Into to Data Visualization with Tableau

MBA Workshop

Objectives

Discuss fundamental concepts around visualizing data

- Visualization examples
- Data fundamentals
- Anatomy of visualizations

Hand on workshop using Tableau Public to visualize data

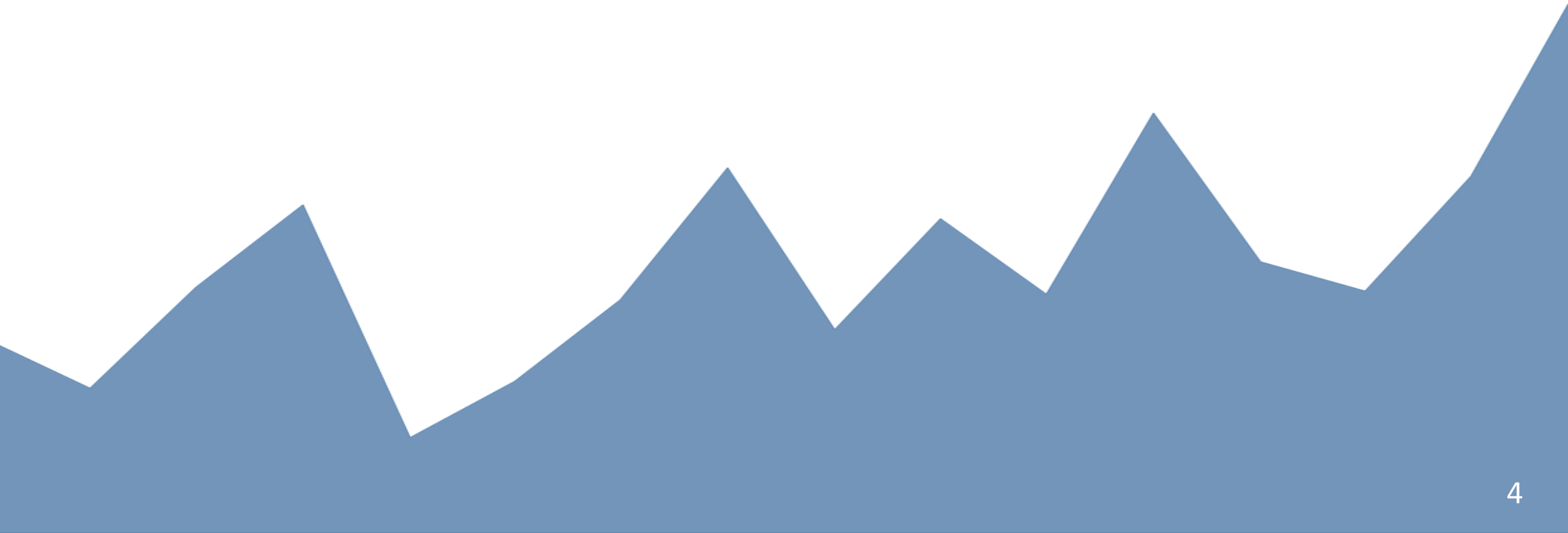
Business Analytics

Finding and communicating insights from data to support decision making.

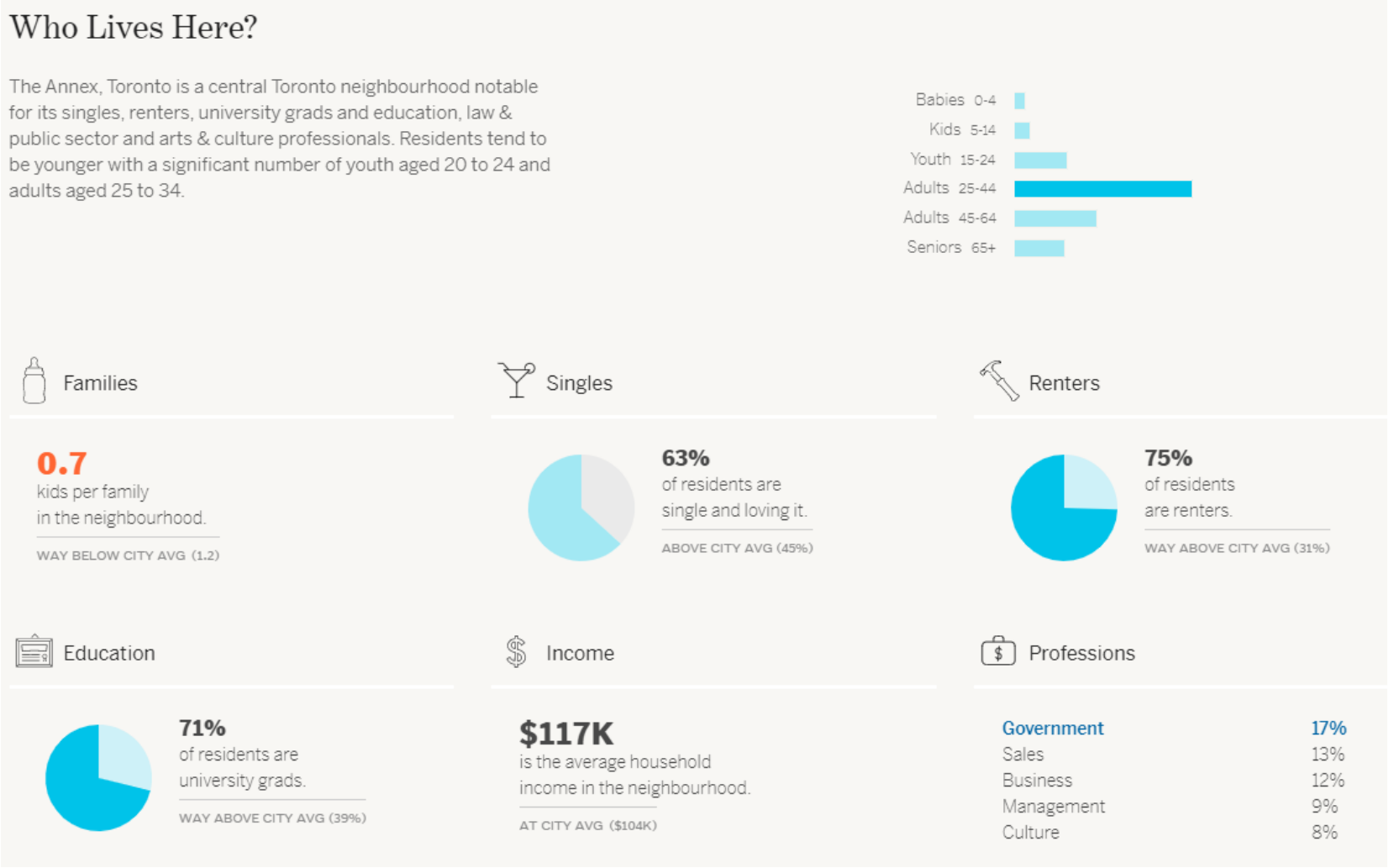
More then just learning a tool:

- Asking questions
- Finding, collecting, managing and cleaning data
- Conducting analysis and creating visualizations

Analytics Examples



Real Estate Marketing



Source: [Realosophy]

Real Estate Data

Census Profile, 2016 Census

Toronto, City [Census subdivision], Ontario and Toronto [Census metropolitan area], Ontario

Topic: Housing ▾ ○ Counts ◉ Rates Submit

Related data ▾

Characteristic	Toronto, C Ontario [Census subdivision] Data quality Map Change geography			Toronto Ontario [Census metropolitan area] Data quality Map Change geography		
	Total	Male	Female	Total	Male	Female
	Percentages (unless otherwise specified)					
Household characteristics						
Total - Private households by tenure - 25% sample data 130	100.0	...	...	100.0	...	...
Owner	52.8	...	...	66.5	...	...
Renter	47.2	...	...	33.5	...	...
Band housing	0.0	...	...	0.0	...	...
Total - Occupied private dwellings by condominium status - 25% sample data 131	100.0	...	...	100.0	...	...

Source: Statistics Canada Census Profile

Library Space Planning

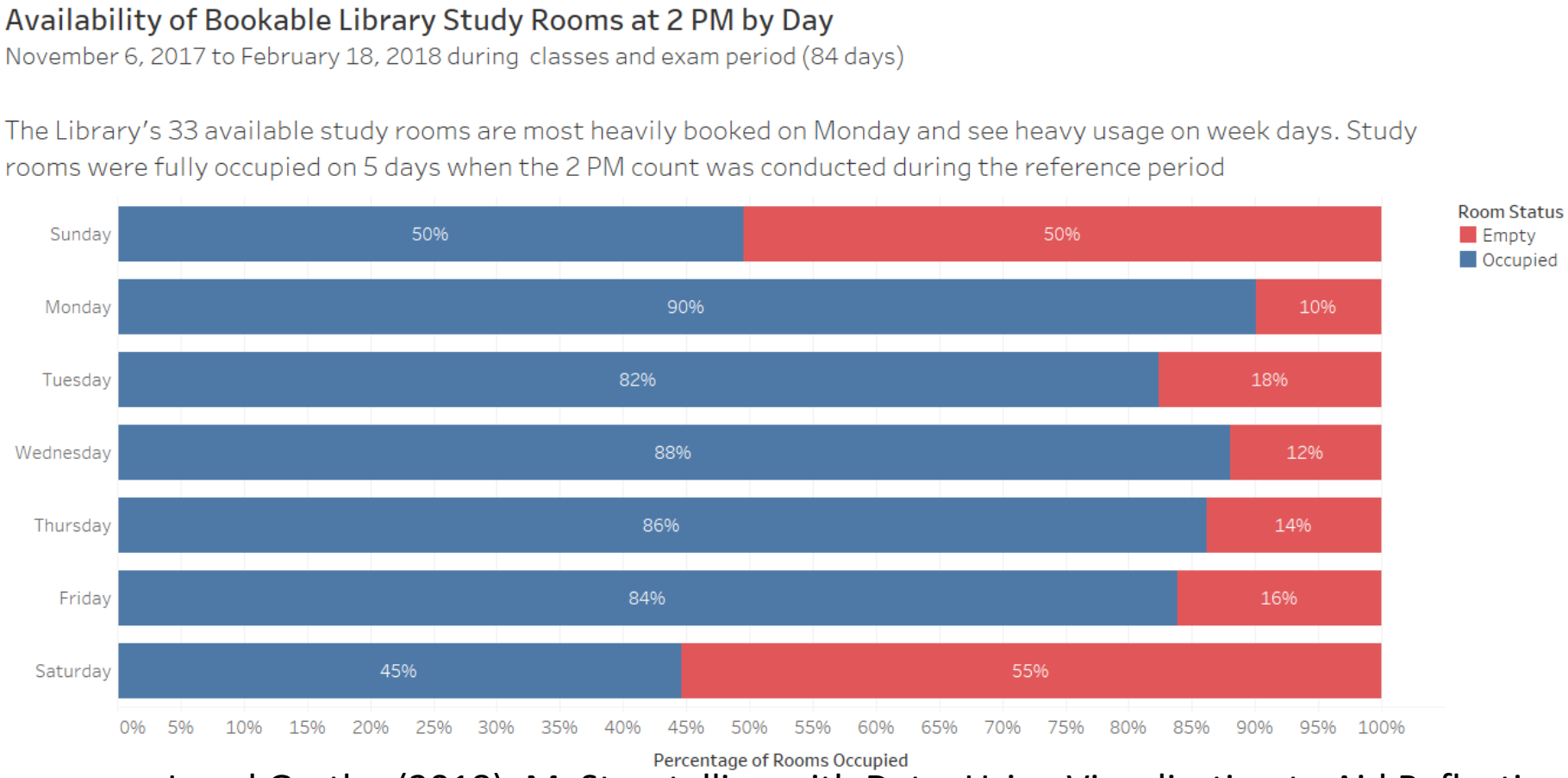
In upcoming library renovation how should the library allocate its student space?

Library Use Data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**date**	**day**	**DayType**	**Building**	**Floor**	**FloorsRooms**	**Time**	**# of Seats**	**HeadCount**	**UniversitySt**	**RoomStat**	**RoomType**	
2	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	8:00 AM	134	3	Classes	occupied	Communal Space	
3	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	10:00 AM	134	32	Classes	occupied	Communal Space	
4	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	11:00 AM	134	NULL	Classes	Unknown	Communal Space	
5	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	12:00 PM	134	102	Classes	occupied	Communal Space	
6	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	1:00 PM	134	NULL	Classes	Unknown	Communal Space	
7	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	2:00 PM	134	128	Classes	occupied	Communal Space	
8	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	4:00 PM	134	NULL	Classes	Unknown	Communal Space	
9	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	6:00 PM	134	66	Classes	occupied	Communal Space	
10	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	9:00 PM	134	42	Classes	occupied	Communal Space	
11	11/6/2017	Monday	Week Day	Library	10th Floor	10th Floor	12:00 AM	134	24	Classes	occupied	Communal Space	
12	11/6/2017	Monday	Week Day	Library	9th Floor	9th Floor	8:00 AM	84	3	Classes	occupied	Communal Space	
13	11/6/2017	Monday	Week Day	Library	9th Floor	9th Floor	10:00 AM	84	65	Classes	occupied	Communal Space	

Source: Levesque, L and Gertler (2018), M. *Storytelling with Data: Using Visualization to Aid Reflective Practice in Libraries.* TRY+ Library Staff Conference.

Library Occupancy



Source: Levesque, L and Gertler (2018), M. Storytelling with Data: Using Visualization to Aid Reflective Practice in Libraries. TRY+ Library Staff Conference.

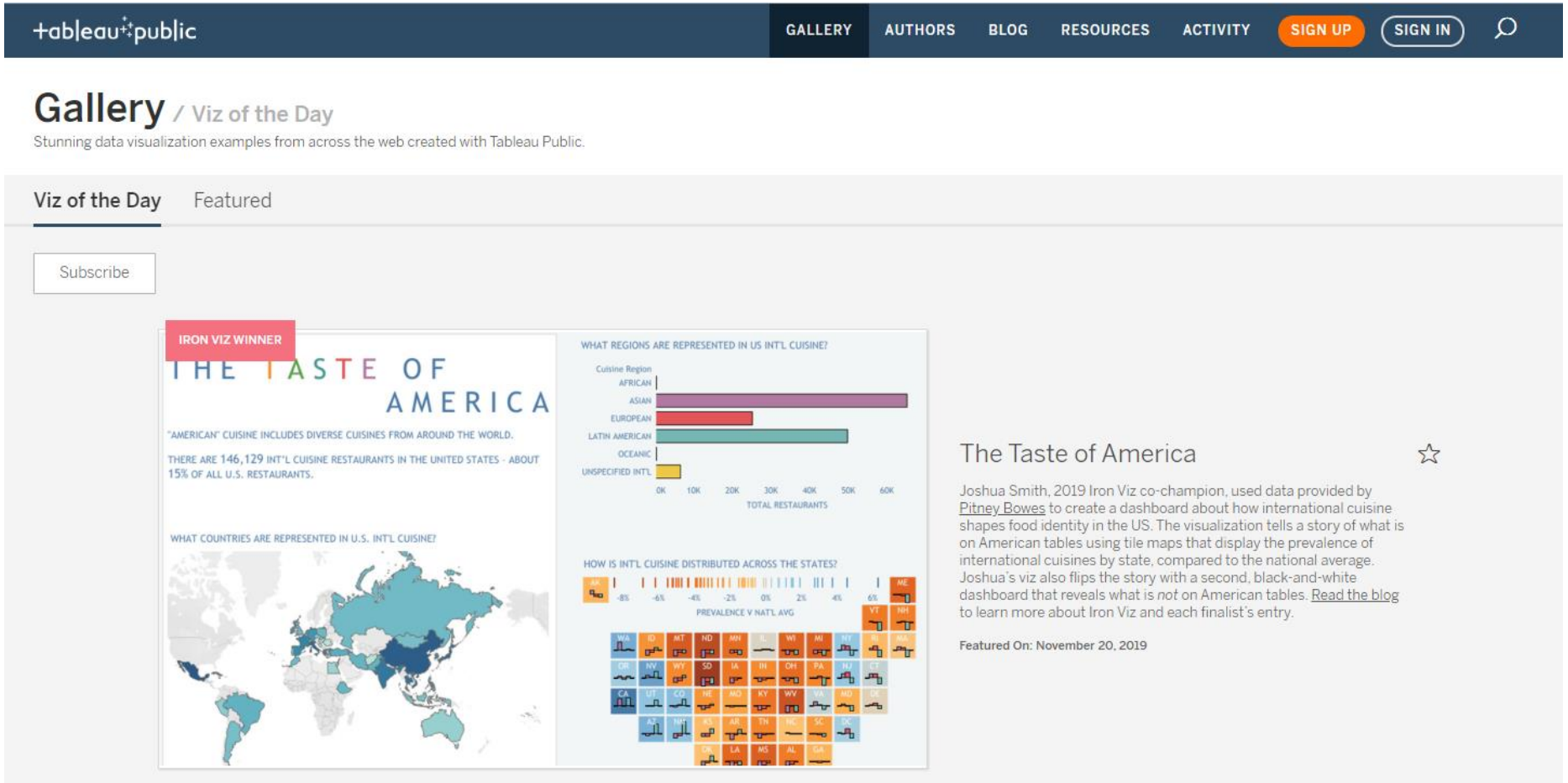
The Tool – Tableau Public

Tableau

- Different versions available - Free version is Tableau Public
- Creates static images
- Creates interactive visualizations that can be embedded in a webpage
- Relatively easy to learn (no coding)
- Connects to an existing data source
- Visualizations can be dynamically updated

Tableau Public

https://public.tableau.com/en-us/gallery/?tab=viz-of-the-day&type=viz-of-the-day



Data Fundamentals

Tabular Data

Row
The Unit of Observation

Column
One Variable or Question

Cell
One Observation

G	H	I	J	K	L	M	N	O	P	Q	R	S
Customer Name	Segment	Postal Co	City	State	Country	Region	Market	Product II	Product N	Sub-Cate	Category	Sales
Anne McFarland	Consumer	36830	Auburn	Alabama	United State	Southern US	USCA	OFF-ST-6289	Tennsco Do	Storage	Office Suppl	900.08
Anne McFarland	Consumer	36830	Auburn	Alabama	United State	Southern US	USCA	FUR-CH-5431	Office Star -	Chairs	Furniture	350.98
Anne McFarland	Consumer	36830	Auburn	Alabama	United State	Southern US	USCA	OFF-PA-6086	Southworth	Paper	Office Suppl	13.08
Kristina Nunn	Home Office	36830	Auburn	Alabama	United State	Southern US	USCA	OFF-AR-5458	OIC #2 Penc	Art	Office Suppl	3.76
Maurice Satty	Consumer	36830	Auburn	Alabama	United State	Southern US	USCA	OFF-LA-3980	Dot Matrix P	Labels	Office Suppl	491.55
Maurice Satty	Consumer	36830	Auburn	Alabama	United State	Southern US	USCA	OFF-EN-3834	Colored Env	Envelopes	Office Suppl	7.38
Amy Hunt	Consumer	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-LA-3219	Avery 499	Labels	Office Suppl	14.94
Cassandra Brandow	Consumer	35601	Decatur	Alabama	United State	Southern US	USCA	TEC-AC-3125	Anker Ultra	Accessories	Technology	239.92
Dave Hallsten	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	TEC-CO-3590	Brother DCP	Copiers	Technology	899.97
Dave Hallsten	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-AR-5286	Newell 31	Art	Office Suppl	24.78
Dave Hallsten	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-BI-3280	Avery Heav	Binders	Office Suppl	19.14
Dave Hallsten	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-PA-6566	Xerox 204	Paper	Office Suppl	32.4
Evan Henry	Consumer	35601	Decatur	Alabama	United State	Southern US	USCA	TEC-PH-5365	Nortel Netv	Phones	Technology	135.98
Evan Henry	Consumer	35601	Decatur	Alabama	United State	Southern US	USCA	TEC-PH-5606	Plantronics	Phones	Technology	44.95
Ruben Ausman	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	FUR-TA-5791	SAFCO Plan	Tables	Furniture	1215.92
Stewart Carmichael	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-AP-2855	1.7 Cubic Fo	Appliances	Office Suppl	208.16
Stewart Carmichael	Corporate	35601	Decatur	Alabama	United State	Southern US	USCA	OFF-BI-3279	Avery Heav	Binders	Office Suppl	16.74

Aggregated Tabular Data

	A	B	C	D	E
1	Geography	Total - Tenure	Owner	Renter	Band housing
2	3501	47830	33880	13940	10
3	3502	35385	27365	8020	0
4	3506	373755	245470	128285	0
5	3507	42750	33350	9400	0
6	3509	28580	22555	6025	0
7	3510	64295	41750	22545	0
8	3511	17050	13775	3280	0
9	3512	57015	40990	16025	0
10	3513	10725	8910	1815	0

Source: Statistics Canada Census Program

Data Types

- Qualitative
  - Categorical - ex. Male/ Female. Levels of Educational Attainment
  - Text - Open text such as a comment

- Quantitative
  - Discrete
  - Continuous

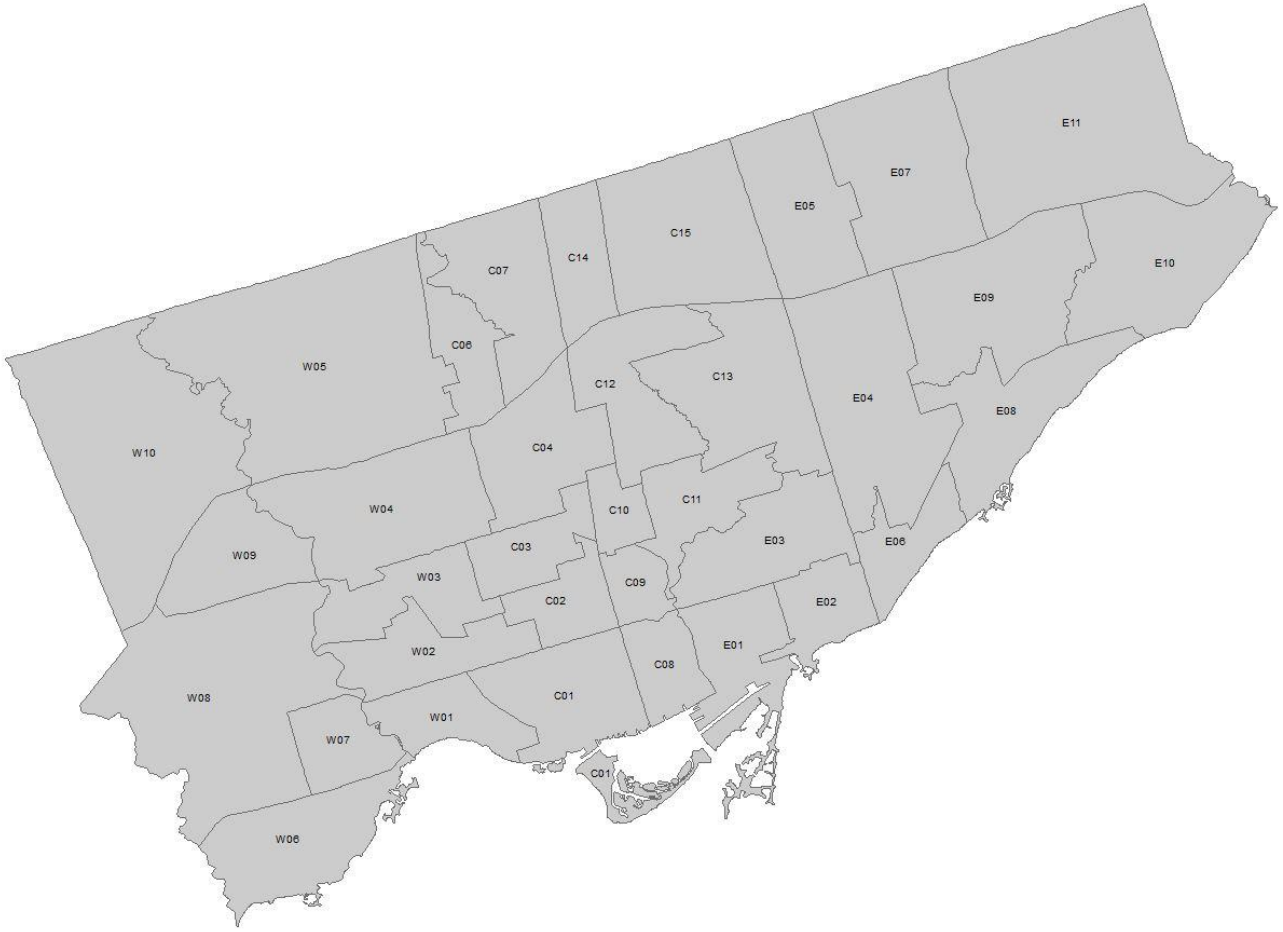
Textual Data

Source: [City of Toronto Open Data, Casino Survey Results]

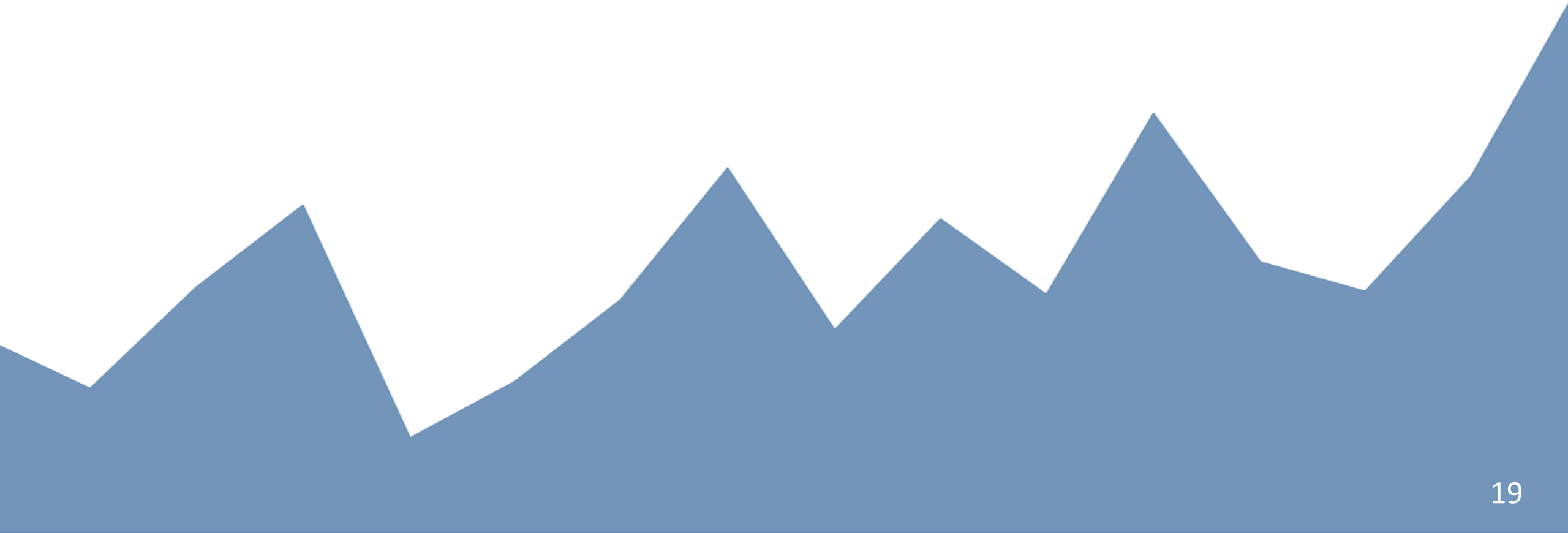
Strongly Opposed	casinos are a cancer on society
Strongly Opposed	Casinos suck the life out of the neighbourhood.
Somewhat Opposed	outweigh the (largely overstated) revenue generating potential of a casino
Somewhat Opposed	It is not necessary in the core of Toronto- better at Woodbine where there is gaming.
Strongly in Favour	money for city

Spatial Data

	FID	Shape *	Muni_Code	Area_Code	Muni_Name	Condo_High	Condo_Town	Detached	Bungalow	SemiDetach	Treb_Area
▸	0	Polygon	C01	01	Toronto C01	380019	418721	787175	0	667715	19498589.6902
	1	Polygon	C02	01	Toronto C02	669613	702161	1147395	0	739210	7446501.3695
	2	Polygon	C03	01	Toronto C03	567051	763143	1186099	403125	577582	8420129.71508
	3	Polygon	C04	01	Toronto C04	341975	363699	1110432	562270	664047	15865485.1884
	4	Polygon	C06	01	Toronto C06	281763	322830	755525	563335	0	9087092.76403
	5	Polygon	C07	01	Toronto C07	328410	360565	737823	599579	449577	16736231.5489
	6	Polygon	C08	01	Toronto C08	358266	401649	885188	0	619373	7081447.48779
	7	Polygon	C09	01	Toronto C09	555510	867367	1891613	1493500	1469246	4669830.23162
	8	Polygon	C10	01	Toronto C10	455930	588547	1266498	970677	652097	4449483.71164
	9	Polygon	C11	01	Toronto C11	192197	296896	1029746	758748	609351	10449641.0072
	10	Polygon	C12	01	Toronto C12	526409	598002	1853406	1243218	500688	16050694.7128
	11	Polygon	C13	01	Toronto C13	295115	365558	721722	626500	390251	22077617.1289
	12	Polygon	C14	01	Toronto C14	347115	459786	907793	654283	0	9185444.13011
	13	Polygon	C15	01	Toronto C15	321485	311617	737037	701236	432169	24683222.629
	14	Polygon	E01	01	Toronto E01	376135	328124	581473	357002	484285	13569538.9876
	15	Polygon	E02	01	Toronto E02	391463	395672	790669	580833	518920	8197101.14674
	16	Polygon	E03	01	Toronto E03	203986	264338	523205	423184	450942	15390403.8302
	17	Polygon	E04	01	Toronto E04	180779	294193	395567	363076	298000	29092269.6328
	18	Polygon	E05	01	Toronto E05	231858	265614	541997	419264	381503	17261713.9444
	19	Polygon	E06	01	Toronto E06	231858	265614	541997	419264	381503	7825085.056
	20	Polygon	E07	01	Toronto E07	201172	283923	464381	416161	349740	24790636.8573
	21	Polygon	E08	01	Toronto E08	180465	234115	481624	370284	280812	17227767.3603
	22	Polygon	E09	01	Toronto E09	233527	189286	393314	346112	301503	25248559.5738
	23	Polygon	E10	01	Toronto E10	162363	222224	469162	376931	343899	23661057.5903
	24	Polygon	E11	01	Toronto E11	132414	230164	418030	297279	309148	43176805.1715
	25	Polygon	W01	01	Toronto W01	330604	386119	811037	633928	537577	9268841.2323
	26	Polygon	W02	01	Toronto W02	371650	308752	689048	402054	453205	11732421.5385
	27	Polygon	W03	01	Toronto W03	199438	311828	362882	319062	366753	11588758.567
	28	Polygon	W04	01	Toronto W04	159415	246948	438205	383688	347458	24510993.5766
	29	Polygon	W05	01	Toronto W05	148730	214010	498563	404418	365324	51513246.0367
	30	Polygon	W06	01	Toronto W06	364710	397303	483317	406790	420821	17401841.2071
	31	Polygon	W07	01	Toronto W07	315614	0	722958	546324	416813	7997188.2111
	32	Polygon	W08	01	Toronto W08	269325	296958	964185	623428	446975	43041994.7121
	33	Polygon	W09	01	Toronto W09	173457	391915	588138	481337	366593	13127568.3474
	34	Polygon	W10	01	Toronto W10	175254	194080	371469	362164	320170	43686021.2928
	35	Polygon				0	0	0	0	0	0



Visualization Fundamentals



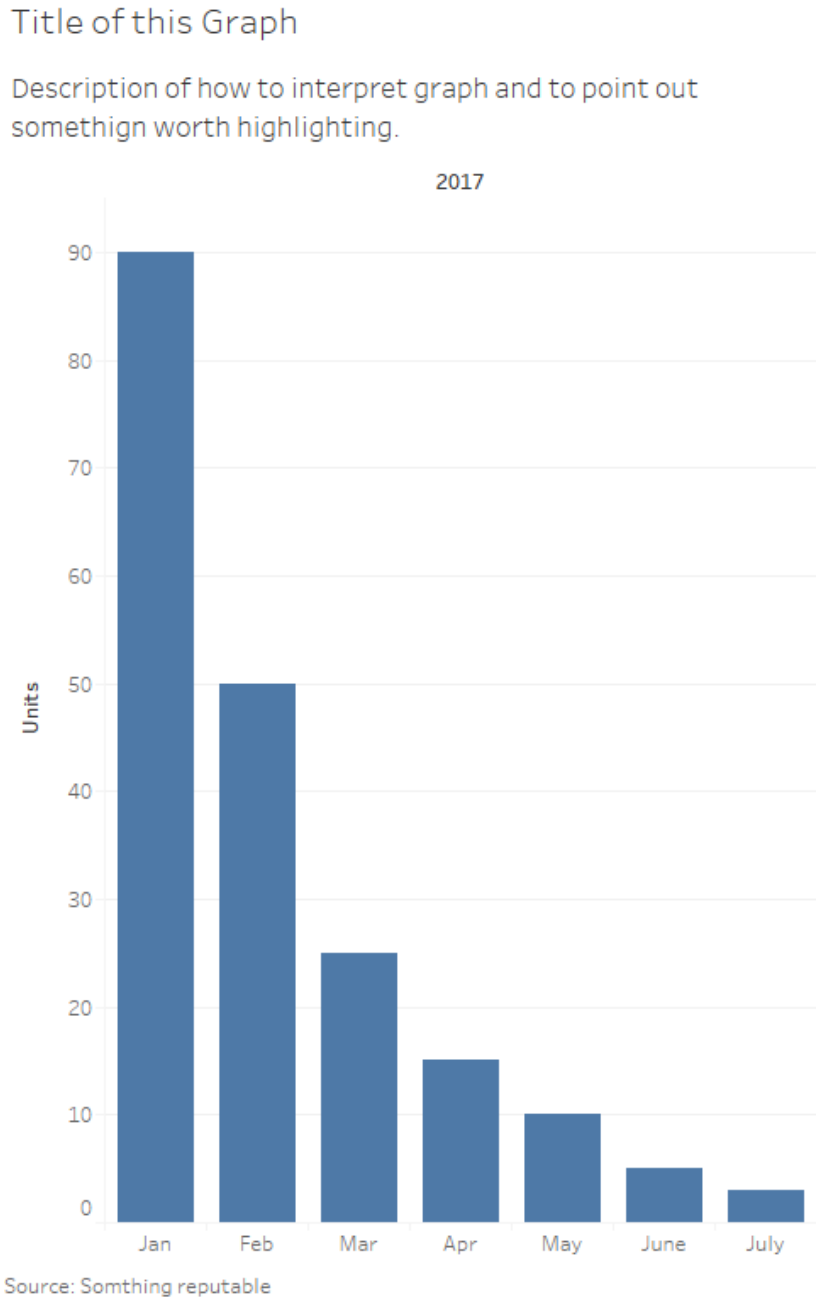
How Visualizations Work

Visual Cues

Coordinate System

Scale

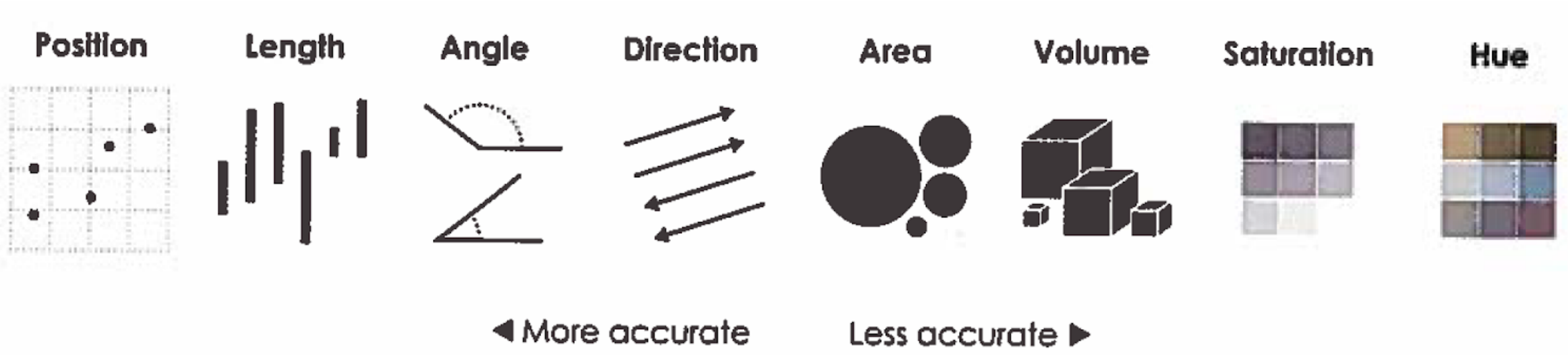
Context



Recreated from: Yau, N. Data Points: *Visualization that Means Something*

Visual Cues

Visualizations use visual cues to communicate quantity



Source: Yau, N. *Data Points: Visualization that Means Something*.

Coordinate System

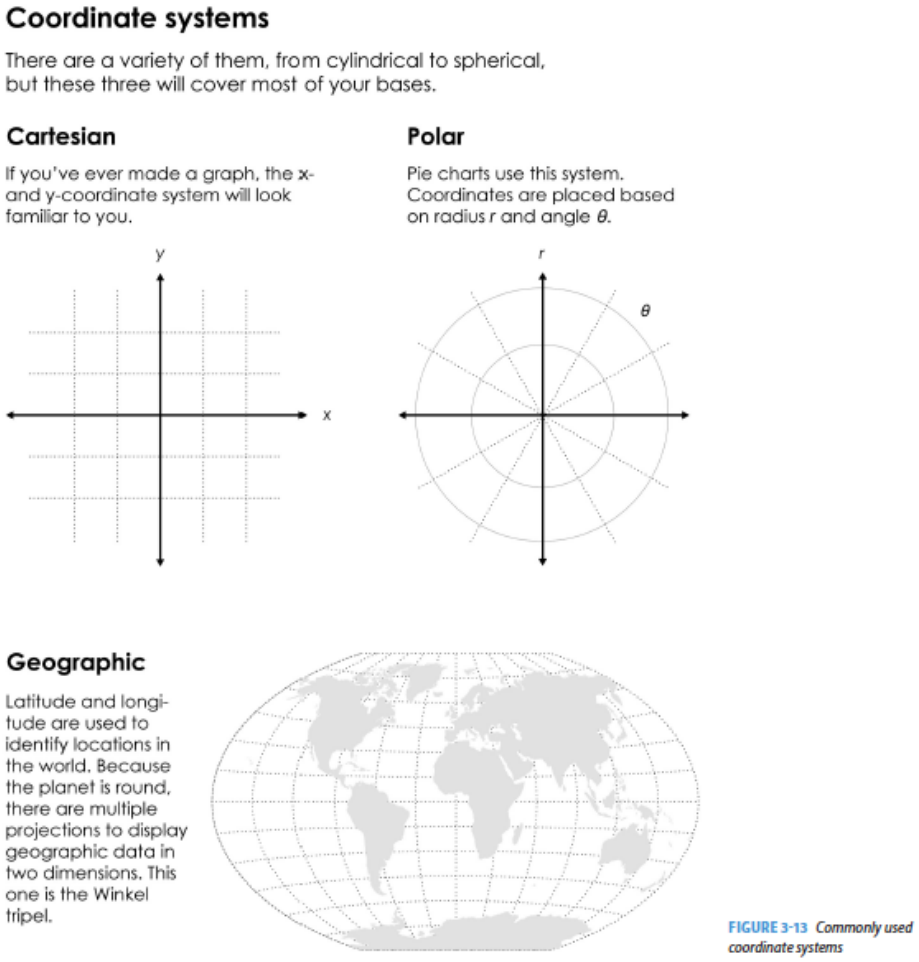
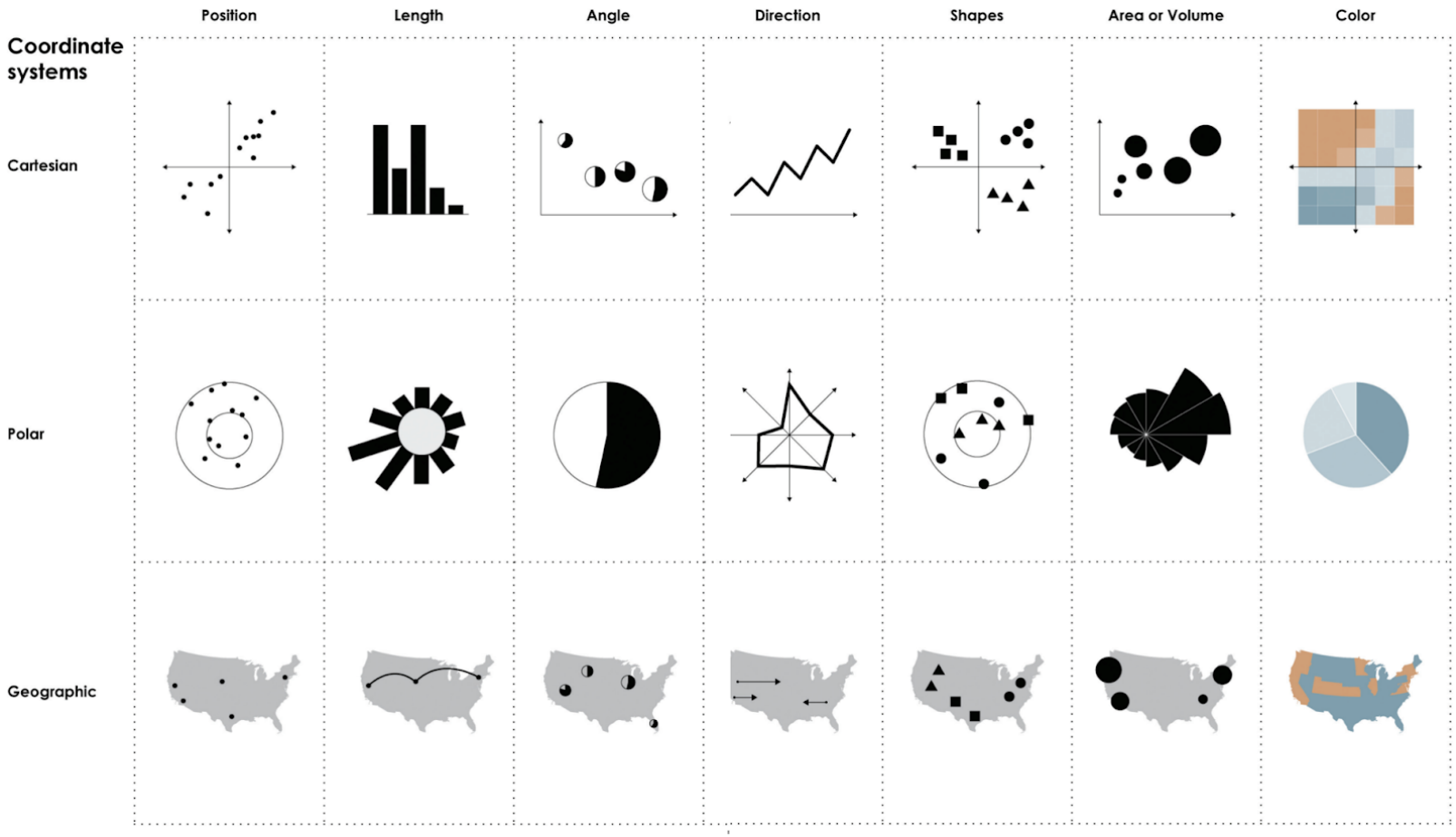


FIGURE 3-13 *Commonly used coordinate systems*

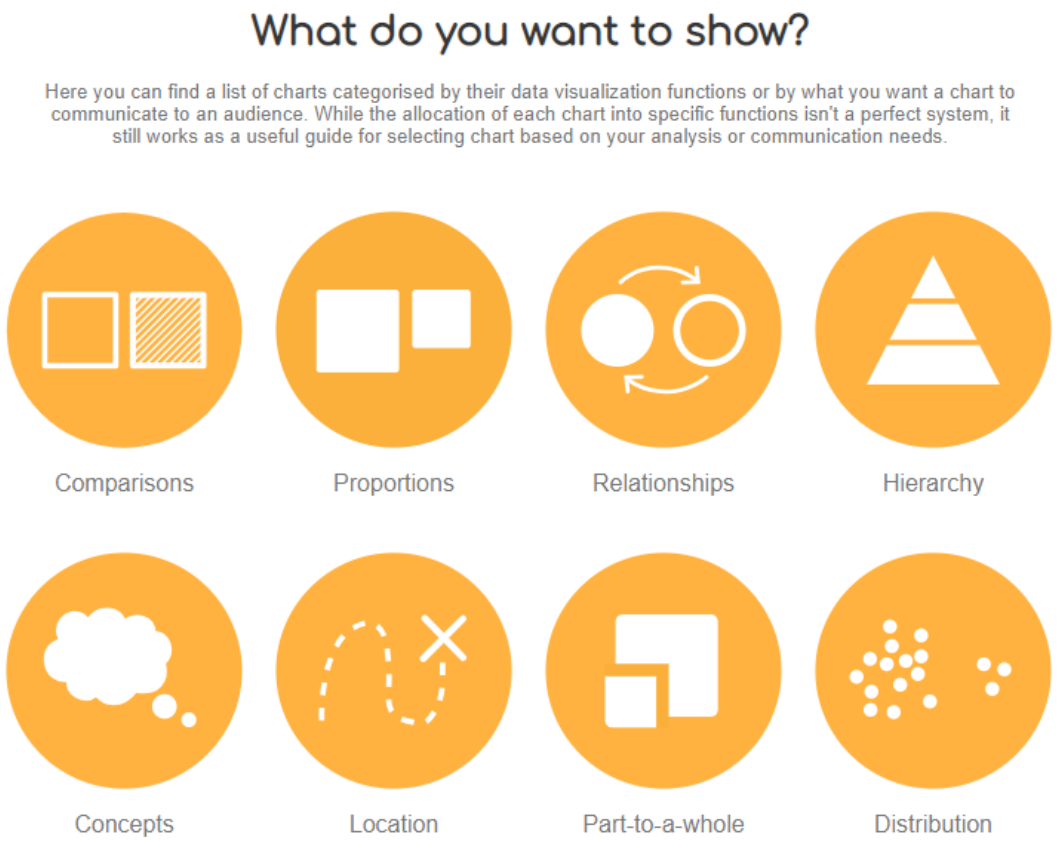
Source: Yau, N. *Data Points: Visualization that Means Something*.

Visual Cues and Coordinate Systems



Source: Yau, N. *Data Points: Visualization that Means Something*.

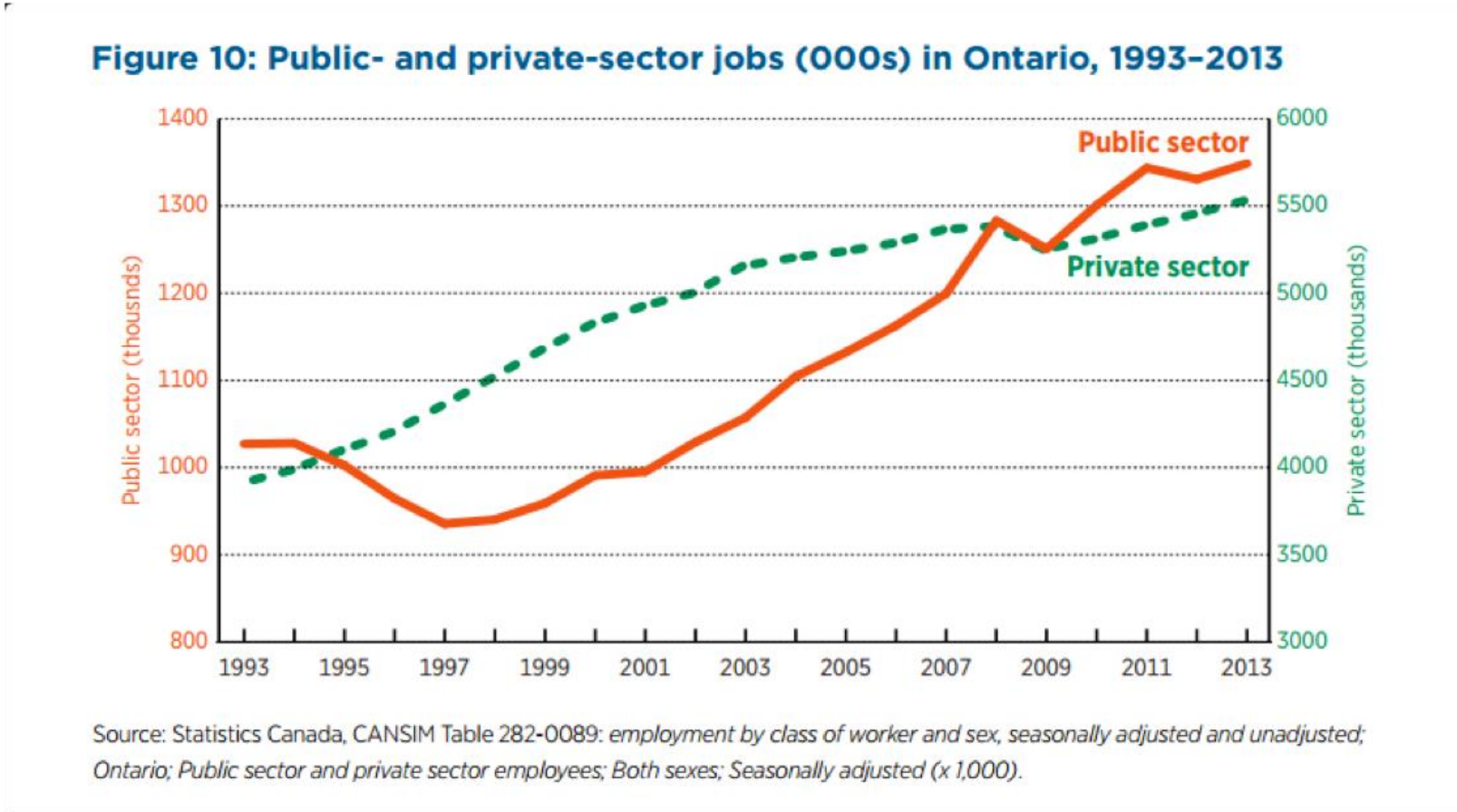
Data Vis Catalog



Source: https://datavizcatalogue.com/search.html

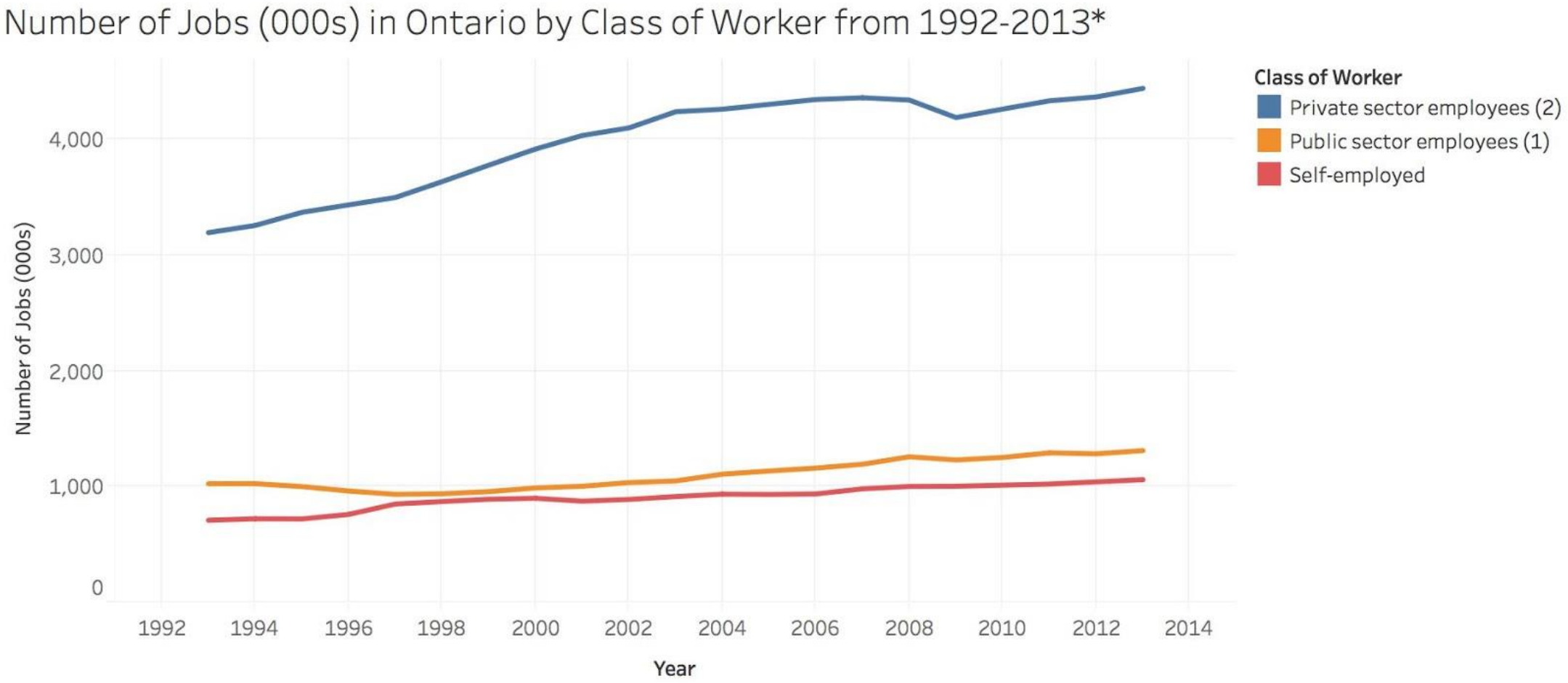
Visualization Examples

Misleading Line Chart



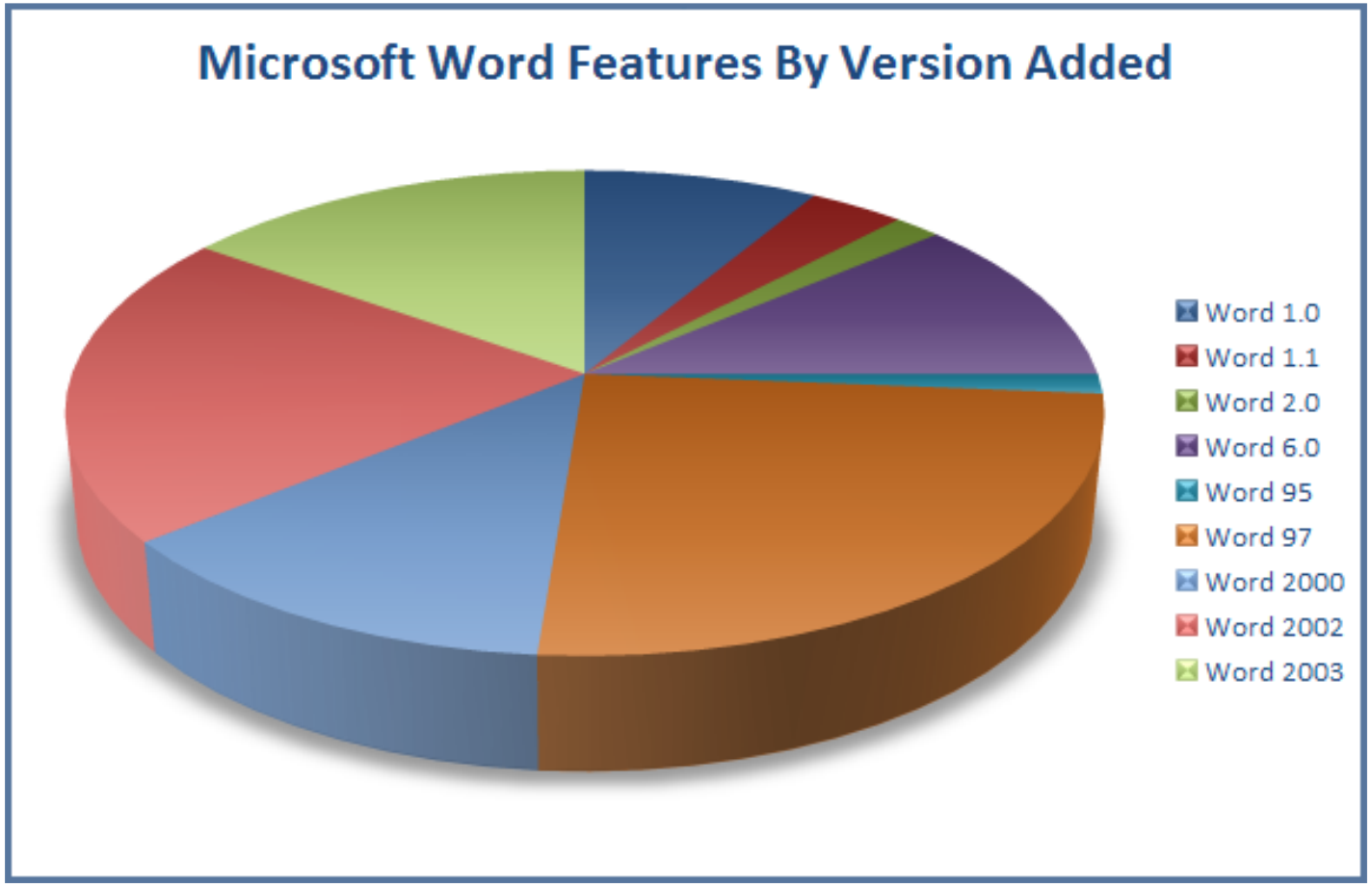
Source: Fraser Institute, Ontario no Longer a Place to Prosper

Statistics Canada Data - Line Chart with One Scale



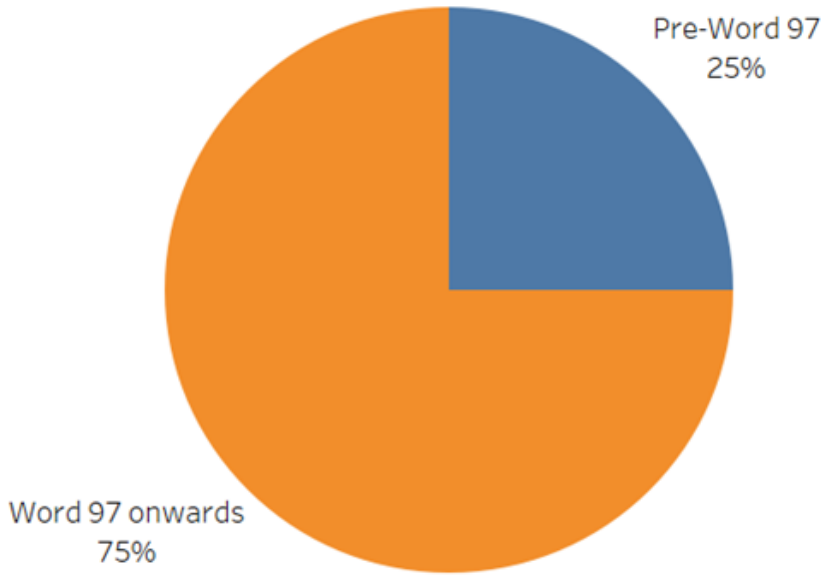
*Data Source: Statistics Canada, Cansim Table 282-0012 - Labour force survey estimates (LFS), employment by class of worker, North American Industry Classification System (NAICS) and sex, annual.

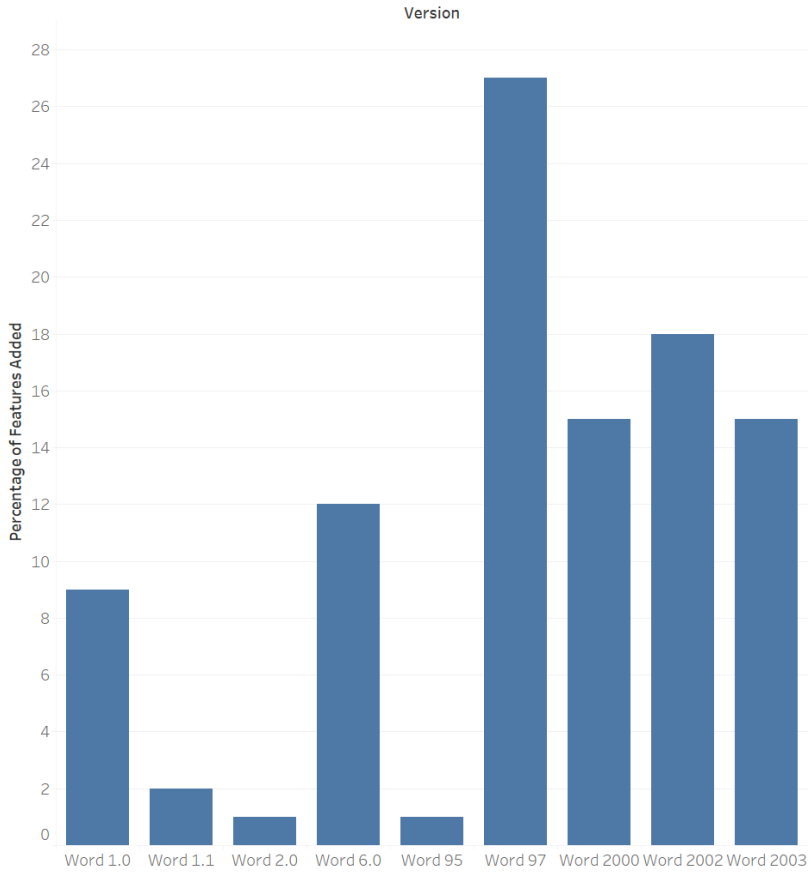
Microsoft Pie Chart



Source: Kelly Schultz, University of Toronto Libraries. *Introduction to Tableau* [Workshop].

Percentage of Features Added to Microsoft Word

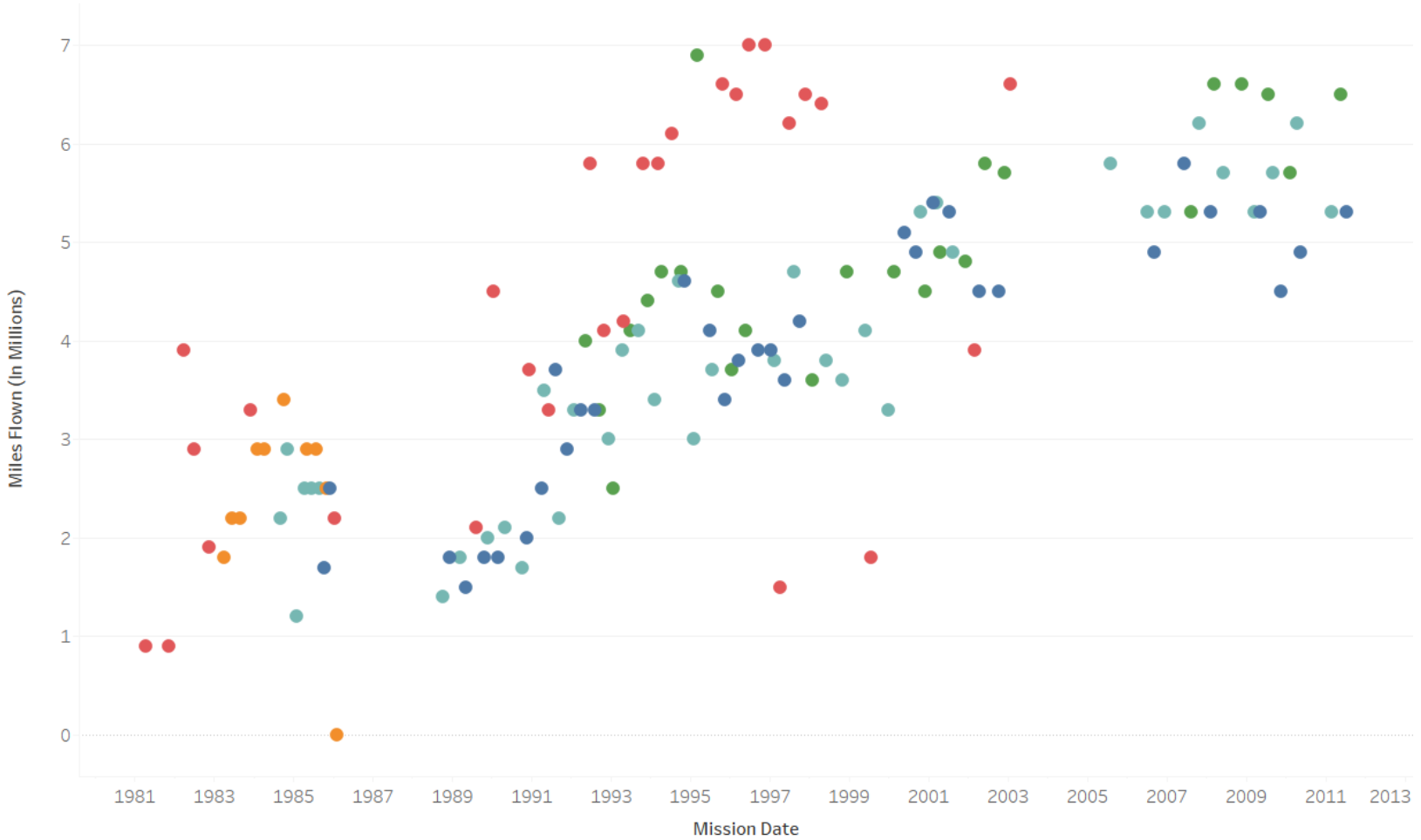




Source: Kelly Schultz, University of Toronto Libraries. *Introduction to Tableau* [Workshop].

History of the American Shuttle Program

Interactive Visualization



Data Source: Joque, J and Saylor, K (2017). Picture It! Data Stories in Visual Form. ICPSR Biennial Meeting.

Tableau Demo

Learning More

Matthew Gertler (Business Librarian) – matthew.Gertler@Carleton.ca

- LinkedIn Learning – Offers Tableau minicourses for Carleton Students
- Tableau.com - Free training videos

Thank you!