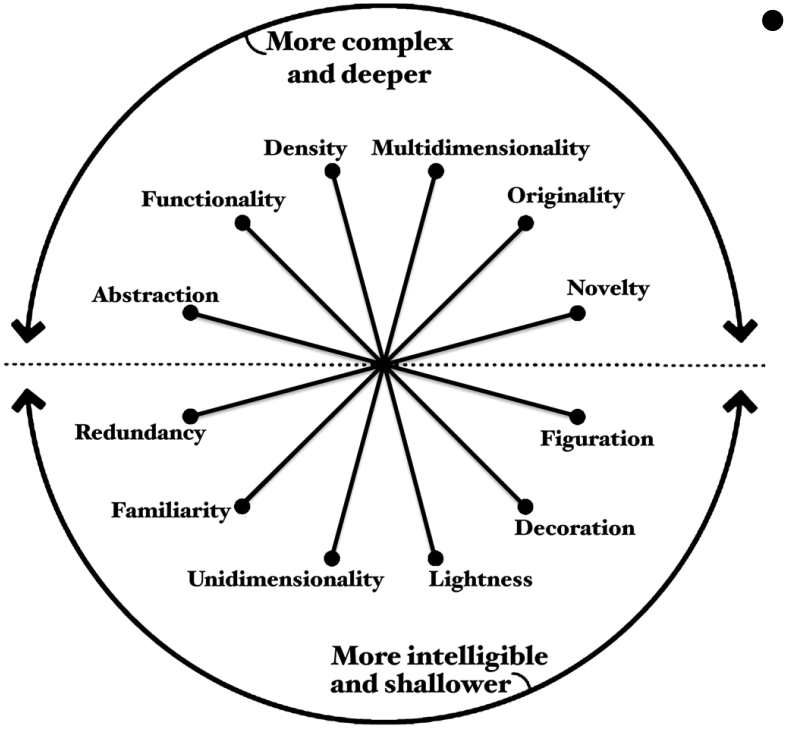
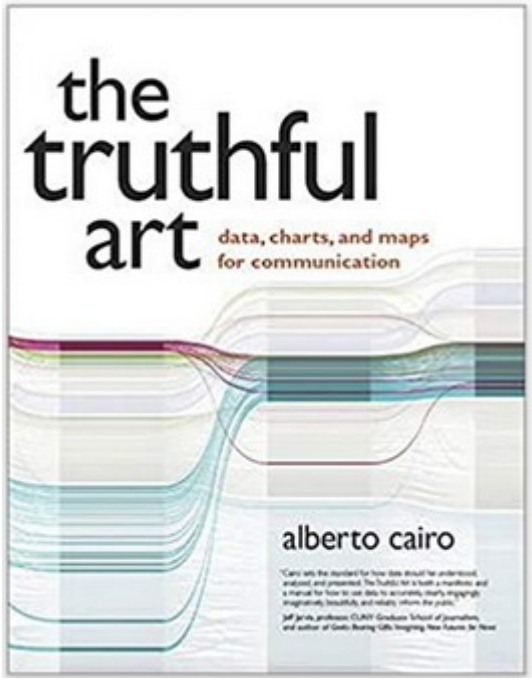
Visualization Wheel



- Alberto Cairo; the truthful art

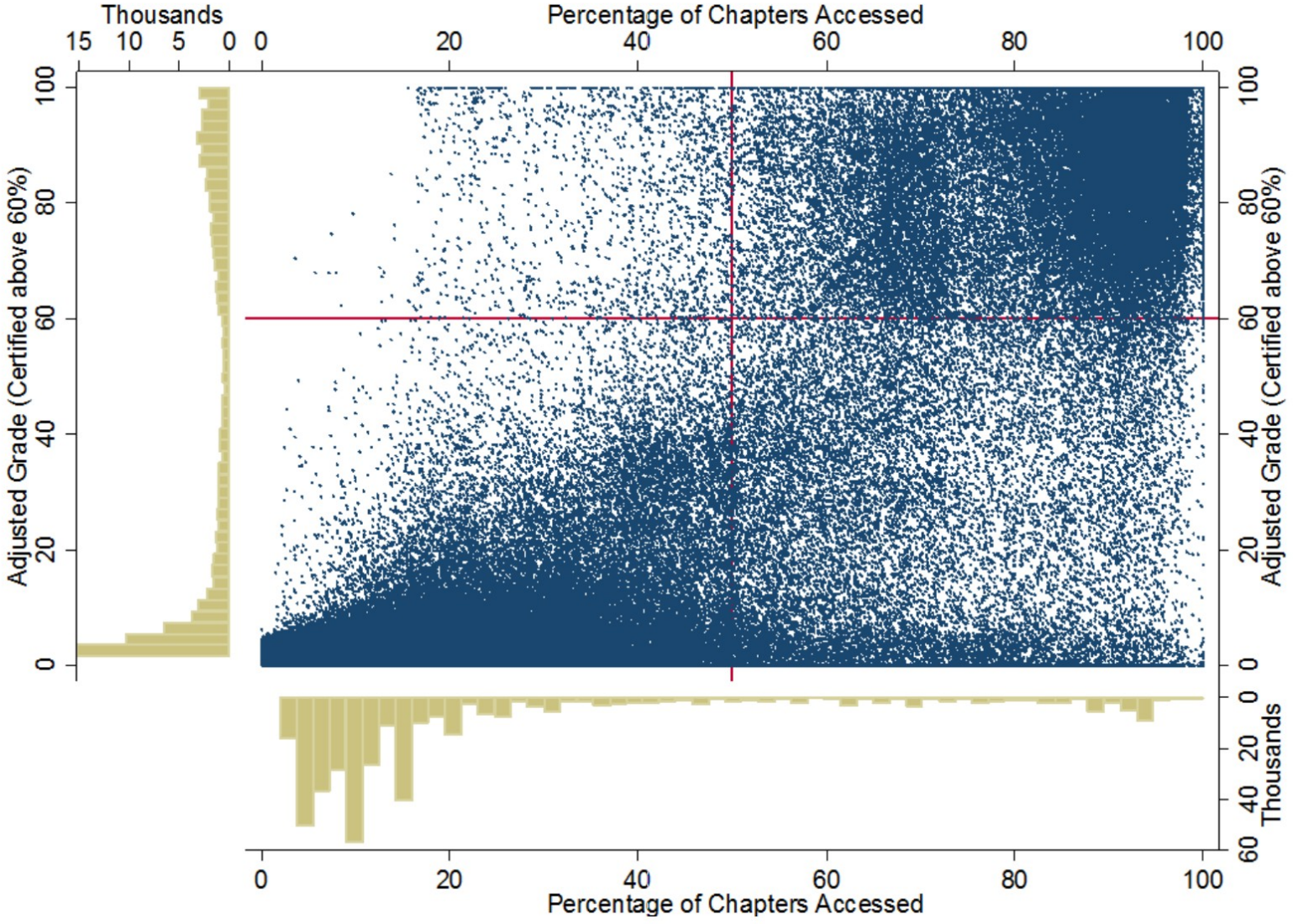


Visualization Wheel Dimensions

- **Abstraction – Figuration**
Boxes and charts (abstraction) or real-world physical objects (figuration)

- **Functionality – Decoration**
No embellishments (functionality) or artistic embellishments (decoration)

- **Density – Lightness**
Must be studied in depth (density) or understandable at a glance (lightness)


Thousands
15 10 5 0
Percentage of Chapters Accessed
0 20 40 60 80 100
Adjusted Grade (Certified above 60%)
0 20 40 60 80 100
Adjusted Grade (Certified above 60%)
0 20 40 60 80 100
Thousands
0 0 20 40 60
0 20 40 60 80 100
Percentage of Chapters Accessed

Visualization Wheel

- **Multidimensional – Unidimensional**

Different aspects of phenomena (multidimensional) or single or few items of phenomenal (unidimensional)

- **Originality – Familiarity**

Novel methods of visualization (originality) or established and well understood methods of visualization (familiarity)

- **Novelty – Redundancy**

Explaining each item once (novelty) or encoding multiple explanations of the same phenomena (redundancy)

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.

Dressée par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite.

Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zônes colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zônes. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M.M. Thiers, de Ségur, de Fezensac, de Chambray et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre.

Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davoust qui avaient été détachés sur Minsk et Mobilow et ont rejoint vers Orscha et Witebsk, avaient toujours marché avec l'armée.

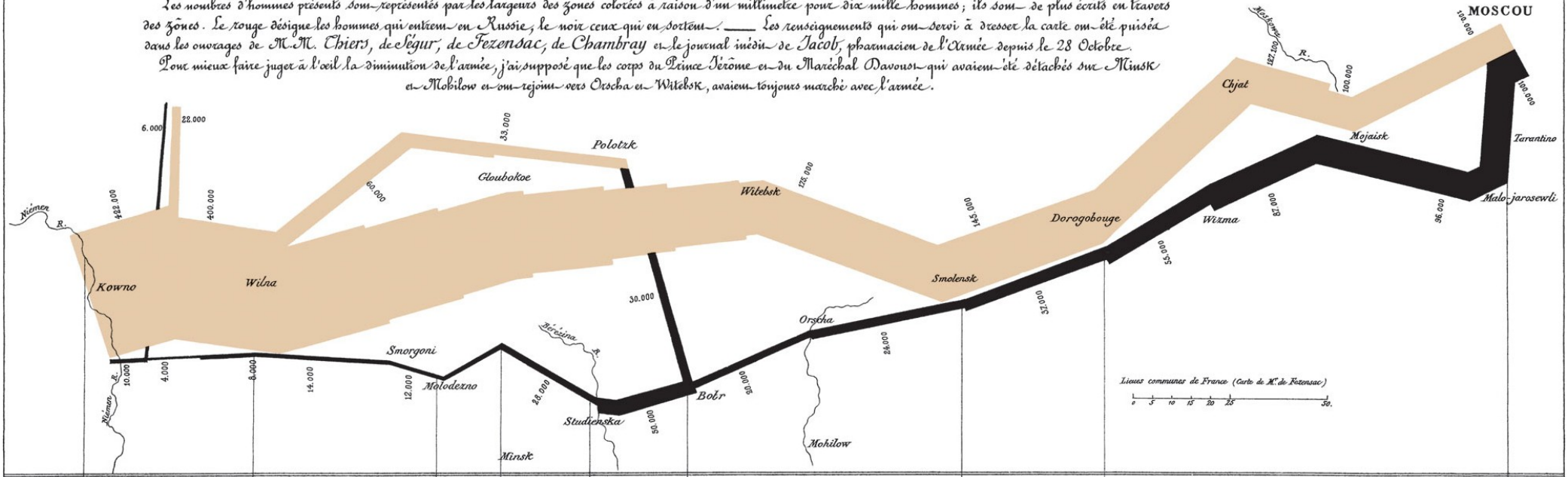
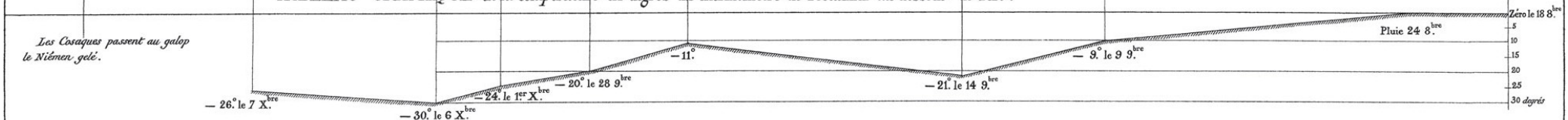


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



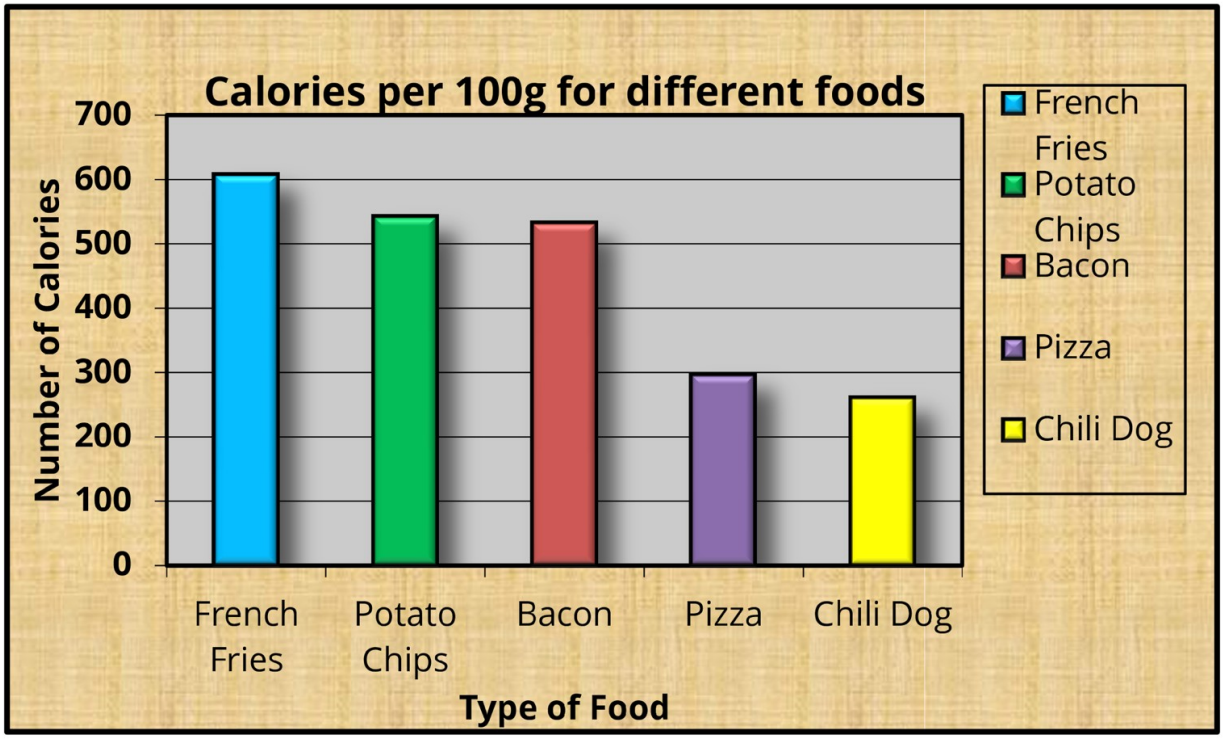
Autog. par Regnier, 8. Pas. Ste Marie St Gilles à Paris.

Imp. Lith. Regnier et Dourdet.

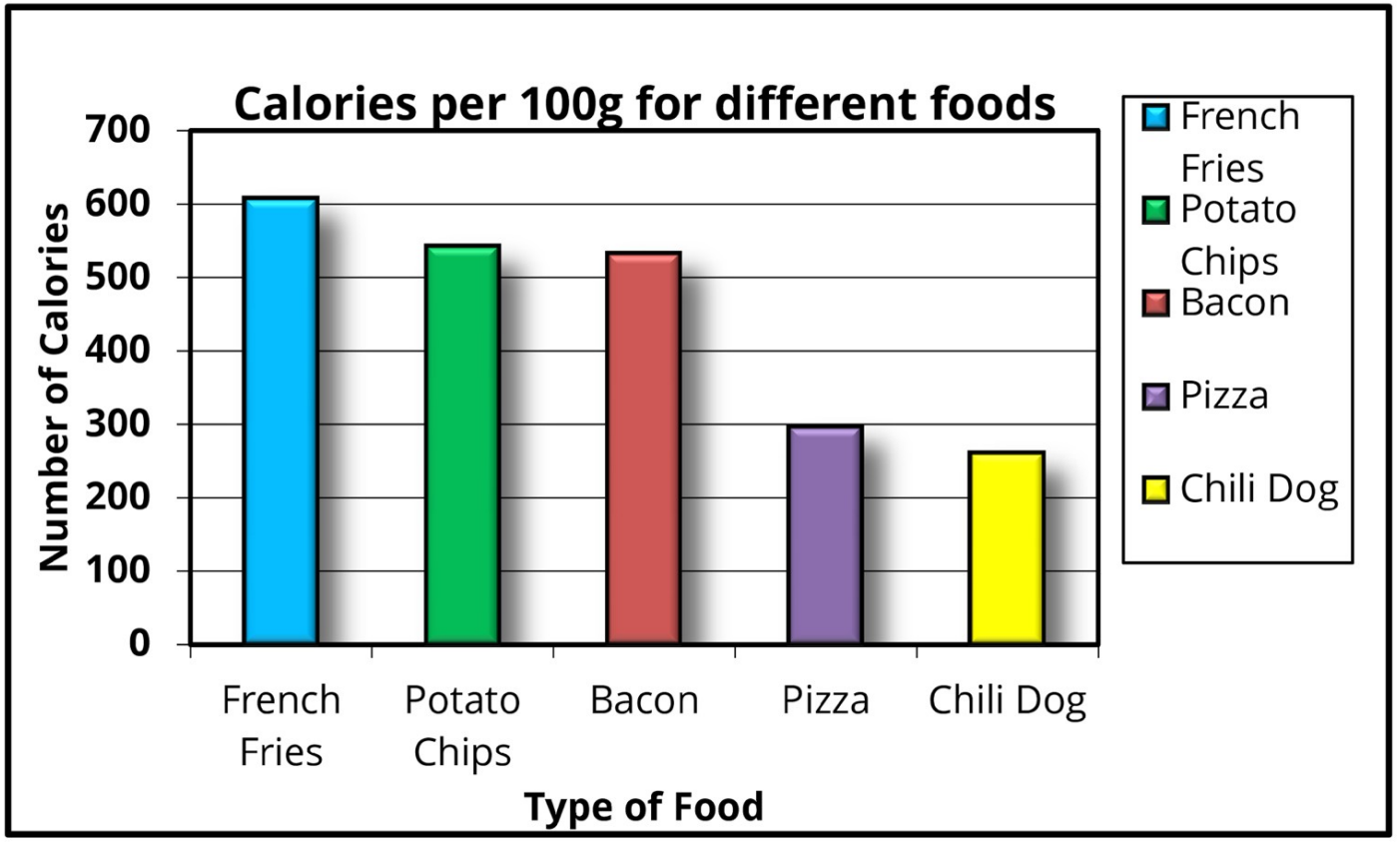
Dark Horse Analytics

Dejunkifying a Visual

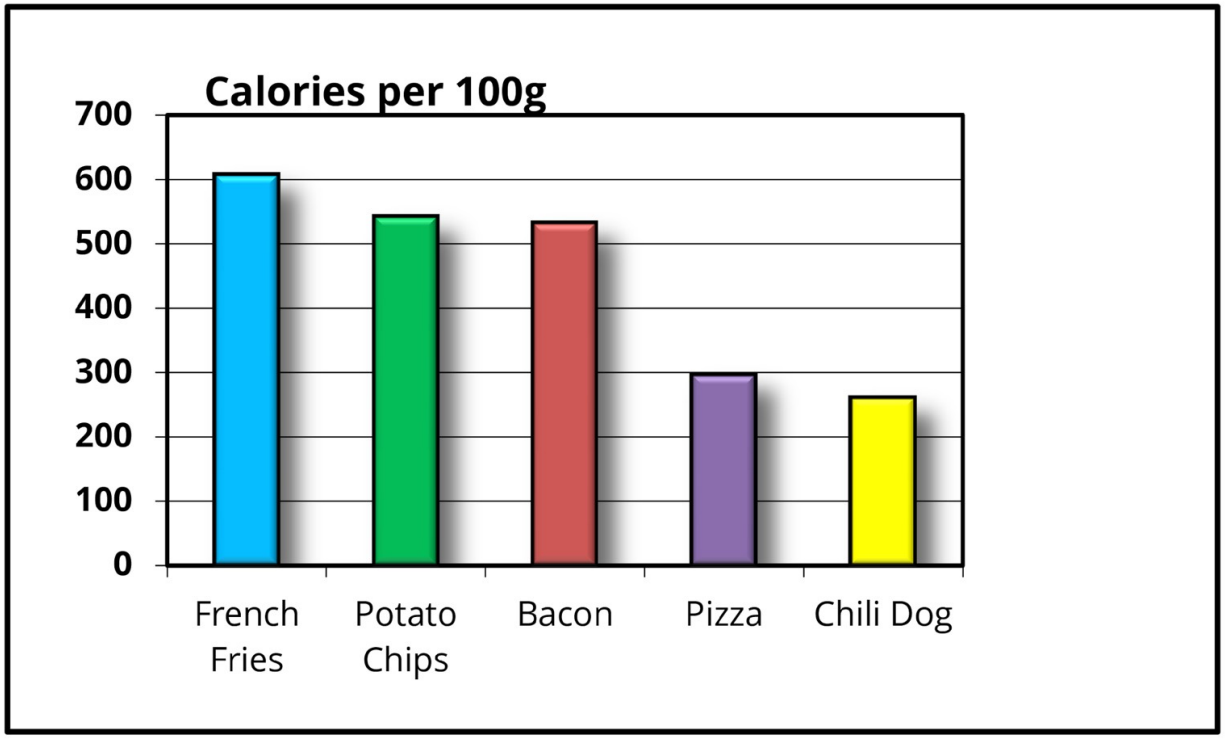
Remove backgrounds



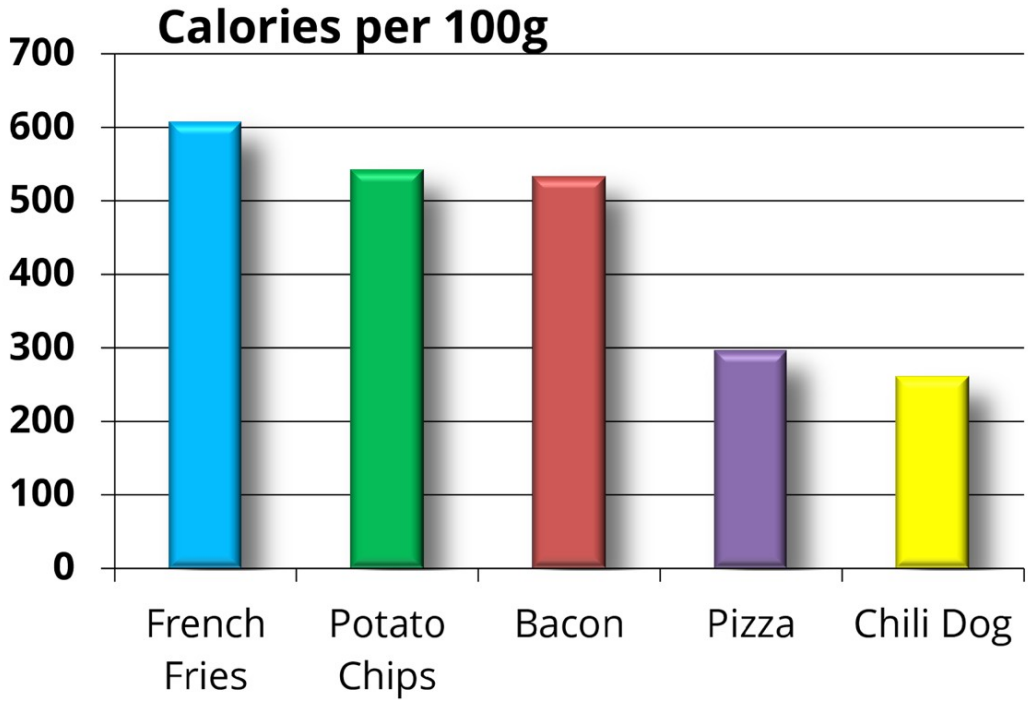
Remove redundant labels



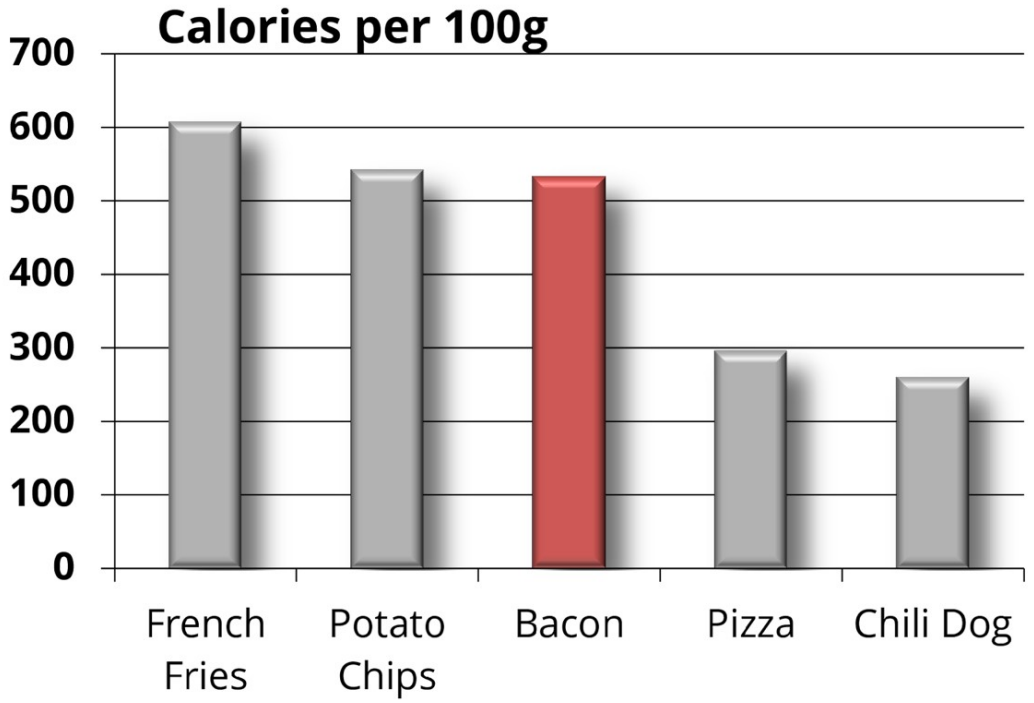
Remove borders



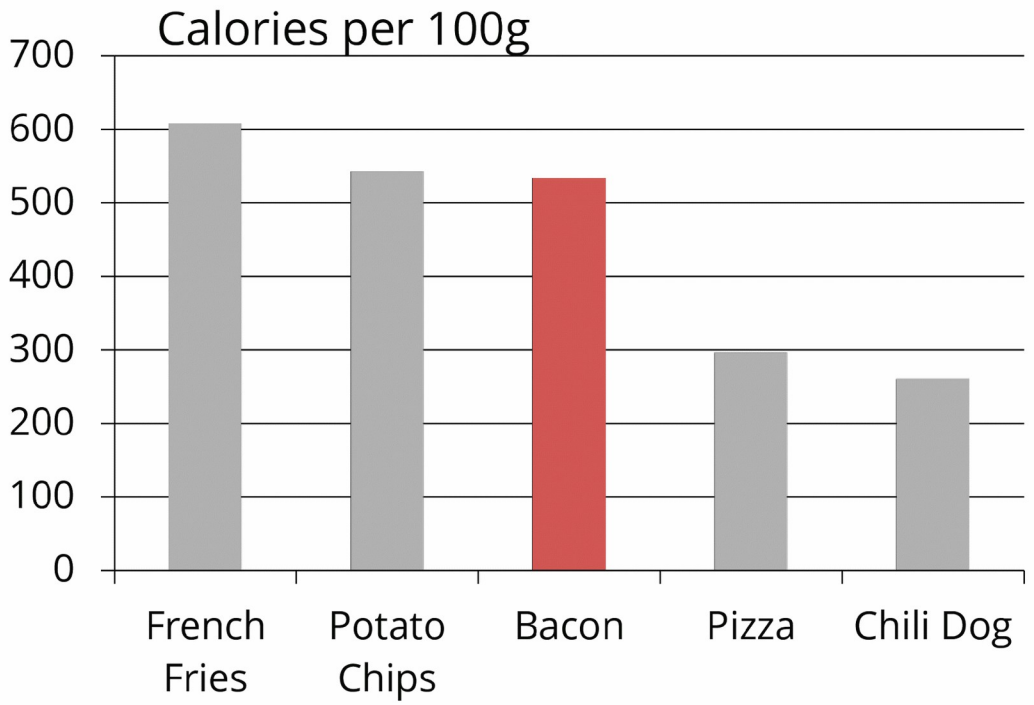
Reduce colors



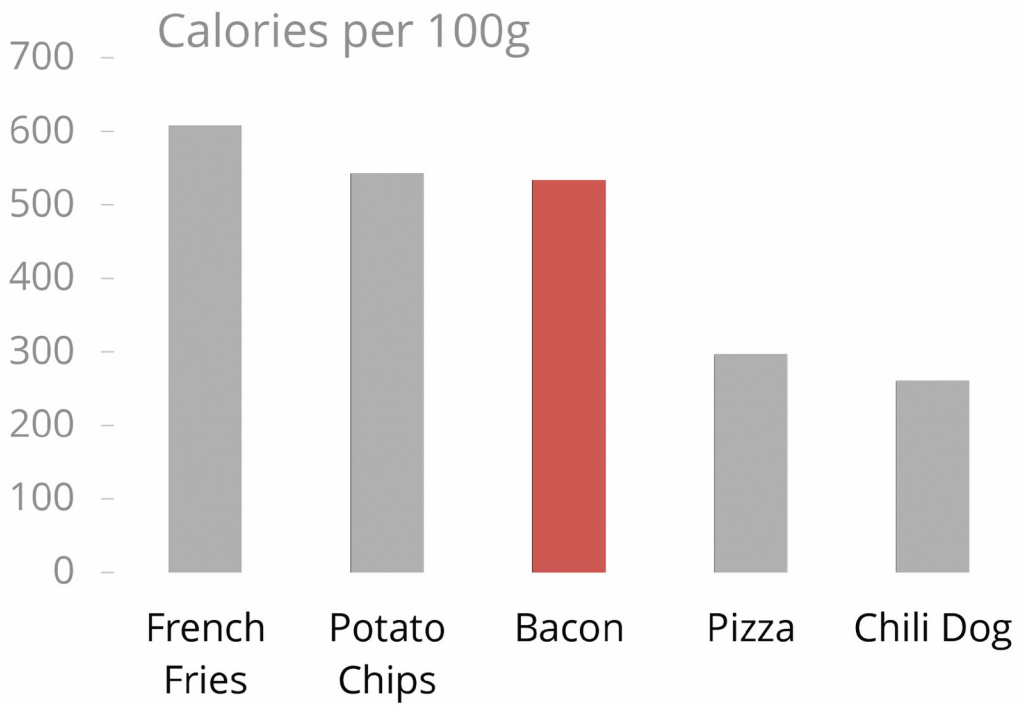
Remove special effects



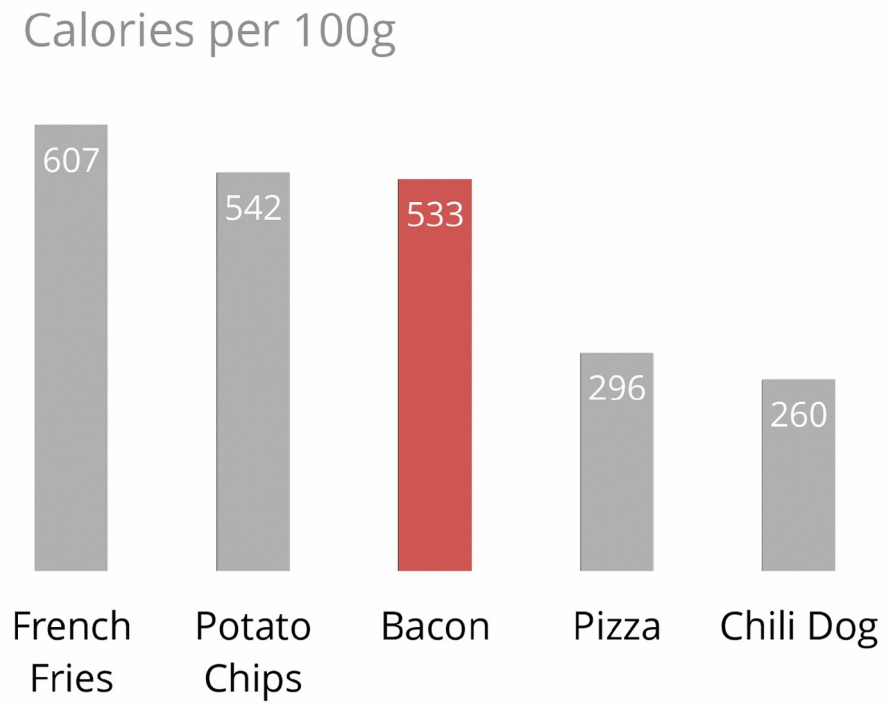
Lighten labels

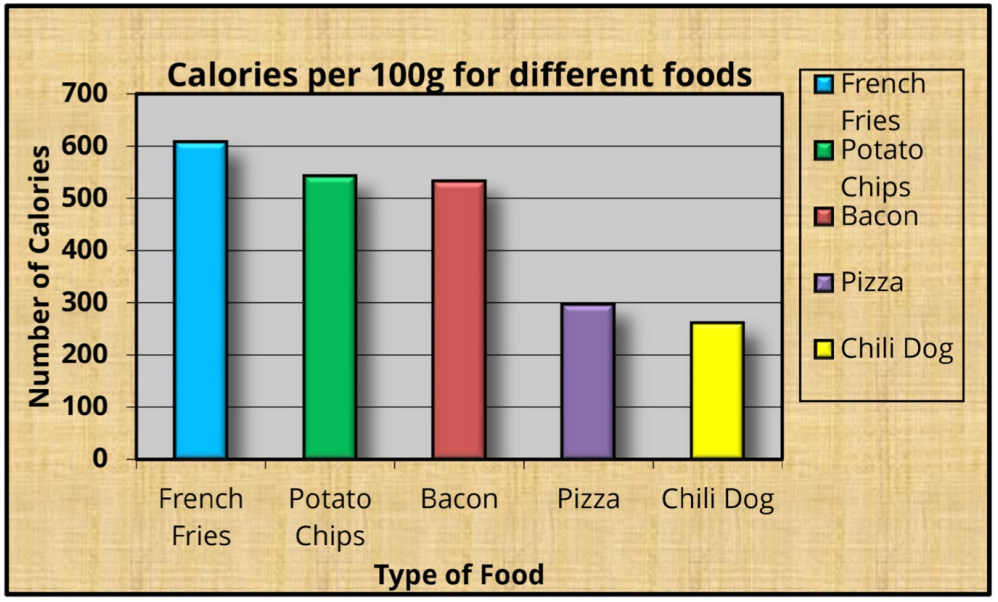


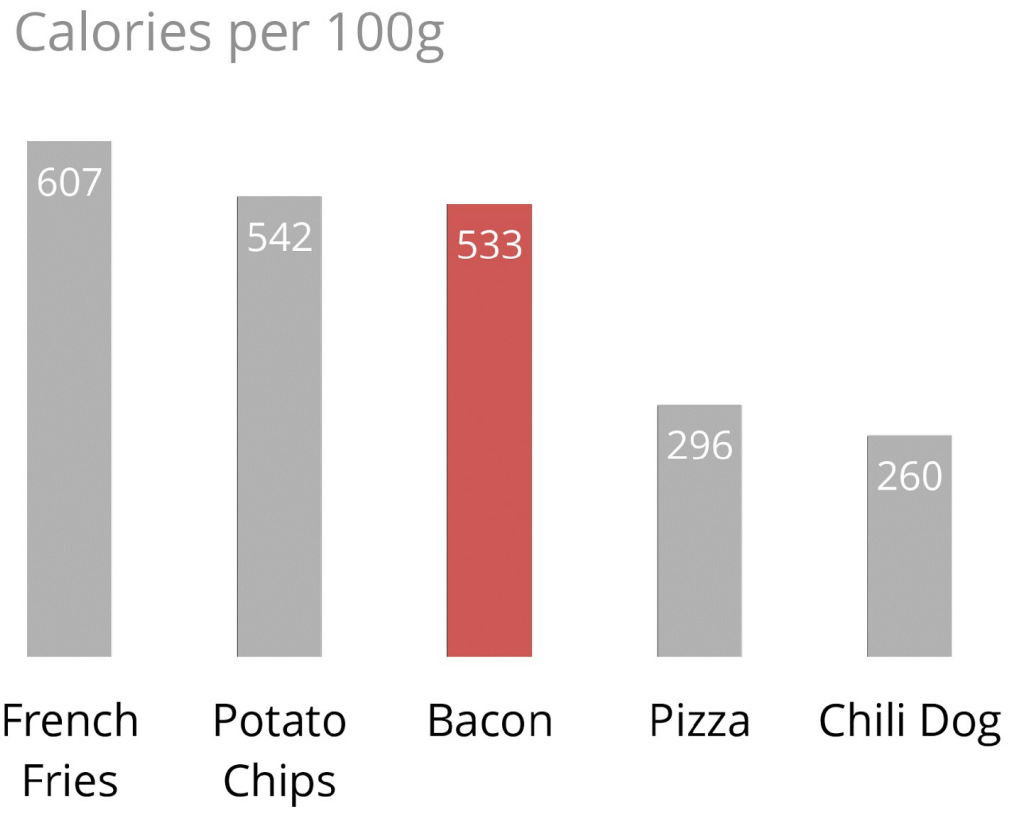
Direct label



Direct label

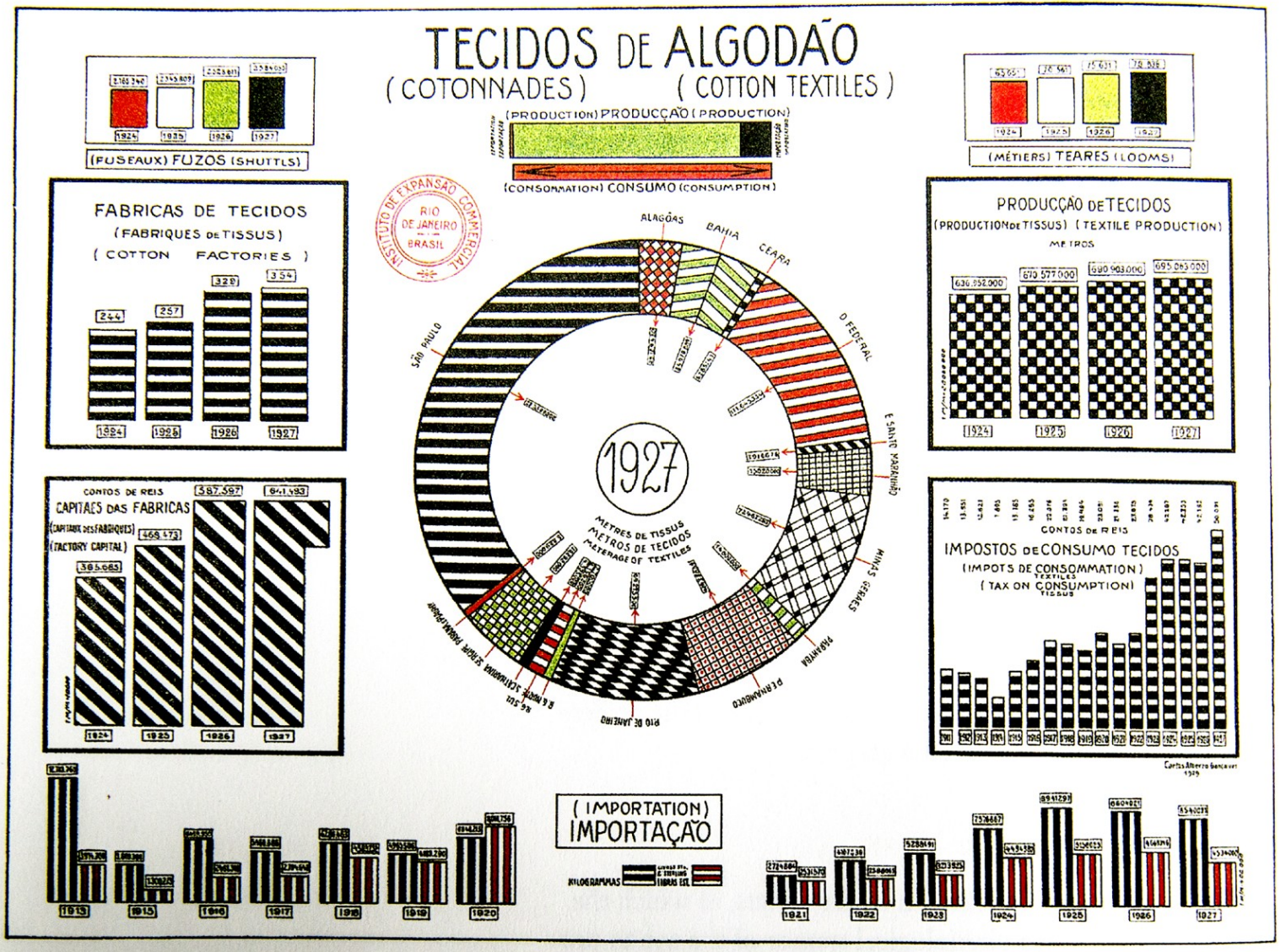


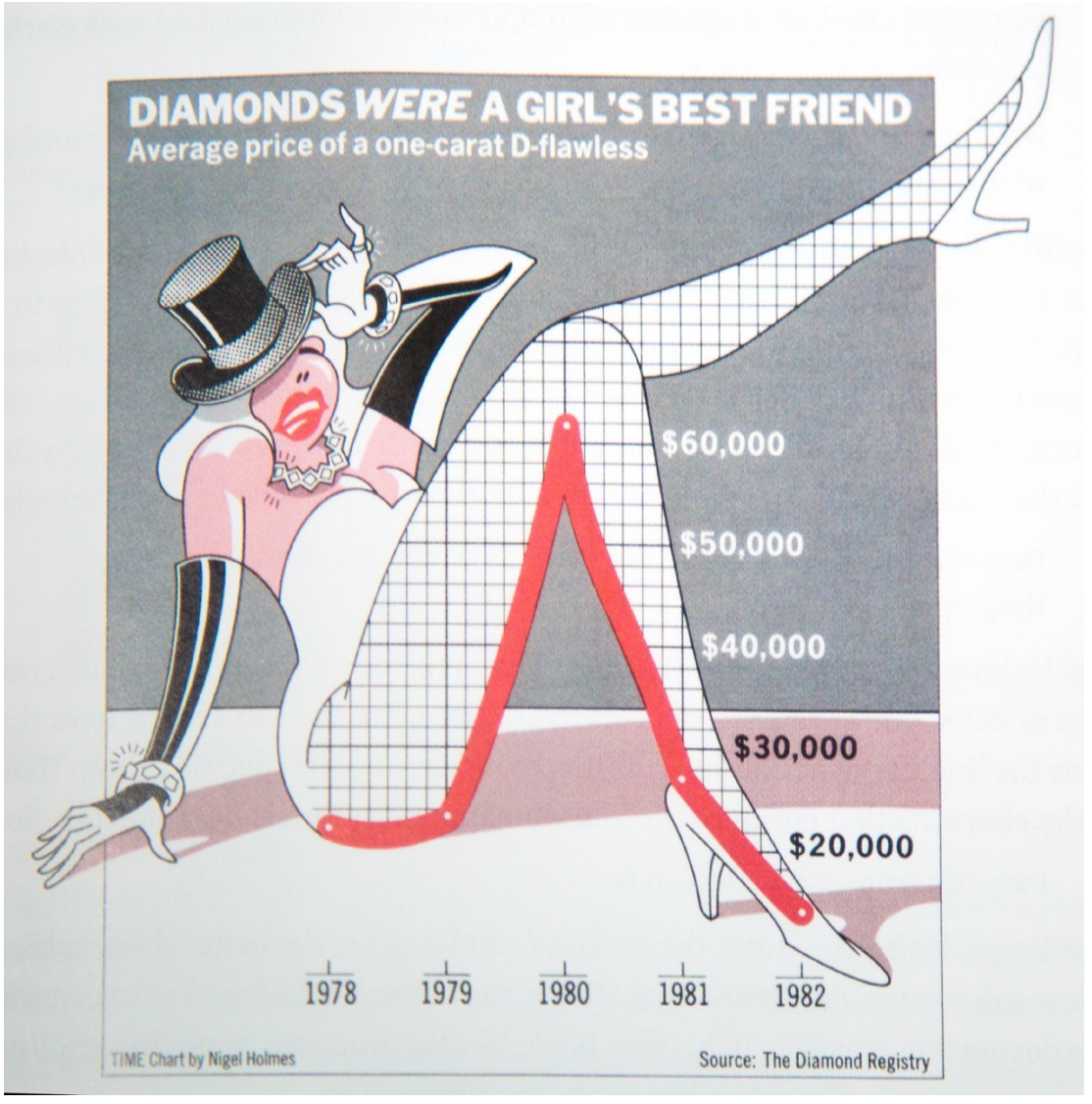

Calories per 100g for different foods
Number of Calories
700
600
500
400
300
200
100
0
French Fries
Potato Chips
Bacon
Pizza
Chili Dog
Type of Food
French Fries
Potato Chips
Bacon
Pizza
Chili Dog


Calories per 100g
607
542
533
296
260
French Fries
Potato Chips
Bacon
Pizza
Chili Dog

Edward Tufte

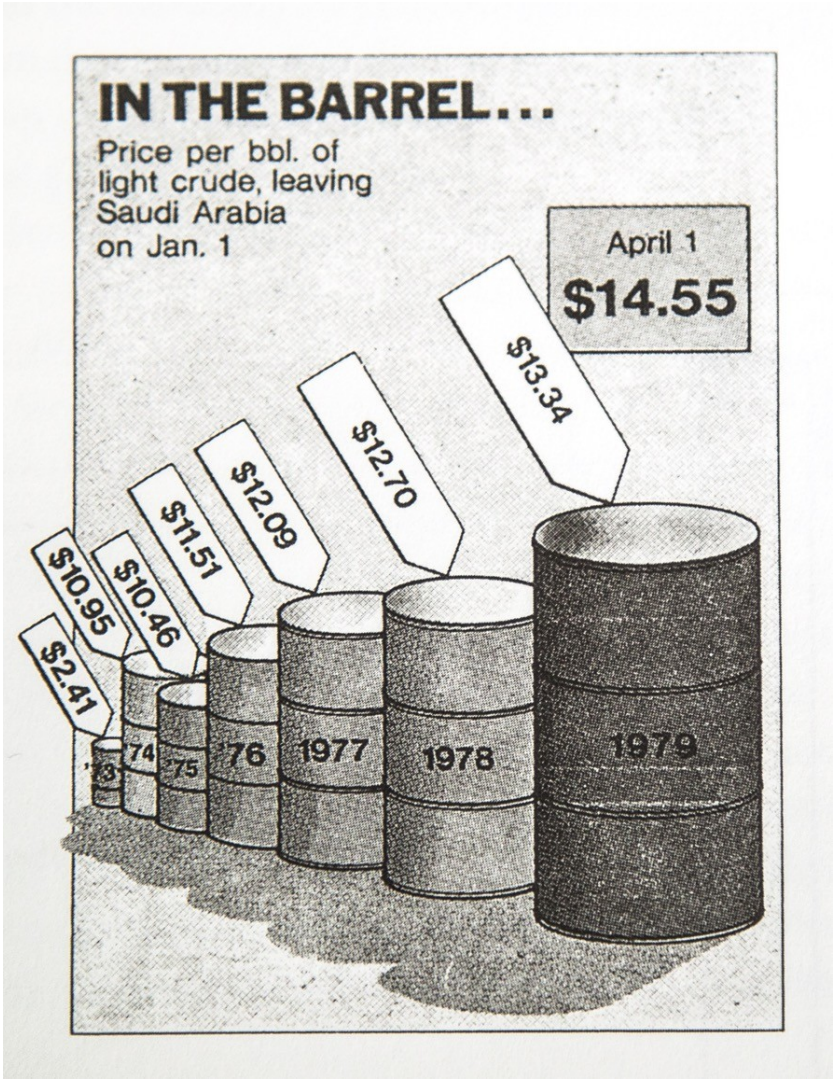
- Data – Ink Ratio
- Chart Junk
  - Optical Art
  - The Grid
  - The Duck (photos, images)
- Lie Factor


TECIDOS DE ALGODÃO
(COTONNADES) (COTTON TEXTILES)
(FUSEAUX) FUZOS (SHUTTLS)
(PRODUCTION) PRODUCÇÃO (PRODUCTION)
(CONSOMMATION) CONSUMO (CONSUMPTION)
(MÉTIERS) TEARES (LOOMS)
INSTITUTO DE EXPANSÃO COMMERCIAL RIO DE JANEIRO BRASIL
FABRICAS DE TECIDOS
(FABRIQUES DE TISSUS)
(COTTON FACTORIES)
244
257
328
354
1924
1925
1926
1927
PRODUCÇÃO DE TECIDOS
(PRODUCTION DE TISSUS) (TEXTILE PRODUCTION)
METROS
630.852.000
670.577.000
690.903.000
695.063.000
CONTOS DE REIS
CAPITAES DAS FABRICAS
(CAPITAUX DES FABRIQUES)
(FACTORY CAPITAL)
365.685
468.473
587.597
641.193
1927
METROS DE TISSUS
METROS DE TECIDOS
METERAGE OF TEXTILES
ALAGOAS
BAHIA
CEARA
D. FEDERAL
S. CATHARINA
MINAS GERAES
PARAHYBA
PERNAMBUCO
RIO DE JANEIRO
E. S. SANTO
E. RIO GRANDE DO SUL
SÃO PAULO
CONTOS DE REIS
IMPOSTOS DE CONSUMO TECIDOS
(IMPOTS DE CONSOMMATION)
(TAX ON CONSUMPTION)
TISSUS
TEXTILES
(IMPORTATION)
IMPORTAÇÃO
KILOGRAMMAS
LIBRAS EST.
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927


DIAMONDS WERE A GIRL'S BEST FRIEND
Average price of a one-carat D-flawless
$60,000
$50,000
$40,000
$30,000
$20,000
1978
1979
1980
1981
1982
TIME Chart by Nigel Holmes
Source: The Diamond Registry

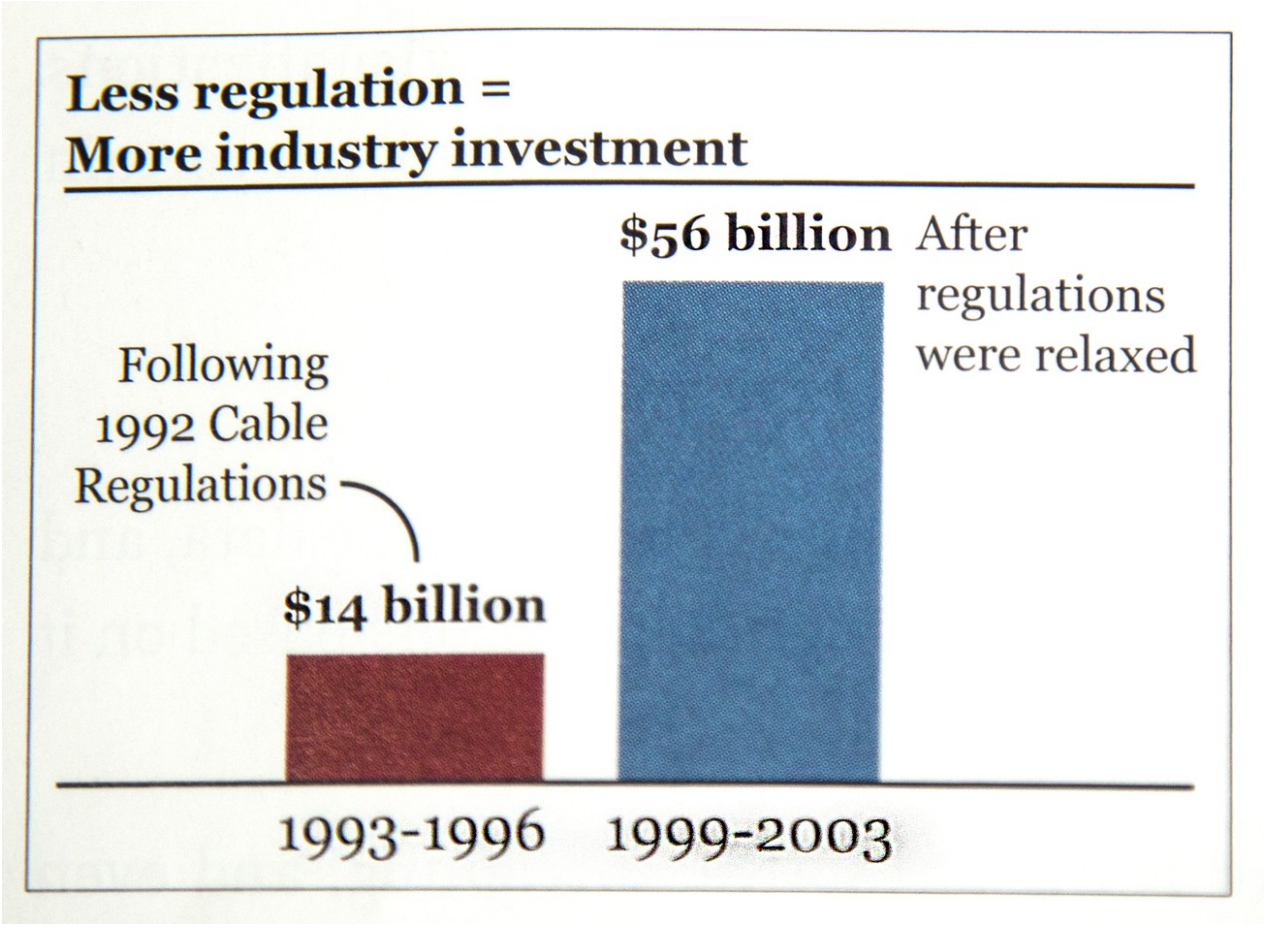
	A	B	C	D	E
1	Date	Apple	Intel	Amazon	IBM
2	10/18/2016	118.18	57.53	822.11	150.02
3	10/19/2016	117.25	57.47	820.4	151.27
4	10/20/2016	116.86	57.5	813.99	151.28
5	10/21/2016	116.81	60.28	809.36	150.58
6	10/24/2016	117.1	59.94	824.95	150.4
7	10/25/2016	117.95	60.85	839.3	150.69
8	10/26/2016	114.31	60.81	832.76	150.71
9	10/27/2016	115.39	60.61	831.24	152.82
10	10/28/2016	113.87	60.01	782	154.05
11	10/31/2016	113.65	60.16	781.03	152.76
12	11/1/2016	113.46	59.97	799	153.5
13	11/2/2016	111.4	59.82	783.93	152.48
14	11/3/2016	110.98	59.53	765.05	152.51
15	11/4/2016	108.53	58.65	762.79	152.4
16	11/7/2016	110.08	59.78	771.64	153.99
17	11/8/2016	110.31	60.55	784.97	154.56
18	11/9/2016	109.88	60	764	152.96
19	11/10/2016	111.09	60.48	778.81	157.66
20	11/11/2016	107.12	58.23	735.73	159.97
21	11/14/2016	107.71	59.02	745.51	161.25
22	11/15/2016	106.57	58.33	730	158.42
23	11/16/2016	106.7	58.94	739.88	158.46
24	11/17/2016	109.81	60.41	749.32	159.22
25	11/18/2016	109.72	60.78	761	159.8

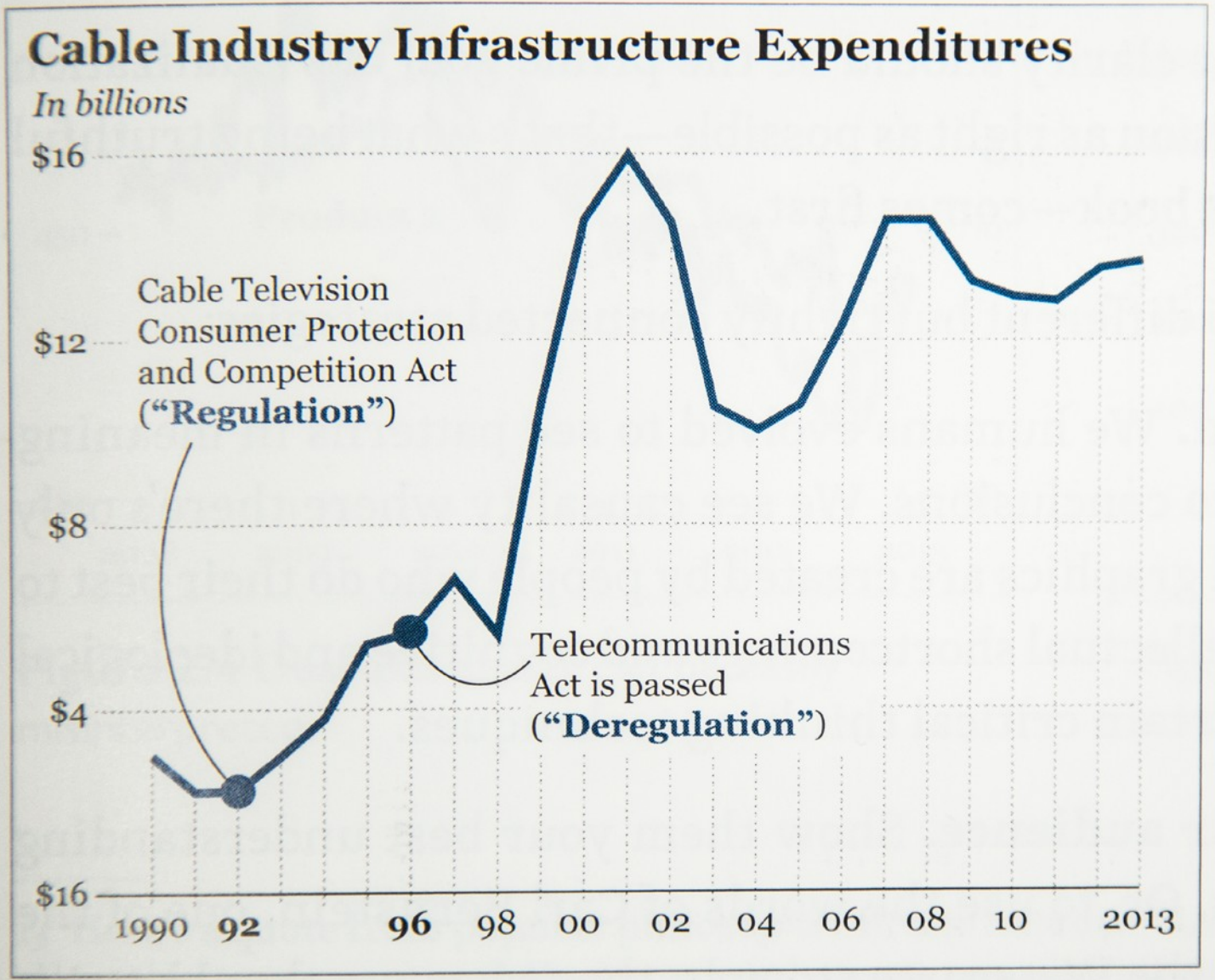
	A	B	C	D	E
1	Date	Apple	Intel	Amazon	IBM
2	10/18/2016	118.18	57.53	822.11	150.02
3	10/19/2016	117.25	57.47	820.4	151.27
4	10/20/2016	116.86	57.5	813.99	151.28
5	10/21/2016	116.81	60.28	809.36	150.58
6	10/24/2016	117.1	59.94	824.95	150.4
7	10/25/2016	117.95	60.85	839.3	150.69
8	10/26/2016	114.31	60.81	832.76	150.71
9	10/27/2016	115.39	60.61	831.24	152.82
10	10/28/2016	113.87	60.01	782	154.05
11	10/31/2016	113.65	60.16	781.03	152.76
12	11/1/2016	113.46	59.97	799	153.5
13	11/2/2016	111.4	59.82	783.93	152.48
14	11/3/2016	110.98	59.53	765.05	152.51
15	11/4/2016	108.53	58.65	762.79	152.4
16	11/7/2016	110.08	59.78	771.64	153.99
17	11/8/2016	110.31	60.55	784.97	154.56
18	11/9/2016	109.88	60	764	152.96
19	11/10/2016	111.09	60.48	778.81	157.66
20	11/11/2016	107.12	58.23	735.73	159.97
21	11/14/2016	107.71	59.02	745.51	161.25
22	11/15/2016	106.57	58.33	730	158.42
23	11/16/2016	106.7	58.94	739.88	158.46
24	11/17/2016	109.81	60.41	749.32	159.22
25	11/18/2016	109.72	60.78	761	159.8
26					


IN THE BARREL...
Price per bbl. of light crude, leaving Saudi Arabia on Jan. 1
April 1
$14.55
$13.34
$12.70
$12.09
$11.51
$10.46
$10.95
$2.41
'73
74
75
'76
1977
1978
1979

Qualities of a Great Visualization

1. **Truthful**
   - *Be aware of your actions when cleaning, summarizing and manipulating data and ensure you aren't*
     - *Misleading yourself (self deception)*
     - *Misleading your audience*
2. **Functionality**
3. **Beauty**
4. **Insightful**
5. **Enlightening**
   - *A combination of the previous four, but with a social ethical responsibility*


Less regulation =
More industry investment
$56 billion
After regulations were relaxed
Following 1992 Cable Regulations
$14 billion
1993-1996
1999-2003


Cable Industry Infrastructure Expenditures
In billions
$16
$12
$8
$4
$16
Cable Television Consumer Protection and Competition Act ("Regulation")
Telecommunications Act is passed ("Deregulation")
1990
92
96
98
00
02
04
06
08
10
2013

Thanks to

- Ho, A. D., Reich, J., Nesterko, S., Seaton, D. T., Mullaney, T., Waldo, J., & Chuang, I. (2014). HarvardX and MITx: The first year of open online courses (HarvardX and MITx Working Paper No. 1). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2381263 for digital copy. (Figure 13, p 31)
- “Charles Minard's map of Napoleon's disastrous Russian campaign of 1812.” Retrieved February 17, 2017 https://en.wikipedia.org/wiki/Charles_Joseph_Minard#/media/File:Minard.png
- Cairo, A. (2013). The functional art: an Introduction to information graphics and visualization. Berkley, CA: New Riders. (Figure 3.11, pp 62)
- Tufte, E. R. (1985). “Instituto de Expansao Commercial, Brasil: ‘Graphicos Economicos-Estisticas’ (Rio de Janeiro, 1929), p 15.” The Visual Display of Quantitative Information. Second Edition. Cheshire, CT: Graphics Press. (pp 108)
- “Diamonds Were a Girl’s Best Friend” | Nigel Holmes in “A Gem That Lost Its Luster,” Time 120, no. 9 (August 30, 1982). http://visualoop.com/media/2015/03/Diamonds-Were-a-Girls-Best-Friend.jpg
- Tufte, E. R. (1985). “In the Barrel.” Originally in Time, April 9, 1979, 57. The Visual Display of Quantitative Information. Second Edition. Cheshire, CT: Graphics Press. (pp 62). http://images.slideplayer.com/14/4283310/slides/slide_10.jpg for digital copy.
- Cairo, A. (2016). The truthful art: Data charts and maps for communication. Berkley, CA: New Riders.
- Christopher Brooks of UM