# Communicating with Data – Storytelling

Dr. Ab Mosca (they/them)

#### Plan for Today

- Mid Semester Project pins
- Narrative structures
- Narrative structures in visualization
- Roles of the reader and the author

#### Mid Semester Project

• Let's make some pins

Storytelling with visualization



#### Discussion

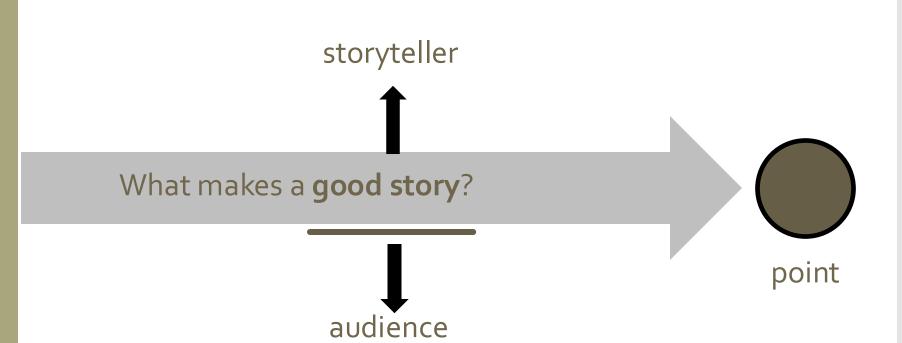


## Story teller & Audience





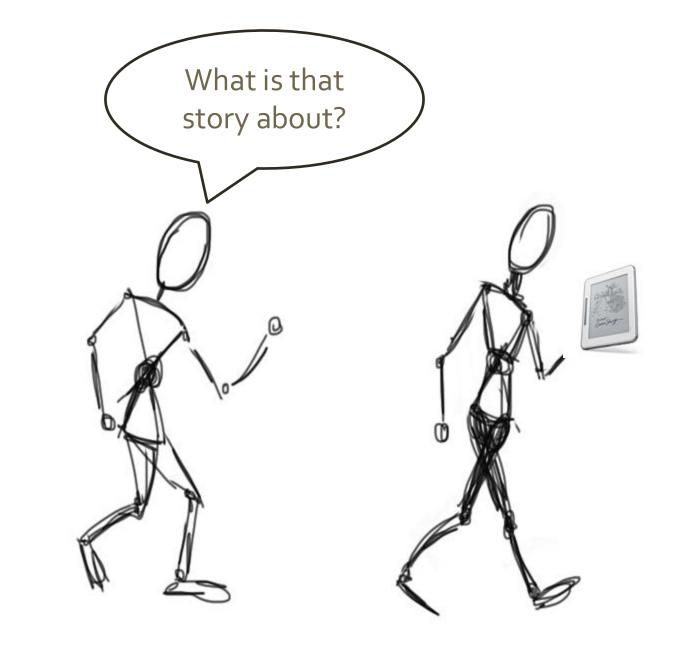
#### Discussion

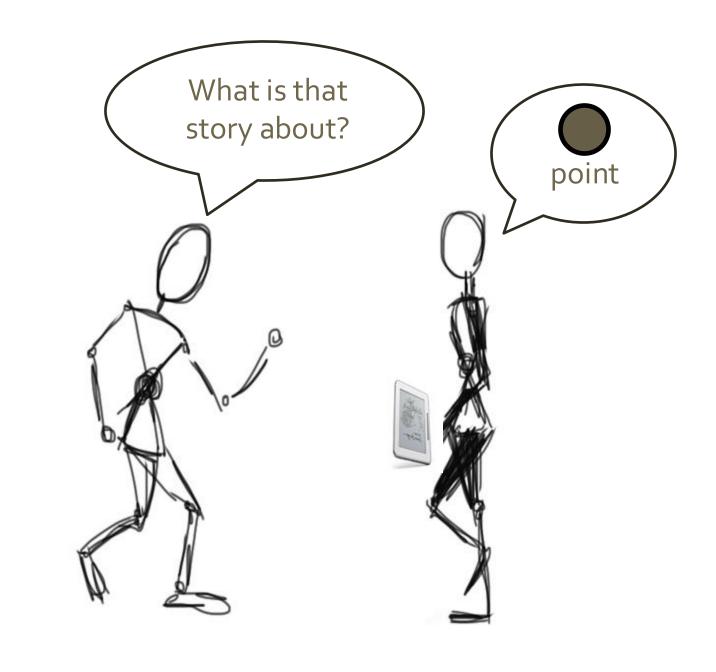


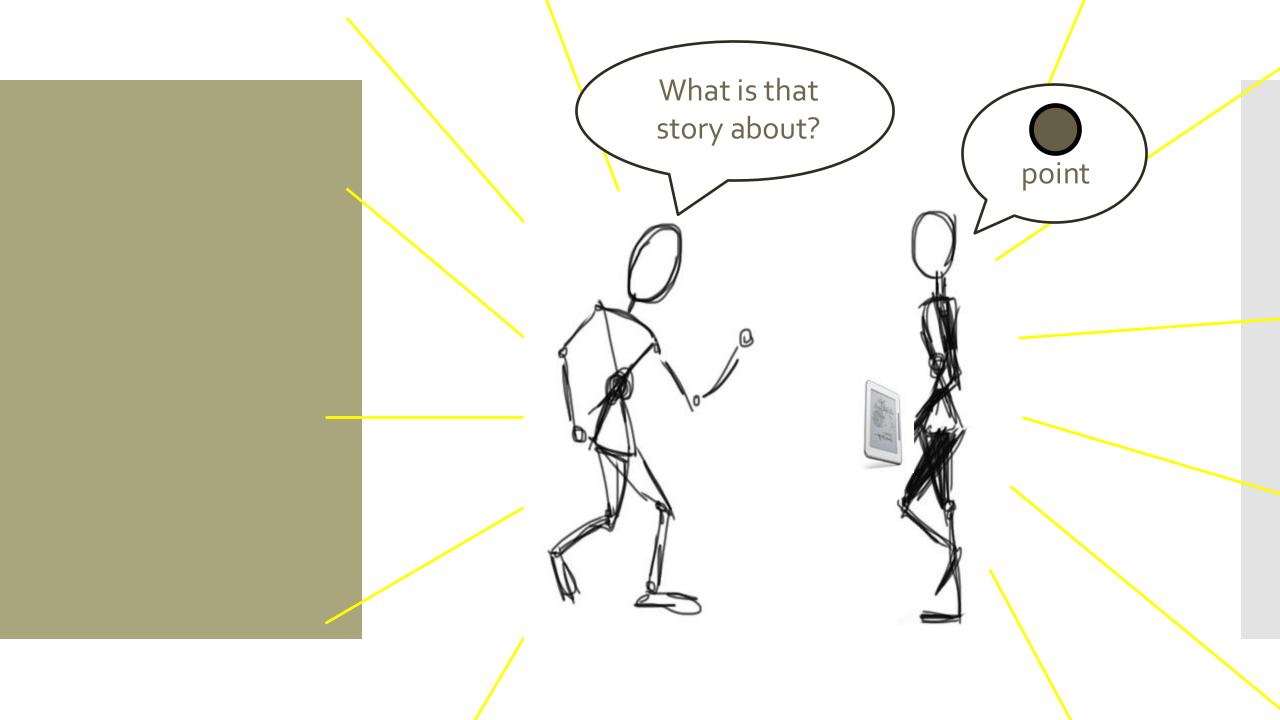




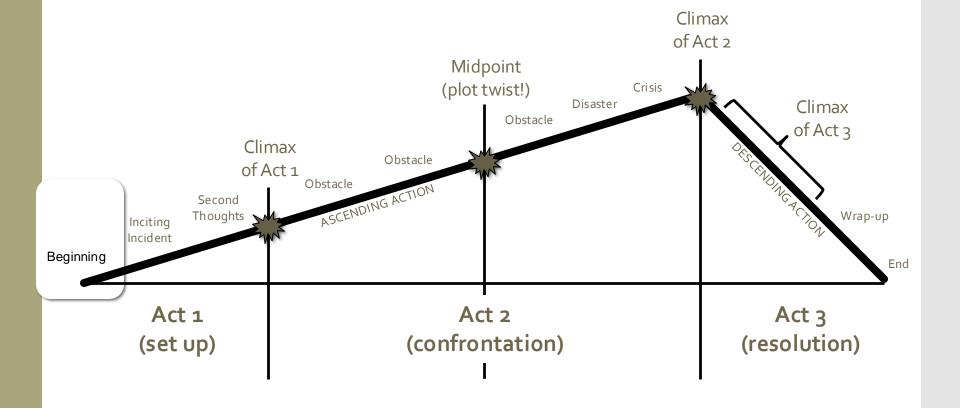






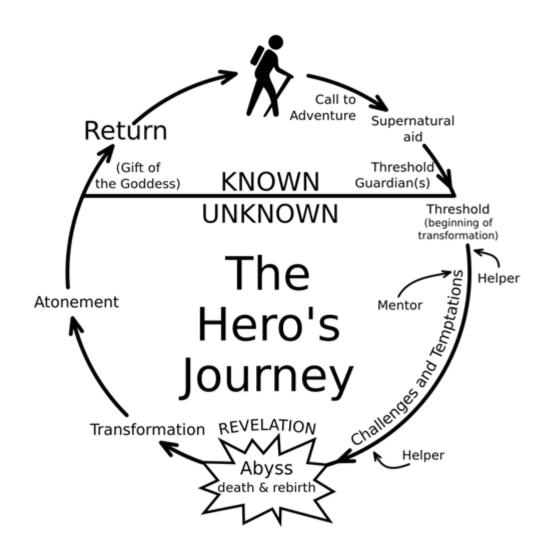


Ways to get to the point

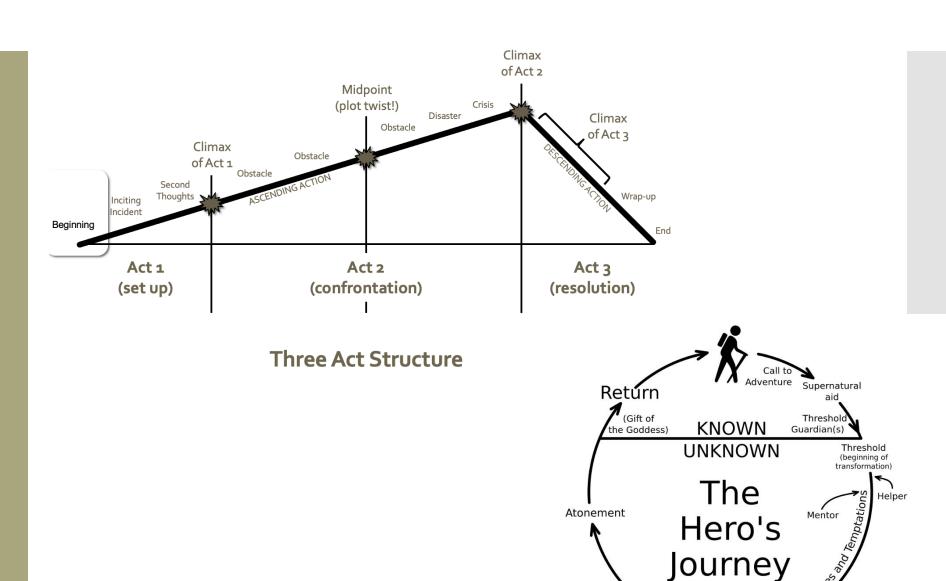


**Three Act Structure** 

## Ways to get to the point



### What movies use what arc?



Transformation

death & rebirth

And a bunch of other stuff, too...



Doesn't default to an easy solution

Goes beyond the five senses

Inner struggle

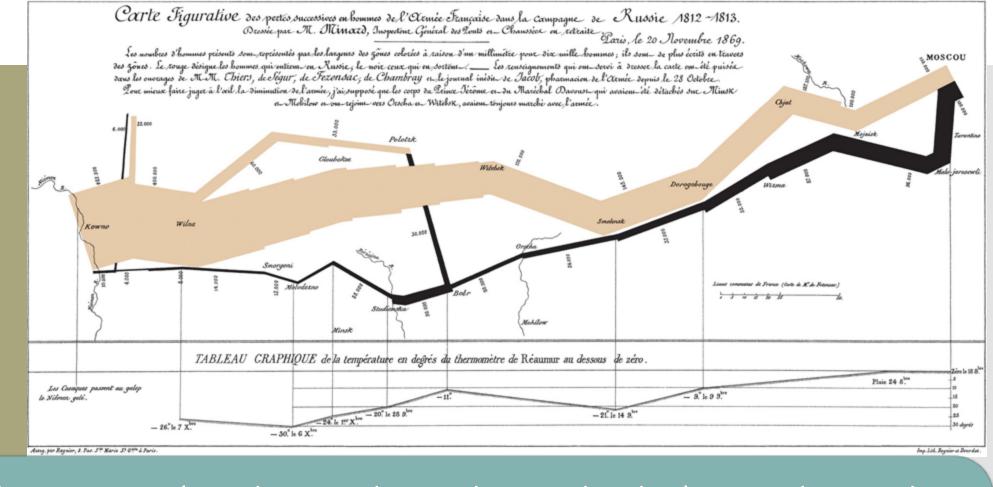
Storytelling with visualization



#### Discussion

Apast Many 100   INSTITUTE	TORONTO CANADA TORONTO CANADA TORONTO CANADA	O CANADA Pr	roduct De None		-	Vone Vone	None	None	Moderate		None	None	None	High
			FOOUCE DIS NUMBER	Norse	None 15									
Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   A Operational   O   72   35   6987   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   22   26   6940   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   24   23   6970   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   24   35   6970   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   24   35   6970   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   24   25   6970   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   24   25   6971   700C   T   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   4   4   4   4   4   4   4   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   4   4   4   4   4   4   4   4   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   4   5   6   6   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   4   5   6   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)000   Pic.   St.   Operational   C   4   5   6   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)001   Pic.   St.   Operational   C   4   5   6   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)001   Pic.   St.   Operational   C   4   5   6   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)001   Pic.   St.   Operational   C   5   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)001   Pic.   St.   Operational   C   5   7   7   7   7   Asset Maria Pic   No.5711   Pic (Blossal, 901)001   Pic.   St.   Operational   C   7   7   7   7   7   7   7   7   7	TORONTO LEANADA - L						Low	Moderate	Moderate	Moderate		None	None	Litter
Asset Marie Fic			dministra None	None		Vone	Moderate	Moderate	Moderate	Moderate	Low	Low	Low	Litter.
March March   Pric   MSTP    Pric (Stricks) P0133002   Pric   Fred Operational C   24   34   6940   700   The March March   Pric   MSTP    Pric (Stricks) P0134001   Pric   Pri	TDRONTO CANADA		ystams in None	None	None A	Vone	None	None	None	None	None	None	None	None
Master Manuel Pick	TORONTO CANADA		ommunica None	None	None h	Vone	None	None	None	None	None	None	None	None
Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Trappent) A   0   4   6977 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Trappent) B   4   27   6977 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) B   4   40   6977 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) B   4   40   6977 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) P0140   4   8   9487 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) P0140   4   1.5   6979 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) P0140   4   1.5   6079 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014000   NIC; 1-5 - 01 (Supent) P0140   4   1.5   6079 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014001   NIC; 1-5 - 01 (Supent) P0140   4   8   6987 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014001   NIC; 1-5 - 01 (Supent) P0140   4   5   6070 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014001   NIC; 1-5 - 01 (Supent) P0140   4   5   6070 100C. TI   Alest Maria Fic.   NSTTI   NIC (SINIAR) P014001   NIC; 1-3 - 01 (Supent) P0140   7   7   7   7   7   7   7   7   7	TDRONTO CANADA	D CANADA Pr	roduct De None	None	None A	Vone	None	None	None	2kone	None	None	None	None
Select Many   FC   NSTTI	TDRONTO CANADA	O CANADA Sa	ales None	None	None A	Vone	Low	Low	Low	Low	None	None	None	None
Mater March   Proc.   NSTP1   Proc. (S) MICKER   POLITICOS   Proc.   To.   Society	TORONTO CANADA		echnology Name			Vone	None	None	None	None	None	None	None	None
Select Many   Fix   No. 1977   No. 1971	TORONTO CANADA		echnology Name			Vone	None	Low	Low	Moderate	None	None	None	None
SIREM MAN   PKC   NOTTE   PKC DELEAK   PD114009   EKC   ST   Operations   B   B   DRED TOX	TORONTO CANADA		all Center None	None		Vone	Low	Low	Moderate	High	None	None	None	None
September   Miles	TORONTO CANADA		ash Manu Low	Low		OW.	None	High	High	Made	None	High	High	High
See	TORONTO CANADA		ocument None				None	Moderate		Mode	None			
Seek March 976   No.	TORONTO CANADA		PORT OF THE PROPERTY OF THE PR	High		righ.			High	regn	110000	High	High	High
See Name   Price   No.   Price   Pri			dministra None	None		OW	None	None	Accessor to the second second	Moderate	Nane	None	Low	L/JW
SIREM MARK   PK   NOTTH   NO	TDRONTO CANADA		drymatra None	None	Charles and the same of the sa	OW	None	None	Moderate	Moderate	None-	None	Low	Moderate
BIRK Mark   PKC	TORONTO CANADA		afationshi None	Low		tigh	None	High	High	High	None	1.0ve	Moderate	High
Internation	TORONTO CANADA		all Center None	None		Yone	None	None .	None	None	None	None	None	None
Internation   Text	TORONTO CANADA	D CANADA 34	ates None	None	None N	Yorke	None	None .	None	None	None.	None	None	None
Met Man   Fic.   NoTT	IDRONTO FANADA	O FANGOA LIN	Sumain Real Name	District	Norte A	Spine	None	None	None	None	None	None	None	None
Instrument   Ins							None	None	None	None	None.	None	None	None
Mart   Mart   Mic   No.   No							None	Moderate	Moderate	Moderate	None	Moderate	Moderate	Moderate
## Maria Pric   NOTE							None	None	None	None	None	None	None	None
## Maria Pric   NOTT							Low	Low	Line	Low	Moderate	Moderate	Moderate	Moderate
## Maria Pic   No.511   ## Maria Pinico   Parico   ## Maria Pinico							High	High	Moderate	Low	Low	Low	Lthw	Low.
Manu   FIC							Moderate	Moderate	Moderate	Moderate	None	None	None	None
Manu   FIC   NOTE							None	None	None	None	None	None	None	None
						-	Part of the last o		Control Control	The state of the s	Access to the second		-	-6
	6345	2+2	CTO	KV/2		E.	Low	Moderate	Moderate	Moderate	None:	Low	Low	Libw.
		GLG					None	None	LOW	Low	None	None	None	None
Name   PARTICES   PA							High.	High	High	1691	High.	High.	High.	High
Manic SMIRCS							None	None	None	None	None	None	None	None:
Manual Park							None	None	None	Low	None	None	None	None -
Manu PARICG							Moderate	Moderate	Moderate	Moderate	None:	1,0xe	Low	Litror.
Manic   Millico   MMTIN   Marco   MMTIN   MM							High.	High	High	High	High.	High:	High.	High
Manic   Millico   MMTIN   Marco   MMTIN   MM							None	Cow.	Lówi	Moderate	Low	100	Low	Listw.
Manil SARIEGO   FAMILIAN							None	None	Nove	None	None	None	None	None
Man   MilCo							None	Note	None	None.	None	None	None	None
6 Mano FARICCO         PMREJEM         MMCCO         FAME FINE FINE FARE         0         191         1360 TS21         V           6 Mano FARICCO         FMREJEM         FMREZO         FAME FINE FIT Blustness         Operational         0         30         39         9242 V4G         B           6 Mano FARICCO         FMREJEM							None	None	Name	None.	None	None	None	None
Manu AMRCO	OF THE MAIN UNITED STA	10-1000 mm = 100	the Control of Street,	Tiral	Mark I	100		A classical and a second		4-constant			4-07-0-0	- COCO
6 Marci FARRICO         IMPRISON         MARCO SINARION         MARCO SINARI	CONTRACTOR OF THE PARTY OF THE		perationa Name	None	None 3	Yorke	High None	None:	High None	None	None	None	High: None	High
Manu - Millor   MM   MM   MM   MM   MM   MM   MM			April 10 Control of the Control of t		the second secon				**************************************	and the parameter			100000000000000000000000000000000000000	None:
Maint AMIRCO			perations High	High		righ:	High.	High	High	High	High.	High:	High:	High
Mani PMRCO		en deren en oproper op de pre	rading High	High.		righ:	10g5s	High	High	High	High.	High	High:	High
Manic Ministo   Ministrat   Ministrat   Ministrat   Manic	DURHAM UNITED STA	A JUNITED STATE	echnology None	None	Secretarion and the second	4ome	None	Note	None	None	None	Nome	None	None
Manis Minico	BOSTON UNITED STA	and the second second second second	rading High	High:		Figh:	High.	High	High	High	High.	High	High	High
Main Minico	BOSTON LINITED STA	LIMITED STANS	turnan Res None	None	None A	Yorke	None	DOW.	Moderate	Moderate	None	10%	Lizher.	Lister.
Mani / MilCO	BOSTON UNITED STA	UNITED STATE	echnology None	None	Nome: A	Vomet	None	Norse:	Noise	None	None	Nome	None	None
Mani   MMCG   FMITPM   FARICE   FMR, IMI,   Asset Man   Operational A   D   T   BEDD V100   B   Mani   AMACO   FMITPM   FARICE   FMR, IMI,   Interestinent Operational D   72   21   9074-V9A   B   9074-V9A   B   Mani   MMCG   FMITPM   FARICE   FMR, IMI   Interestinent Operational B   T   24   26822-T31E   Mani   MMCG   FMITPM   FARICE   FMR, IMI   FMITPM   FARICE   FMR, IMI   FMIT   FMIT   FARICE   FMR, IMI   FMIT   FM	BOSTON UNITED STA	LINITED STAW	westment None	None	None 3	Vone:	None	Note	None	None	Low	1.0ne	Moderate	High
Mani   MiRCo   FMRIPM   FMRCs   FMR   IP   Investment Operational D   72   11   9074 VIA   B   Mani   MiRCo   FMRIPM   FARRCS   FARR   IP   Investment Operational B   1   24   26822 TS1E   N   Mani   MiRCo   FMRIPM   FARRCS   FARR   IST   Asset Ment (IT Support A   D   136   54965 VIB B   Mani   MiRCo   FMRIPM   FARRCS   FARR   IST   Asset Ment (IT Support A   D   126   24965 VIB B   Mani   MiRCo   FMRIPM   FARRCS   FARR   MARCO   FARR   MARCO   FARR   MARCO   FARR   MARCO   MARC	BOSTON UNITED STA	UNITED STAIN	westment High	High.	High: It	figh:	None	Moderate	Moderate	Moderate	None	None	None	Name
Maint AMICO	BOSTON LINITED STA	and the contract of the contract of the	casi High	High		Figh	None	Noise	Name	None	High.	High.	High	High
Mani PMICO	BOSTON LINITED STA	and the second second second	Inancial 54 None	None		Yorke	None	Noise	Name	Lów	None	Norter	None	Nane:
Mani J Milico   FMX19M   FMRCe   FMR, IST   Asset Mani IT Support   A	MERRIMAC UNITED STA		telepartisonal Low	Low	-	Date:	Moderate	High	High.	High	Moderate	High	High	High
Maint AMINCO	BOSTON LINITED STA	CAR DOLLOW THE CA	artinophia Many	1000	2011	Yorke Yorke	None	Note	None	None	None	None	None	None:
Maril JMINCO   FMRIPM   FMRCE   FMR OR   Operational Operational B   E   18   12512 VPA   B	DURHAM UNITED STA		echnology None			Yone Yone	None	None:	None	None	None:	10000	None	None:
Maril JMRCO			echnology None	Norse.		Marie Comment	0.000		(repolitions)			None	-	-9-10-0
Main   MiliCo	CONTROL TO STATE OF THE		ruk Manag None	None		,0ve/	None	Note	LOW	Low	None	None	(TDA)	Life.
Maris AMICO         FAMILY         FA	WESTLAKE UNITED STA		Inancial 54 None	None		Vone .	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderati
Maris MMICO   FMM35M   FMMCC   FMM, PM   Product Gol Operational O   72   30   6091 V30M   9			echnology None	None		Yorne	None	Noise	None	None.	None:	None	None	None:
Manif AMIKCo   FARLISM   FARCE   FMR GA   Quality Asis   Operational O   \$380   220   14998 VPC   0	BOSTON UNITED STA		roject / Pr None	None		4ome	None	Noise	Name	None.	None	None	None	None
Manif AMINCo   FRATIJAM   MARCO   MAR, TO   Treasurer's Operational A   0   40   321 4 V30   9   Manif AMINCo   FRATIJAM   FAMICO   FAMI	BOSTON UNITED STA	UNITED STAPS	roduct None	None	None A	4ome	None	Noise	Name	None.	None:	Nome	None	Nane:
Mani, FMRCo         FMRISM         FMRICE         FMR, TRM         Information (Emergency A.         0         32         9498         99C         9           Mani, FMRCo         FMR, TSOC Infrastruct (Emergency A.         0         68         21570         NMAAA. D.         0AA. P.S. (AAA. P. Foods) Operations         0         25         4         7134         V30. D.         9           Mani, Global Assid STRTST         Global Assid GAA. R.         Resistantial Operations         0         25         3         7134         V3E. D.           Mani, Global Assid STRTST         Global Assid SAA. A.         Admini Flat Operations         72         5         7134         V3E. D.           Mani, Global Assid STRTST         Global Assid SA. EM.         Electrifier N Operations         0         25         3         7134         V3A. D.           Mani, Global Assid STRTST         Global Assid SA. EM.         Electrifier N Operations         0         8         6         7134         V5O. D.         9           Mani, Global Assid STRTST         Global Assid SA. S. S. A.         Adminior Control of Co	BOSTON UNITED STA	UNITED STATE	buildry Chy None	None.	None A	Vome .	None	Noise	Name	None:	None:	Nome	None	Nane:
Mand FMRCO         FMRIJM         FMR	BOSTON UNITED STA	UNITED STATE	reasory High	High.	High: 9	righ.	High	High.	High	High	High:	High.	High	High
Manif AntiCo			ontinuity Nane			Yorke	None	Noise	Name	None:	None:	None	None	None
Mann Global Assol STRTST         F134 V13E         B         12 P134 V13E         B           Mann Global Assol StRTST         Global Assol MKS_SPM Institution Operations Q         72         5 T134 V13E         B           Mann Global Assol STRTST         Global Assol SAL_A         A drimin Flart Operations Q         25         14         T134 V1A         B           Mann Global Assol STRTST         Global Assol SAL_EM         Executive N Operations Q         8         6         7134 V5O         B           Mann Global Assol STRTST         Global Assol SAL_M         SAL Invested Operations Q         330         12         7134 V5C         B           Mann Global Assol STRTST         Global Assol SAL_IM         SAL Invested Operations Q         0         29         7134 V5C         B			echnology Nane	None		ione	None	Noise	Notes	None	None	None	None	None:
Asing Global Asing STRTST         Global Asing GARA, IR         Research         Operations(8)         B         32         T134         V1E         9           Asing Global Asing STRTST         Global Asing Asing Asing Asing Asing Garage	Company of the Compan		trategic by None	None	PC-0-10-10-10-10-10-10-10-10-10-10-10-10-1	Yorke	None	Noise	Nesher	None	None	Norter	None	None:
Aland Global Assid STRTST         Global Assid SMCS : 9M Institutional Operations Q         7Z         9         73.34 VSA         9           Aland Global Assid STRTST         Global Assid SAL, A         Albrein Flat Operational Q         2S         24         71.34 VSA         9           Aland Global Assid STRTST         Global Assid SAL, EM         Exception to Operational Q         8         6         72.34 VSO         9           Aland Global Assid SAL SS         SAL Financic Operational Q         330         12         71.34 VSO         9           Aland Global Assid SAL, SS         SAL Financic Operational Q         330         12         71.34 VSO         9           Aland Global Assid SAL, SS         SAL Financic Operational Q         0         29         71.34 VSO         9			usiness At None		100000000000000000000000000000000000000	fone	None	High.	High	High	None	High	High	High
Ann Global Asso STRTST         Global Asso SAL A         Admin Flat Operational D         25         14         7134 VSA         9           Asso Global Asso STRTST         Global Asso SAL EM         Esecutive N Operational D         8         6         7134 VSO         9           Asso Global Asso STRTST         Global Asso SAL SAL SAL FIRMAN D         530 Firman Q Operational D         330         12         7134 VSO         9           Asso Global Asso STRTST         Glo	Control of the Contro		Asnassma None	None.	-	ione	None	None	None	None	None:	None	None	None:
Many Global Associating         Global Association         Empty Service			dministral None					None:	100000000000000000000000000000000000000	None	None:		None	
Mani Global Assid STRTST         Global Assid SA: PS         SAI Financi Operational O         330         12         7134         V5O         B           Mani Global Assid STRTST         Global Assid SA: JM         SAI Investor Operational A         0         29         7134         V5C         B	Control of the Contro	and the second second second second	The second secon	None.		40me	None		None	Annahia in the same of		None	-	None:
Man Global Asso STRTST Global Asso SAL M SAL Investre Operations A 0 29 7134 VSC B			Aunagamo None	None.		Pone	None		Moderate	Moderate	None:	None	None	None: -
			Inince None	None:	74	Pone	None	None:	None	None:	None:	None	None	None:
Annaton and starter I from a society of the form of the society of	BOSTON UNITED STA		overtinent Low	LOW		Only	Low	Moderate	High	High	Low	Moderate	High	High
	BOSTON UNITED STA	JUNITED STAN	ortfolio M None	None.	None 5	Forse	None	None	None	None-	None:	None	None	None: -
Mand Global Assd STRTST Global Assd SAL_PMI   Portfolio M Operational B   S   7134 VSA   B	BOSTON UNITED STA	UNITED STAN	ortfolio M Low	Low	Low L	OW.	None	High	High	High:	None:	High	High	High
	BOSTON UNITED STA	UNITED STAPE	ortfolio M None	None .		Owl .	Low	Moderate	High	High:	Low	Moderate.	High	High
	SMITHFIELEUNITED STA		Surketing None			OW.	None	None	None	None	None	Norter	None	None
	SMITHER ELECTIVITED STA	THE STREET STREET	latomer \$ Sone			figh	None	Moderate	Moderate	Hinds	None:	Moderate	Moderate	Modera
THE PARTY STREET AND STREET	Statistics with Buast Pro- Stol	THE STATE OF THE SE		Low		vign. Voderate	None	None	Total	Low	None:	Ninosser acta.	Money	None
									LOW		None	170074	None	
	SMITHFIELS UNITED STA				None C	.016	None	None Moderate	Moderate	Moderate	None.	74oner	None	Note: Moderal

#### Napoleon's March

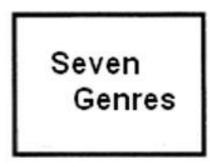


"Probably the best statistical graphic ever drawn, this map by Charles Joseph Minard portrays the losses suffered by Napoleon's army in the Russian campaign of 1812. Beginning at the Polish-Russian border, the thick band shows the size of the army at each position. The path of Napoleon's retreat from Moscow in the bitterly cold winter is depicted by the dark lower band, which is tied to temperature and time scales." - Edward Tufte

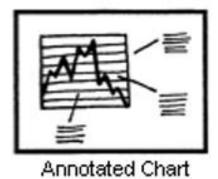
## Design Space of Narrative Visualization

- 1. Genre
- 2. Visual Narrative Tactics
- 3. Narrative Structure

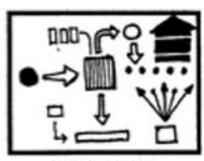
#### Genre

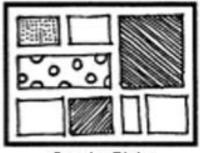


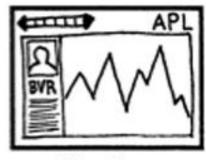














Flow Chart

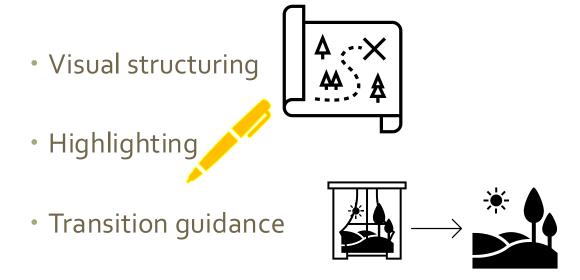
Comic Strip

Slide Show

Film/Video/Animation

#### Visual Narrative Tactics

Visual devices that assist and facilitate the narrative



#### Narrative Structure

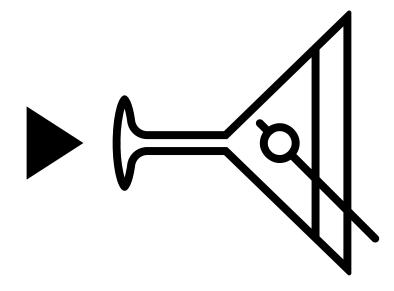
**Author Driven** 

Reader Driven

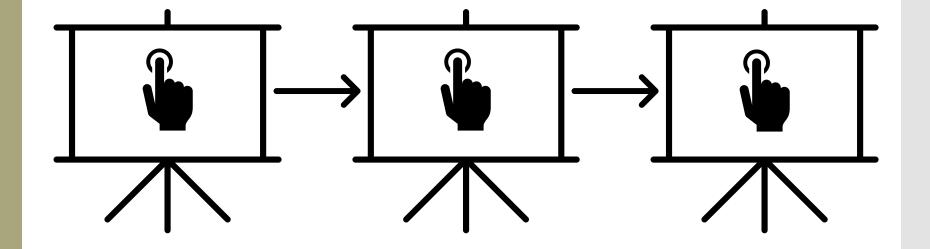
- Linear ordering of scenes
- Heavy messaging
- No interactivity

- No prescribed ordering
  - No messaging
  - Free interactivity

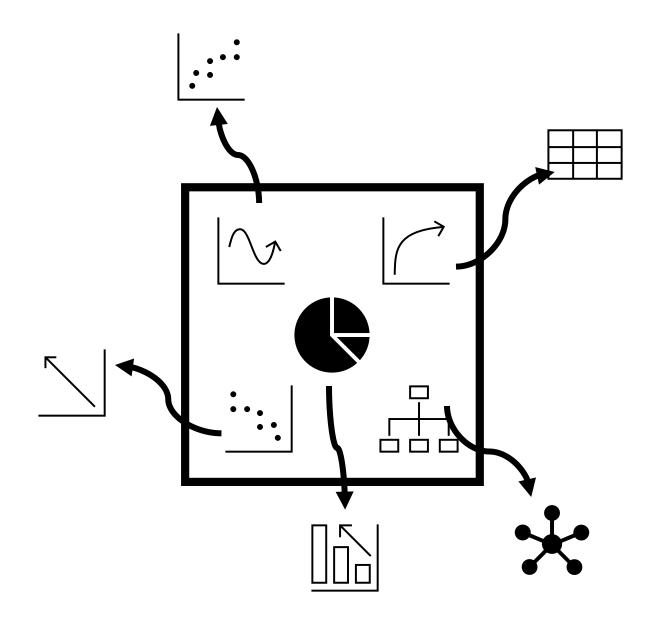
Narrative Structure: Martini Glass



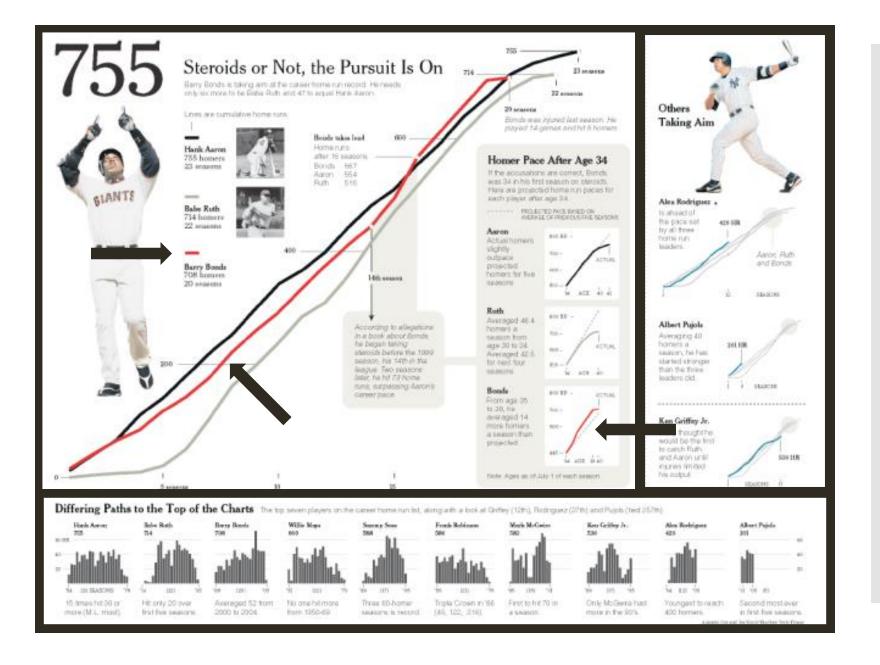
Narrative Structure: Interactive Slide Show



Narrative Structure: Drill-Down Story



## Example: Baseball (static)



Example:
Wealth
inequality in
the US
(animated)



https://youtu.be/QPKKQnijnsM?si=j\_hPOOslxFGkNgHM

Example:
Wealth
inequality in
the US
(interactive)



https://www.npr.org/sections/money/2015/02/11/384988128/the-fall-and-rise-of-u-s-inequality-in-2-graphs

#### Practice

- Work in small groups or pairs
- Pick a topic of interest to you
- Sketch 3 possible narrative visualizations for your topic
  - One should be primary author-driven
  - One should be primarily reader-driven
  - And the last should be somewhere between