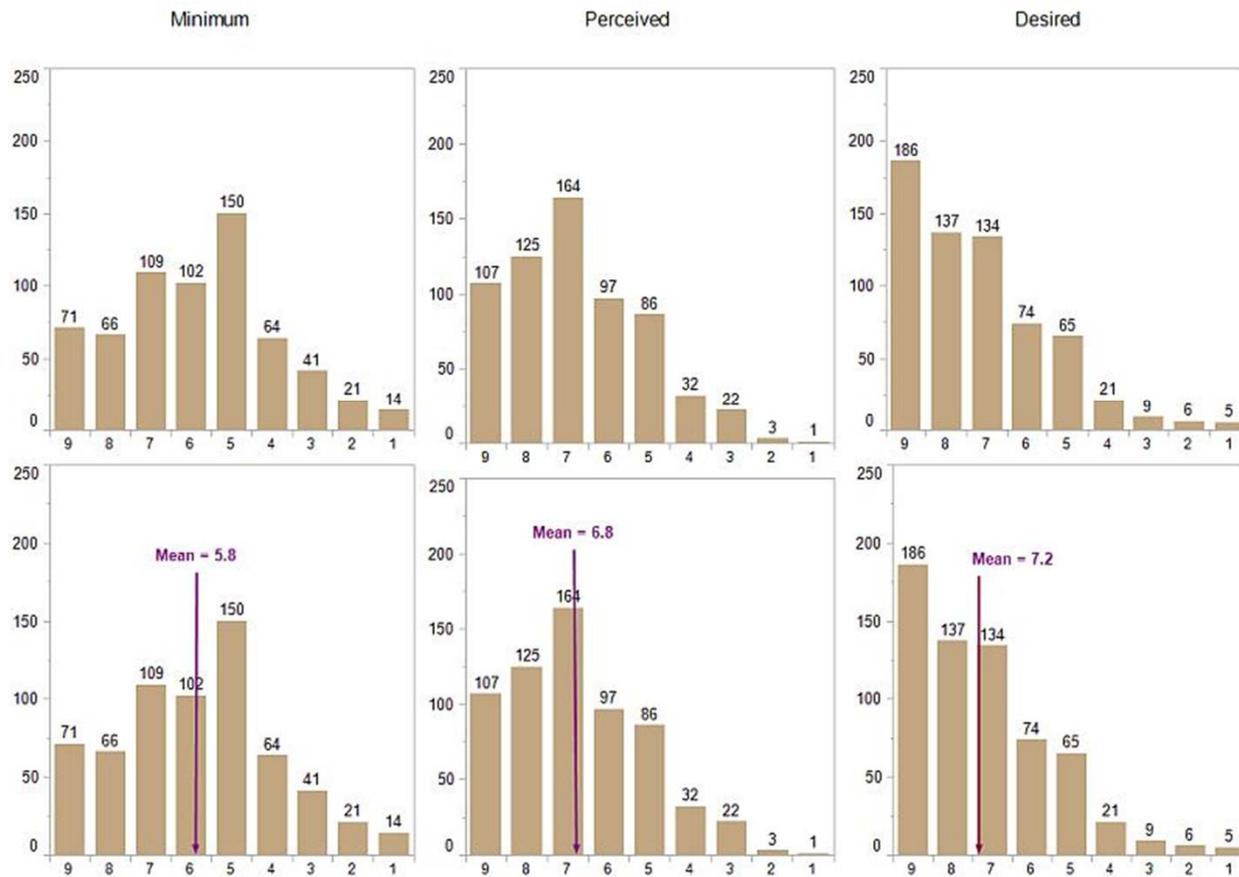
When an adequacy gap is negative, the upper and lower halves of the chart axis each has its own zero point.

Pink region here denotes negative adequacy gap for three Information Control items, IC-2, IC-3, and IC-8.

Means tell us about the centrality of data

Exploring data requires examining and *getting a feel* for the variation in the data, i.e., its distribution

Histograms for LibQual+® Affect of Service Item 2 -
Employees Give Individual Attention
All Respondents

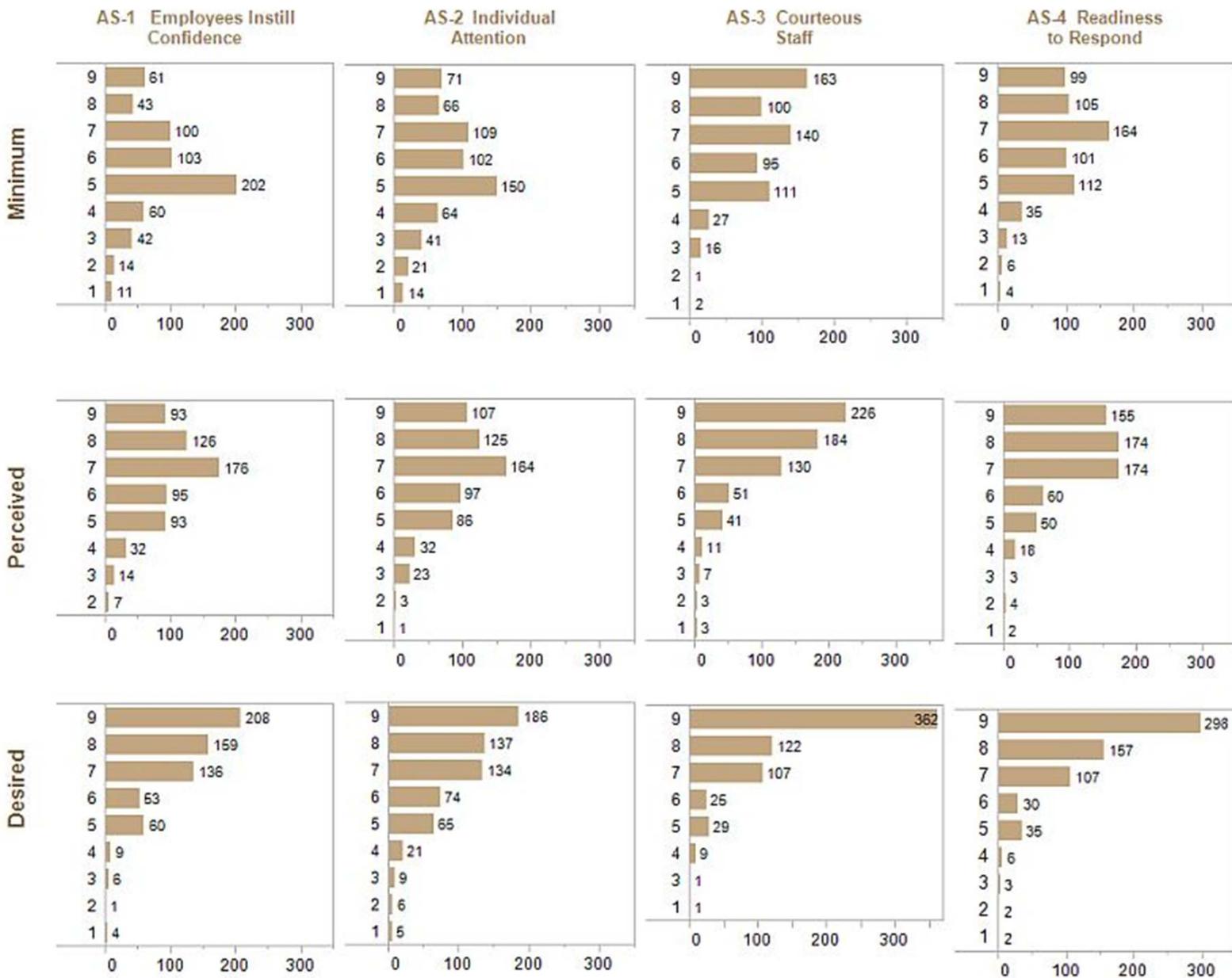


Data variation always underlies measures of centrality (like means, medians).

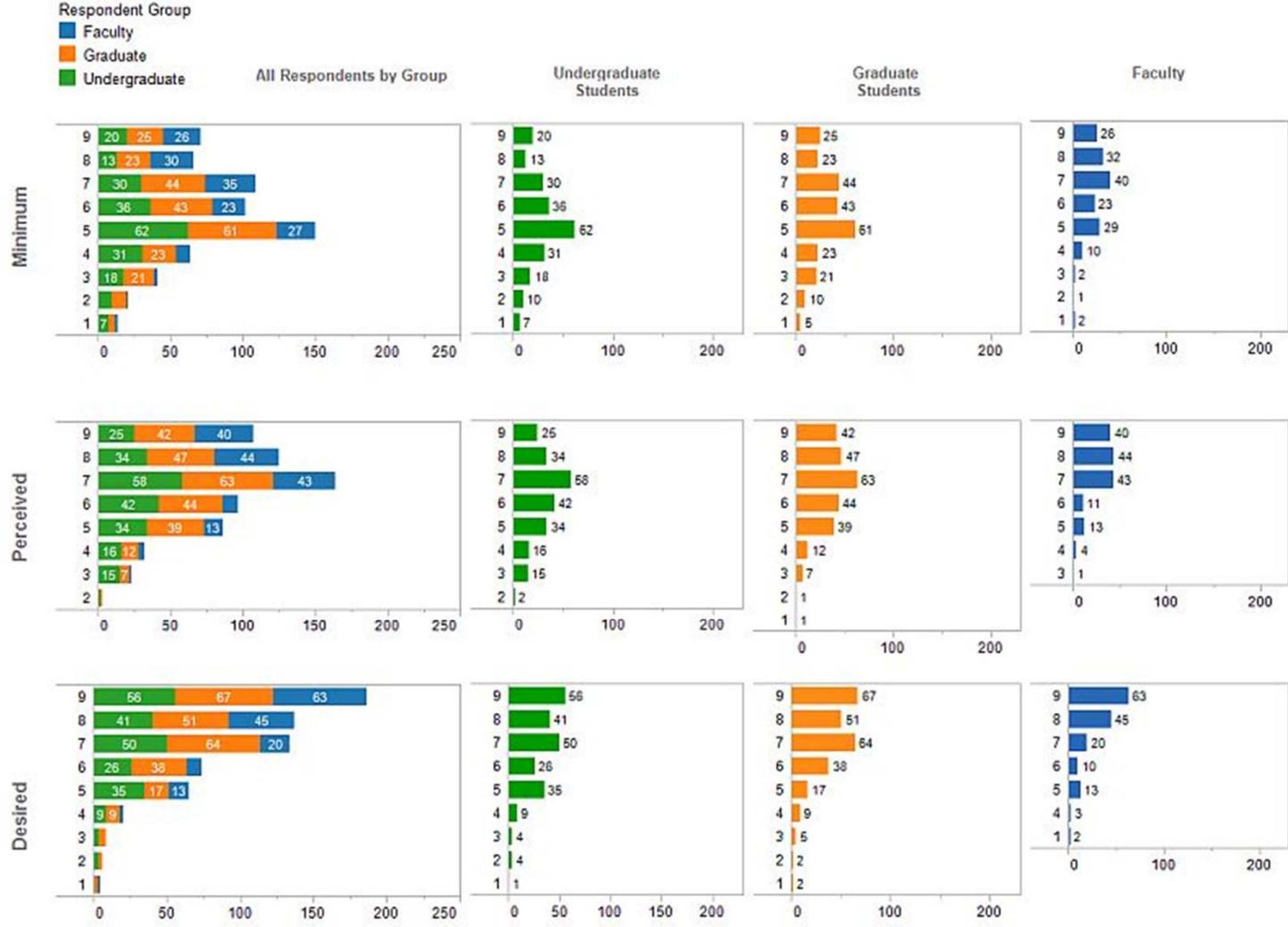
Explore data variability in order to:

- Understand full scope of the data
- Identify minorities of respondents whose needs/perspectives may tend to be neglected
- Examine changes/differences in variability for data from different survey periods

Histograms for LibQual+® Affect of Service Items 1 - 4 All Respondents



Histograms for LibQual+® Core Item: AS-2 Users Get Individual Attention



- Simple graphing tools enable a more thorough understanding of survey data
- Require creativity and discipline to create detailed graphs relevant to management questions
- Hundreds of graphs may need created in order to explore for most meaningful patterns

- Explore data by ‘drilling down’:
 - By meaningful respondent groups and sub-groups
 - Minorities who tend to be outliers from the majority
 - Comparisons over time

- Utility of graphical formats presented here depend upon feedback from users
- Further research is needed to determine which formats and contents are useful for libraries of different sizes/types/missions

- Analysis of LibQUAL+[®] survey data should take the form of generalizations about patterns and trends taking relevant to library management's quality and performance assessment efforts
- Take the time to get a feel for your survey data!