

# Exploring the Measures of Accessibility and Technical Quality of Web Pages

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<http://www.smithw.org/cair2008/caweb.ppt>

# Outline

- Overview of Problem
- Evaluation Methodology
- Compelling Questions
- Results
- Recommendations
- Q & A

# Overview of Problem

- “Web Accessibility” is the art and science of crafting web pages that are fully-functionally available to those with visual, aural, motor, and cognitive difficulties
  - In theory, practice, and law, this usually means “equivalently”
  - We loosely refer to this area as “Section 508”
- “Accessibility” is a particularly polarizing topic
- Studying anything on WWW is non-trivial
  - Large, Dynamic, Complex, Organic, Non-Linear
- Critical Need for empirical data

# Overview of Problem

- Some organizations have been litigated against—AOL, Southwest, Priceline, Ramada, Metro. Atlanta Rapid Transit Authority, and Target Stores (class action...and now *settled*)
- US DoJ Office of Civil Rights investigates complaints directly, usually ADA (42 U.S.C. § 12182(a) and 42 U.S.C. § 12132) or Sect. 504 of the Rehab. Act of 1973 (29 U.S.C. § 794a and 29 U.S.C. § 794b)
- California Laws include the Unruh Civil Rights Act (Cal. Civil Code § 51) and the California Disabled Persons Act (Cal. Civil Code § 54)
- Cal. Government Code § 11135 (applies to all CA public entities)
- Excerpt from the CSU system-wide Executive Order--“It is the policy of the CSU to make information technology resources and services accessible to all CSU students, faculty, staff and the *general public* regardless of disability.” (emphasis added)

# Nat. Fed. Blind vs. Target Corp

Case No.: C 06-01802 MHP (Northern District, SF)  
First Amended Complaint (class action)

- Bruce Sexton (UCB student) – blind; uses screen reader
- **www.target.com** site has (among other things) missing alt-text on graphics—e.g. image-based “submit”, inadequate labeling for text boxes, mouse requirement)
- Blind users cannot create an account or successfully complete a basic economic transaction
- In late 2005, NFB offered to help Target webmasters with accessibility issues, but Target refused
- Target claims to be ADA-compliant for physical (in store) purchases (i.e., web presence is different than physical presence)
- Lawsuit filed in early 2006; escalated to class action in mid-2007; lost appeal to drop class-action in late 2007
- Settlement in late August, 2008
  - [http://www.dralegal.org/cases/private\\_business/](http://www.dralegal.org/cases/private_business/)

# Major Technological Issues in NFB v. Target case

- Text alternatives for images
- Labeling of Forms
- Accommodations for in-page navigation
- Keyboard access
  
- So if nothing else, we need to measure and manage these four issues well
  - Definitely within the institution
  - And potentially for institutional providers as well
  - Many folks start with "<http://wave.webaim.org>"

# An Example of a text alternative for an image

```
<html>

  <head>
    <link rel="stylesheet" type="text/css"
          href="mystylesheet.css" />
  </head>

  <body>
    <p class="emphasis">This is my web page.</p>
    
  </body>

</html>
```

# Evaluation Methodology

- In an *ideal* world
  - N web pages (in the tens of millions, at least)
  - M diagnostic conditions (in the hundreds, at least)
  - Multi-year funding for research to inform all webmasters
  - Reliable, Valid, Multi-Method, Multi-Trait, Panel data sets
  - Deep interaction between IT/IR/others on campus
  - Clear goals for assessment (learning) and evaluation (tests)
  - Qualitative follow-ups, focus groups, and leadership
  - Deep use of *in situ* disabled individuals directly
- In *our* world
  - Need to choose N x M patterns wisely in the short-run
  - Let's use the popular web pages as the pattern for now
  - Let's use federal definitions for "accessibility" (Sect. 508)
  - Let's use W3C definitions for "quality" (HTML/CSS)

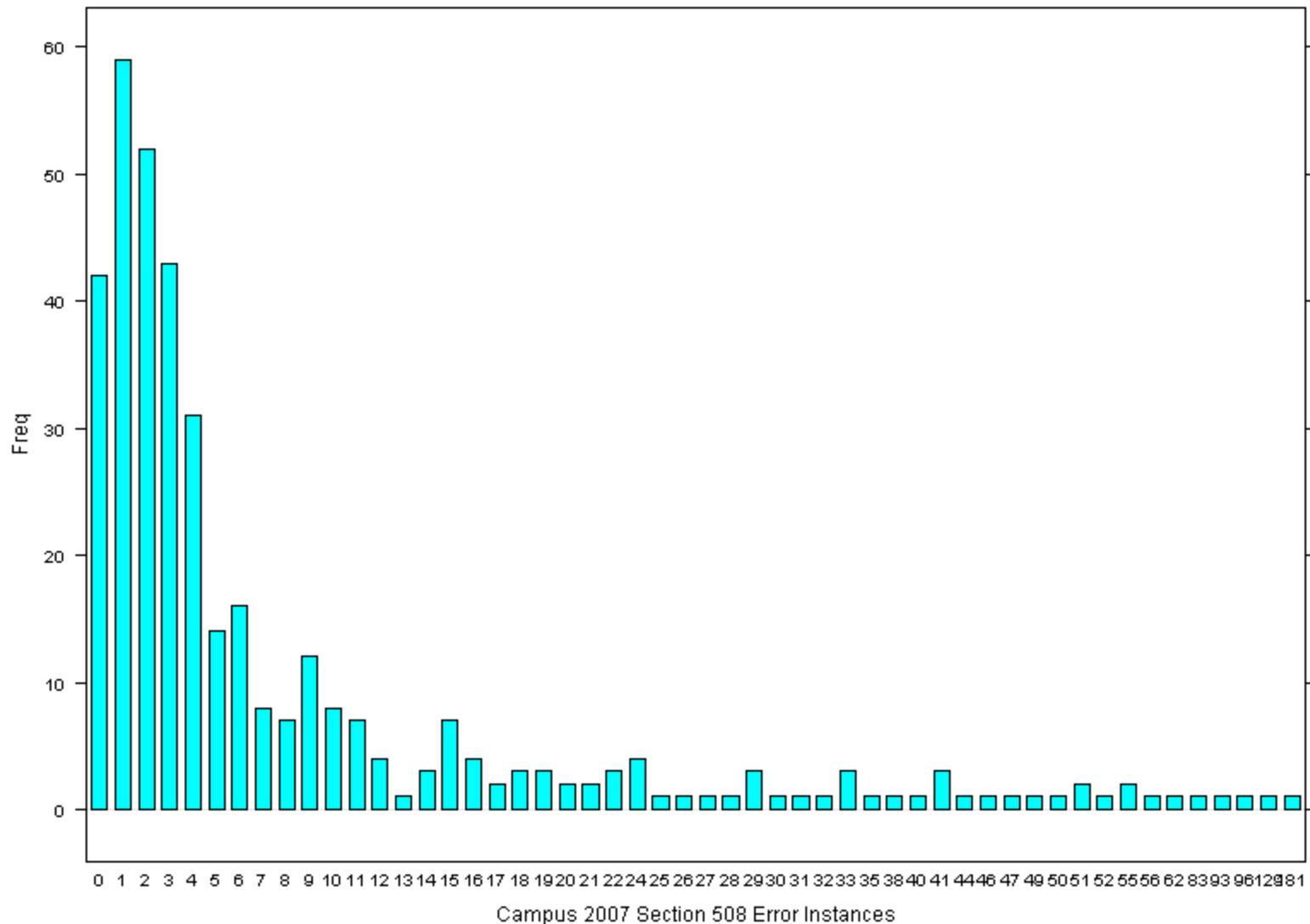
# Evaluation Methodology

- IPEDS data
  - >~ 400 unique UnitID's for California
  - ~375 are usable
  - Let's include the UC labs for now
  - Used 2005-2006 data now, but can adjust over time
- Data Collection
  - Used CAST Bobby (popular at the time) for Section 508 defects
  - Used W3C HTML Validation for HTML defects
  - Used W3C CSS Validation for CSS defects
  - Used two time periods, Jan 2006 and Jul 2007
  - Used two "levels"—main campus and library

# Compelling Questions

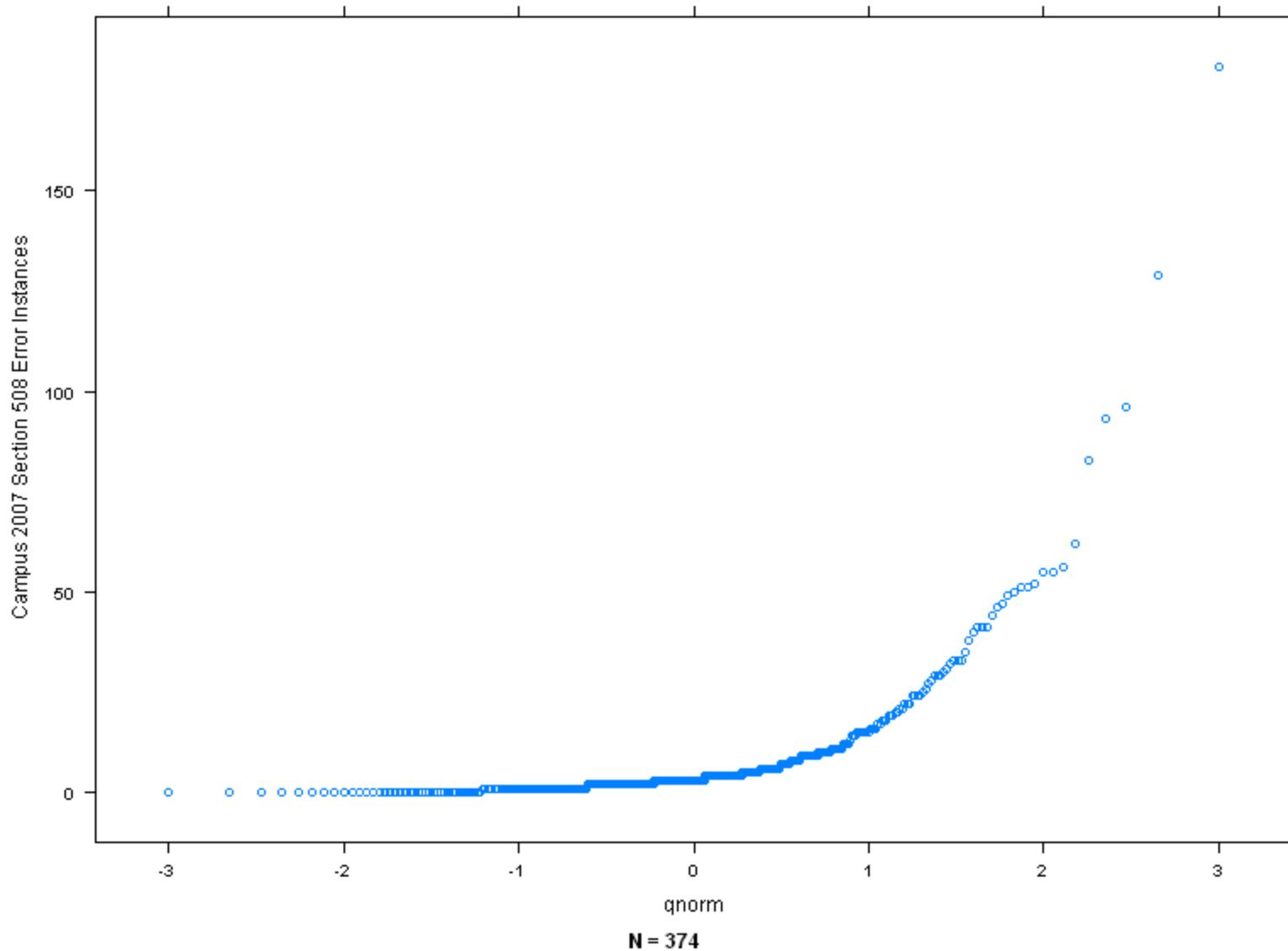
1. Status of Main Campus web pages?
2. Status of Library web pages?
3. Transition of Campus and Library pages over time (e.g., Jan 2006 -> Jul 2007)?
4. Correlates among Section 508, HTML, and CSS?
5. Significant findings by institutional and technical characteristics?
6. What about further down in the web hierarchy?

# What is the shape of the Section 508 Error distribution (Campus, 2007)?



N = 374

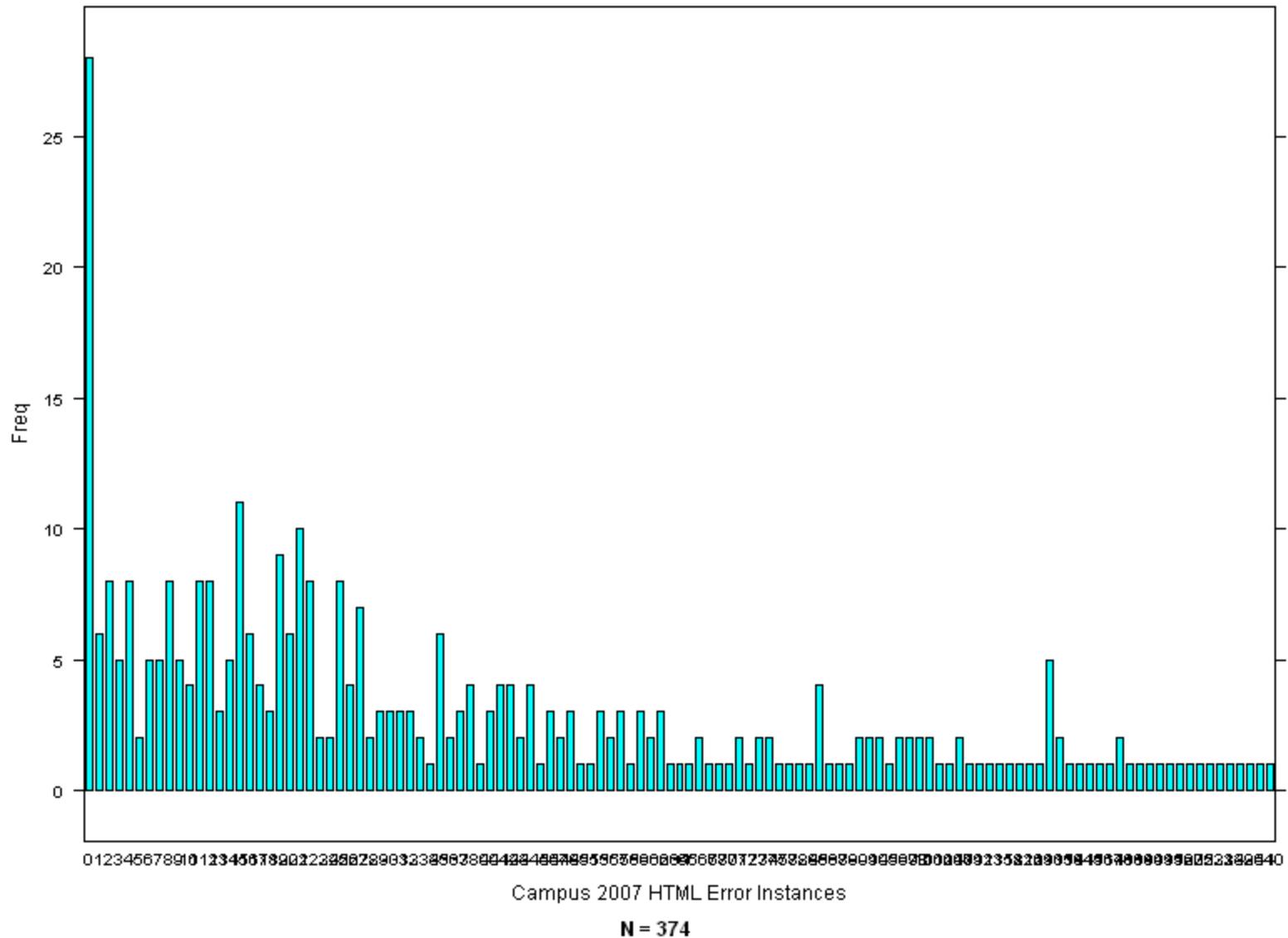
Just how different is the empirical distribution compared to a theoretical normal distribution?



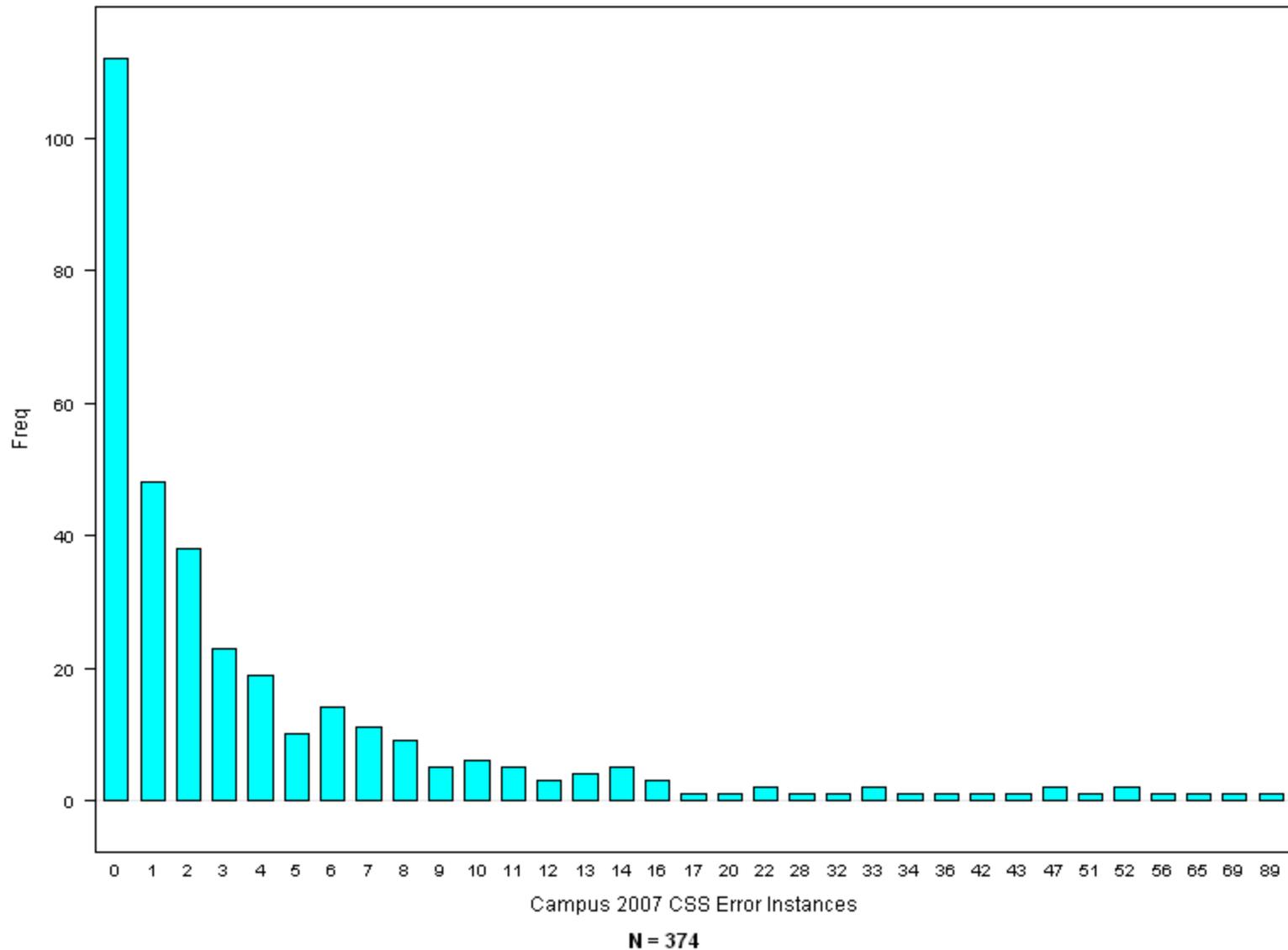
What is the frequency distribution of the Section 508 Errors (Campus, 2007)?

<b>No. of Errors</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cum. %</b>
0	42	11.3	11.3
1	59	15.8	27.1
2	52	13.9	41.0
3	43	11.5	52.5
4	31	8.3	60.9
5	14	3.7	64.6
...			
181	1	0.3	100.0

The shape of the HTML Error distribution (Campus, 2007) is similar.



The shape of the CSS Error distribution (Campus, 2007) is similar.



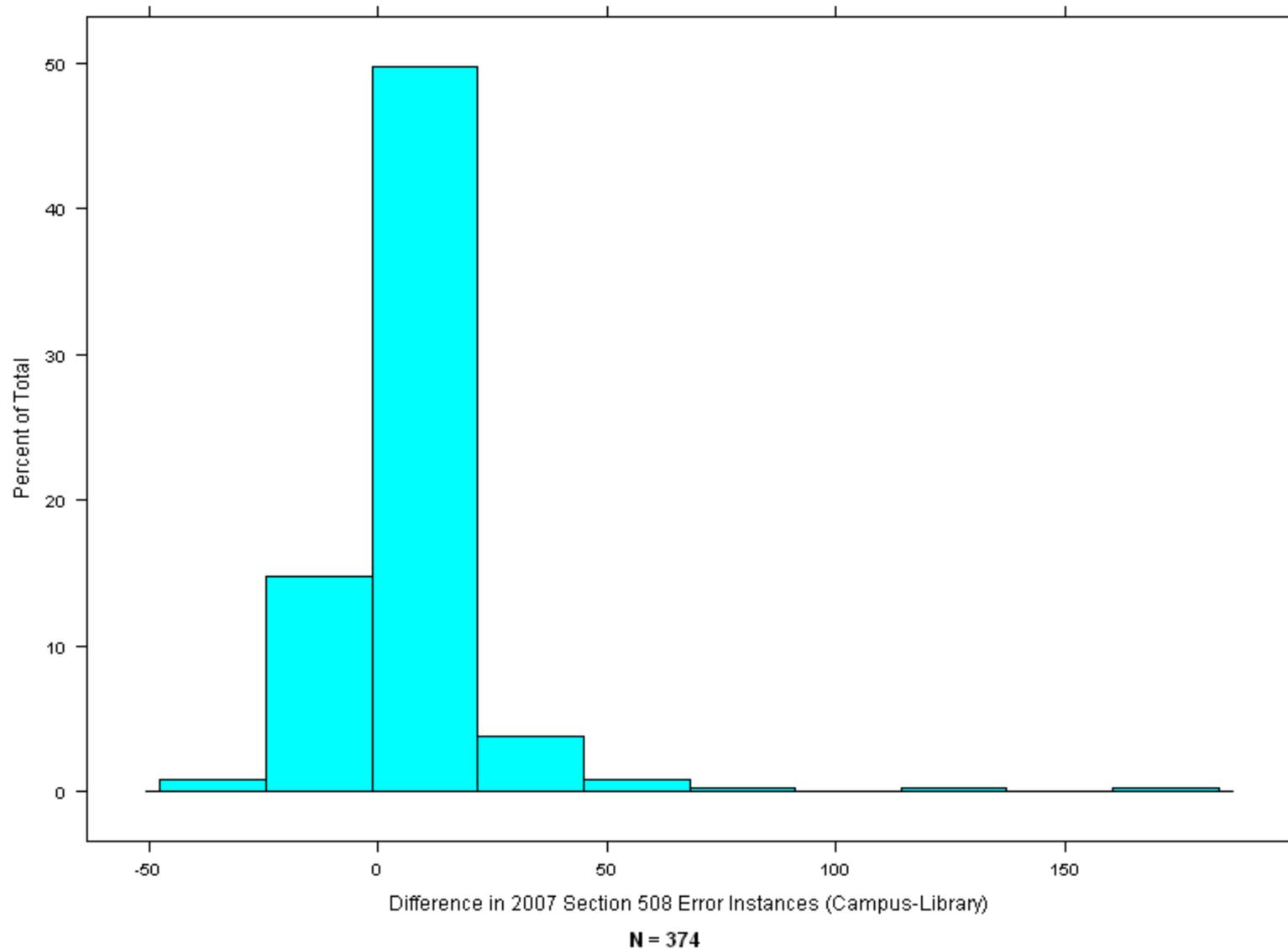
What are the descriptive statistics for all three Error measures (Campus, 2007)?

<b>Statistic</b>	<b>Sect 508</b>	<b>HTML</b>	<b>CSS</b>
N	373	348	336
Minimum	0.00	0.00	0.00
Maximum	181.00	610.00	89.00
Mean	9.23	46.23	5.38
Median	3.00	25.00	2.00
Std. Deviation	17.42	61.82	11.13
Skewness	4.90	3.70	4.04
Kurtosis	34.44	23.43	19.15

What are the descriptive statistics for all three Error measures (Library, 2007)?

<b>Statistic</b>	<b>Sect 508</b>	<b>HTML</b>	<b>CSS</b>
N	264	244	218
Minimum	0.00	0.00	0.00
Maximum	101.00	712.00	129.00
Mean	5.29	40.73	8.44
Median	2.00	21.00	2.00
Std. Deviation	9.83	66.11	19.16
Skewness	5.39	5.55	.17
Kurtosis	40.40	46.23	18.45

# What is the shape of the differences in 508 Errors between Campus and Library (2007)?



Are the differences in means (albeit strongly skewed) between the Campus and Library significant (2007)?

<b>Statistic</b>	<b>Sect 508</b>	<b>HTML</b>	<b>CSS</b>
<i>r</i> =	.365	.395	.553
<i>p</i> <	.001	.001	.001
<i>t</i> =	3.167	.910	-2.083
df=	263	235	203
<i>p</i> =	.002	.364	.039

What are the descriptive statistics for all three Error measures (Campus, 2006)?

<b>Statistic</b>	<b>Sect 508</b>	<b>HTML</b>	<b>CSS</b>
N	353	331	n/a
Minimum	0.00	0.00	n/a
Maximum	263.00	617.00	n/a
Mean	11.61	48.64	n/a
Median	3.00	28.00	n/a
Std. Deviation	21.78	66.35	n/a
Skewness	5.74	3.82	n/a
Kurtosis	53.20	22.04	n/a

Are the differences in means (albeit strongly skewed) between the 2006 Errors and the 2007 Errors significant (Campus)?

<b>Statistic</b>	<b>Sect 508</b>	<b>HTML</b>	<b>CSS</b>
<i>r</i> =	.773	.307	n/a
<i>p</i> <	.001	.001	n/a
<i>t</i> =	3.240	1.006	n/a
df=	351	322	n/a
<i>p</i> =	.001	.315	n/a

# Institutional Factors that are *not* Statistically Significant

- IPEDS Data (most recent, AY2005-2006)
  - Revenue
  - Expenditures
  - Number of contact hours
  - Number of faculty, prof. staff, or non-professional staff
  
  - Relative geographic location (North, Central, South)
  - Whether the campus has a medical or law school
  - Whether the campus is religious or secular
  - Whether the campus is for-profit or not-for-profit
- Finally, the type of web server and OS is irrelevant
  - And the distribution of Apache/IIS for California campuses is almost exactly matches the distribution for the Internet as a whole

# 2007 Results – Statistically Significant Institutional Factors

- Main campus (Section 508 Errors)
  - corr. with enrollment ( $r = -.159$ ,  $r^2 = .025$ ,  $p < .001$ )
- Library (Section 508 Errors)
  - corr. with tuition/fees ( $r = .188$ ,  $r^2 = .035$ ,  $p < .006$ )
- Main Campus (CSS Errors)
  - corr. with public service expenses ( $r = .198$ ,  $r^2 = .039$ ,  $p < .006$ )
- Over time, campuses with an earlier effort to reduce the number of HTML errors had a larger reduction in Sect. 508 errors (as opposed to vice-versa)
- Section 508 Errors (both main campus & library)
  - The public institutions are doing better (fewer errors in all categories) than the private institutions
- See Table 6.7.10 (separate handout) for “Segments”

What are the mean errors at five (5) “organizational levels” for the UC/CSU campuses? (N < ~40 for each)

<b>Google Search String</b>	<b>Sect 508 Mean</b>	<b>HTML Mean</b>	<b>CSS Mean</b>
“Section 508”	1.60	11.18	1.96
“Emergency”	3.62	26.41	5.41
“Information Technology”	4.30	23.27	1.18
“Registration”	8.73	31.53	25.13
“Syllabus”	3.68	50.00	32.39

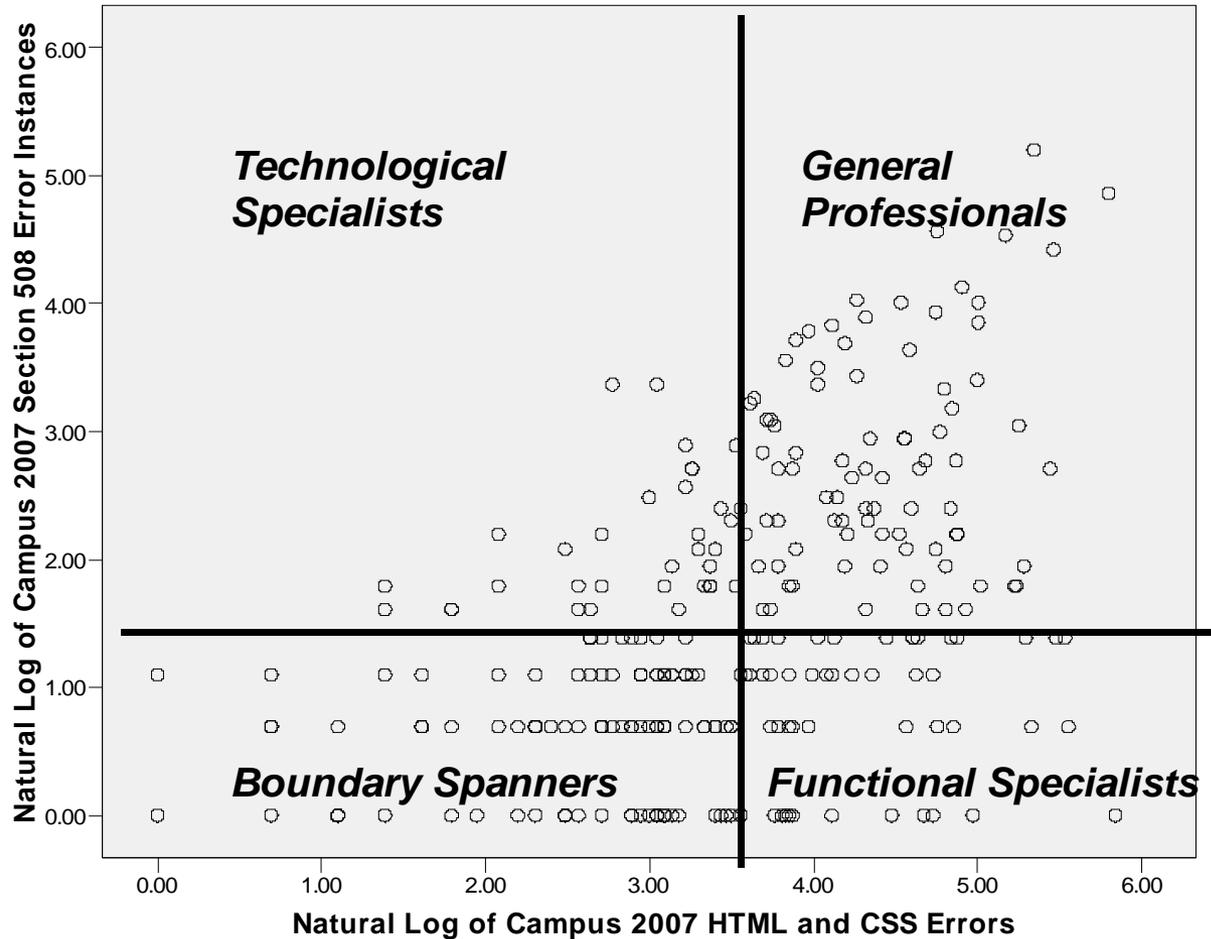
# Achieving zero-defects is difficult, but possible

- Six (6) zero-error (i.e., zero-defects) *campus* pages (Section 508, HTML, and CSS)
  - Chaffey (CCC), CSU Long Beach, Sonoma State, Coastline (CCC), Cal Lutheran, Ohlone (CCC)
- Five (5) zero-error (i.e., zero-defects) *library* pages (Section 508, HTML, and CSS)
  - Bethel Seminary, CalPolySLO, Sonoma State, Pasadena (CCC), CSU Dominguez Hills

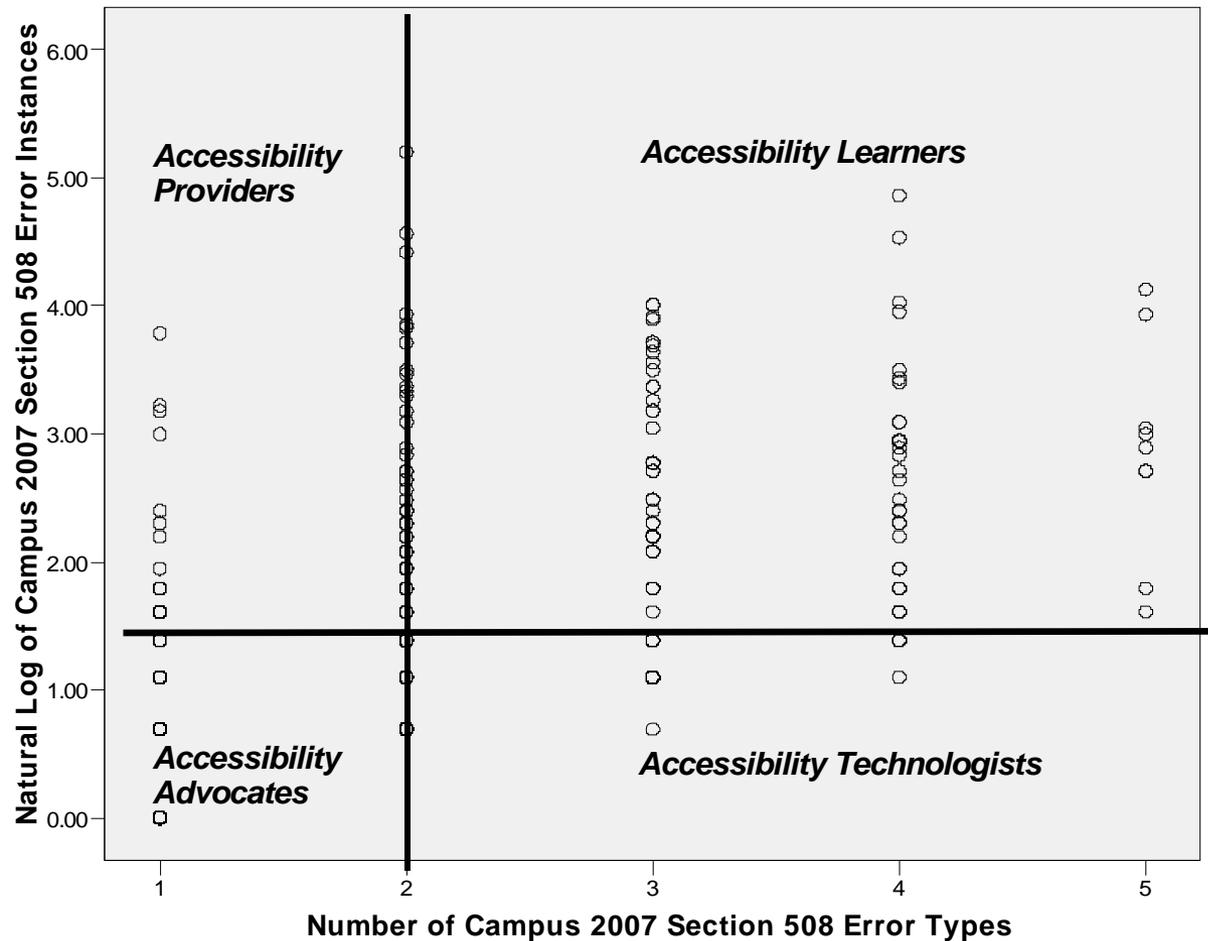
# Screenshot of Sonoma's campus web page



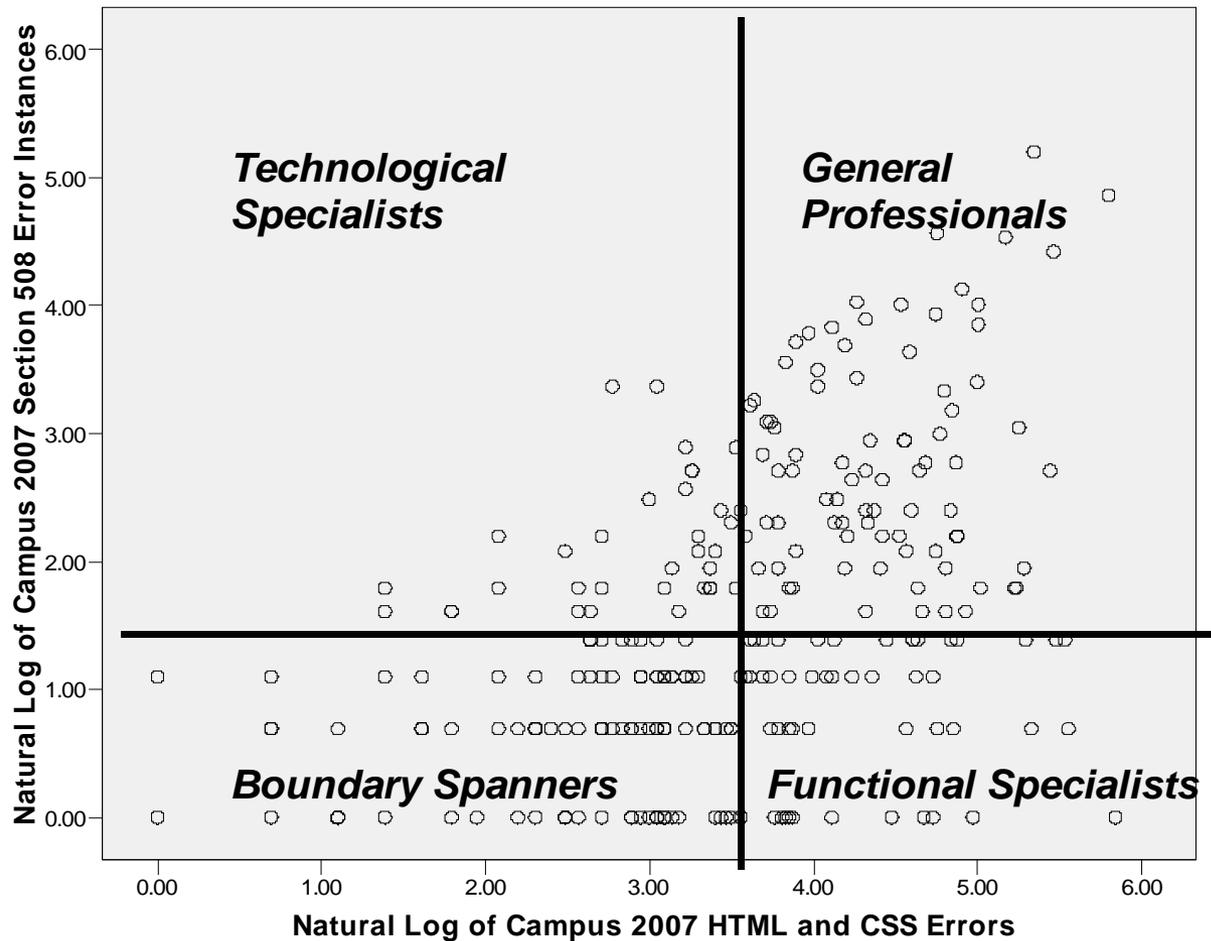
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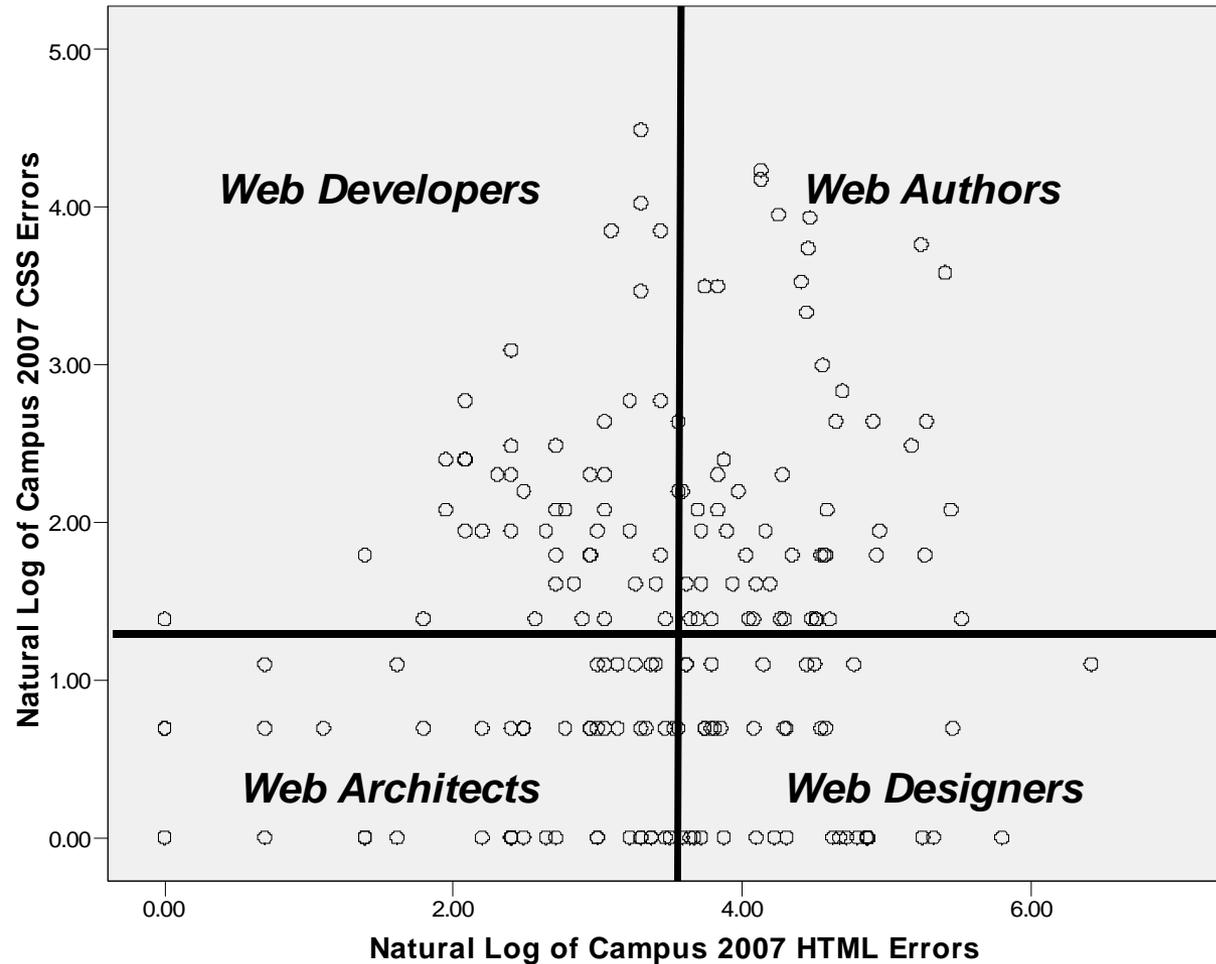
# What can we say about the campus patterns to help executives?



# What can we say about the campus patterns to help managers?



# What can we say about the campus patterns to help professionals?



# Outlook – Technical

- Methodological improvements
  - GLM w/ Poisson errors
  - adjust for intra-error coupling
  - desperately need causal models
- Theory/Practice improvements
  - Diffusion
  - Social networking (including design)
  - Best authoring practices (inc. development)
- Large number of research questions
  - Technological, Organizational, Regulatory, Economic
- Shift from “accommodations” model (reactive/remediate) to “access” model (proactive/design)