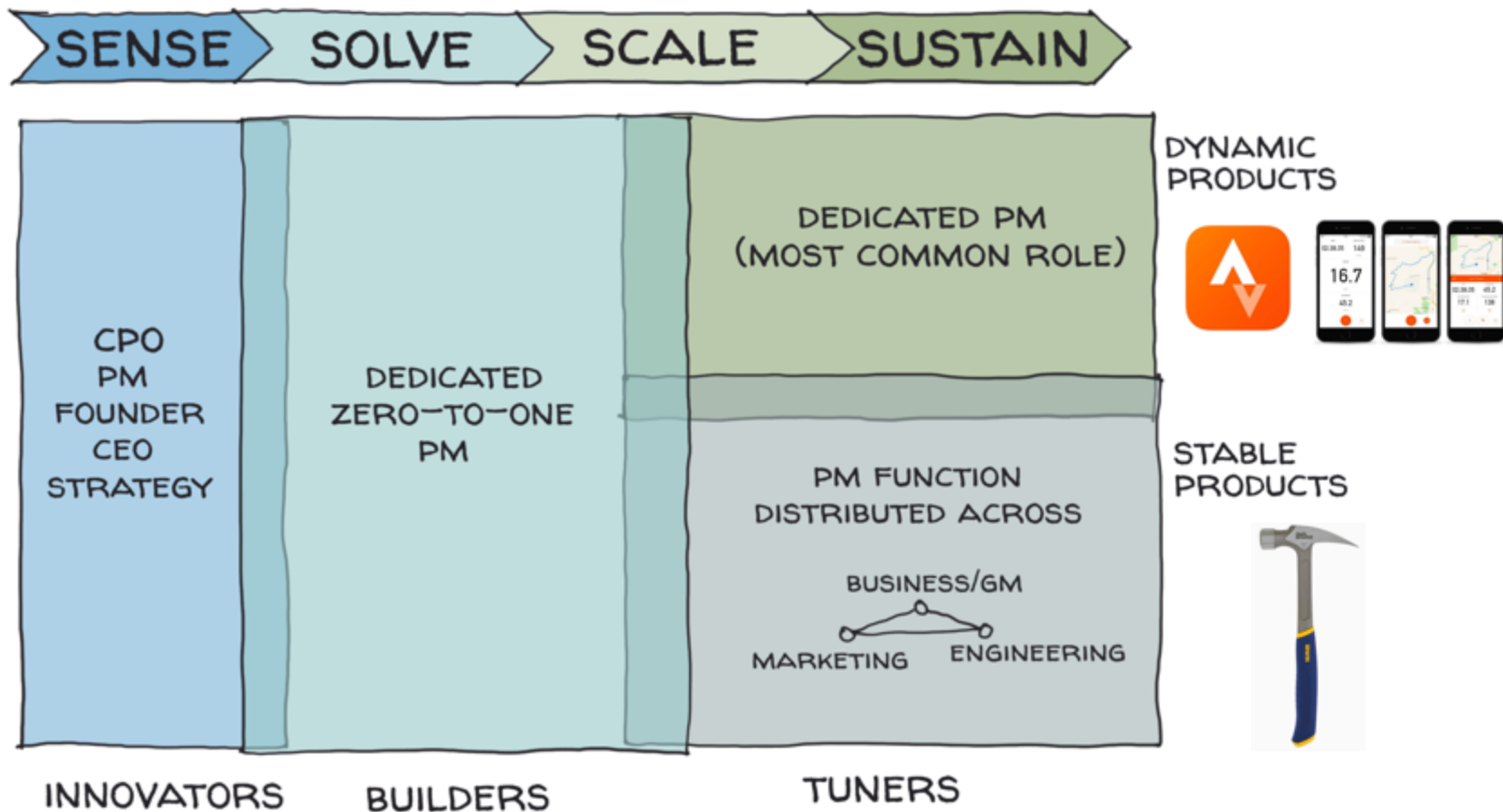# KPIs, Dashboards, Data Displays for Product Managers
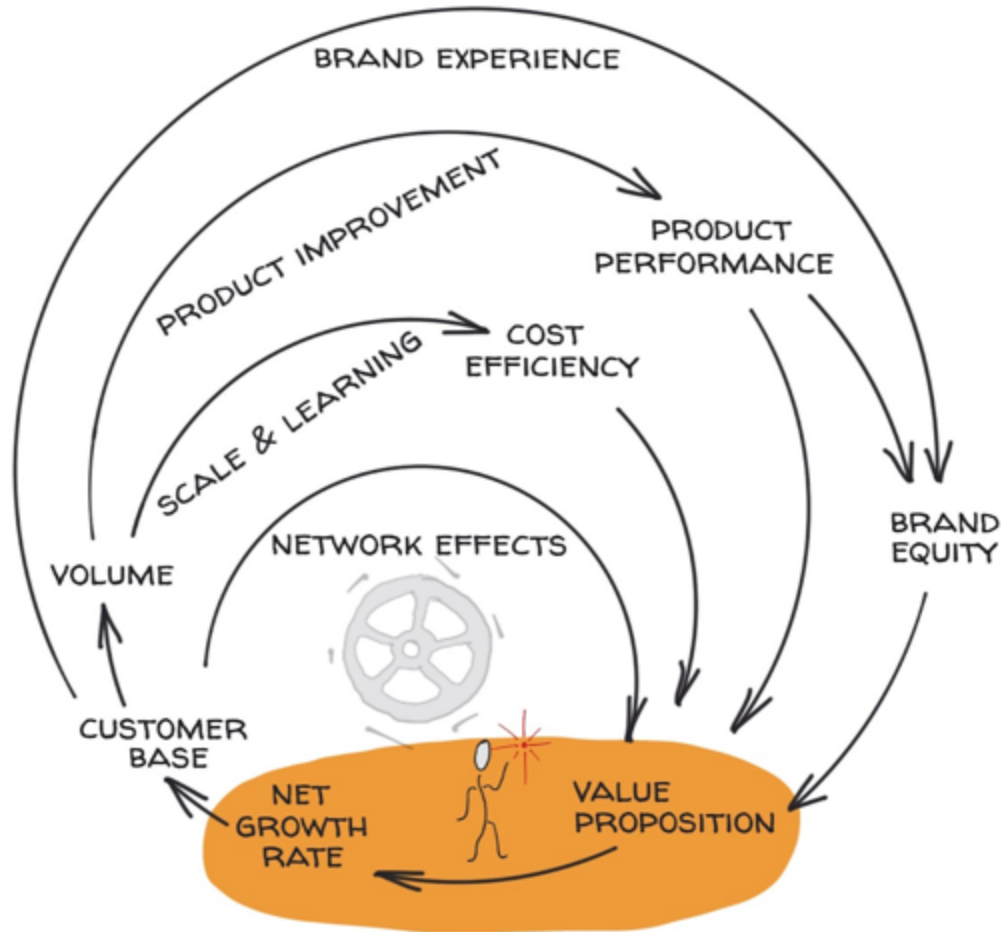
Professor Karl T. Ulrich

@ktulrich | ktulrich.com | ulrich@wharton.upenn.edu
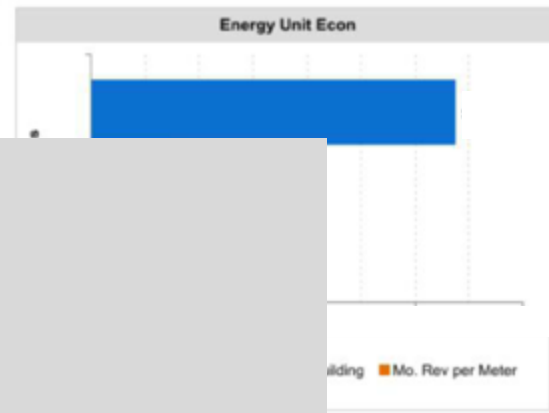
PM in Context

SENSE › SOLVE › SCALE › SUSTAIN

DYNAMIC PRODUCTS

DEDICATED PM (MOST COMMON ROLE)

CPO
PM
FOUNDER
CEO
STRATEGY

DEDICATED ZERO-TO-ONE PM

STABLE PRODUCTS

PM FUNCTION DISTRIBUTED ACROSS

BUSINESS/GM

MARKETING   ENGINEERING

INNOVATORS   BUILDERS   TUNERS
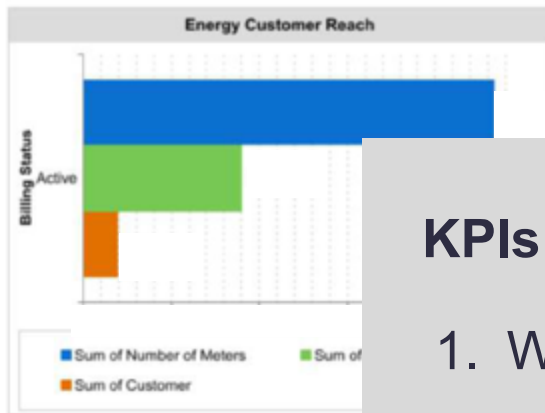
Karl T. Ulrich

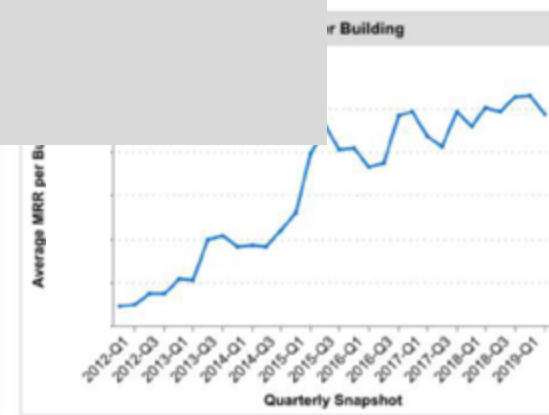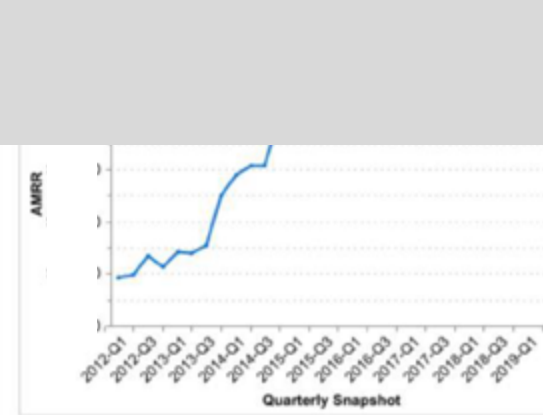# Five Flywheels

Current SaaS | Energy (as of 8/2)

Energy at $ K up from $ K.   Q-Q growth.
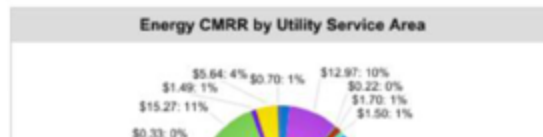
KPIs and Dashboards

1. What to measure?

2. How to show it?

Dashboards

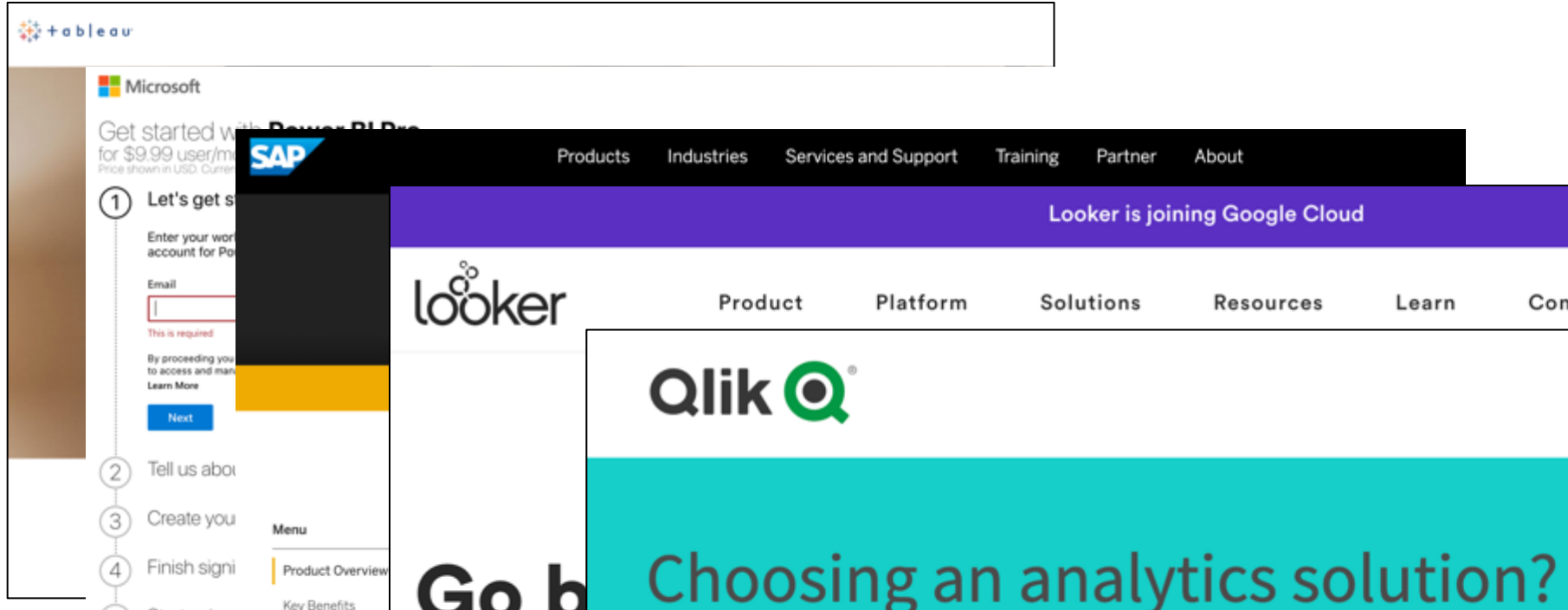"A dashboard is a visual display of the most important information needed to achieve one or more objectives, consolidated and arranged in a single screen so the information can be monitored at a glance."

Stephen Few

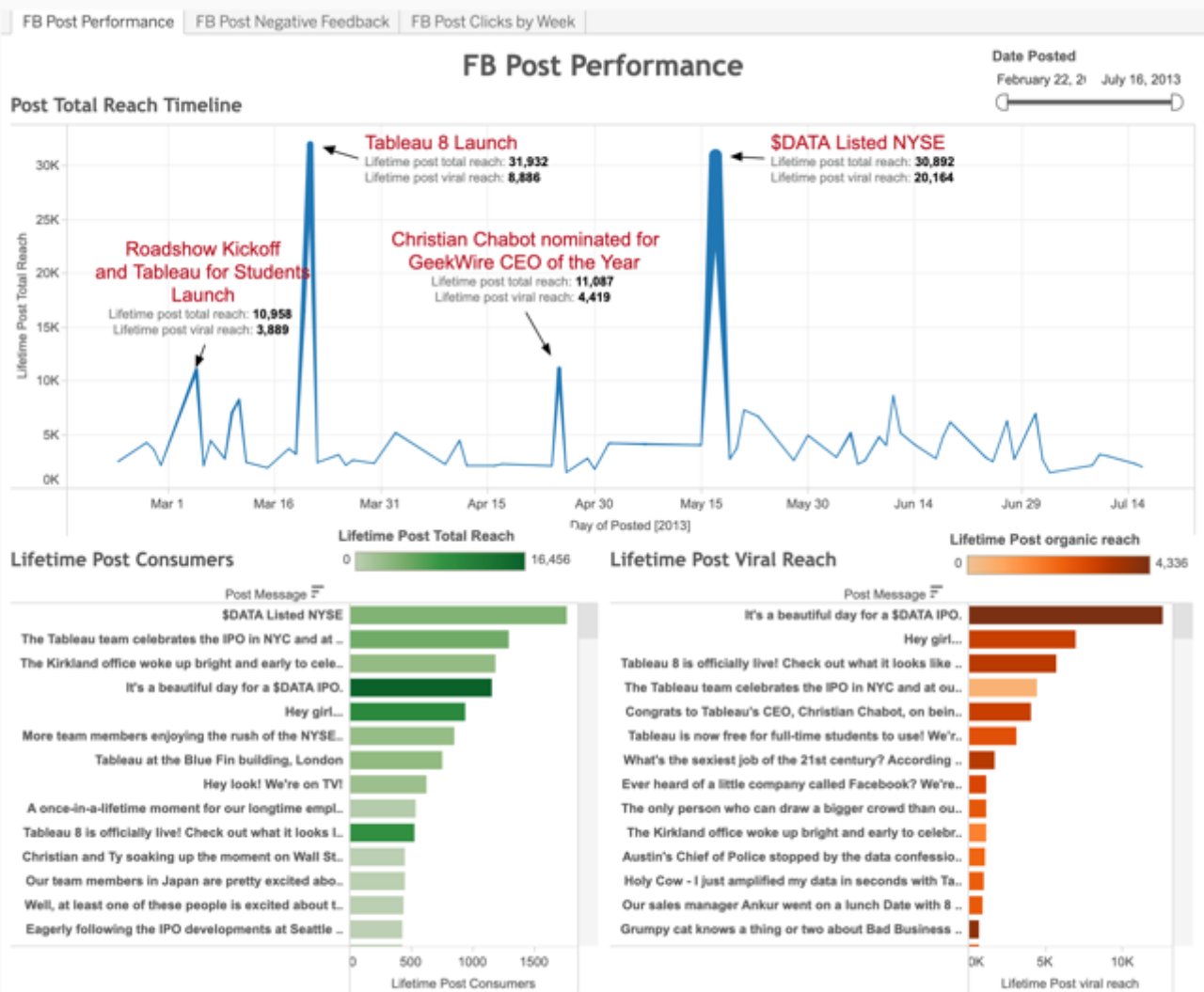"Business Intelligence" or "BI" (USD30 Billion market)

Quite a few commercial products available for dashboards (e.g., Tableau, Power BI, SAP Business Objects, etc.)
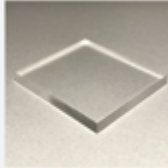
c2022 market leader

The **business**

The **financial model**
- Net operating income
- Total working capital

Monthly, Quarterly, Annually
Budget and Actual

The Managerial KPIs
(Weekly)

Karl T. Ulrich

7

MakerStock KPIs

Revenue
Revenue growth rate

N Orders
Average order value

N New Customers
Total Customers
Total Repeat Customers (ordering within 180 days)
% of Repeat Customers Ordering

for 2 segments:
Direct-to-Maker
EDU Lab

N orders not shipped by promise day (2nd biz day)
% Orders not shipped by promise day

Pieces ordered
Laser-cut panels ordered
Fraction of orders fulfilled entirely from FGI

Advertising Spend
N Organic DTM Acquisitions (assume 2.5% of organic)
Implied N Paid DTM Acquisitions
4-wk ave Customer Acquisition Cost ($/paid-acq)

Total Unique Visitors (Google Analytics)
Organic Unique Visitors
Paid Users
Site Conversion Rate (N-orders / N-uniques)
Makerstock.com Domain Authority
Inbound Links (Unique Domains Linking to Us)

(most metrics shown as weekly actual and 4-week trailing average)

For MakerStock c2022, the product *is* the business…

- Typical of new ventures.
- Most PMs in large companies do not own the business.

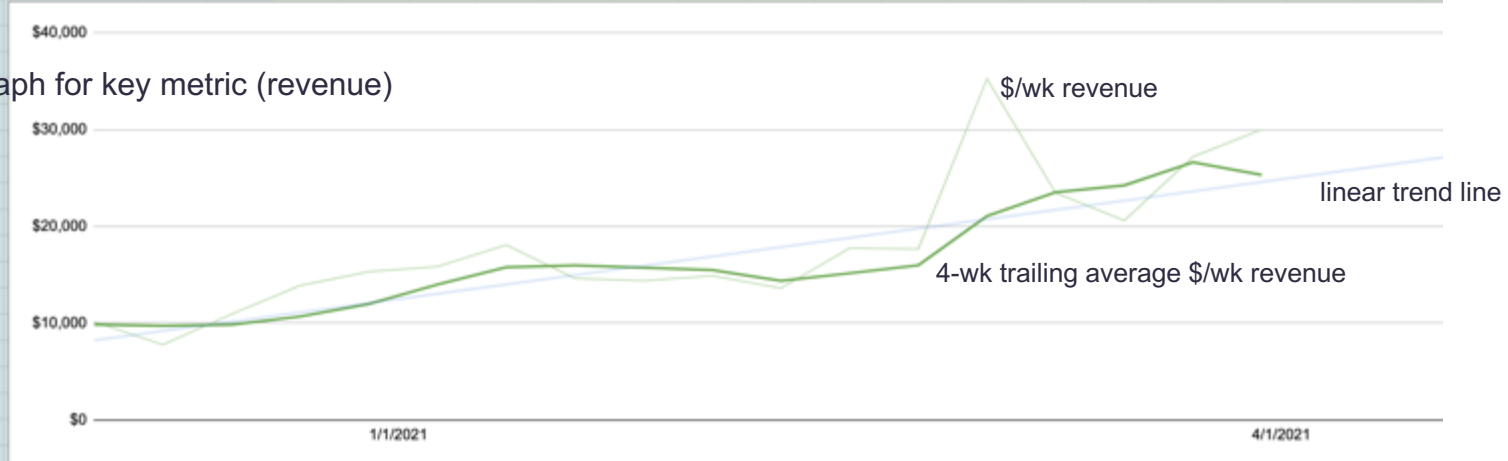# Real Example – dashboard implemented entirely as Google sheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	NEWCO Dashboard									5.00%	per week revenue growth																					
2										14,007	14,707	15,443	16,215	17,026	17,877	18,771	19,709	20,695	21,730	22,816	23,957	25,155	26,412	27,733	29,120	30,576	32,104	33,710	35,395	37,165	39,023
3			get organized, trained, ramped back up						back on track>>>																			EDU Customers Returning to Campus				
4		WHO?	12/1/202	12/8	12/15	12/22	12/29	1/5	1/12	1/19	1/26	2/2	2/9	2/16	2/23	3/2	3/9	3/16	3/23	3/30	4/6	4/13	4/20	4/27	5/4	5/11	5/18	5/25	6/1	6/8	6/15	6/22
5	EDU Revenue	JB	$3,302	$470	$0	$486	$0	$0	$2,162	$1,427	$1,335	$6,116	$180	$1,288	$326	$2,599	$0	$1,969	$14,610	$4,595	$3,475	$6,551	$1,980									
6	DTM Revenue	JB	$5,032	$9,988	$10,508	$9,682	$7,792	$10,939	$11,736	$13,910	$14,518	$11,972	$14,458	$13,094	$14,572	$11,028	$17,764	$15,698	$20,640	$18,871	$17,138	$20,648	$28,028								
7	Total Revenue	JB	$8,334	$10,458	$10,508	$10,168	$7,792	$10,939	$13,898	$15,337	$15,853	$18,088	$14,638	$14,382	$14,898	$13,627	$17,764	$17,667	$35,250	$23,466	$20,613	$27,199	$30,008								
8	4-wk ave Total Revenue					$9,867	$9,731	$9,852	$10,699	$11,992	$14,007	$15,794	$15,979	$15,740	$15,501	$14,386	$15,168	$15,989	$21,077	$23,537	$24,249	$26,632	$25,321								
9	Ave weekly growth rate (trailing 8 weeks)																				5.4%	6.8%	6.3%								
11	N EDU Orders	JB	4	2	0	0	0	0	8	2	8	10	2	8	2	8	0	12	14	8	6	10	4								
12	4-wk ave N EDU orders						0.5	0.0	2.0	2.5	4.5	7.0	5.5	7.0	5.5	5.0	4.5	5.5	8.5	8.5	10.0	9.5	7.0								
13	N DTM Orders	JB	64	140	134	118	100	142	132	188	194	142	118	144	140	152	178	176	184	190	170	208	252								
14	4-wk ave N DTM orders					114	123	124	123	141	164	164	161	150	136	139	154	162	173	182	180	188	205								
16	4-wk ave EDU order value					$710	$478		$331	$359	$274	$394	$412	$319	$359	$220	$234	$222	$564	$623	$616	$769	$593								
17	4-wk ave DTM order value					$77	$77	$79	$82	$79	$78	$79	$85	$90	$99	$96	$92	$91	$94	$100	$100	$103	$103								
19	N New EDU Customers	JB	2	2	0	0	0	0	2	0	0	0	0	0	6	0	2	0	0	0	0	2	0								
20	Total EDU Customers		96	98	98	100	100	100	102	102	106	106	106	106	106	112	112	114	114	114	114	116	116								
22	N New DTM Customers	JB	34	100	106	72	78	102	92	138	146	120	94	112	104	120	134	122	138	152	124	152	198								
23	Total DTM Customers (ordered >$10 within 180 days)	JB	1,876	1,896	1,998	2,070	2,048	2,124	2,132	2,204	2,326	2,360	2,388	2,410	2,422	2,468	2,556	2,600	2,676	2,772	2,832	2,922	3030								
24	N New Repeat DTM Customers (order 2nd time this wk)	JB				15	6	9	10	9	8	11	3	7	9	7	9	16	12	15	13	13	14								
25	Total Repeat DTM Customers (>$10, ordering <180 days)	JB	320	318	318	336	344	344	364	372	382	394	394	404	416	426	438	462	476	502	516	534	542								
26	4-wk ave % repeat DTM cust ordering each week					11.1%	10.3%	10.1%	10.7%	10.7%	12.2%	10.6%	9.3%	8.0%	7.1%	7.6%	8.6%	9.5%	9.8%	9.7%	9.4%	9.2%	9.3%								
28	N orders not shipped by promise day (2nd biz day)	JB	0	4	0	4	0	8	0	2	2	12	8	0	2	2	2	4	10	6	8	6	8								
29	% Orders not shipped by promise day			2.9%	0.0%	3.4%	0.0%	5.6%	0.0%	1.1%	1.0%	8.5%	6.8%	0.0%	1.4%	1.3%	1.1%	2.3%	5.4%	3.2%	4.7%	2.9%	3.2%								
31	Pieces ordered (via Shopify)	JB	508	1,076	908	1,872	590	706	1,326	1,358	1,134	1,698	1,010	1,022	1,068	1,020	1,012	1,304	2,964	2,338	1,432	2,314	1732								
32	Laser-cut panels ordered (via Shopify)	JB	4	0	4	12	6		0	8	8	4	42	2	6	12	12	30	10	42	10	8	4								
33	Fraction of orders fulfilled entirely from FGI	JB													35.9%	36.3%	38.5%	37.0%	29.2%	10.3%	8.2%	9.0%	14.5%								
35	Advertising Spend (Adwords)	KU	$0	$2,320	$2,774	$2,820	$2,960	$2,880	$3,220	$4,240	$4,120	$4,460	$4,300	$4,730	$4,726	$3,728	$4,976	$4,128	$4,226	$4,290	$4,440	$4,462	$5,280								
36	Assumed N Organic DTM Acquisitions	KU	34	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30								
37	Implied N Paid DTM Acquisitions	KU	0	70	76	42	48	72	62	108	116	90	64	82	74	90	104	92	108	122	94	122	168								
38	4-wk ave Acquisitions Cost ($/paid-acq)	KU	$0	$33	$37	$42	$46	$48	$53	$46	$40	$43	$45	$50	$59	$56	$52	$49	$43	$41	$41	$39	$37								
40	Total Unique Visitors (Google Analytics)	KU	1,038	3,620	4,106	3,752	4,298	4,836	4,666	6,328	6,758	6,610	6,102	6,440	6,268	5,364	6,526	5,736	6,778	5,652	5,530	5,990	7010								
41	Organic Unique Visitors	KU	1002	872	1,018	790	774	1,030	976	1,582	1,534	1,096	1,078	1,112	1,296	1,090	1,012	1,240	2,140	1,224	990	1,296	1,480								
42	4-wk ave Organic Uniques	KU	0	0	0	921	864	903	893	1,091	1,281	1,297	1,323	1,205	1,146	1,144	1,128	1,160	1,371	1,404	1,399	1,413	1,248								
43	Paid Users	KU	36	2,748	3,088	2,962	3,524	3,806	3,690	4,746	5,224	5,514	5,024	5,328	4,972	4,274	5,514	4,496	4,638	4,428	4,540	4,694	5530								
44	Site Conversion Rate (N-orders / N-uniques)	KU	6.2%	3.9%	3.3%	3.1%	2.3%	2.9%	2.8%	3.0%	2.9%	2.1%	1.9%	2.2%	2.2%	2.8%	2.7%	3.1%	2.7%	3.4%	3.1%	3.5%	3.6%								
45	4-week average site conversion rate	KU				3.7%	3.1%	2.9%	2.8%	2.8%	3.0%	2.8%	2.6%	2.4%	2.2%	2.4%	2.6%	2.8%	3.0%	3.1%	3.2%	3.3%	3.5%								
46	NEWCO.com Domain Authority	KU	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	24	24	22	22								
47	Inbound Links (Unique Domains Linking to Us)	KU	32	34	36	36	36	36	36	36	36	36	38	38	38	38	38	38	38	40	40	40	22	38								

Team meeting every Wednesday (slowest day). "Week" ends Tuesday midnight. 5-minute review of numbers. Manually flag good (green), caution (yellow), bad (red).

https://docs.google.com/spreadsheets/d/111EDD6mgEYm-tLEFIL_s1skWYEozepRnFhvMsjlsVSU/edit?usp=sharing

Simple line graph for key metric (revenue)

4	0	4	0	8	0	2	2	12	8	0	2	2	2	4	10	6	8	6	8
2.9%	0.0%	3.4%	0.0%	5.6%	0.0%	1.1%	1.0%	8.5%	6.8%	0.0%	1.4%	1.3%	1.1%	2.3%	5.4%	3.2%	4.7%	2.9%	3.2%
1,076	908	1,872	590	706	1,326	1,358	1,134	1,698	1,010	1,022	1,068	1,020	1,012	1,304	2,964	2,338	1,432	2,314	1732
0	4	12	6	4	0	8	8	4	42	2	6	12	12	30	10	42	10	8	4
											35.9%	36.3%	38.5%	37.0%	29.2%	10.3%	8.2%	9.0%	14.5%
$2,320	$2,774	$2,820	$2,960	$2,880	$3,220	$4,240	$4,120	$4,460	$4,300	$4,730	$4,726	$3,728	$4,976	$4,128	$4,226	$4,290	$4,440	$4,462	$5,280
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
70	76	42	48	72	62	108	116	90	64	82	74	90	104	92	108	122	94	122	168
$33	$37	$42	$46	$48	$53	$46	$40	$43	$45	$50	$59	$56	$52	$49	$43	$41	$41	$39	$37
3,620	4,106	3,752	4,298	4,836	4,666	6,328	6,758	6,610	6,102	6,440	6,268	5,364	6,526	5,736	6,778	5,652	5,530	5,990	7010
872	1,018	790	774	1,030	976	1,582	1,534	1,096	1,078	1,112	1,296	1,090	1,012	1,240	2,140	1,224	990	1,296	1,480
0	0	921	864	903	893	1,091	1,281	1,297	1,323	1,205	1,146	1,144	1,128	1,160	1,371	1,404	1,399	1,413	1,248
2,748	3,088	2,962	3,524	3,806	3,690	4,746	5,224	5,514	5,024	5,328	4,972	4,274	5,514	4,496	4,638	4,428	4,540	4,694	5530
3.9%	3.3%	3.1%	2.3%	2.9%	2.8%	3.0%	2.9%	2.1%	1.9%	2.2%	2.2%	2.8%	2.7%	3.1%	2.7%	3.4%	3.1%	3.5%	3.6%
	3.7%	3.1%	2.9%	2.8%	2.8%	3.0%	2.8%	2.6%	2.4%	2.2%	2.4%	2.6%	2.8%	3.0%	3.1%	3.2%	3.3%	3.5%	
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	24	24	22	22
34	36	36	36	36	36	36	36	36	36	38	38	38	38	38	38	40	40	38	38

$40,000

$/wk revenue

$30,000

linear trend line

$20,000

4-wk trailing average $/wk revenue

$10,000

$0

1/1/2021

4/1/2021

Some Common PM KPIs in Software

Monthly recurring revenue (MRR)

Customer Lifetime Value (CLV or LTV)

Customer Acquisition Cost (CAC)

Daily Active Users

Weekly/Monthly Active Users

Daily/Weekly sign-ups

Daily/Weekly premium conversions

Session duration

Paid traffic

Organic traffic

Bounce rate

Churn rate

Net Promoter Score

Customer satisfaction score

For tech product managers specifically:
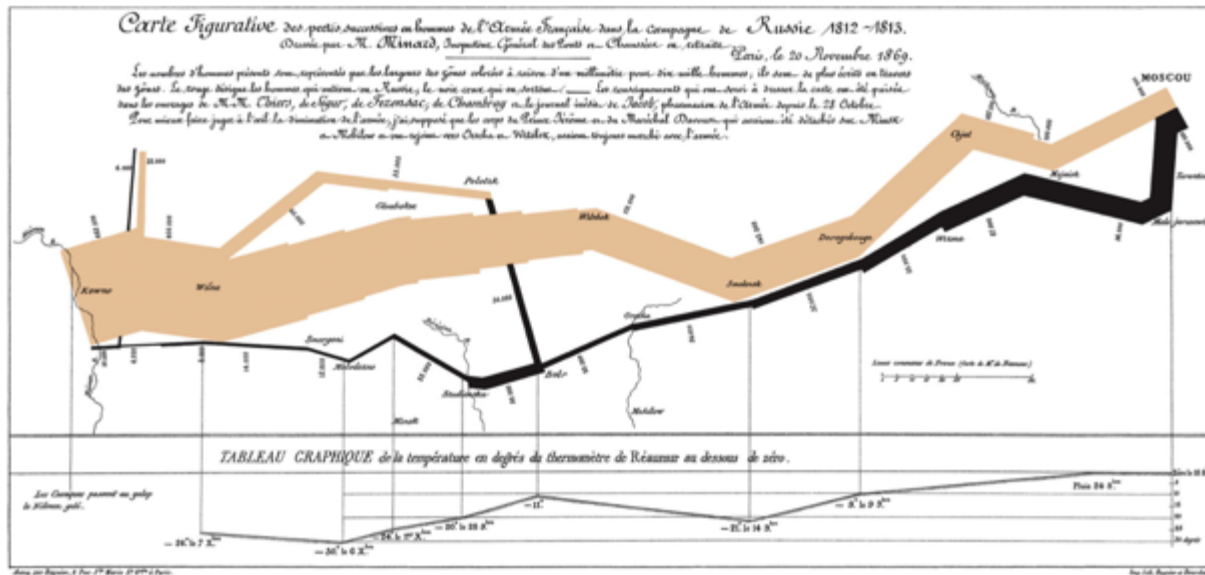- Acquisition
- Engagement
- Satisfaction
- Monetization

Edward Tufte
(b1942)

"The DaVinci of Data"

Also…
>   Yale Professor of Statistics
>   Sculptor
>   Self-publishing phenomenon

Still running one-day workshops, some on-line.
http://www.edwardtufte.com/

Stephen Few
(Very practical Tufte … without the style)

http://www.perceptualedge.com

Karl T. Ulrich
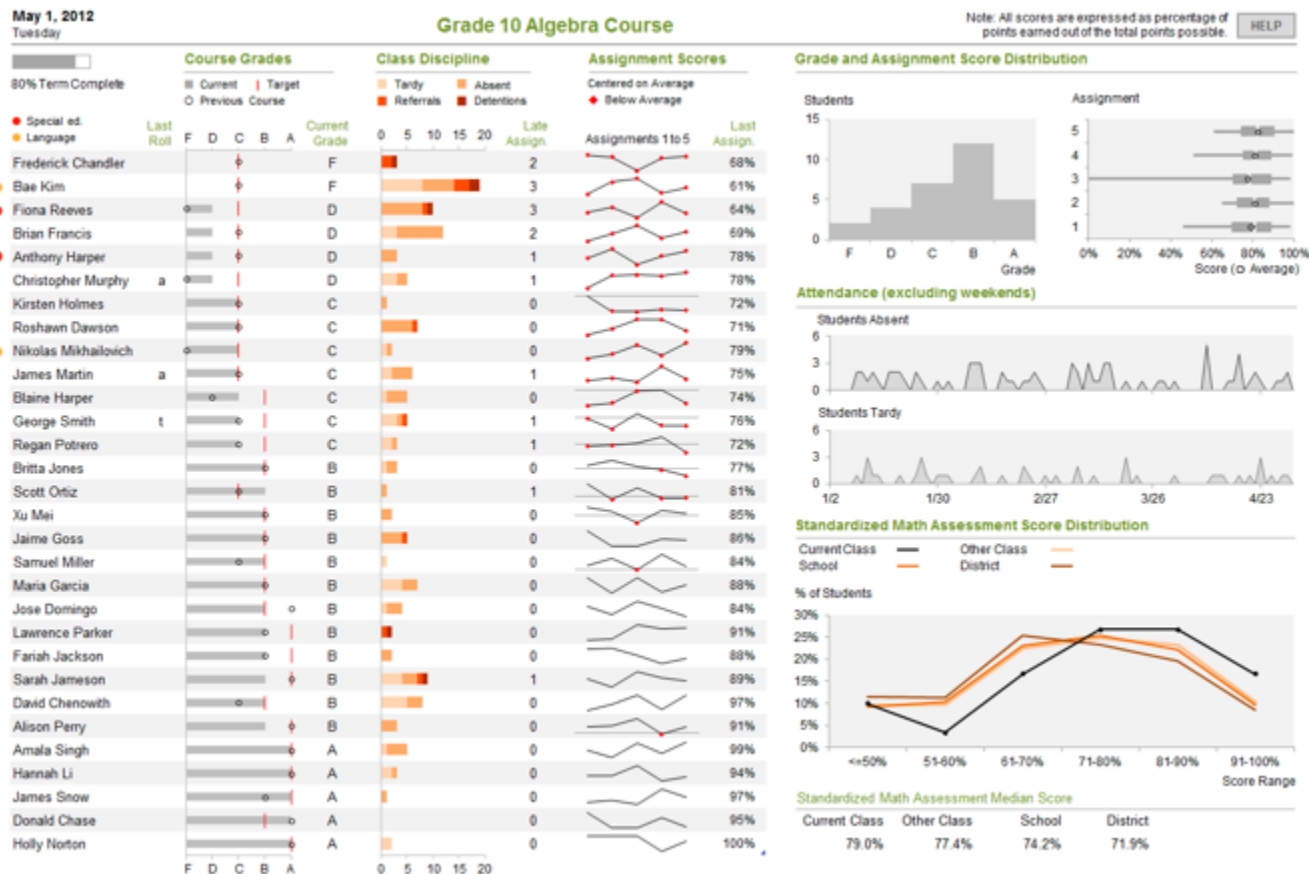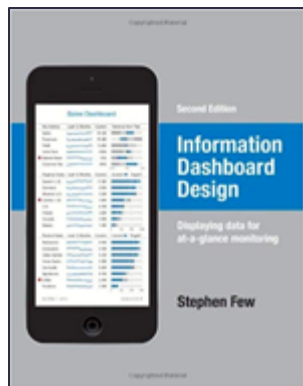
Dashboard Design
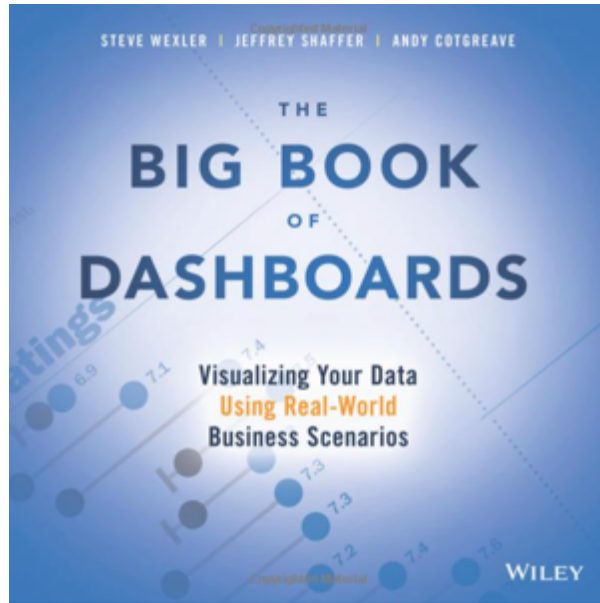
Lots of real examples.
Tableau files/templates at https://www.bigbookofdashboards.com/dashboards.html

1. Above all else, show the data.

Investment Exit Multiple vs. Angel's Due Diligence Effort

N = 270
R = 0.18
p = 0.003

Notes:

- Minimum exit value set at $1000 to account for different sizes of losses, and to allow log to be defined.
- Includes 270 survey responses with values for investment, exit, and due diligence.
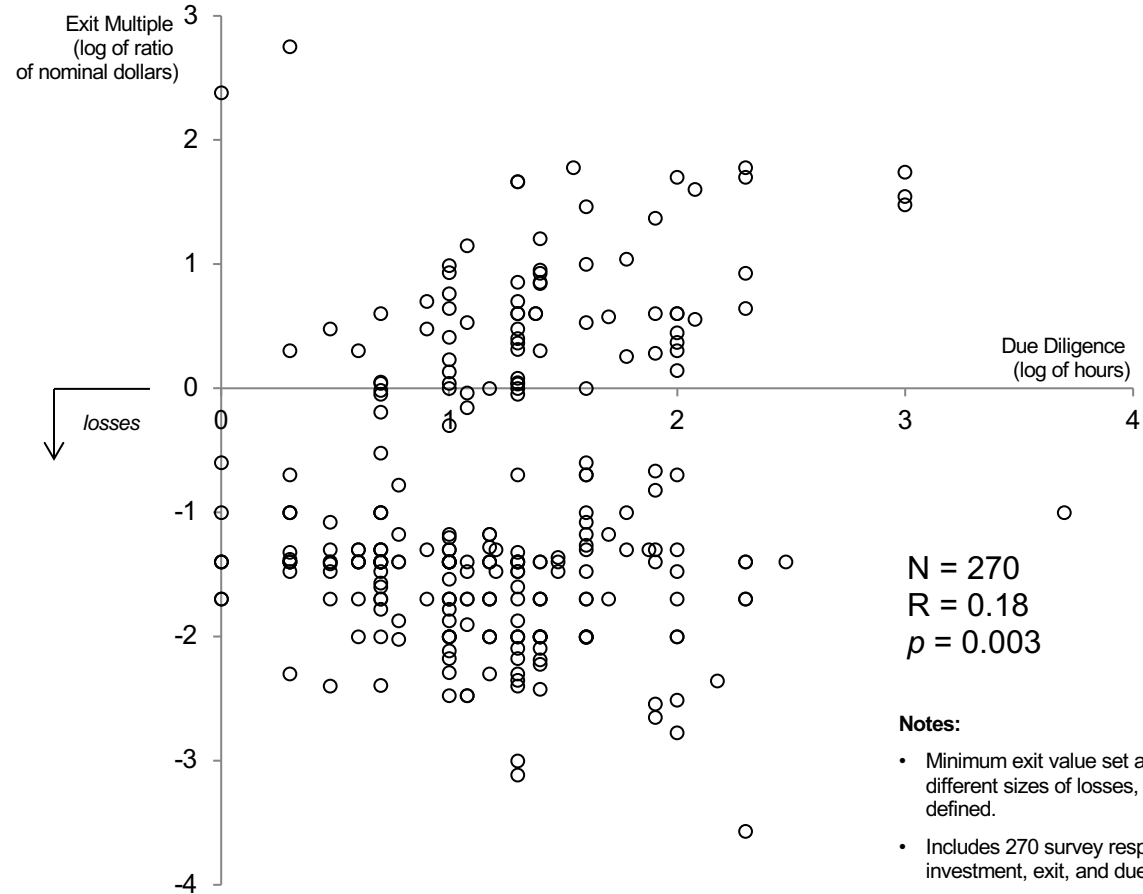
2. Start with a good table. May be all you need.

Product Name	Section	Mystery	Students	Public	Total	Raw Share	Weighted Vote Total	Weighted Share	Price	Unit Cost	Margin	% Margin	Estimated Profits
DesKlip	414	8	14	89	111	4.6%	127	4.68%	$ 35.00	$ 4.81	$ 19.69	80%	$ 941,226
Flada	412	5	11	70	86	3.6%	96	3.54%	$ 50.00	$ 3.08	$ 31.92	91%	$ 807,377
JogBuddy	411	4	14	76	94	3.9%	102	3.76%	$ 50.00	$ 5.00	$ 30.00	86%	$ 806,239
Wrist Angel	413	8	13	44	65	2.7%	81	2.99%	$ 14.95	$ 1.00	$ 9.47	90%	$ 675,580
CoatGuard	411	7	12	58	77	3.2%	91	3.36%	$ 50.00	$ 8.24	$ 26.76	76%	$ 641,608
Nima	412	8	9	43	60	2.5%	76	2.80%	$ 20.00	$ 1.62	$ 12.38	88%	$ 619,750
Super Scrubber	414	0	11	64	75	3.1%	75	2.77%	$ 49.99	$ 4.00	$ 30.99	89%	$ 612,568
Spatutong	414	4	8	63	75	3.1%	83	3.06%	$ 15.99	$ 2.60	$ 8.59	77%	$ 587,607
3Denti	411	2	10	68	80	3.3%	84	3.10%	$ 15.00	$ 2.91	$ 7.59	72%	$ 559,941
Key Keep	414	6	18	25	49	2.0%	61	2.25%	$ 19.99	$ 1.00	$ 12.99	93%	$ 522,323
Cut[tupp]	411	11	13	30	54	2.2%	76	2.80%	$ 6.00	$ 1.14	$ 3.06	73%	$ 510,618
Hanger Loose	412	4	15	38	57	2.4%	65	2.40%	$ 16.95	$ 1.86	$ 10.01	84%	$ 505,444
Tri Top	414	5	12	56	73	3.0%	83	3.06%	$ 24.95	$ 6.19	$ 11.28	65%	$ 494,125
Beddersheet	412	1	10	52	63	2.6%	65	2.40%	$ 35.00	$ 5.10	$ 19.40	79%	$ 474,635
Trimswell	411	2	12	64	78	3.2%	82	3.02%	$ 6.99	$ 1.85	$ 3.04	62%	$ 470,274
E-Packit	412	2	13	37	52	2.2%	56	2.07%	$ 14.95	$ 1.00	$ 9.47	90%	$ 467,068
CompCove	414	6	13	33	52	2.2%	64	2.36%	$ 49.99	$ 7.52	$ 27.47	79%	$ 463,357
PILLight	413	0	12	44	56	2.3%	56	2.07%	$ 24.99	$ 2.32	$ 15.17	87%	$ 447,925
easl	413	0	17	48	65	2.7%	65	2.40%	$ 50.00	$ 9.28	$ 25.72	73%	$ 440,481
LitSwitch	414	0	13	60	73	3.0%	73	2.69%	$ 19.99	$ 6.06	$ 7.93	57%	$ 381,645

The people you work with are smart.

They can process a lot of information if you make it available to them.

For in person meetings, if you have a lot of items (e.g., >20), use a table, print it, and hand it out.

3. Careful display of time series

194.6
191.8
190.0
190.6
190.6
190.6
190.6
189.8
188.6
190.6
188.6
189.0
189.6
189.6
187.8
187.8
188.6
189.8
188.2
187.2
184.2
191.2
192.2
192.2
189.2
187.2
187.2
188.6
188.6
187.2
185.6
185.6
185.6
185.8
185.6
186.4
186.4
184.8
186.8
186.8
187.2
185.4
186.4
187.6
187.8
188.0
188.0
189.0
186.4
187.2

Tables are great for comparisons of a lot of values – not as helpful for detecting trends in noisy signals.

Be especially cautious with
"% Change from Previous Period"
with noisy data.
(Usually meaningless and distracting)

3. Careful display of time series

194.6
191.8
190.0
190.6
190.6
190.6
190.6
189.8
188.6
190.6
188.6
189.0
189.6
189.6
187.8
187.8
188.6
189.8
188.2
187.2
184.2
191.2
192.2
192.2
189.2
187.2
187.2
188.6
188.6
187.2
185.6
185.6
185.6
185.8
185.6
186.4
186.4
184.8
186.8
186.8
187.2
185.4
186.4
187.6
187.8
188.0
188.0
189.0
186.4
187.2
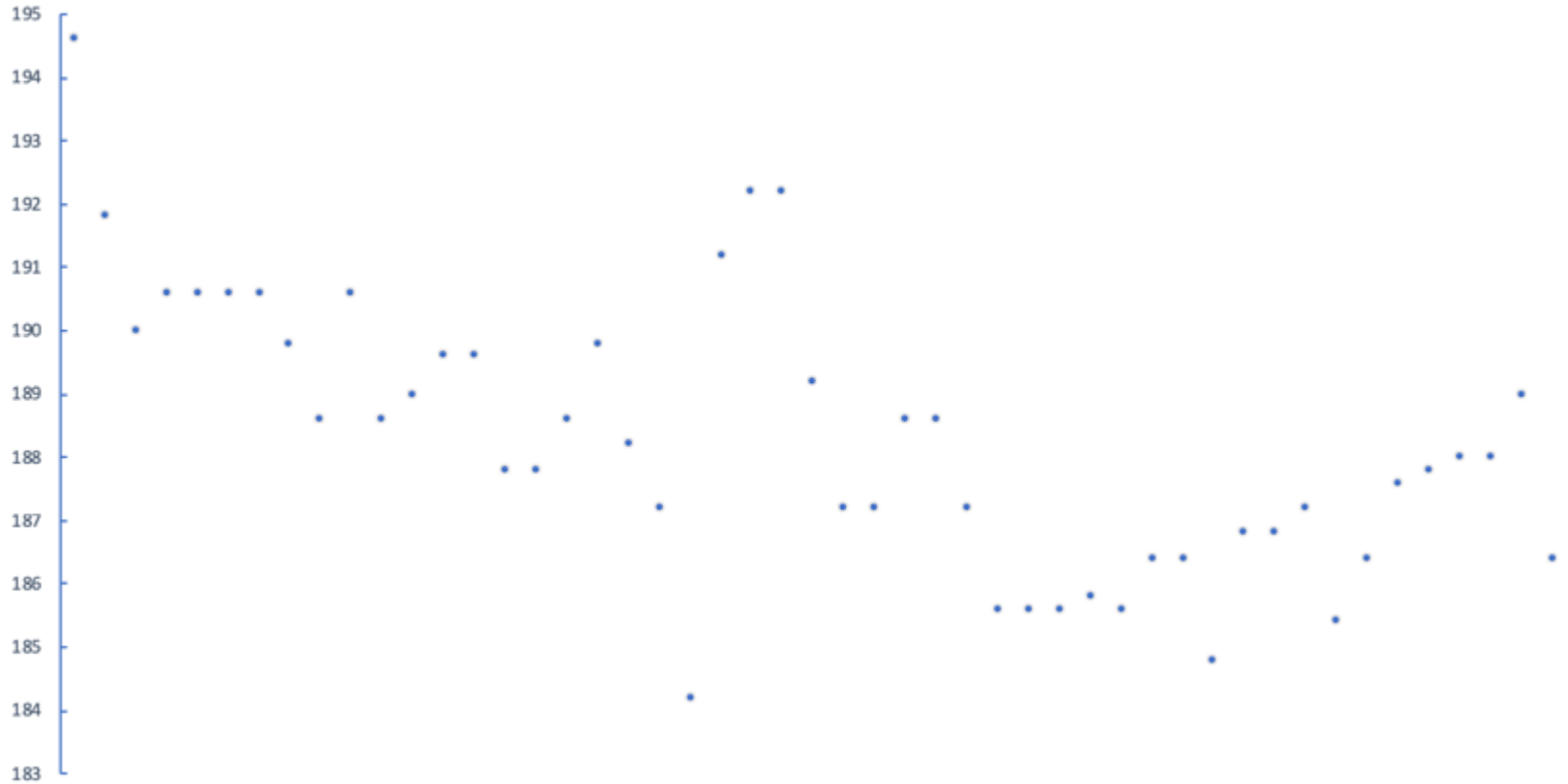
Same 50 points in "line" graph (but since measurement not continuous – only "markers" shown.

3. Careful display of time series (use of rolling averages to detect real trends)

7-day rolling average
(day +/- 3 days)

21-day rolling average
(day +/- 10 days)
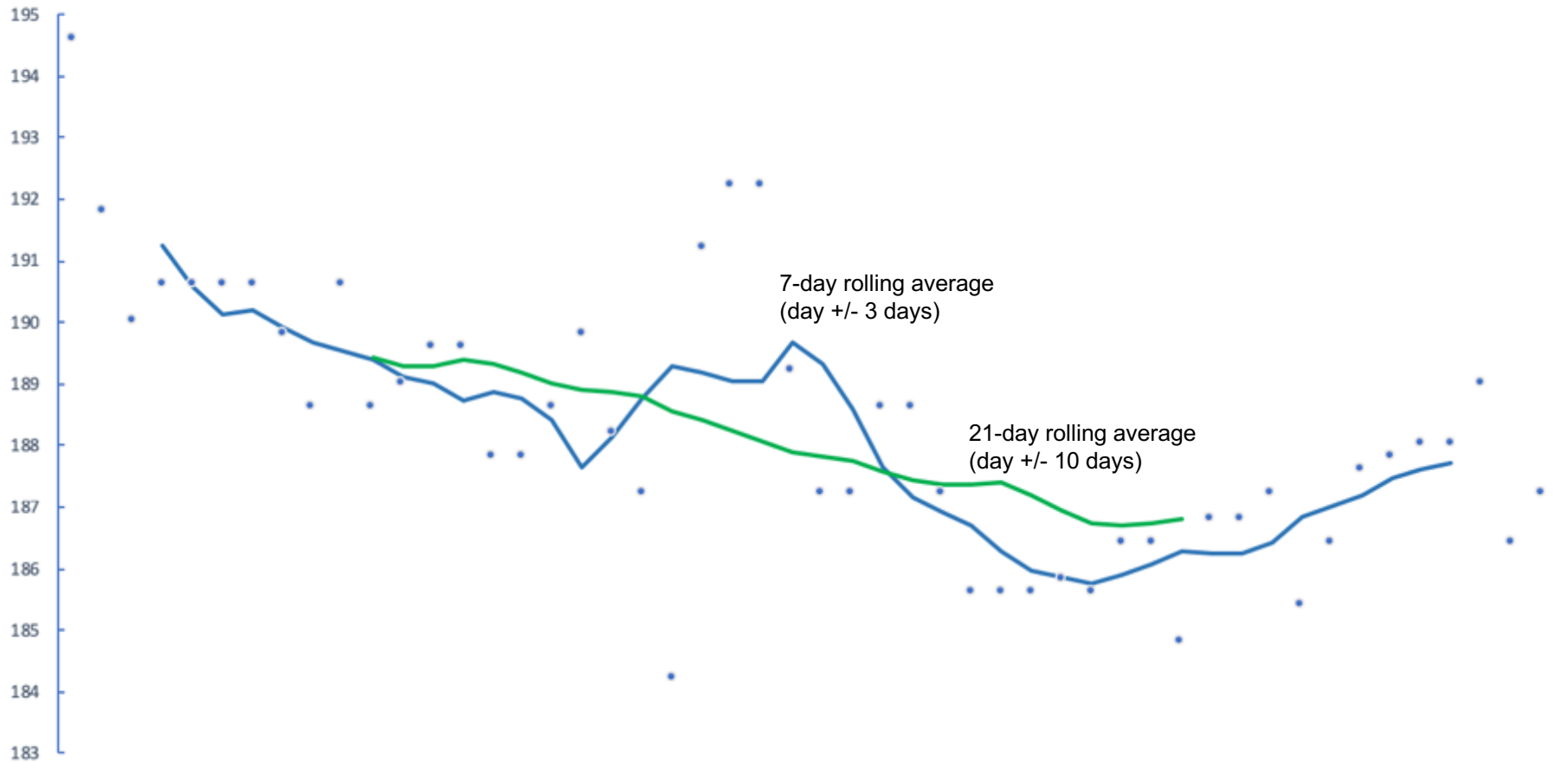
3. Careful display of time series (annotation to support discussion)

Weight (lbs)

7-day rolling average
(day +/- 3 days)

21-day rolling average
(day +/- 10 days)

Annual Bike Trip

Sep

Oct

(day)
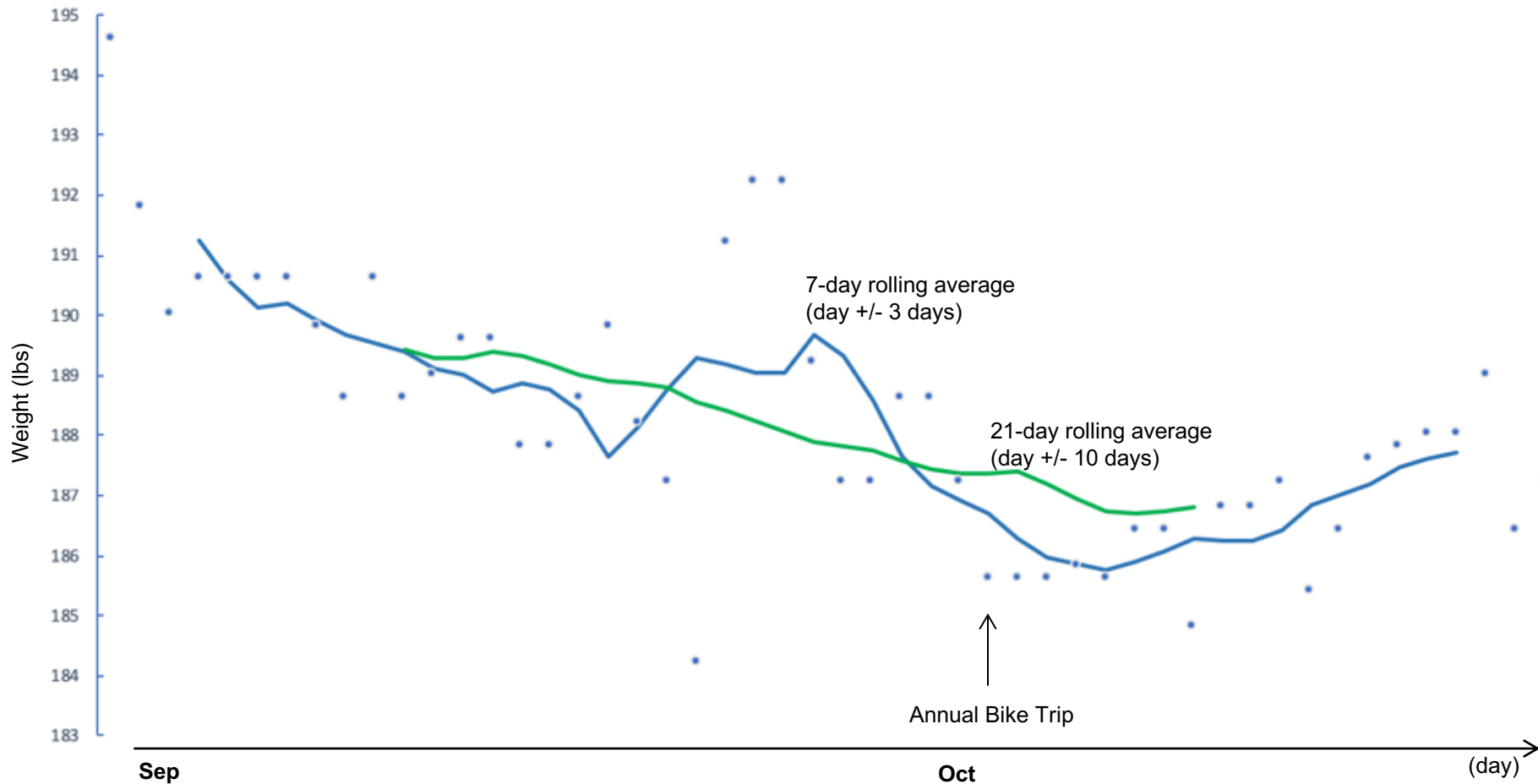
4. Invest in a Single Carefully Designed Graphic to Support an Important Discussion
(How many scooters do we need through the end of the year – accounting for 2020 pandemic effect)

K.T. Ulrich 05Sep2020
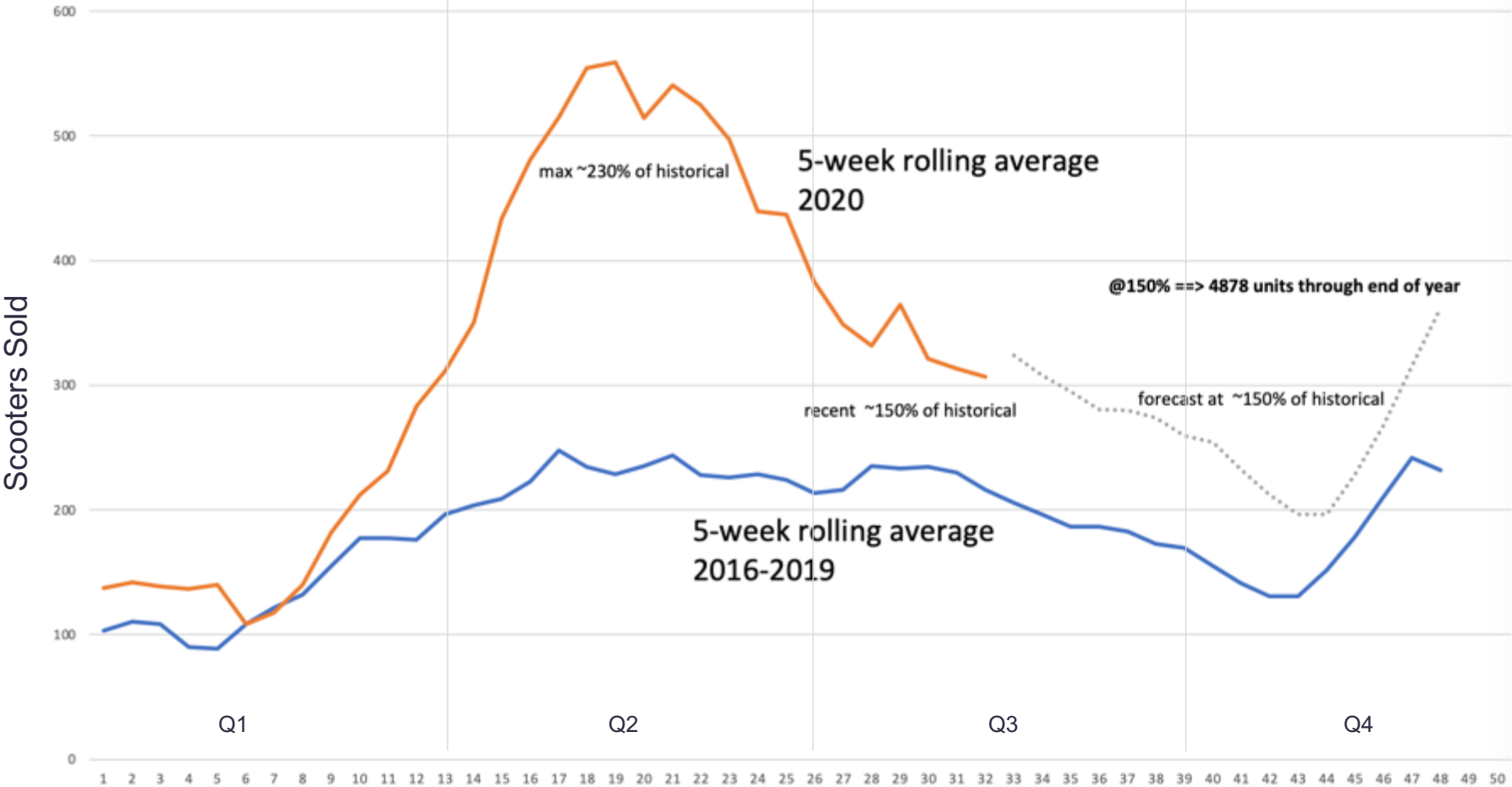
# MBA program – Student Views

- What are the most important aspects of a global school?

Domestic Students	International Students	Overall
Brand Name/Reputation	Brand Name/Reputation	Brand Name/Reputation
Diverse International Student Body	Alumni Network	Diverse International Student Body
International Curriculum	Diverse International Student Body	Alumni Network
Alumni Network	Extra Curricular Activities	Extra Curricular Activities
Extra Curricular Activities	International Curriculum	International Curriculum

Real example from a real Wharton committee report.
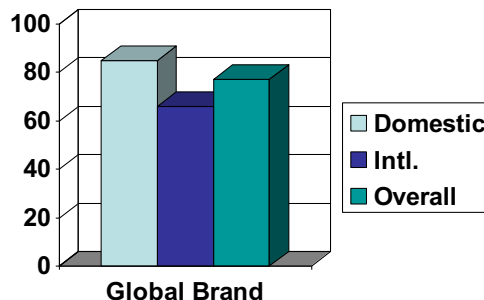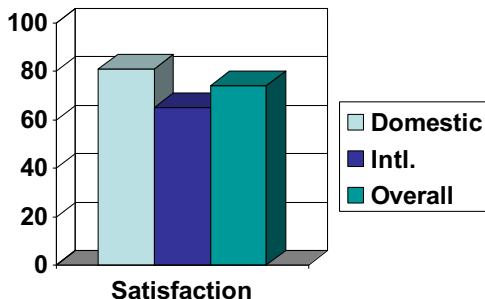
MBA program – Survey Results

- Why is being part of a global school is important?
- Overall, 90% of the students surveyed strongly agree or agree with the statement: "It is important that a MBA education provide a global business education experience."
- Applications and acceptance are affected
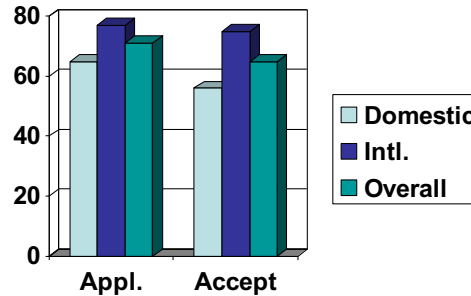
Real example from a real Wharton committee report.

MBA program – Survey Results

- How are we doing in delivery?
- 74% of the surveyed strongly agree or agree with the statement: "Wharton has met my expectations in terms of a global business education experience."

Satisfaction

Global Brand

Real example from a real Wharton committee report.

MBA program – Survey Results

- How are we doing in delivery?
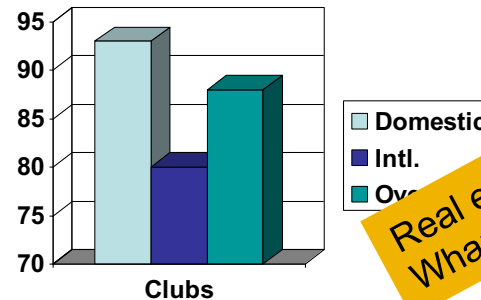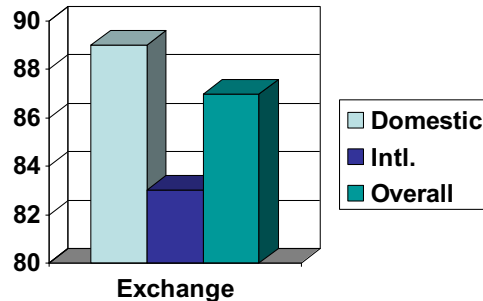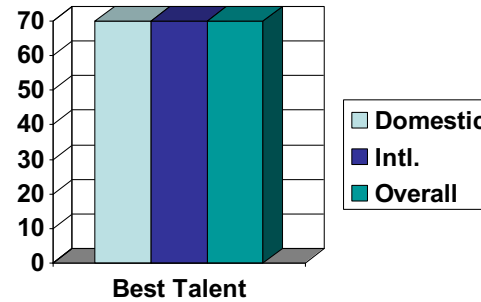
Real example from a real Wharton committee report.

MBA program – Survey Results

- How are we doing in delivery?
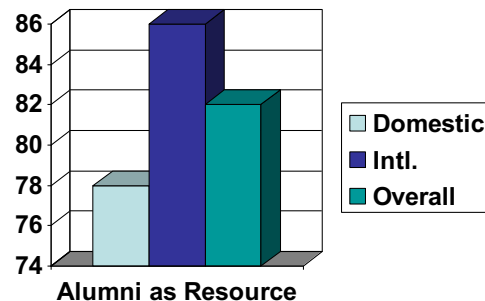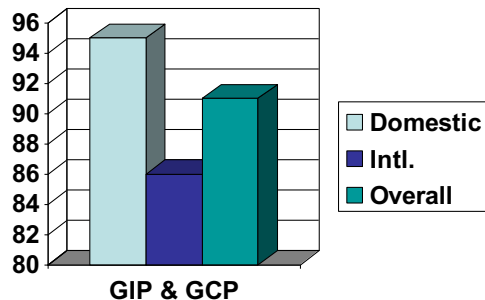
Real example from a real Wharton committee report.

MBA program – Survey Results

- How are we doing in delivery?

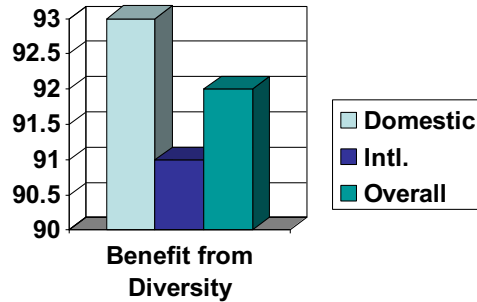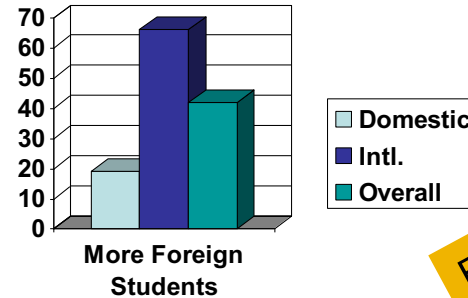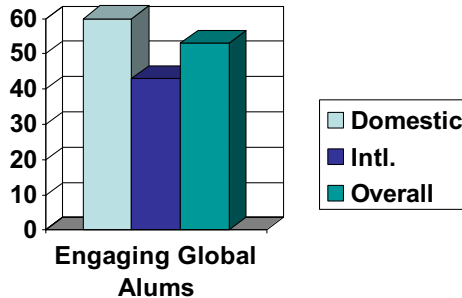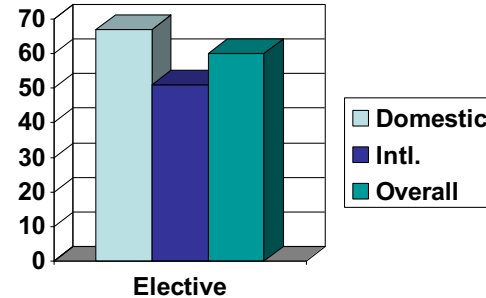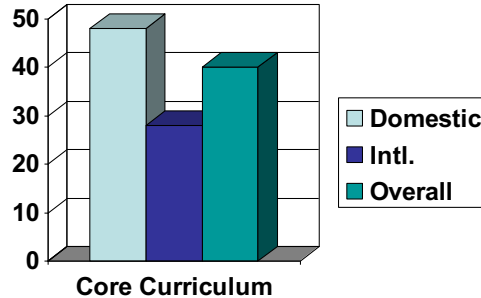Real example from a real Wharton committee report.

MBA program – Survey Results

- Summary Findings

  - Being globally well-known has tangible benefits to Wharton
    - Applications
    - Acceptance
    - Learning experience
  - By and large, we are delivering along the dimensions that matter to MBA's
  - There is room to improve in adding more global content to the elective and core curriculum and in engaging global alums
  - Domestic students feel better about school's globalization efforts
  - We are probably at the upper boundary in terms of the proportion of international students

Real example from a real Wharton committee report.

Easily improved by getting all data on one page…(but we can do better)

Horizontal bar chart comparing Non-US (red) and US (blue) responses:

Category	Non-US	US
Enough global electives	~51	~66
Core sufficiently global	~28	~48
GIP and GCP effective	~86	~95
Student-run activities broaden global perspectives	~80	~93
Wh has enough exchange options	~83	~89
Wh attracts best student talent globally	~70	~70
Wh should increase % non-US	~66	~19
I benefit from int'l diversity	~91	~93
Wh strong global brand	~62	~84
Wh met expectations for global business ed	~62	~80

5. Use scatter plots to both show relationships and enable comparisons.

MBA Student Perspectives – US vs. Non-US Students
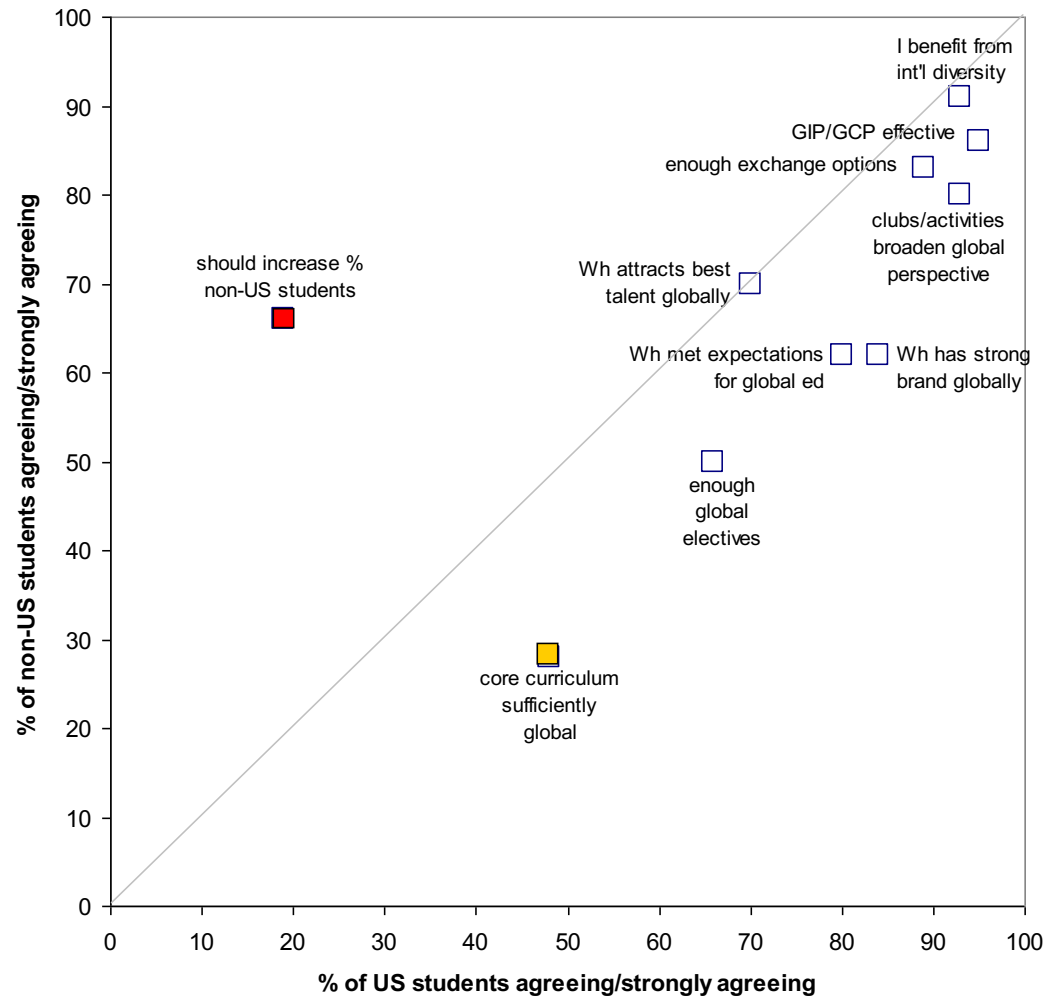
% of non-US students agreeing/strongly agreeing

100

90 — I benefit from int'l diversity

GIP/GCP effective

80 — enough exchange options

clubs/activities broaden global perspective

should increase % non-US students

70 — Wh attracts best talent globally

Wh met expectations for global ed — Wh has strong brand globally

50 — enough global electives

30 — core curriculum sufficiently global

20

10

0

0   10   20   30   40   50   60   70   80   90   100

% of US students agreeing/strongly agreeing

Picky Point A – Care, Craft, and Hygiene

- Eliminate chart chunk.
- Maximize data-pixels/non-data-pixels ratio.
- Careful use of color.
- Include your name and the date.

Shire Return Curve
Revision of October 9, 2019

ILLUSTRATIVE ONLY
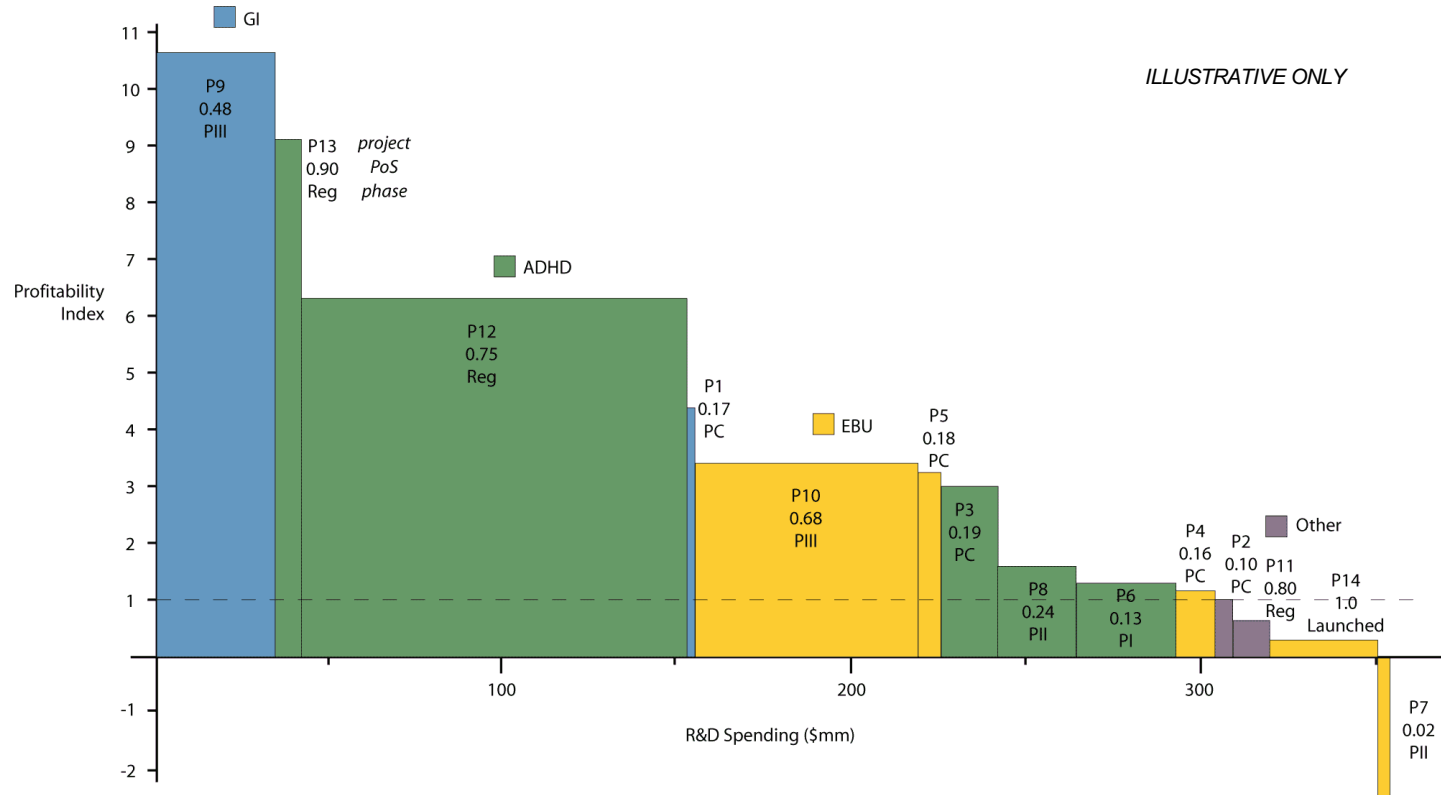
Profitability Index = PV(expected profit contribution)/investment ~ (eNPV + R&DSpend)/R&DSpend

to be as brave as the people we help.

Picky Point B - Avoid legends. Use direct labeling instead.

Components of Foreign Aid
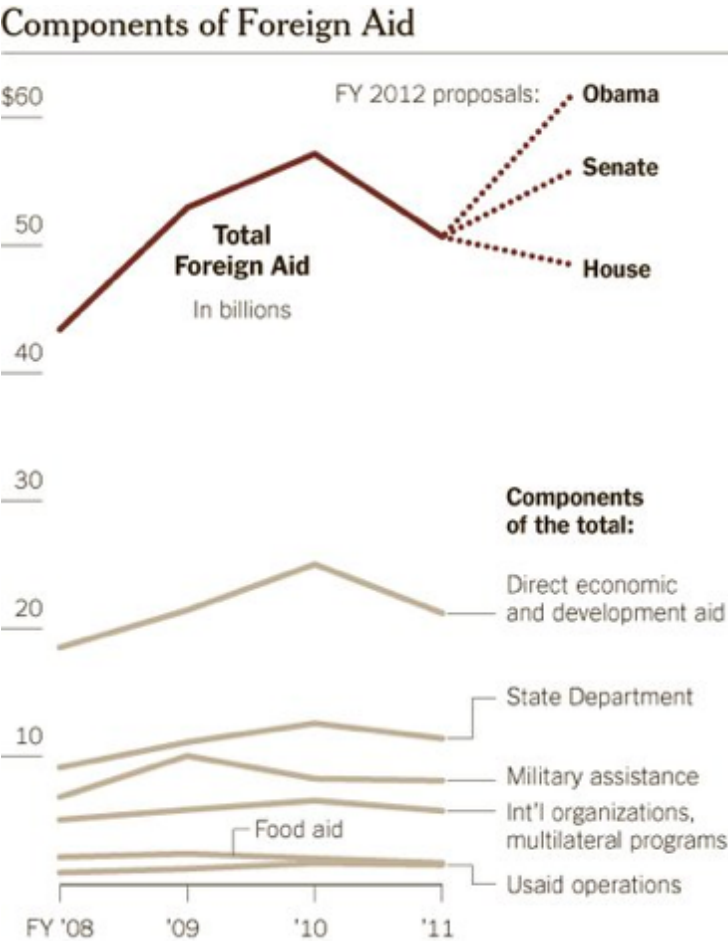
Source: New York Times, 2011

Picky Point C
Make all X and Y dimensions meaningful
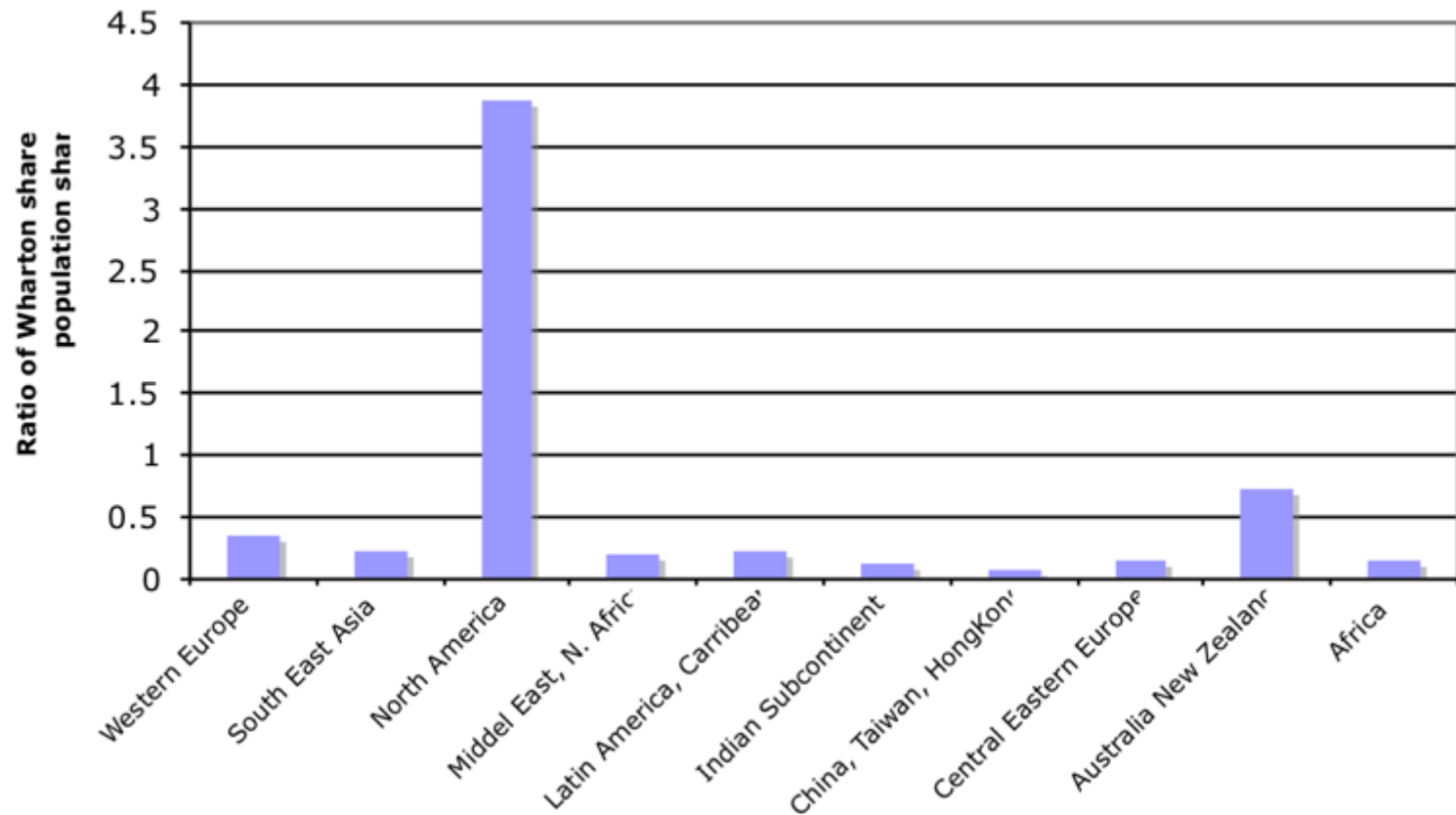
How might X axis be put to work?

Source: New York Times, 2011

The *New York Times* and *The Wall Street Journal* are the gold standard today. Their data graphics pros are very, very good. They've been thoroughly "Tufte-d."

Nail salons

Services for the elderly and disabled

Other professional services (translation, interpretation)

Internet publishing, broadcasting, search

A Mixed Recovery

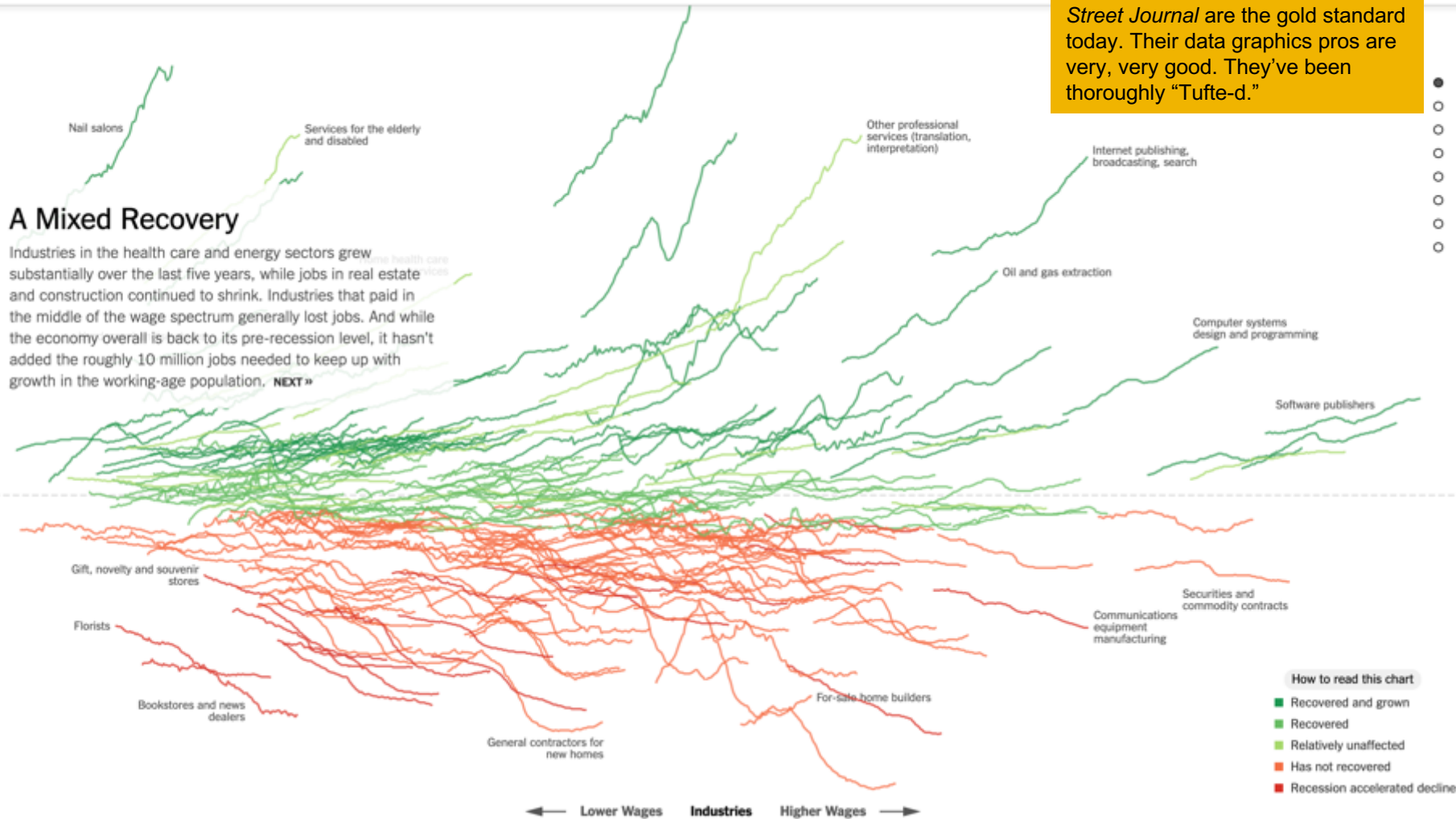Industries in the health care and energy sectors grew substantially over the last five years, while jobs in real estate and construction continued to shrink. Industries that paid in the middle of the wage spectrum generally lost jobs. And while the economy overall is back to its pre-recession level, it hasn't added the roughly 10 million jobs needed to keep up with growth in the working-age population. **NEXT »**

Oil and gas extraction

Computer systems design and programming

Software publishers

Increased

Jobs since recession

Decreased

Gift, novelty and souvenir stores

Florists

Bookstores and news dealers

General contractors for new homes

For-sale home builders

Communications equipment manufacturing

Securities and commodity contracts

How to read this chart

- Recovered and grown
- Recovered
- Relatively unaffected
- Has not recovered
- Recession accelerated decline

← Lower Wages   **Industries**   Higher Wages →

Data Graphics Checklist

1. Have you shown the data?

2. Do you have a clear understanding of the reasoning you are trying to support with the graphic?

   - Do the variables and relationships shown support the reasoning?

   - Have you avoided lines connecting unrelated points?

3. Have you enabled comparisons?

4. Have you wasted any visual dimensions (e.g., arbitrary ordering of items in charts)?

5. Have you directly labeled data points (avoiding legends if at all possible)?

6. Have you used scatter plots where appropriate to show two attributes for items?

   - Are the X-Y axes sensible?

7. Did you consider a nicely implemented table when displaying more than two dimensions?

8. Have you used good graphic hygiene?

   - Appropriate font sizes (usually smaller).

   - Avoiding arbitrary use of color.

   - No chart junk.

   - Your name and the date are on the graphic.

   - All axes and units are labeled and/or specified.

   - You have minimized non-data-pixels/ink.

Karl T. Ulrich